CAZALY RESOURCES LIMITED

PARKER RANGE IRON ORE PROJECT

MT CAUDAN DEPOSIT

PUBLIC ENVIRONMENTAL REVIEW

November 2010
Public Release, Revision E

DOCUMENT HISTORY

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Cover photos have been sourced from Cazaly archives, HWE Mining, Pacific National Bulk Rail and Fremantle Ports, replicated with permission for this report.

This report also includes contributions provided by a range of supporting consultants including (in alphabetical order) Botanica Consulting, Ecotech Pty Ltd, Greenbase Pty Ltd, Herring Storer Acoustics Pty Ltd, HWE Mining Pty Ltd, Independent Metallurgical Operations Pty Ltd, Rockwater Pty Ltd and Runge Limited. The assistance and contributions of these supporting consultants is acknowledged and appreciated.

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INVITATION TO MAKE A SUBMISSION

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal. Both electronic and hard copy submissions are most welcome.

Cazaly Resources is proposing to mine iron ore from the Parker Range deposit, Marvel Loch. In accordance with the *Environmental Protection Act 1986 (EP Act),* a Public Environmental Review (PER) has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of six weeks from 29 November 2010 closing on 10 January 2011.

Comments from government agencies and from the public will help the EPA to prepare an assessment report in which it will make recommendations to government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal. All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence, subject to the requirements of the *Freedom of Information Act 1992 (FOI Act)*, and may be quoted in full or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposal. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements of the PER:

- Clearly state your point of view;
- Indicate the source of your information or argument if this is applicable;
- Suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- Attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- Refer each point to the appropriate section, chapter or recommendation in the PER;
- If you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- Attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- Your name;
- Address;
- Date; and
- Whether and the reason why you want your submission to be confidential.

Information in submissions will be deemed public information unless a request for confidentiality of the submission is made in writing and accepted by the EPA. As a result, a copy of each submission will be provided to the proponent but the identity of private individuals will remain confidential to the EPA.

The closing date for submissions is: 10 January 2011.

The EPA prefers submissions to be made electronically using one of the following:

- By email to submissions.eia@epa.wa.gov.au
- By email to the officer Ms Helen Dagnall – helen.dagnall@epa.wa.gov.au

Alternatively, submissions can be:

- Posted to Chairman, Environmental Protection Authority, Locked Bag 33, Cloisters Square, WA 6850 (Attention: Ms Helen Dagnall).
- Delivered to the Environmental Protection Authority, Level 4, The Atrium, 168 St Georges Terrace, Perth (Attention: Ms Helen Dagnall).
- Faxed to (08) 6467 5556 (Attention: Ms Helen Dagnall).

If you have any questions on how to make a submission, please ring the EPA Assessment Officer, Ms Helen Dagnall on (08) 6467 5416.

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EXECUTIVE SUMMARY

The Parker Range Iron Ore Project – Mt Caudan Deposit (Project) is located approximately 52 km south of Southern Cross and 15 km south-east of Marvel Loch townships in the Yilgarn region of Western Australia. The Perth-Kalgoorlie rail line is approximately 60 km to the north-west of the Project, with rail services to the ports of Kwinana and Esperance.

Cazaly Resources Limited (Cazaly) has 100% iron ore development rights for the Project and proposes to develop the Mt Caudan deposit which contains an estimated 30 million tonnes of iron ore with an expected mine life of 7-10 years at a production rate of 4 million tonnes per annum. Mining is scheduled to commence in quarter 1 in 2011.

The Project includes the development, operation, decommissioning and rehabilitation of:-

- A single mine pit.
- One overburden waste landform (constructed of un-mineralised earth materials).
- Operational areas for ore stockpiles, internal mine roads, plant, infrastructure, administration facilities and amenities.
- A road train ore haulage road, consisting of an upgraded public and new private road.

Cazaly have signed a Memorandum of Understanding with HWE Mining Pty Ltd (HWE) for the co-development of the Project, which may lead to an 80% Cazaly and 20% HWE Mining Pty Ltd joint venture. This Public Environmental Review (PER) Environmental Impact Assessment (EIA) has been prepared in consideration of HWE Environmental management systems, procedures, policies and iron ore experience.

Summary of Impact Assessment

This document has been prepared in accordance with EPA (2008a) for the purposes of an impact assessment of the Project proposal under s40(2)(b) of the *Environmental Protection Act 1986 (WA)*. The Project's environmental, social and economic impacts are assessed.

This EIA document identifies that the Project will have a non-significant impact on environmental and social factors. The Project has substantially increased the State's biological knowledge base and contributed to the conservation of threatened species following extensive survey activity. The Project also has positive benefits on economic factors associated with the proposal. Overall the Project will have a net gain for the environment, society and the economy.

Cazaly has developed specific plans to manage adverse impacts. Key management actions are detailed in the Environmental Management Plan (M8521-G00-EN-PL-001) for the proposed Project development. The tables below summarise the proposal's main elements and provide an assessment of the proposal's environmental, social and economic factors.

In addition to Cazaly's environmental policies, several management commitments are provided for environmental and social factors (summarised in Section 9.0 of this report).

Summary of the Main Elements for Parker Range Project

Element	Description
Life of Project	7 -10 years (current JORC resource and Export Port Capacity)
Mining Resource	30 Mt
Mining Method	Open pit
Mine Operation	Continuous
Depth of Pit	Up to 135 m
Depth to Water Table	60 m (365 mRL)
Total Area of Disturbance	421 ha (approx)
List of Major Components: Pit Process plant Waste rock landform Tailings storage facility	 Open pit, 4.0 km (L) x 0.4 km (W) x 135 m (D) Mobile Crushing and Screening (year 1) replaced by Permanent Crushing and Screening with Wet-Plant/Beneficiation (year 2+) Contour profiled 2.0 km (L) x 0.5 km (W) x 45 m (H – maximum) Up to 1 Mm^3 capacity 350 m (W) x 350 m (L) x 8 m (H) – 4 lifts
Ore Mining Rate	4 Mtpa (nominal), 4.6 Mtpa (max)
Total waste rock	55 Mt (approx)
Dewatering Rate (approximate)	14 L/s – mine pit
Water Supply: Source Maximum daily requirement Maximum annual requirement	 Pit Dewatering Bores Supply 1.1 ML/day (year 1) then 1.8 ML/day (year 2+) 321 ML/year (year 1) then 506 ML/year (year 2+)
Power Generation and Requirements	Initially diesel generation (during construction and initial operation), then 33 kV Grid power from Marvel Loch
Fuel Supply	Fuel Bunkers (nominally 2 x 55 kL).
Ore Haulage	57 km, 14 road trains
Operating Hours	24 hrs per day, 7 days per week
Operations Workforce	159 people (114 average on-site)
Construction Period Construction Workforce	Up to 12 months Up to 250 people (peak)
Construction commencement (anticipated)	January 2010

Item	Environmental Factor	Existing Environment	EPA Objective	Potential Impacts	Proposed Environmental Management	Predicted Outcome
	Biophysical					
1.	Landform and Soils	Project is located in major valley incised in the less resistant granitoid dome, with BIF ridges rising up to 475 m ASL. Soils are of red-yellow loamy and sandy earths. Landform and soils study completed in Project area.	To maintain the integrity, ecological functions and environmental values of the soil and landform. Ensure that rehabilitation achieves an acceptable standard compatible with the intended land use, and consistent with appropriate criteria.	Increased soil erosion due to clearing activities. Changes in soil structure. Reduced viability of seeds due to inappropriate stockpiling activities.	Topsoil integrity will be managed and preserved during removal and storage. Waste landforms will be designed to be consistent with natural topography. Progressive rehabilitation of disturbed areas (topsoiled, deep ripped on the contour and respread with vegetation). During revegetation process, the sites will be seeded with local native species. Topsoil condition beneath and along-side haul roads will be monitored. On long broad slope profiles, erosion control banks to be installed to control rainfall runoff from causing erosion on downslope.	Project presents a Non-Significant impact for landform and soils.
2.	Vegetation	Project is within the Coolgardie and Avon IBRA bioregions. Project located within Parker Range Priority Ecological Community (PEC) and Great Western Woodlands. Vegetation studies completed in Project area and PEC region.	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	Direct or indirect impacts leading to a loss or a fragmentation of vegetation community biodiversity within the natural environment. The Project will result in 421 ha of vegetation clearing. Vegetation communities are represented with clearing being 0.7% of PEC and 0.003% of the Great Western Woodlands in area.	Vegetative material and topsoil will be collected and correctly stockpiled for later use at selected sites. Procedures will be developed and implemented to minimise clearing. All staff and contractors will be environmentally inducted and trained on clearing procedures. Cazaly Environmental staff will supervise vegetation clearing works. Traffic will be restricted to established roads and parking areas so as not to disturb vegetation. Completed areas will be progressively rehabilitated as soon as practicable. Only local native plant species and local provenance seed will be used for rehabilitation.	Project presents a Non-Significant impact for vegetation.
3.	Flora	Project located within Parker Range PEC. Completed flora studies have detected 268 flora species in 120 genera representing 48 families in Project area. Flora species are well represented in the PEC region. *Isopogon robustus* (DRF) adjacent to Project area.	Maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge.	Direct or indirect impacts leading to a loss or reduction of DRF or Priority threatened flora affecting the biodiversity of the natural environment. No populations of DRF will be impacted. Of all Priority flora, <13.9% impact on any individual species based on known regional populations.	Project footprint designed cognisant of known GPS locations of DRF and Priority flora species. Development and implementation of DRF Management Plan. Clearing procedures which clearly mark Priority flora to minimise over-clearing. Staff and contractors attend compulsory environmental inductions. Health monitoring program for DRF and Priority flora. Restricting traffic to established roads and parking areas so as not to disturb flora. Prior to clearing, native seed will be collected for rehabilitation.	Project presents a Non-Significant impact for flora.

Item	Environmental Factor	Existing Environment	EPA Objective	Potential Impacts	Proposed Environmental Management	Predicted Outcome
4.	Weed Species and Dieback	Four weeds are within the impact area (not listed as declared weeds by DAFWA). Dieback is not anticipated due to climate. Weed surveys completed in Project area.	Avoid introduction of invasive weeds which may have a negative impact on native vegetation communities.	Introduction or spread of weed species leading to a loss, degradation or alteration of vegetation and fauna habitat from natural environment. Introduction or spread of dieback leading to a loss, degradation or alteration of vegetation and fauna habitat from natural environment.	Identification of weed infestations or areas susceptible to infestation adjacent to or within the proposed disturbance area. Restriction of vehicular access to designated tracks. Ensure vehicles that access the Project site are free from soil and vegetation prior to arrival. Eradication of weeds where necessary following approved control mechanisms. All staff will be advised of potential weed species during the induction process and advised to report any incidence of weed establishment. Regular monitoring/maintenance of the mine area and road for the establishment of weed species will be undertaken during construction and operation.	Project presents a Non-Significant impact for weeds species and dieback.
5.	Terrestrial Fauna	Known species in area, including Malleefowl, White-browed Babbler and Western Rosella. Similar habitat exists in surrounding area and region. Completed terrestrial fauna studies in the Project area.	Maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge. Protect specially protected (threatened) fauna consistent with the provisions of the *Wildlife Conservation Act 1950*. Protect other fauna species of particular conservation significance (e.g. range extensions).	Direct or indirect impacts leading to a loss or reduction of significant terrestrial fauna species in the natural environment. Direct or indirect impacts leading to a loss or reduction of fauna habitat in the natural environment. Fauna habitat not restricted to the Project area but widespread in the region. One abandoned Malleefowl mound impacted with no effect upon population. No effect upon mammals, birds with part loss of reptiles and invertebrates (low mobility) with indirect impacts upon nearby fauna habitat.	Malleefowl management actions including targeted surveys immediately prior to disturbance. Design avoids known Malleefowl mounds (+50 m) and White-browed Babbler nests (+20 m). Induction awareness and training regarding the conservation significance of Malleefowl and recording. Vehicle speed limit restrictions. All staff and contractors attend compulsory environmental inductions. Design to include perimeter fence protection around TSF and water storage facilities. Supervision of clearing activities will be undertaken by the Cazaly Environmental staff. Prohibition on bringing pets, firearms, or traps into the Project area. Prohibition of feeding or sheltering of native animals. Waste management to minimise attraction of feral animals.	Project presents a Non-Significant impact for terrestrial fauna.
6.	Invertebrate Terrestrial Fauna (including SREs)	Known invertebrates in area include spiders, scorpions, pseudoscorpions and land snails. Completed invertebrate studies in the Project area.	Protect specially protected (threatened) fauna consistent with the provisions of the *Wildlife Conservation Act 1950*. Protect SRE species of particular conservation significance.	Fire, modified surface water flows, dust deposition or vibration leading to loss or reduction of invertebrate/SRE species in the natural environment and loss or reduction of invertebrate/SRE habitat in the natural environment. No known SREs. Indirect impacts on invertebrate habitat. Threatened invertebrate Tree-stem Trapdoor Spider known in Project area.	Project design 'footprint' to be optimised during construction and operations phase to avoid known Tree-stem Trapdoor Spider populations.	Project presents a Non-Significant impact for invertebrate terrestrial fauna.

Item	Environmental Factor	Existing Environment	EPA Objective	Potential Impacts	Proposed Environmental Management	Predicted Outcome
7.	Subterranean Fauna	The knowledge base for subterranean fauna species in the Southern Yilgarn region is immature. Stygofauna do not occur in the Project area, however, troglofauna exist within the Project area. Completed studies in the Project area and region.	Maintain the abundance, diversity, geographic distribution and productivity of subterranean fauna at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge. Protect specially protected (threatened) subterranean fauna consistent with the provisions of the *Wildlife Conservation Act 1950.*	Open pit mine excavations and dewatering leading to loss or reduction in subterranean fauna species and habitat from the natural environment. Indirect impacts dewatering, blasting operations, surface water flows and water quality. No impact upon stygofauna not being known to occur in Project area. Removal of 58 ha of troglofauna habitat, eight species identified in impact area (four singletons).	Mining scale and geometry of the deposit will limit vibrations in local troglofauna habitat. Further troglofauna studies in the BIF within the Parker Range area and region. Lodgement of representative animals collected by the subterranean fauna survey with the WA Museum.	Project presents a Non-Significant impact for subterranean fauna.
8.	Surface Hydrology	Drainage is north-south with flows into Lake Eva and Lake Seabrook. Peak flows from catchment of 5.5 m^3/s in Project area. Completed studies in Project Area.	Maintain the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance are protected. Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Diversion of Project area surface water catchments around proposed mine infrastructure re-connecting to downstream natural flow paths. Minor reduction in local catchment area as a result of proposed mine and infrastructure local surface water containment and use. No material effect upon health of vegetation or fauna at downstream locations. Minor emissions from mine and infrastructure for large storm events >100 year ARI.	Provision for a diversion levee around plant infrastructure to maintain natural water flows. Provision of drainage culverts under roadways to maintain natural water flows. Scour protection for culverts and levees designed for 100 year ARI events with at least 0.3 m freeboard. Stormwater diversion structures will be constructed to control erosion and sedimentation downstream through the use of sedimentation ponds, riprap pads and maintenance excavation work to keep channels free flowing. Rehabilitation will occur as soon as practicable and within six months of decommissioning of a work area or location.	Project presents a Non-Significant impact for surface water.
9.	Groundwater	Groundwater table of 365 m ASL established (approximately 60 m below natural surface). No groundwater dependent vegetation exists.	Maintain the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected.	Localised groundwater drawdown within maximum extent of 1 km from open pit edge during mine dewatering activity. Water balance is demand driven, hence no excess water from mine dewatering activity. No impact on other groundwater users from mine dewatering. No groundwater dependent vegetation in Project area.	Monitoring bores will be established, monitored and results reported to DOW annually. Hydrogeological model shall be updated annually based on empirical rate of aquifer drawdown. Water related infrastructure will be inspected as part of routine operational procedures. Extraction points on bores will be fitted with flow meters which shall be routinely calibrated. Monthly visual recording of vegetation condition in proximity to production bores to monitor health of local area.	Project presents a Non-Significant impact for groundwater.

Item	Environmental Factor	Existing Environment	EPA Objective	Potential Impacts	Proposed Environmental Management	Predicted Outcome
10.	Acid Rock Drainage and Metal Leaching	Mine waste is generally characterised as non-acid forming (S<0.3%). Mine waste is stable and will not leach heavy metals. Completed studies characterising mine materials.	Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Release of ARD or metalliferous leachate runoff leading to a reduction in the quality of soil, surface water and/or groundwater in the natural environment. Waste rock material has a positive neutralising capacity and negative net acid generating capacity (AMD unlikely). Waste rock material is stable and with very low metalliferous leaching properties.	Monitor for the presence of acid forming materials during mining. Provision for a PAF encapsulation cell in waste landform.	Project presents a Non-Significant impact for ARD and metal leaching.
11.	Fire	The Project area has historical evidence of modified vegetation and habitat from fire.	Maintain the abundance, diversity, geographic distribution and productivity of vegetation, flora and fauna at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge.	Hot work activities, vehicle exhausts, lightening strikes, unauthorised camping or discarded cigarette leading to bushfire which results in loss of vegetation or habitat. Potential for bushfire which alters the Project area habitat.	Establishment of fire breaks around perimeter of Project disturbance. Fire prevention controls including designated smoking areas, safe work permits for all hot work activities. Vehicle movements will be restricted to designated site roads to minimise ignition risk from exhausts. Site emergency response plan shall be completed, inclusive of agreement with FESA and other potential respondents regionally. Personnel will be informed of burning restrictions, fire prevention, and trained in the use of fire fighting equipment and procedures.	Project presents a Non-Significant impact for fire.
12.	Rehabilitation and Closure	The Project area has an existing rehabilitation legacy from exploration.	To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values.	Cessations of mining with an inability to rehabilitate impacting the long-term post mining environment and land use. Open pit void with pit void lake to remain for Mt Caudan (north and central) with Mt Caudan (south) to be backfilled. Approx 333 ha to be rehabilitated. Waste landform to maximum 45 m high, 2 km long and 500 m wide.	Undertake progressive rehabilitation as practicable (within six months) as areas become available during construction and operations. Undertake decommissioning and closure of the site to statutory requirements and as identified within conceptual closure plan. Pit void abandonment bund for North and Central pits with South pit backfilled. Contingency actions identified in the event that decommissioning and rehabilitation performance indicators are not being achieved. Collect and correctly stockpile vegetative material and topsoil for later use at selected sites. Only use local native plant species. Optimise rehabilitation approach through trials. Outcomes based EFA monitoring commitment for rehabilitation program post closure.	Project presents a Non-Significant impact for rehabilitation and closure.

Item	Environmental Factor	Existing Environment	EPA Objective	Potential Impacts	Proposed Environmental Management	Predicted Outcome
	Pollution Management					
13.	Groundwater quality	The existing groundwater is saline (<35,000 mg/L TDS). Completed water quality testing in Project area.	Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Reduced quality of groundwater through migration of pollutants from the surface operations into groundwater system through infiltration. No impact on groundwater quality from ARD, metalliferous drainage, TSF and process water storage	Encapsulation of any PAF material in WRL. All chemicals and hydrocarbons will be stored in safe storages in accordance with the relevant AS and DMP/DEC guidelines. Bioremediation of hydrocarbon infused soil. Monitoring bores and annual reporting results to DOW.	Project presents a Non-Significant impact for groundwater quality.
14.	Surface water quality	Drainage in the Project area comprises several ephemeral drainage lines with no permanent surface water bodies.	Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Reduced quality of surface water through sediment run-off from operations. No impact on surface water quality.	Stormwater runoff inside the mine infrastructure area will be collected either within pollution detention trap or within the mine pit. Hydrocarbons will be recovered. Sediment settling drains will be provided. Contaminated soils will be remediated on-site in a bioremediation area. Fuel and lubricants will be stored in one central facility designed to with impervious bunds and/or linings. Natural water flows will be maintained with use of levees, floodways and culverts for infrastructure. Sediment control devices such as detention basins and sediment traps will be incorporated as appropriate to the specific location and routinely inspected and maintained to ensure functionality. Pipelines corridors shall be constructed in a vee-drain or bund such that any undetected spill to unsealed ground is contained. Stormwater drainage containment will be based on a 100 year ARI storm event.	Project presents a Non-Significant impact for surface water quality.
15.	Dust	The Project area has existing dust generation from unsealed public roads and agricultural activities. Baseline study and modelling has been completed.	Ensure that air emissions (dust) do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Mining, processing or road haulage activities generating dust leading to loss or reduction of vegetation and habitat in the natural environment or reduction in the health of workforce or community. Dust losses from road haulage will be <0.4% and from stockpiling <0.05%. Modelling estimates highest dust deposition rates within 50 m of mining and plant operations, with monthly dust deposition <5 mg/m^2 at 250 m distance (Mt Caudan) and 125 m distance (truck haul road). Local indirect impacts on nearby vegetation <250 m distance.	Water carts with dribble bars will be used for regular watering of all mine roads and dust prone areas. Water sprays will be included in the crusher design. Restriction of vehicle speeds within the mine site. Upgraded sealed roads for truck haulage operations. Stabilisation of dust on stockpiles with surfactants. Moisture control of product throughout handling. Water sprays (and surfactants) on road train haulage. Inspection of the truck route and periodic clean-up. Routine community meetings to present results of dust monitoring and effectiveness. Staff training on dust minimisation practices. Progressive rehabilitation of disturbed areas. Health monitoring of vegetation, flora and fauna surveys in impact zone and reference areas. Baseline and monthly operating dust monitoring in the Project area.	Project presents a Non-Significant impact for dust.

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16.	Noise and Vibration	Project area has existing grain haulage operations. Baseline noise survey and modelling completed.	Protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards.	Truck haulage operations generating excessive noise / vibration leading to loss of lifestyle quality to the rural landholders and the community or property damage in the existing human environment. Predicted noise levels from trucking of 37 dB(A) are well below the standard of 50 dB(A) night limits. No impact from vibration in mining or trucking operations to the community.	Truck haulage route avoids sensitive noise receptors. Equipment will be performance tested and operated in compliance with noise regulations. Validation of noise modelling within three months of initial operations. Modern truck fleet with noise performance limits. Monthly noise monitoring of noise levels at mine site and period locations along ore haulage route through the community at sensitive noise receptor locations. Community incident reporting procedure for observed noise emissions from mining or truck haulage operations.	Project presents a Non-Significant impact for noise and vibration.
17.	Erosion	The Project area contains cleared areas (Shire gravel pit and exploration access) subject to erosion.	Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Loss of soil, sedimentation or vegetation leading to an increase in erosion of the natural environment. Minor erosion to the natural environment will occur.	During the operational phase, high erosion potential areas shall be identified by Cazaly Environmental personnel. High erosion potential areas shall be treated with by water cart sprays and/or commercially available stabilisation surfactant. Disturbed sites will be rehabilitated within six months of becoming available from operations to minimise erosion exposure risk.	Project presents a Non-Significant impact for erosion.
18.	Waste Products	The Shire of Yilgarn has domestic waste disposal facilities in the Project area. Industrial waste disposal facilities located in Perth and Kalgoorlie.	Ensure that wastes are contained, treated or collected so there is no long-term impact on the environment.	Wind-blown, inappropriate storage or degradation of waste leading to reduction in soil quality, breeding ground for vermin or attraction of feral animals to the environment. Threat to native fauna through population expansion of feral animals. Project will generate general putrescible waste, tyres, concrete, steel, plastic, glass, batteries, liquid hydrocarbons, filters and toner cartridges.	All waste shall be collected and removed from site. Recycling shall be adopted (in conjunction with registered off-site waste disposal providers). Sewage will be collected and treated. Waste hydrocarbons will be collected. Monthly planned inspections will include waste disposal and transfer areas. Feral fauna will be monitored. Work areas shall have designated waste collection locations with clearly identified bins, and recycling points for collection and storage in the designated on-site storage and packaging area while awaiting dispatch.	Project presents a Non-Significant impact for waste products.

Item	Environmental Factor	Existing Environment	EPA Objective	Potential Impacts	Proposed Environmental Management	Predicted Outcome
19.	Dangerous and Hazardous substances	The Project area has an existing mine explosives facility at Southern Cross.	Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Incorrect storage of dangerous and hazardous substances leading to reduced quality of soil, surface water, groundwater and reduction in vegetation and fauna habitat. Impact from hydrocarbons and chemical emissions to unsealed ground.	All hydrocarbons and chemicals to be supplied, stored, transported and handled in accordance with relevant regulations and codes. Authorised and trained personnel. Spill response equipment will be available. Contaminated soils will be remediated. Unenclosed impervious bunds or linings shall have a capacity of 110% of the largest storage container or vessel. Refuelling facilities shall not be constructed within 30 m of stormwater drainage system. Refuelling systems shall incorporate dry-break hoses. Hydrocarbon recovery system will be provided in stormwater detention basin.	Project presents a Non-Significant impact for dangerous goods and hazardous substances.
20.	Light	The Project area consists of existing public road which has frequent light sources from vehicles. The nearest residence is >10 km from the proposed mine.	Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Artificial light disruption to fauna adjacent to Project area. Light is necessary part of the proposal, with no impact to residents or community.	Directional lighting will be used to minimise light spill outside of the Project area in both fixed light design and positioning of large mobile lighting towers. Light overspill associated with construction and operations will be managed in accordance with the AS requirements.	Project presents a Non-Significant impact for light.
21.	Greenhouse Gas Emissions	Industry in WA produces approximately 70 Mt greenhouse gas per year. The Project area is synonymous with existing agriculture and mining.	Ensure that gaseous atmospheric emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Carbon gas emissions associated with mining, processing and road haulage leading to reduction in local and regional air quality. Project greenhouse gas emissions 43,129 t CO_2-e per year, minor emitter representing 0.06% of WA's total per year.	Preventative maintenance of vehicles and machinery. Training and disposal of refrigerant off-site. Employee education on energy efficient practices. Greenhouse gases and energy consumption will be reported and measured against reduction targets in accordance with regulatory requirements.	Project presents a Non-Significant impact for greenhouse gas.
	Social Surroundings					
22.	Aboriginal Heritage	There are no significant sites registered in the Project area. Surveys have been completed.	Ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with the relevant heritage legislation.	Clearing activities of significant sites or artefacts resulting in loss or reduction of Aboriginal heritage. No archaeological or ethnographic sites of significance exist in Project area.	Development and implementation of a Cultural Heritage Plan, in event of detection of a significant site. Inclusion of Aboriginal heritage awareness in site induction programs to aid in identification and preservation of any possible heritage sites. Periodic awareness training shall be offered with traditional owner groups. Reporting of any new sites identified to DIA per regulatory requirements.	Project presents a Non-Significant Impact for Aboriginal heritage.

Item	Environmental Factor	Existing Environment	EPA Objective	Potential Impacts	Proposed Environmental Management	Predicted Outcome
23.	European Heritage	There are four European heritage sites listed adjacent to the Project area (east side of water reserve at Mt Caudan and three along Parker Range Road)	Ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with the relevant heritage legislation.	Clearing or demolition activities of significant sites or buildings resulting in loss or reduction of European heritage. No sites of European heritage significance in Project area, hence no impact from disturbance.	No environmental management strategies are proposed.	Project presents a Non-Significant impact for European heritage.

PARKER RANGE (MT CAUDAN) IRON ORE PROJECT
PUBLIC ENVIRONMENTAL REVIEW
TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLES

FIGURES

TABLE OF CONTENTS

APPENDICES

1.0 DEFINITIONS AND ABBREVIATIONS

1.1 Definitions

Project	The Parker Range Iron Ore development outlined in this proposal.
Project Area	The local area surrounding the Project impact area.
Project Region	The region in context of the Yilgarn region in Western Australia including the PEC.
Impact Area	The proposed area of clearing for the Project.
Mt Caudan Deposit	The area of iron mineralisation comprised of three areas – northern, central and southern.

1.2 Abbreviations

AMD	Acid mine drainage
ANC	Acid neutralizing capacity
ARD	Acid Rock Drainage
ARI	Assessment on Referral Information
AS	Australian Standard
ASL	Above Sea Level
AW1	Avon Wheatbelt
bcm	Bulk cubic metres
BIF	Banded Iron Formation
Cazaly	Cazaly Resources Limited
dB(A)	Decibel (A-weighting)
DAFWA	Department of Agriculture and Food (Western Australia)
DEC	Department of Environment and Conservation
DEWHA	Department of the Environment, Water, Heritage and the Arts (Commonwealth)
DFS	Definitive Feasibility Study
DIA	Department of Indigenous Affairs
DMP	Department of Mines and Petroleum
DOW	Department of Water
DRF	Declared Rare Flora
EAT	Emmerson Aggregate Test
EC	Electrical Conductivity
EFA	Ecosystem Function Analysis
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPBC	Environmental Protection and Biodiversity Conservation
ESA	Environmentally Sensitive Area
Fe	Iron
FESA	Fire and Emergency Services Authority
GPS	Global Positioning System
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
JORC	Australasian Joint Ore Reserves Committee
K	Potassium
kg	Kilograms
lcm	Loose cubic metres
L/s	Litres per second
m^3	Cubic metre
mAHD	Mine Australian Height Datum
mE	Metres - Easting
mg	Miligrams
MGA	Map Grid Australia
ML	Megalitres
Mn	Manganese
mN	Metres - Northing
MRWA	Main Roads of Western Australia
NSW	New South Wales
OEPA	Office of the Environmental Protection Authority
PAF	Potential Acid Forming
PEC	Priority Ecology Community
PER	Public Environmental Review
PRCT	Parker Range Conservation Trust
RC	Reverse Circulation
RL	Relative Level
ROM	Run-of-Mine
S	Sulphur
SO_4	Sulphate

SRE	Short Range Endemic invertebrates
SWL	Standing Water Level
TDS	Total Dissolved Salts
TSF	Tailings Storage Facility
TSP	Total Suspended Particulates
WA	Western Australia
WET	Waste Extraction Test
WRL	Waste Rock Landform

2.0 INTRODUCTION

2.1 Background

The Parker Range Iron Ore Project (the Project) is 100% owned and managed by Cazaly Resources Limited (Cazaly) and comprises 900 ha of mining tenements within the Southern Cross greenstone belt, part of the Yilgarn iron ore province.

The Yilgarn iron ore province has a history of large-scale iron ore production, with the first iron ore exported from Western Australia coming from the Koolanooka deposit in the Yilgarn during the mid 1960s. Koolyanobbing Iron Ore (Cliffs Natural Resources Ltd) is the only current iron ore operation in the Yilgarn region.

Within the Parker Range, resource drilling has centred on a Banded Iron Formation (BIF) horizon at the Mt Caudan deposit. A 4 km strike length was identified on Mt Caudan and is the focus of the Parker Range Project development.

Cazaly has completed an extensive program of reverse circulation and diamond drilling at Mt Caudan comprising 240 holes for 18,200 m since 2007. Drilling is ongoing, however, based on an October 2009 JORC resource estimate by Runge Limited, the current indicated and inferred resource contains 28.7 Mt @ 55.4% Fe with over 90% in the Indicated Category. Iron grades range up to 64% Fe in some drill hole intersections.

Cazaly has an exploration target of 60-100 Mt of iron ore at a grade of 56 - 58% Fe for the Parker Range region.

2.2 Purpose of the Document

Cazaly proposes to develop an Iron Ore mining operation in Parker Range.

Cazaly is seeking approval for the iron ore operation under Part IV of the *Environmental Protection Act 1986 (EP Act)* and *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. On 21 September 2009, the Environmental Protection Authority (EPA) determined that the level of assessment for the proposal would be a Public Environmental Review (PER) with a 4-week public review period. On 17 May 2010, the Department of the Environment, Water, Heritage and the Arts (DEWHA) determined that the proposal was a Controlled Action to be assessed under the bilateral agreement between the Commonwealth and the State of Western Australia. Relevant controlling provisions under the *EPBC Act* are:

- Listed threatened species and communities (Sections 18 and 18A).
- Migratory species (Section 20 and 20A).

Preparation of this document has been undertaken in accordance with the 'Guidelines for Preparing a Public Environmental Review / Environmental Review and Management Programme' (EPA, 2009a). This PER document has been prepared to provide the EPA, DEWHA and other relevant government and non-government agencies and the public with details on the environmental factors and impacts associated with the proposed Project and the management strategies adopted.

This PER document:

- Details the proposed mining operations and activities.
- Describes the existing natural and human environments.
- Identifies the key environmental and social factors, potential impacts and assessment of these impacts.
- Summarises key management strategies and commitments.
- Summarises community consultation.
- Describes programs to monitor management strategies and commitments.
- Provides conclusions on expected impacts and predicted outcomes.

2.3 Changes to the Proposal since the Environmental Scoping Document

The main changes to the Project proposal included in the PER since the Environmental Scoping Document approval include:

- Additional resource drilling which has improved the level of ore body knowledge and expanded subsequent mining resource. Based on an expanded JORC resource and available port export capacity, the proposal has increased the estimated life of the mine from 5.5 to 7-10 years operation at 4 Mtpa.

- Completion of a Definitive Feasibility Study (DFS) which provides improved definition of infrastructure and mine planning requirements.
- Further definition of water requirements and ore body dewatering based on information from testing bores and hydrogeological field surveys.
- Optimised truck haulage route which includes a new proposed private haul road thus reducing the use of proposed public roads.
- New mine site access road and power line alignment positioned to improve mine safety and also reduce impact to Malleefowl nesting mounds from increased vehicle movements.
- Removal of ammonium nitrate storage facility from the proposal and relocation of the explosives magazine site and access road to avoid Declared Rare Flora (DRF).
- Preferred Tailings Storage Facility (TSF) design location has now been selected.
- Additional baseline environmental surveys (i.e. vegetation, flora and fauna) completed in 2010 to increase the level of knowledge of the Project area and region. The disturbance footprint has reduced from 450 ha to 421 ha.

2.4 Overview of the Proposal

Cazaly propose to mine iron ore from the Parker Range deposit by conventional open pit hard rock mining methods at 4 Mtpa. The estimated life of the mine is 7-10 years based on current economically mineable JORC resources and availability of port export capacity.

The mining operation is expected to generate approximately 55 Mt of waste rock. The waste rock landform will be located east of the open pit away from the BIF ridge.

A Run-of-Mine (ROM) pad will be built from waste rock to a final height equal to the primary crushing process plant tipple station. The ROM pad will be accessed by vehicle ramps.

A low grade ore landform shall be constructed in the region south of the ROM pad in a similar method utilising waste rock material to a base height matching the ROM pad.

For the first year of operation, ore will be treated by an on-site 4 Mtpa mobile dry crushing, screening and stockpiling plant located to the west of the mine operation. From year 2 of operation, the mobile dry plant will be replaced with a permanent wet-plant/beneficiation process which involves washing and screening of lower grade ore impurities to tailings.

A Tailings Storage Facility (TSF) is proposed to be positioned to the south west of the permanent process plant, which will be designed with a water recovery from tailings circuit. The tailings will not contain adverse chemical reagents; as such it will have similar chemical properties to the waste rock.

Iron ore products will be loaded into on-highway road trains and transported approximately 57 km northwest to railway infrastructure at the Moorine Rock rail siding. Products will be loaded from the stockyard at Moorine Rock rail siding into ore cars and transported along existing rail infrastructure to the Port of Kwinana (Kwinana Bulk Terminal), Western Australia. Fremantle Ports operate the Port. The Moorine Rock rail siding, rail haulage transport and Kwinana Port Operations are excluded from this Project assessment.

Various buildings will be constructed at the Mt Caudan mine site, including a temporary construction office, mine/operations administration complex, mine/operations crib rooms with toilets, workshop/warehouse/laydown facility, fuel management facility (storage tanks and in/outloading pumps), vehicle park-up (including go-line and water stand-pipe) and heavy/light vehicle wash down bays.

Pit dewatering bores will provide water for the mine site. A desalination plant will treat some of the bore water to provide fresh water for the site. The remaining bore water will be used for dust suppression during operations.

A stormwater diversion system will be installed to cater for a 100-year ARI rainfall event.

On-site generators will initially provide power for the site followed by a new 33 kV powerline supply connected to existing mains situated at Marvel Loch within the first year of operations.

A new 172-room village will be constructed at Marvel Loch. The village is excluded from this project assessment.

Further information on the Project is provided in Section 3.0 – Description of the Proposal.

2.5 Benefits to State and Community

Mineral resource Projects and the associated benefits, which flow onto the community through construction, operations and business commerce, underpin Western Australia's economy.

The Project is located within the Yilgarn Shire, an area synonymous with mining and farming, and is located in close proximity to state controlled infrastructure such as the Perth-Kalgoorlie standard gauge railway and Goldfield water supply pipeline 60 km away with the Kwinana bulk export port 416 km away.

Highlights of the benefits for the State of Western Australia and community through development of the Project include:

- Total investment into capital works of approximately A$300 million, inclusive of third party contractor investment.
- Creation of approximately 750 construction jobs, with an expected peak workforce of 250 persons over a 12 month period.
- Creation of approximately 159 permanent operational jobs for life of mine, with a preference to employ local community workers.
- Extensive commerce benefits to Shire of Yilgarn and local businesses situated within close proximity to Marvel Loch, Southern Cross and Moorine Rock.
- Anticipated revenue of A$1.8 billion generated through iron ore exports over the initial life of mine.
- State royalties on export sales estimated to be A$100 million over the initial life of mine.
- Investment to enhance Local Government and State infrastructure inclusive of roads, rail and port.
- Community participation and support programs within the Shire of Yilgarn.

2.6 Alternatives Considered

Throughout the definition of the Project, several alternatives were considered prior to selecting the preferred development case described herein. In consideration of each alternative, the Project team was enabled to redesign or modify the development to either mitigate or minimise adverse environmental impacts.

The alternatives evaluated considered the following:

- Mineralised deposit (current and possible future) locations.
- Tenement holdings.
- Location of recognised areas with high conservation value.
- Landform and topography.
- Greenhouse gas emissions (carbon footprint).
- Proximity of existing infrastructure.
- Mining extraction limitations.
- Economic factors.
- Mining and public interaction within community.
- Interaction between mining and farming operations.

The criteria used to evaluate each alternative are consistent with EPA principals, EPA Guidance Statements, recent bulletins and reports regarding the conservation of the environment and evaluation of social impacts on the community.

The following sections discuss each alternative.

2.6.1 Mine Site Location

The Parker Range has a defined location of 16 km of banded iron formation (BIF) which hosts the mineralised zone for the resource. The Mt Caudan prospect is the most accessible and defined deposit for Cazaly. The Mt Caudan deposit is situated in the northern part of the Parker Range BIF strike and hence is the defined location for the mine site.

Iron ore mineralisation in the southern parts of Parker Range BIF (within the 16 km strike) is probable, however resource drilling of these exploration prospects is not sufficiently advanced to allow consideration, but may factor in the longer term expansion for the iron ore region.

Mine services for the Project considered placement of explosives magazine on-site either south of the WRL or south of the Mt Caudan deposit - southern pit area. A minimum separation distance of the explosives facility must be maintained from populated area on the site. Of the two alternatives for the facility, the location south of the WRL was positioned in close proximity to known DRF. The southern pit area represented the preferred location selected as it provided 400 m plus separation distance from disturbance to DRF and met distance obligations from populated areas.

2.6.2 Plant Location

The crushing and screening plant, and future beneficiation wet-plant were evaluated for placement in the following 3 locations relative to the Mt Caudan deposit:

- Eastern side of the Mt Caudan deposit.
- Western side of the Mt Caudan deposit (selected alternative).
- Northern side of the Mt Caudan deposit.

Due to the requirements for low grade ore upgrading at year 3 with beneficiation-wet-plant, locations greater than 5 km from the Mt Caudan deposit were not favoured due to technical and economical reasons. In addition, other locations would involve additional clearing for mine roads and pipeline corridors not preferred environmentally.

The Mt Caudan ore body is dipping from the natural surface at approximately 60 degrees from east to west. The eastern mine footwall material is weathered and unlikely to sustain permanent access ramps to the mine, which necessitates a ramp position on the western side of the deposit in hanging wall material.

The Mt Caudan deposit is also truncated by the existing gazetted Parker Range Road, which is the preferred access route for the site and ore trucking route.

The Mt Caudan topography is, in parts, steeply sloping (up to 48 m above natural ground level) in the northern area of the deposit, but with gentle undulations in the western region of the deposit.

The eastern plant alternative was eliminated based on the excessive haul distance from a western ramp location and the excessive distance for truck haulage onto Parker Range Road given that the existing road will be diverted and eventually closed.

The northern plant alternative was eliminated based on excessive excavation of landform due to unfavourable topography. In addition, the proposed location was outside existing Project mining tenements.

The western plant location was the preferred alternative due to favourable topography and close access to the mine ramp position and Parker Range Road.

2.6.3 Site Access and Truck Route

The Project is fortunate in that an existing public access road passes directly over the mineralised deposit. Existing rural landholders, who operate predominately wheat and sheep farms in the region, flank Parker Range Road.

Ore transport by truck will be a significant operation with an expected 96 loaded truck cycles required in any 24-hour period to achieve haulage of 4 Mtpa.

Alternative site access and truck haul route options included:

- 55-58 km: Parker Range and Southern Cross Roads (for a Southern Cross Rail Head location).
- 56-67 km: Parker Range Road (for a Moorine Rock Rail Head location).

The Parker Range-Southern Cross Road alternative was eliminated as it passes either through (or within 0.5 km) of the Southern Cross Township. The route is also very curvaceous and has the added complication of crossing Great Eastern Highway in a short stagger turn (unfavoured by Main Roads and local Shire), which would pose a significant safety risk to the public from truck haulage operations.

The Parker Range Road route was favoured as it is an existing grain haulage route (in part), has a straight alignment and is easily upgradable to a sealed standard. However, the local farming community uses Parker Range Road for equipment and stock movements and the route passes through the sparsely populated Moorine Rock Township before terminating in a T-intersection at Great Eastern Highway. Consultation with the Shire and rural landowners along the truck route identified 6 sub-alternatives which were considered for the Project. Each route has the same initial alignment from site along Parker Range Road (Figure 1).

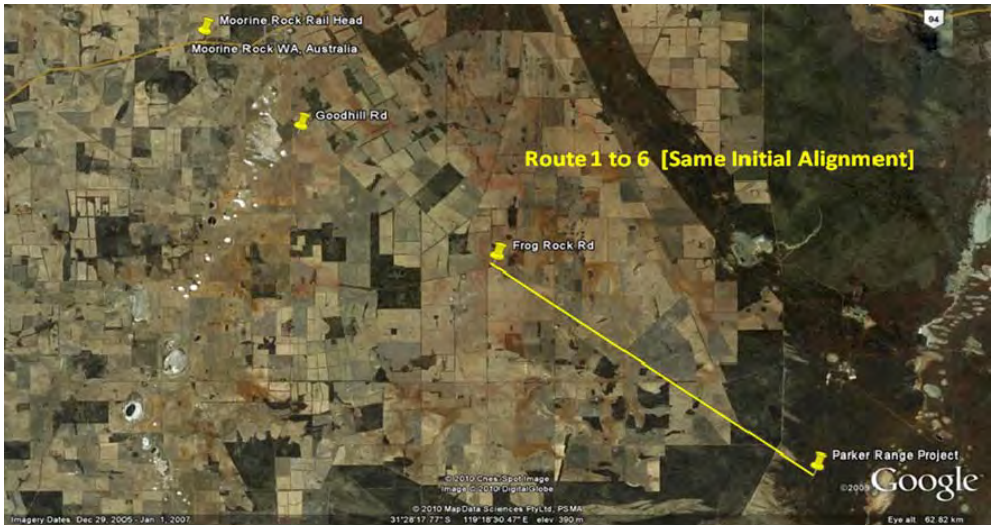

Figure 1: Truck Route Alternatives 1 to 6 – Initial Alignment (Site to Parker Range Road)

- Route 1 – 63.1 km distance from site along Parker Range Road to Moorine South Road Intersection, along Moorine South Road to Liddell Road intersection, along Liddell Road to proposed rail terminal location at Moorine Rock (Figure 2).
- Route 2 – 57.2 km distance from site along Parker Range Road, to new private road intersection, along new private road Lot 59 to proposed rail terminal location at Moorine Rock (Figure 3).
- Route 3 – 60.1 km distance from site along Parker Range Road, to Goodhill Road Intersection, along Goodhill Road to new private road intersection, along new private road Lot new private road intersection, along new private road Lots 66, 67, 70, to Liddell and Moorine South Road intersection, along Liddell Road to proposed rail terminal location at Moorine Rock (Figure 4).
- Route 4 – 66.8 km distance from site along Parker Range Road, to Frog Rock Road Intersection, along Frog Rock Road to Moorine South Road intersection, along Moorine South Road to Liddell Road intersection, along Liddell Road to proposed rail terminal location at Moorine Rock (Figure 5).
- Route 5 – 57.0 km distance from site along Parker Range Road, to new private road intersection, along new private road Lot 61 to new intersection Moorine South Road, along new private road Lot 59 to proposed rail terminal location at Moorine Rock (Figure 6).
- Route 6 – 60.0 km distance from site along Parker Range Road, to new private road intersection, along new private road Lot 61, to new intersection Moorine South Road, along new private road Lot 59 to new Liddell Road intersection, along Liddell Road to proposed rail terminal location at Moorine Rock (Figure 7).

Evaluation of each sub-alternative (Table 1) included considerations of noise/vibration, dust, public safety, land clearing, greenhouse gas, business interruption (mining-farming) and economic factors.

Table 1: Assessment – Sub-Alternative Truck Route along Parker Range Road

Factor/Impact	Route 1	Route 2	Route 3	Route 4	Route 5	Route 6
Attributes	63.1 km All Public Roads MR Township 2 Direction Changes	57.2 km Public & Private Roads MR Township 1 Direction Change	60.1 km Public & Private Roads Avoids Township 2 Direction Changes & 1 Stop/Go	66.8 km All Public Roads Avoids Township 3 Direction Changes	57.0 km Public & Private Roads Avoids Township 3 Direction Changes & 1 Stop/Go	60.0 km Public & Private Roads Avoids Township 2 Direction Changes & 1 Stop/Go
Noise/Vibration	Unfavourable	Unfavourable	Neutral	Neutral	Favourable	Neutral
Dust	Neutral	Favourable	Neutral	Unfavourable	Favourable	Neutral
Public Safety	Neutral	Favourable	Unfavourable	Unfavourable	Neutral	Neutral
Land Clearing	Favourable (Nil)	Neutral (16 ha)	Neutral (8 ha)	Favourable (Nil)	Neutral (7 ha)	Favourable (Nil)
Greenhouse Gas	Neutral (Medium km)	Favourable (Shortest km)	Neutral (Medium km)	Unfavourable (Longest km)	Favourable (Shortest km)	Neutral (Medium km)
Business Interruption	Favourable	Favourable	Neutral	Neutral	Unfavourable	Neutral
Capital Cost	Low Cost	Low Cost	High Cost	High Cost	Medium Cost	Medium Cost
Operating Cost	Medium Cost	Low Cost	Medium Cost	High Cost	Low Cost	Medium Cost

After consideration of all factors and impacts presented in Table 1 and extensive consultation with the Shire and rural landowners along the truck routes, truck Route 5 (Figure 6) was selected as the preferred development alternative for the Project primarily based on:

- Avoidance of residences situated in close proximity to Parker Range Road at the Moorine Rock Township region and in close proximity to Liddell Road.
- Manageable interactions between farming and mining, subject to further detailed planning.
- Public safety risk can be reduced by appropriate intersection and crossing designs, subject to further detailed planning with the Shire of Yilgarn.
- School bus and truck interactions can be reduced by re-routing buses which shall not need to travel along Parker Range Road, subject to further detailed planning with the Department of Education.
- Land clearing can be minimised by following existing cleared tracks for private roads through uncleared vegetation, which in part is degraded from stock grazing.
- Sustainable outcome for the Project and community.
- Acceptable economics which will allow the Project to remain commercially viable.

Figure 2: Truck Route Alternative 1 (All Public Roads)

Figure 3: Truck Route Alternative 2 (Public and Private Roads)

Figure 4: Truck Route Alternative 3 (Public and Private Roads)

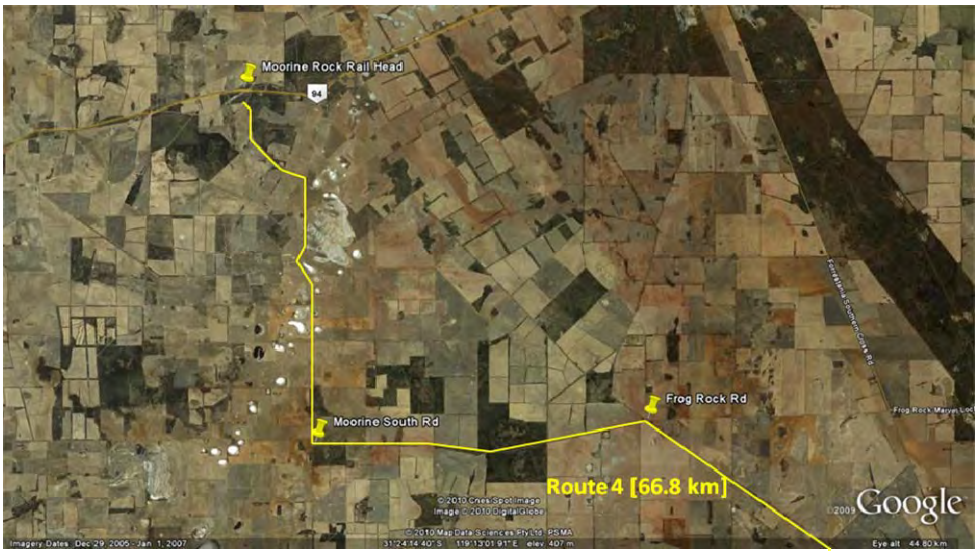

Figure 5: Truck Route Alternative 4 (All Public Roads)

Figure 6: Truck Route Alternative 5 (Public and Private Roads)

Figure 7: Truck Route Alternative 6 (Public and Private Roads)

2.6.4 Port and Rail

Please note: The rail head siding, rail path and port are excluded from this Project assessment.

Existing ports capable of handling iron ore include Esperance (640 km by rail) and Kwinana (416 km by rail). Each port is serviced by the existing WestNet Rail standard gauge network.

The port of Esperance is eliminated on the grounds of the excessive rail distance for ore haulage, which is unfavourable economically and adds to the greenhouse emissions / community disturbance for the Project.

The port of Kwinana is favoured due to the shorter transport distance, lower carbon footprint and industrialised pathway to export with a lower level of community disturbance.

The alternatives for the rail head siding are:

- Moorine Rock (to suit a Parker Range Road truck route)
- Southern Cross (to suit a Parker Range-Southern Cross Road truck route)

Public access roads and existing CBH grain terminals flank both rail head locations. The Southern Cross grain terminal is flagged for long-term operation and has open stockpile storage, whereas the Moorine Rock Terminal is flagged for closure in the long term.

The Southern Cross location is constrained by available land and it is unlikely iron ore could be loaded without adverse cross contamination impacts with CBH's open grain handling operations. On this basis the Southern Cross rail head location was eliminated.

The Moorine Rock location is favoured due to alignment with the Parker Range Road truck route, available land for development, lower adverse impact on grain operations as storage is enclosed and closer distance to the port of Kwinana.

2.6.5 Infrastructure - Power

The Project is fortunate to be located in relatively close proximity to the Western Power grid at Marvel Loch, which has excess capacity due to regional gold mine closures.

The alternatives for mine power supply included:

- Diesel generation
- 33 kV mains power – 10 to 14.5 km route
- 33 kV mains power – 17.5 km route

Diesel generation was eliminated as an alternative due to unfavourable economic factors, additional fuel handling facilities and increased greenhouse gas emissions. Diesel generation will only be used as a short-term power supply for construction and operations start-up; it is eliminated as a long term alternative.

The remaining power alternatives involve extensions to the existing 33 kV Western Power network, with an identified connection point located 10 km south-east from Marvel Loch township, which has capacity for the mine site. In each alternative a 10 m easement is proposed with an approximate part-clearing footprint of 1 ha per km.

The shortest power line route is approximately 10 km (traverses old mine workings, the northern end of Parker Range and significant tracts of woodland forest). This route can be rationalised to extend to 14.5 km by using existing road reserves (Emu Fence and Parker Range Roads), avoid old mine workings and minimise the need for such excessive clearing. The 10 to 14.5 km alternative was eliminated due to excessive clearing requirements despite the lower installation costs.

The preferred 17.5 km power line route alternative is entirely within existing shire road reserves (Marvel Loch/Yellowdine - Emu Fence - Parker Range Roads) which could accommodate a 10 m easement, with approximately half of the route within disturbed ground.

2.6.6 Infrastructure - Water

The Project has process and potable water requirements at the mine site. A spur line from the Water Corporation's Mundaring to Kalgoorlie water pipeline supplies the Marvel Loch township. The mine has a requirement to be dewatered to extract ore from below the water table.

The alternatives for mine water supply included:

- A new 20 km water pipeline from Marvel Loch to the mine site.
- Trucking water from Marvel Loch to the mine site.
- Water bores and desalination at the mine site.

Both the 20 km pipeline and water trucking alternatives will provide a reliable, quality water source for the Project; however neither option at required quantities is economically feasible due to the relatively high purchase price of scheme water from the Water Corporation. A pipeline will also require an easement along Shire roads and associated vegetation clearing, whilst trucking adds significant vehicle movements and greenhouse gases emissions to the Project footprint.

The Mt Caudan deposit will require dewatering, which will necessitate in-pit bores. These bores can be used to provide water for the mine site, with part of the water desalinated for consumption. On the basis of mine dewatering (i.e. existing supply), the bore and desalination option is preferred. Environmental management of the dewatering influence, desalination plant and brine disposal will be required.

2.6.7 Infrastructure - Accommodation

Please note: The accommodation village is excluded from this Project assessment.

The Project has requirements for worker accommodation during both the construction (i.e. peak 250 persons) and operations (i.e. 159 persons). Marvel Loch township is less than 20 km by road.

The following accommodation alternatives were considered:

- A new village at the mine site.
- A new village at Marvel Loch.
- Utilising existing accommodation at Marvel Loch currently operated by St Barbara Mines.

A new village at the mine site will require establishment of new utility services and sports and recreation facilities together with all of the accommodation, meals and general facility services required of a village. The excessive economic factors eliminate this alternative, notwithstanding the additional clearing activities required for village establishment.

St Barbara Mines currently operates about 350 rooms in Marvel Loch associated with gold mining operations. Currently, about 80 rooms could be made available for Project use. Project development requires room numbers during construction and ongoing operations which greatly exceed the amount of available accommodation, thus eliminating this as a long-term alternative. The existing rooms may be used as a short-term accommodation alternative only (e.g. during construction peak).

A new accommodation village at Marvel Loch is the preferred alternative. The proposed site for the village has been identified in conjunction with the Shire of Yilgarn at the old Marvel Loch school site. This site is substantially established with infrastructure and land cleared suitable for village development.

2.7 Legislative Approval and Policy Framework

Cazaly will comply with the provisions in applicable Acts and their Regulations which include but may not be restricted to those listed in Table 2.

Table 2: Relevant Legislation

Reference	Scope	Administering Body
Western Australia - Legislation		
Aboriginal Heritage Act 1972	Protects Aboriginal Heritage	Department of Indigenous Affairs, Western Australia
Agriculture and Related Resources Protection Act 1976.	Provides for the management, control, prevention, introduction and spread, prohibition and regulation of certain plants and animals keeping for the protection of agriculture and related resources.	Department of Agriculture and Food.
Bush Fires Act 1954	Make better provision for diminishing the dangers resulting from bush fires, for the prevention, control and extinguishment of bush fires	Department of Environment and Conservation (DEC)
Conservation and Land Management Act 1984	Manages state conservation and land management matters.	DEC
Contaminated Sites Act 2003	Requires the reporting of known or suspected contaminated sites.	DEC
Environmental Protection (Noise) Regulations 1997	Sets standards for noise emissions, monitoring and controls.	DEC
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Provides protection of native vegetation.	Department of Mines and Petroleum (DMP)
Environmental Protection Act 1986 (EP Act) (and Administrative Procedures 1993)	Part IV defines the process of referral and assessment of proposals subject to formal assessment under the *EP Act*. Works Approvals and licences are issued under Part V of the *EP Act.*	Environmental Protection Authority (EPA) and DEC
Health Act 1911	Regulation of activities and provision of services relating to public health.	Department of Health
Heritage Act of Western Australia 1990	Protects European Heritage in Western Australia.	Heritage Council of Western Australia
Land Administration Act 1997	Governs administration of State land in WA.	Department of Regional Development and Lands
Local Government Act 1995	Provides for a system of local government in WA.	Department of Local Government
Local Government (Miscellaneous Provisions) Act 1960	Provides standards for construction activities.	Department of Local Government
Main Roads Act 1930	Provides for construction, maintenance, supervision, management and control of access to highways, main roads and secondary roads.	Main Roads Western Australia
Occupation Safety and Health Act 1984	Promotes and secures safety and health of persons in the workplace.	Department of Commerce (Worksafe)
Rights in Water and Irrigation Act 1914	Manages the use of water resources in Western Australia.	Department of Water (DoW)
Soil and Land Conservation Act 1945	Provides for development of soil conservation districts and communities, enables covenants on agricultural land to protect native vegetation.	Department of Agriculture and Food
Wildlife Conservation Act 1950	Principal legislation regarding the protection of flora and fauna species.	DEC
Dangerous Goods Safety Act 2004	Covers safe storage, handling and transport of dangerous goods and for related purposes.	DMP
Mining Act 1978 and Regulations 1981	Manages mineral exploration and mining operations.	DMP
Mines Safety and Inspection Act 1994 and Regulations 1995	Protects employees in the mining industry.	DMP
Commonwealth Legislation		
Environment Protection and Biodiversity Conservation Act 1999	Protects the environment, particularly matters of National environmental significance.	DEWHA
Native Title Act 1973	To provide for the recognition and protection of native title.	DEWHA, National Native Title Tribunal
National Greenhouse and Energy Reporting Act 2007 (DEWHA)	Provides framework for Australian corporations to report greenhouse gas emissions, reductions, removals and offset, and energy consumption and production.	Department of Climate Change and Energy Efficiency

A summary of the Project's environmental approvals to be obtained are summarised in the following sections.

2.7.1 Environmental Protection Act 1986 (WA)

The EPA has determined that the level of assessment for the proposal will be a Public Environmental Review (PER) with a four-week public review period.

An Environmental Scoping Document was submitted to the EPA in February 2010 to enable the EPA to determine the environmental factors that were relevant and significant to this proposal. The EPA approved the scoping document on 12 July 2010.

This PER was drafted and submitted to the EPA for review to ensure the document addresses all of the environmental factors and studies identified in the Environmental Scoping Document. The EPA authorised this PER for release for public review on 29 November 2010.

This PER document has been released for a six-week public review period during which time the public may make submission on the proposal to the EPA. Cazaly will prepare a summary of the submissions and a response to issues and matters raised in the submissions to the satisfaction of the EPA.

The EPA will provide an assessment report to the Minister for the Environment, consisting of a report and recommendations, in accordance with Section 44 of the Act. The Minister will then publish and circulate the EPA's report. Any person may lodge an appeal with the Minister for the Environment against the contents and/or recommendations of the Authority's assessment report within 14 days of the publication of the report.

The Minister will then decide if the Project should be implemented and if so, under what conditions. These conditions will then be released as a Ministerial Implementation Statement.

2.7.2 Environmental Protection of Biodiversity and Conservation Act 1999 (Commonwealth)

In April 2010, the Project was referred to the Commonwealth Minister for the Environment, Water, Heritage and Arts (DEHWA) under the *Environmental Protection of Biodiversity and Conservation Act (EPBC) 1999* (EPBC 2010/5435). Matters of national environmental significance addressed in the referral related to listed threatened species, namely *Isopogon robustus* (Robust Coneflower), *and Leipoa ocellata* (Malleefowl).

The referral decision was deemed to be a "controlled action" inasmuch as the proposed action is likely to have a significant impact on the critically endangered *Isopogon robustus* and the threatened and migratory Malleefowl. The DEWHA advised that the Project will be assessed under the bilateral agreement between the Commonwealth and the Western Australian EPA.

The DEWHA Administrative Guidelines (DEWHA, 2006) state that in order to decide whether an action is likely to have a significant impact it is important to consider matters such as:

- Sensitivity of the environment which will be impacted.
- Timing, duration and frequency of the action and its impacts.
- All on-site and off-site impacts.
- All direct and indirect impacts.
- Total impact which can be attributed to the action over the entire geographic area affected, and over time.
- Existing levels of impact from other sources.
- The degree of confidence with which the impacts of the action are known and understood.

2.7.3 *Mining Act 1978* (WA)

The *Mining Act 1978* is the principal mining legislation in Western Australia and is regulated by the Department of Mines and Petroleum (DMP). Cazaly has obtained mining tenements from DMP for the Project and associated infrastructure corridors and agreement with the Shire of Yilgarn / rural landowners for use of the public Parker Range Road and private haul road corridors.

Cazaly will prepare and submit a Mining Proposal (MP) to the DMP to permit development of the Project. The MP assessment process will be undertaken concurrently with the EPA and DEWHA assessment and approvals process under the *Environmental Protection Act 1986* and *EPBC Act 1999*.

2.7.4 *Environmental Protection Act 1986* – Part V (WA)

Under the provisions of Part V of the *EP Act 1986*, certain premises with significant potential to cause pollution of air, land or water are known as 'prescribed premises' and must hold a Works Approval (licence to construct) prior to commencing any work or construction. In addition, prior to operating these premises a Licence must be obtained for operation of the premises.

Prescribed premises for the Project requiring a Works Approval and Operating Licence at the Project will include:

- Processing or beneficiation of metallic or non-metallic ore - greater than 50,000 tpa.
- Electrical power generation - greater than 20 MW gas or greater than 10 MW diesel.
- Sewage facility – where sewage is treated (excluding septic tanks) – greater than 100 m^3/day.

- Tailings Storage Facility (if required).
- Putrescible landfill - greater than 20 tpa.

The assessment process for the Works Approval and licence will be undertaken concurrently with the EPA and DEWHA assessment and approvals process under the *Environmental Protection Act 1986* and *EPBC Act 1999*.

2.7.5 Rights in Water Irrigation Act 1914 (WA)

The *Rights in Water Irrigation Act 1914* is the principal water legislation in WA and is regulated by the Department of Water (DoW).

Cazaly has submitted a groundwater abstraction licence application to the DoW to allow for groundwater supplies for the Project. An Operating Strategy for the licence is being developed.

The licence assessment process will be undertaken concurrently with the EPA and DEWHA assessment and approvals process under the *Environmental Protection Act 1986* and *EPBC Act 1999*.

2.7.6 Wildlife Conservation Act 1950

The *Wildlife Conservation Act 1950* provides for taxa of native plants (flora) and native animals (fauna) to be specially protected because they are under identifiable threat of extinction. Such specially protected wildlife (fauna and flora) is considered to be "threatened".

The Project will not adversely impact any threatened flora or fauna, thus, no additional approvals under this Act are required.

2.7.7 Other Legislation (WA)

The *Aboriginal Heritage Act 1972* is regulated by the Department of Indigenous Affairs (DIA). As no sites of Aboriginal heritage have been identified at the Project, no additional approvals under this Act are required.

3.0 IDENTIFICATION OF THE PROPONENT

3.1 Cazaly Resources Limited

The proponent information for Cazaly is as follows:

Address:	2nd Floor, 38 Richardson Street WEST PERTH WA 6005 PO Box 396 WEST PERTH WA 6872
Telephone:	08 93226283
Facsimile:	08 93226398
ABN:	23101049334
Directors:	Nathan McMahon Clive Jones Kent Hunter
Project Contact:	Matthew Timbrell - Senior Project Manager

Cazaly Iron Pty Limited is a 100% owned and managed subsidiary of Cazaly Resources Limited.

3.2 Future Joint Venture

Cazaly has signed a Memorandum of Understanding with HWE Mining Pty Ltd (HWE) for the co-development of the Project. The possible future joint venture will comprise a company structure in which Cazaly holds 80% and HWE holds 20% of the development.

In the proposed joint venture, HWE would develop the proposal in conjunction with Cazaly, hence this PER has been prepared in consideration of HWE's environmental management systems, procedures, policies and iron ore experience.

HWE is highly experienced in iron ore mining and is the largest mining contractor in Australia. Under contract for its clients, HWE currently mines over 110 million tonnes of iron ore per annum and owns 50% of the Cockatoo Island iron ore operation.

4.0 DESCRIPTION OF THE PROPOSAL

4.1 Project Location

The Project is located approximately 52 km south of Southern Cross and 15 km south-east of Marvel Loch (Figure 8).

The Perth – Kalgoorlie public access rail line is approximately 60 km to the north west of the Project area, with the preferred rail siding located at Moorine Rock (57 km via the Parker Range Road).

The public access rail line services the ports of Esperance and Kwinana. The port of Kwinana is preferred for the Project as it is 416 km by rail from Moorine Rock and is approximately 240 km closer to the Project than Esperance.

4.2 Tenure

Cazaly formed the Project through an iron ore farm-in agreement with Gondwana Resources Limited (Gondwana). Cazaly recently reached an agreement with Gondwana and now holds 100% of the iron ore rights of the tenement package.

The proposed Project will occur within mining tenements M77/764, M77/741 and M77/742 (Table 3 and Figure 9). These iron ore mining rights within these tenements are 100% Cazaly owned. In July 2010, Cazaly applied for a miscellaneous license L77/220 to develop an infrastructure services corridor for a powerline and alternate site access road.

The proposed mining Project is located within the Shire of Yilgarn. Cazaly received consent from the Shire of Yilgarn to use the existing public and new private road proposed for road train haulage on the 2 June 2010 (Shire reference no. 10336). In addition Cazaly has received consent from the rural landowners for the lease, construction and road haulage operation on Lot 59 and Lot 61 Jilbadji Location.

Crown Reserve (Water Supply) #13208 administered by the Department of Planning is located in M77/741. Cazaly received consent to mine on this reserve on 22 March 2010.

There are no native title claimants over the Project area.

Table 3: Land Tenure of Proposed Project Area

Area	Holder*	Size (ha)	Date Granted	Expiry Date
M77/764	Cazaly Iron Pty Ltd	190	25/01/2007	24/01/2028
M77/741	Cazaly Iron Pty Ltd	560	20/10/2009	19/10/2030
M77/742	Cazaly Iron Pty Ltd	154	20/10/2009	19/10/2030
L77/220	Cazaly Iron Pty Ltd	25	Lodged 16/7/2010	Pending

* Cazaly Iron Pty Limited is a 100% owned and managed subsidiary of Cazaly.

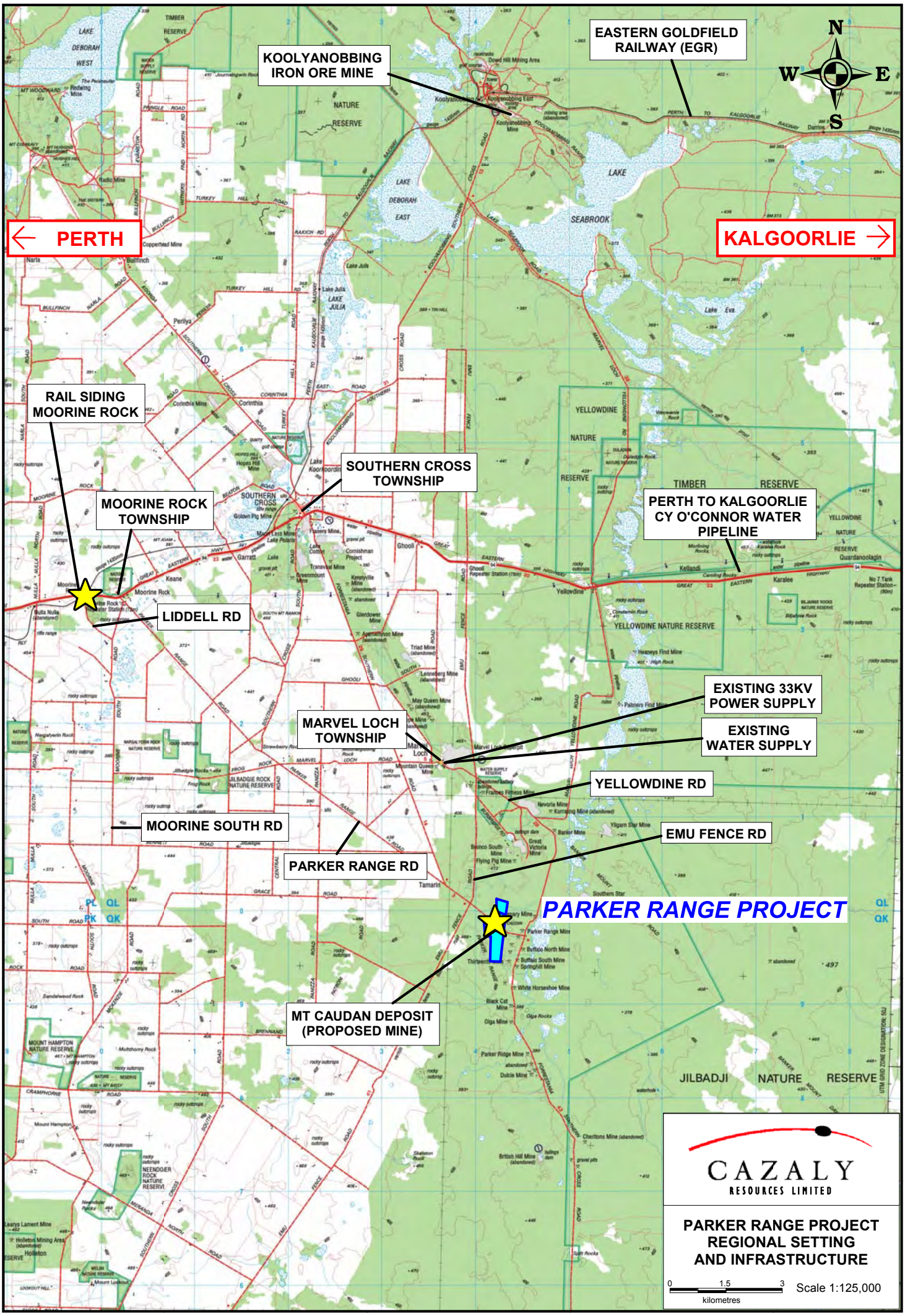

Figure 8: Location of the Parker Range Project

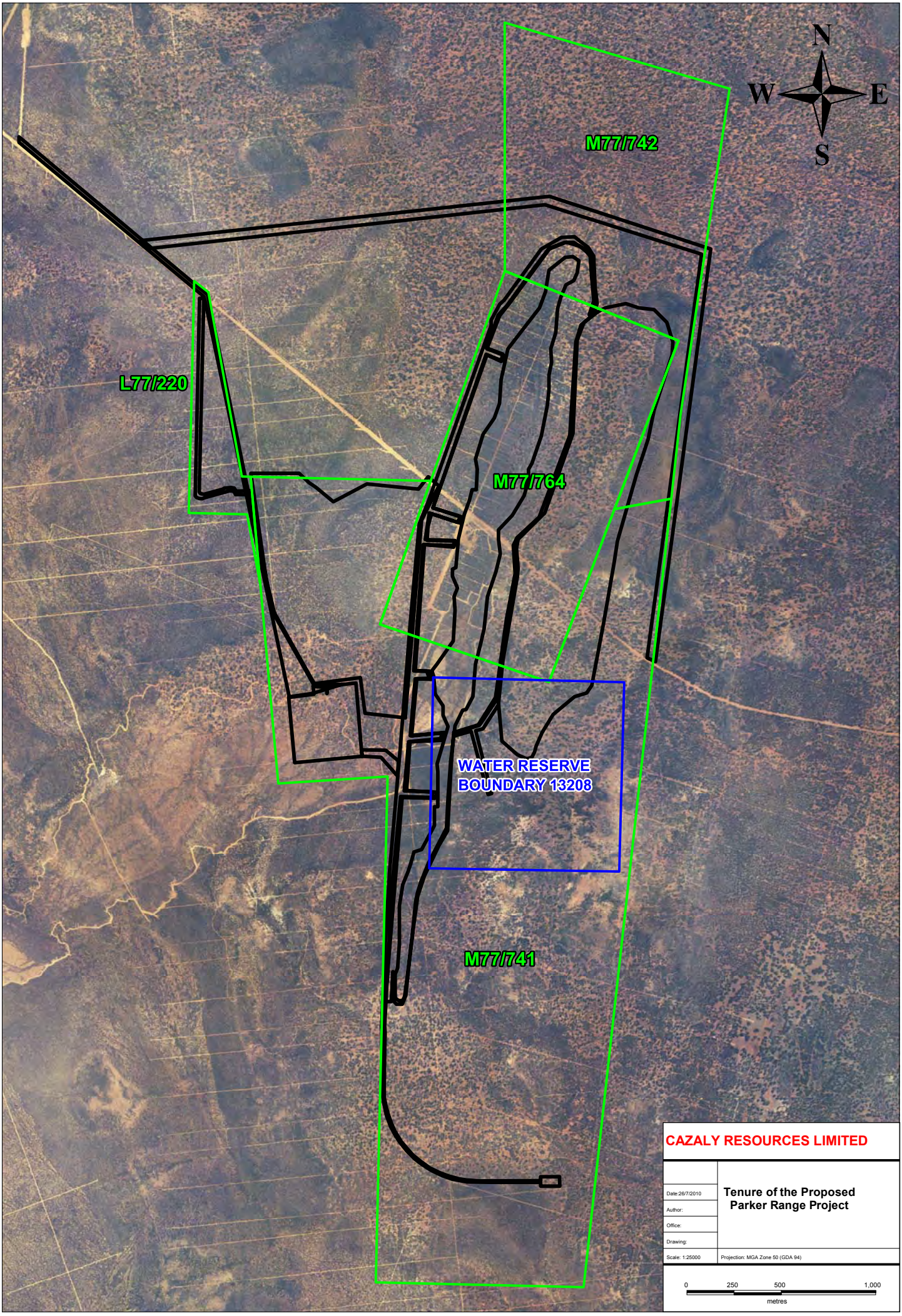

Figure 9: Tenure of the Mt Caudan Project Area

4.3 Key Proposal Characteristics

Table 4 lists the Project's main elements. Figure 10 shows the location of proposed infrastructure.

Table 4: Summary of the Main Elements of the Project

Element	Description
Life of Project	7 -10 years (current JORC resource and Export Port Capacity)
Mining Resource	30 Mt
Mining Method	Open pit
Mine Operation	Continuous
Depth of Pit	Up to 135 m
Depth to Water Table	60 m (365 mRL)
Total Area of Disturbance	421 ha (approx)
List of Major Components: Pit Process plant Waste rock landform Tailings storage facility	 Open pit, 4.0 km (L) x 0.4 km (W) x 135 m (D) Mobile Crushing and Screening (year 1) replaced by Permanent Crushing and Screening with Wet-Plant/Beneficiation (year 2+) Contour profiled 2.0 km (L) x 0.5 km (W) x 45 m (H – maximum) Up to 1 Mm^3 capacity 350 m (W) x 350 m (L) x 8 m (H) – 4 lifts
Ore Mining Rate	4 Mtpa (nominal), 4.6 Mtpa (max)
Total waste rock	55 Mt (approx)
Dewatering Rate (approximate)	14 L/s – mine pit
Water Supply: Source Maximum daily requirement Maximum annual requirement	 Pit Dewatering Bores Supply 1.1 ML/day (year 1) then 1.8 ML/day (year 2+) 321 ML/year (year 1) then 506 ML/year (year 2+)
Power Generation and Requirements	Initially diesel generation (during construction and initial operation), then 33 kV Grid power from Marvel Loch
Fuel Supply	Fuel Bunkers (nominally 2 x 55 kL).
Ore Haulage	57 km, 14 road trains
Operating Hours	24 hrs per day, 7 days per week
Operations Workforce	159 people (114 average on-site)
Construction Period Construction Workforce	Up to 12 months Up to 250 people (peak)
Construction commencement (anticipated)	January 2010

Figure 10: Proposed Mine Infrastructure for the Project

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4.4 Mining Program

Cazaly propose to mine iron ore from the Parker Range deposit by conventional open pit hard rock mining methods at 4 Mtpa. The estimated life of the mine is 7-10 years based on current mineable JORC resources and subject to port export capacity allocation during the development.

The mineable ore is located to 135 m depth and occurs along a strike length of 4.0 km and to width 0.4 km within the BIF for the Mt Caudan deposit (Figure 10).

An open pit will be developed to mine the ore body using a conventional drill and blast operation at 10 m bench intervals (governed by local geotechnical conditions).

A magazine for detonator storage will be provided on-site (Figure 10) with explosives supplied to the mine from an off-site storage and mixing facility near Southern Cross.

Two permanent environmental monitoring stations will be provided on-site to monitor wind speed, wind strength, rainfall, temperature, humidity and periodic dust deposition levels (Figure 10).

A 500 m blasting exclusion zone from pit edge has been used to position non-process infrastructure and personnel away from fly-rock risk areas (Figure 10). During blasting times, this 500 m perimeter will be cleared of personnel for safe mine operation.

The estimated total material movements are presented in Table 5.

Table 5: Forecast Mining Material Movement - Ore and Waste

Description*	Units	Year 1-2		Year 3-7		Total LOM	
		Ore	Waste	Ore	Waste	Ore	Waste
Mining tonnage	Mt	5.42	11.45	24.19	43.86	29.6	55.3
Mining volume	Mbcm	1.79	5.35	8.5	21.48	9.9	26.8

*all material movement quoted in dry tonnes and insitu bcm.

4.4.1 Mine Dewatering

Dewatering of the Mt Caudan deposit will be required once the pit reaches the water table at approximately 60 m below natural surface level (i.e. 365 mRL) (Rockwater 2010a - Appendix 4). This will necessitate the need for below water table mining in the second year of mining. In-pit sumps and perimeter dewatering bores installed during initial mine development will be used for dewatering.

Preliminary water inflow modelling predicts a mine dewatering rate of approximately 14 L/s will be required. Section 5.6 further describes groundwater investigation results from Rockwater (2010a - Appendix 4).

As the demand for plant water is estimated at 1.1 ML/day (4 Mtpa dry processing year 1), it is proposed that mine dewatering will commence with initial mining operations (albeit not due to mining requirements). Mine dewatering activities will be expanded at year 2 of operations to 1.8 ML/day to accommodate the wet-beneficiation plant.

The mine water will be extracted and pumped to a 'turkeys nest' water storage facility positioned near mine go-line access road. Water will be utilised for dust suppression on roads and also within the crushing and screening plant.

In addition to mine dewatering additional mine perimeter bores will be required to supplement plant water requirements from year 2 onwards (refer to Section 4.8.1 Water Resources for further details).

4.4.2 Waste Rock Landform

Based on current JORC resource, approximately 55 Mt of waste rock is expected to be generated from the mining operation. The waste rock landform (WRL) will be located east of the open pit away from the BIF ridge (Figure 10).

The WRL profiles will have side slopes contoured to 15 degrees overall with minimum 10 m wide berms, inter berm lift height of 10 m, and constructed to a maximum height of 45 m (Figure 42). Access ramps will be constructed to a 1 in 10 gradient.

The first layer of the WRL will be built by paddock tipping over the WRL footprint area cleared of vegetation and topsoil. The WRL area will be subsequently levelled before the next lift is established.

A Run-of-Mine (ROM) pad will be built from waste to a final height equal to the primary crushing process plant tipple station of approximately 10 m accessed by a ramp.

A low grade waste stockpile shall be constructed in the region south of the ROM pad in a similar method utilising waste material to a base height matching the ROM pad.

Topsoil shall be segregated from waste rock for use in progressive rehabilitation and mine closure. Topsoil stockpiles shall not exceed 6 m in height and will be located around the WRL's perimeter in non-trafficable areas.

4.5 Crushing and Screening

4.5.1 Mobile Dry Plant Operations

An on-site 4 Mtpa mobile dry crushing, screening and stockpiling plant, located to the west of the mine operation, will treat ore for the first year of operation (Figure 10).

ROM ore will be blended and tipped into the primary size reducing circuit, then dry screened, further crushed and final screened to a fines only iron ore product with particle sizes of less than 14 mm.

Product will be stacked onto product stockpiles with a nominal capacity of 50,000 t.

The process flowsheet for the dry plant is presented in Figure 11.

4.5.2 Fixed Dry and Wet-Plant/Beneficiation Operations

From year two of operation, a new fixed dry crushing plant with a wet-plant/beneficiation process (which involves washing and screening of lower grade ore impurities to tailings) will replace the mobile dry crushing plant.

Metallurgical testwork has indicated that only approximately 30% of the total dry plant feed will be separated after primary sizing for treatment in the wet-plant. The key processes for wet treatment of this material are outlined as follows:

- The plant feed would be primary crushed, sized on a vibrating screen and 30% of the feed would be sent to the wet plant. Remaining dry material would be downstream crushed and screened to a product stockpile.
- The wet-plant feed would be wet-screened at 0.5 mm, with the oversize material returning to the dry plant product stockpile.
- Following wet-screening, the greater than 0.5 mm fines have further water added to compile a slurry and then cyclone sized and spiralled/jigged to separate the coarser particles from the ultrafine particles.
- Cyclones and a belt filter would dewater coarser particles, which are then placed onto the product stockpile.
- The ultrafine particles would be thickened and pumped to an unlined Tailing Storage Facility (TSF).
- Water would be reclaimed from both product stockpiles and TSF to a tails thickener, then recycled and reused via a process water storage facility.

Figure 12 presents the wet plant process flowsheet.

4.5.3 Process Water Demand

Water sprays will add water to the ore during processing to increase the moisture content to a target of 6% by weight. Although the ore will contain some entrained moisture from the pit, this addition of water will be a key to controlling dust during plant operation.

The water demand for the mobile dry plant operation (year 1) will require an estimated 1.6 ML/day increasing to 1.8 ML/day for the fixed dry and wet-plant/beneficiation operations (year 2+).

Section 4.8.1 Water Resources presents a complete operations water balance and further discussion on water supply.

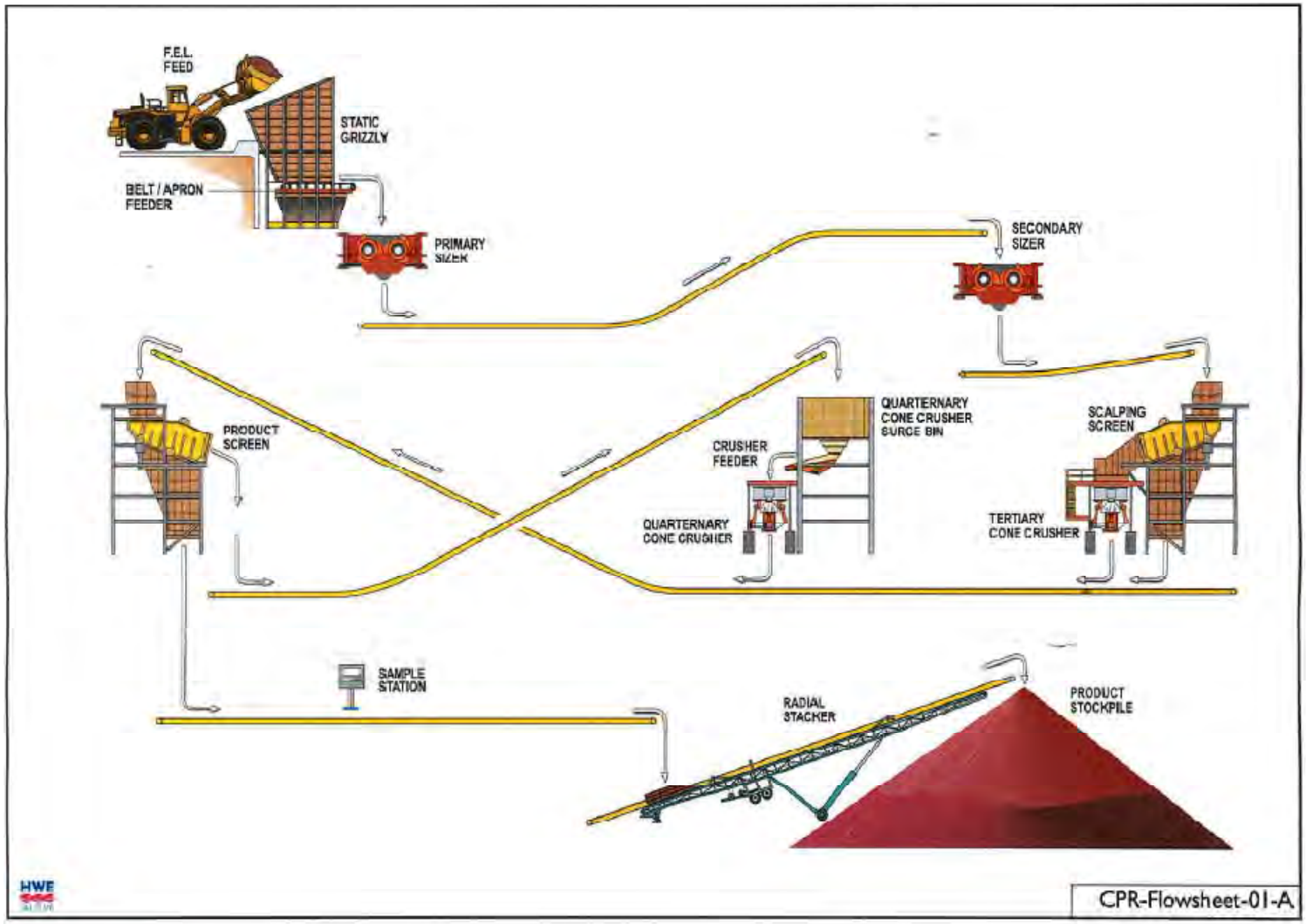

Figure 11: Dry Plant Flowsheet

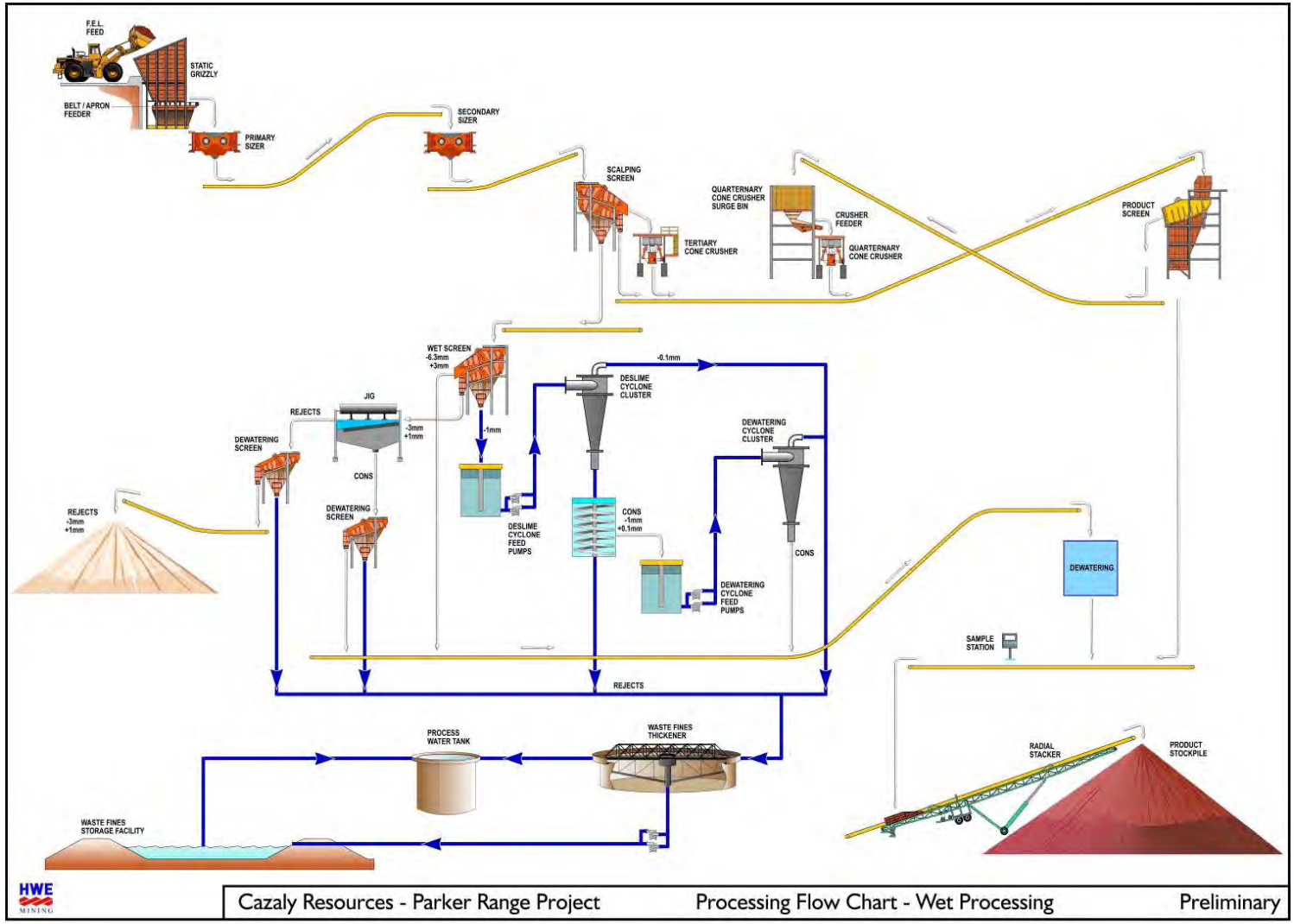

Figure 12: Wet Plant Flowsheet

4.6 Transport

Front end loaders will load iron ore product into on-highway road trains to be transported 57 km northwest to railway infrastructure at the proposed Moorine Rock rail siding (Figure 15).

The transport route is on Shire gazetted public roads for 51 km and future private roads through rural property for 6 km. Cazaly will upgrade and seal gazetted roads and intersections to Yilgarn Shire requirements in conjunction with Main Roads of Western Australia (MRWA). Use of the public road network for restricted access vehicles (i.e. proposed road trains) will require approval from MRWA in accordance with State policy and regulations. As the gazetted roads are formed to a 14 m minimum cleared width, no additional clearing activities will be required. Some additional clearing for the future private roads will be required, however, most of the 6 km road alignment follows existing cleared paddock or access tracks along fence lines. Existing shire and rural landholder borrow pits will be used to source road base, supplemented by laterite gravels from mine pre-strip.

The trucks will unload ore product into a designated stockpile area located at a proposed rail siding at Moorine Rock, as determined in conjunction with the rail provider.

Iron ore product will be loaded from the proposed rail siding at Moorine Rock rail siding into ore cars and transported along existing rail infrastructure to the Port of Kwinana (Kwinana Bulk Terminal, KBT), Western Australia. Fremantle Ports operate the Port.

Iron ore product will be unloaded at the port and stored, prior to being loaded onto iron ore shipping vessels with existing iron ore ship-loading facilities.

The proposed 4 Mtpa logistics operations from Parker Range site to the KBT port is outlined as follows:

- 14 road trains operating four cycles per hour, 24 hours per day.
- 12 train cycles per week operating on a fixed terminal to terminal schedule.
- Port storage, handling and ship loading of up to eight iron ore vessels per month for delivery to market.

The dust extinguishment moisture level for Parker Range ore has been established as 6% moisture by weight. Facilities have been designed with the ability to manage from site to port moisture content of product and use dust surfactants on uncovered trailer loads and stockpiles for the control of dust emissions.

The proposed Moorine Rock rail siding, rail haulage transport and Kwinana Port Operations are excluded from this Project assessment.

4.7 Infrastructure

4.7.1 Buildings

Various temporary and permanent buildings will be constructed at the Mt Caudan mine site, including a construction office, mine/operations administration complex, mine/operations crib rooms with toilets, workshop/warehouse/laydown facility, fuel management facility (storage tanks and in/outloading pumps), vehicle park-up (including a go-line and water stand-pipe) and heavy/light vehicle wash down bays (Figure 10).

Other temporary contractor offices and workshops will also be required throughout Project development, but will vary based on the contractor strategy adopted for Project implementation.

Semi-permanent and permanent buildings shall be connected to a common leach drain sewerage system, with temporary buildings supplied with self-contained pump-out sewerage tank systems.

4.7.2 Site and Bypass Roads

Mine site light vehicle roads will be 14 m in width, with a drainage bund alongside roads to capture runoff. Mine heavy vehicle haul roads shall be up to 32 m in width and built up to a finished windrow height of 1.8 m (nominal) for mine haul roads above the natural surface with a drainage bund alongside public roads (where required).

Culverts (designed for 100-year ARI event) will be placed as required to facilitate surface drainage under the roads in the event of severe rainfall events.

A new 6 km gazetted road will be constructed for the Parker Range Road bypass around the proposed mine site, as the existing road currently passes through the proposed mine area (Figure 10). The location of this road has been selected to align with previously cleared exploration tracks (nominally 5 m in width), which shall require additional clearing to a 14 metre width to re-instate public access.

Construction materials for new and existing road upgrades shall be sourced from the mine site, rural landholders' pastoral properties and the rail terminal (borrow to fill gravel materials).

4.8 Resource Requirements

4.8.1 Water Resources

Project and mining operations will require potable and process water. Process, sub-potable and potable water shall be sourced from local in-pit and perimeter dewatering bores (1.1 ML/day year 1) and supplemented by further in-pit and perimeter dewatering bores (1.8 ML/day year 2+) located along the open pit.

All pipelines will be either buried or located within a vee-trench to enable containment of any potential leaks or spills.

A groundwater licence will be obtained from DoW to permit groundwater abstraction.

A desalination plant is proposed to be installed to treat mine dewatering for the purposes of sub-potable and potable supply. The desalination plant is required to treat up to 0.9 ML/day by year 2+ and will produce up to 37 kg/day of brine solids in water mixture given the salinity of the water in the deposit is estimated at 41,000 mg/L TDS (Rockwater 2010) (Appendix 4). Brine water will be mixed with mine dewatering and disposed by watering in-plant roads. The salinity of the brine is estimated to be approximately 60,000 mg/L TDS, with the combined water for road dust suppression expected to be approximately 50,000 mg/L TDS.

Field investigations and test bores were drilled by Cazaly in during May and June 2010 indicating that pumping rates per bore are expected to yield 5 L/s to in excess of 15 L/s (Rockwater 2010a - Appendix 4). The transmissibility of the deposit is variable, with some bore locations yielding negligible water.

Cazaly will initially commission two bores for construction and the first year of operation, then commission subsequent bores identified for years 2+ to meet required water demand for the development.

Progressive development of dewatering bores shall be sufficient to provide for an estimated water demand of 1,783 kL/day from year 2+ operations (refer to Section 4.8.2 for demand estimation).

4.8.2 Water Balance

The Project will require water for dust suppression on site roads/stockpiles, ore processing and ancillary uses for amenities. Water will be supplied from combined sources of entrained moisture in the ore during mining, rainfall in the open pit catchment and supplemented from in-pit and perimeter dewatering bores. Water will also be reclaimed from the TSF after year 3.

The estimated supply requirements from pit dewatering bores are 1.1 ML/day (i.e. 321 ML/y) for the mobile crushing operations (year 1) and 1.8 ML/day (i.e. 506 ML/y) for the permanent crushing/screening with wet plant/beneficiation operations (year 2+).

Table 6 and Table 7 summarise the Project's water balance for year 1 and years 2+ respectively.

Table 6: Summary of Water Balance for Year 1

Description	Water Balance (kL/d)	Water Balance (kL/y)	Comment
Supply			
Ore / Rainfall Capture	653	185,452	Water entrained with ore and rainfall capture in open pit area
Pit Dewater Bore Supply	1,132	321,488	Combined bore pumping 13 L/s.
Total Supply	1,785	506,940	
Demand			
Process Plant to Product	700	198,800	Water sprays to increase moisture
Dust control on roads	960	272,640	Site roads mine and infrastructure
Treated sewage	5	1,420	Ablutions and amenities
Stockpile evaporation	120	34,080	Natural evaporation due to climate
Total Demand	1,785	506,940	

Table 7: Summary of Water Balance for Years 2+

Description	Water Balance (kL/d)	Water Balance (kL/y)	Comment
Supply			
Ore / Rainfall Capture	653	185,452	Water entrained with ore and rainfall capture in open pit area
Pit Dewater Bore Supply	1,783	506,372	Combined bore pumping 21 L/s.
Total Supply	2,436	691,824	
Demand			
Process Plant to Product	845	239,980	Water sprays to increase moisture
Dust control on roads	960	272,640	Site roads mine and infrastructure
Treated sewage	7	1,988	Ablutions and amenities
Stockpile evaporation	120	34,080	Natural evaporation due to climate
TSF evaporation	386	109,624	Natural evaporation due to climate
TSF retention	118	33,512	Entrained moisture in tailings
Total Demand	2,436	691,824	

The water balance is in deficit throughout the proposal (demand for year 1: 1.1 ML/day, year 2+: 1.8 ML/day); hence the operations will develop water bores in accordance with demand, rather than dictated from dewatering supply due to mining below water table.

The estimated mine water usage during dry processing operations (year 1) of 321 ML/year is consistent with Cliffs' Windarling Range mine near Koolyanobbing which used 380 ML/year in 2006 (5 Mtpa) and 560 ML/year (8 Mtpa) in 2008 (Cliffs, 2009).

4.8.3 Electricity

On-site diesel generation units will initially provide electricity for Project construction and initial operations. The mobile crushing plant is expected to demand 1 MVA for the first year of operation. The fixed and wet plant will have an expected demand of 5.2 MVA at the start of year 2.

The existing high-voltage (HV) powerline extends east along the Marvel Loch - Yellowdine Road. A new connection to this HV line will be made at the intersection of Emu Fence and Marvel Loch - Yellowdine Roads. The new overhead powerlines will extend along Emu Fence Road to the Parker Range Road intersection and then into the processing plant, covering a distance of approximately 17.5 km. This will supply long-term power for operations. The 33 kV power supply will be completed in conjunction with Western Power (Figure 13).

4.8.4 Fuel Supply

Diesel fuel will be required for construction, mining operations and road haulage activities. A mixed-use fuel facility sufficient to store up to one week's site diesel consumption will be installed.

The facility will comprise up to two nominal 55 kL bunded (i.e. self contained) tanks, which will be located adjacent to the mine office complex and road train refuelling station (Figure 10).

The bulk diesel storage tanks complete with pumps, valves and piping will be installed in a dedicated bunded area for fleet refuelling. A reinforced concrete apron and spillage containment system will be established adjacent to the tanks for both light and heavy vehicle refuelling.

4.8.5 Lighting

Mobile lighting towers will be provided for the ROM pad, the workshop/warehouse, mine complex and administration offices during the mobile dry crushing plant stage.

Fixed lighting towers will be provided for the ROM pad, the workshop/warehouse, mine complex and administration offices on completion of the fixed and wet plant.

Lower level lighting will be installed within the crushing and screening plant to meet relevant Australian luminescent standards.

Figure 13: Proposed 33 kV Power Supply Route

4.8.6 Sewage

A sewage system for the mine/operations administration, workshop/warehouse and contractors' ablutions consisting of a septic tank/leach drain system or self-contained pump out septic system will be installed.

The septic system will be designed and operated in compliance with the health requirements of the Health Department of Western Australia and the Shire.

4.8.7 Iron Tailings

An engineered TSF facility will be constructed for year 2+ operations for the storage of wet plant ultrafines tailings. Tailings will be beached against the perimeter embankment by use of a branched perimeter main with distributed spigot discharge points. Water will be recovered and pumped back to the wet plant tails thickener for recycling via a central decant system and a collection drain system installed in the floor of the TSF. The decant system will limit the volume of water stored across the surface of the TSF.

The tailings material will contain no adverse reagents, and will have similar chemical composition to the ROM feed material.

The TSF is to be unlined, however structural preparation of the internal sheeting will include clayey gravels and initial tailings rolled and formed to achieve less than 10^{-8} m/s permeability.

The proposed TSF facility will store 1 Mm^3 of tailings for the estimated life of the mine and be constructed with an effective area of 350 m x 350 m x 8 m high. It will be constructed in 4 lift stages of 2 m per stage.

Monitoring bores will be established around the periphery of the TSF to facilitate assessment of groundwater quality during TSF operation.

All pipelines will be either buried or located within a v-trench to enable containment of any potential leaks or spills.

Figure 14 depicts the TSF design, which will be located to the southwest of the proposed mine pit.

4.9 Hazardous Materials

All hazardous materials will be handled and stored in accordance with the requirements of the *Dangerous Goods Safety Act 2004*. Hazardous material on-site will include hydrocarbon consumables, predominately diesel fuel, lubricants and oils.

Bulk diesel storage tanks complete with pumps, valves and piping will be installed in a bunded area to provide fuel or self bunded tanks will be used. A concrete apron and spillage containment system will be established adjacent to the tanks for fuel deliveries and vehicle refuelling.

All bulk hydrocarbons (with the exception of bulk diesel) will be stored in concrete bunded areas adjacent to the workshop. Storage areas will be capable of containing 110% of the largest container stored and 25% of the aggregate of all containers stored.

The washdown bay will include a water/oil interceptor system, which will be located next to the washdown pad, to remove hydrocarbons contaminating the washdown water. The "cleaned" water will then be available for recycling through the washdown bay.

Waste oil will be stored in a tank and removed from site for recycling by a licensed collection service.

The water treatment plant (i.e. desalinisation plant) proposed to produce potable water will require biocide and hypochlorite solutions, which will be stored in fully contained areas capable of withholding 110% of the largest storage vessel. Flocculant will be the main process plant reagent, which will be delivered as a dry powder and mixed into a solution as required. The proposed flocculant is not classified as a Dangerous Good. Antiscalent is likely to be added to the water circuit given the high salinity of the raw water. This reagent will be supplied as a solution and contained in a bunded area adjacent to the dosing point; it is not regarded as a Dangerous Good.

4.10 Access Roads

Site access from either Perth or Kalgoorlie will be from the existing Parker Range Road.

A dedicated northern bypass will be constructed for Parker Range Road to maintain public access given the gazetted road passes through the proposed Mt Caudan mine area (Figure 15).

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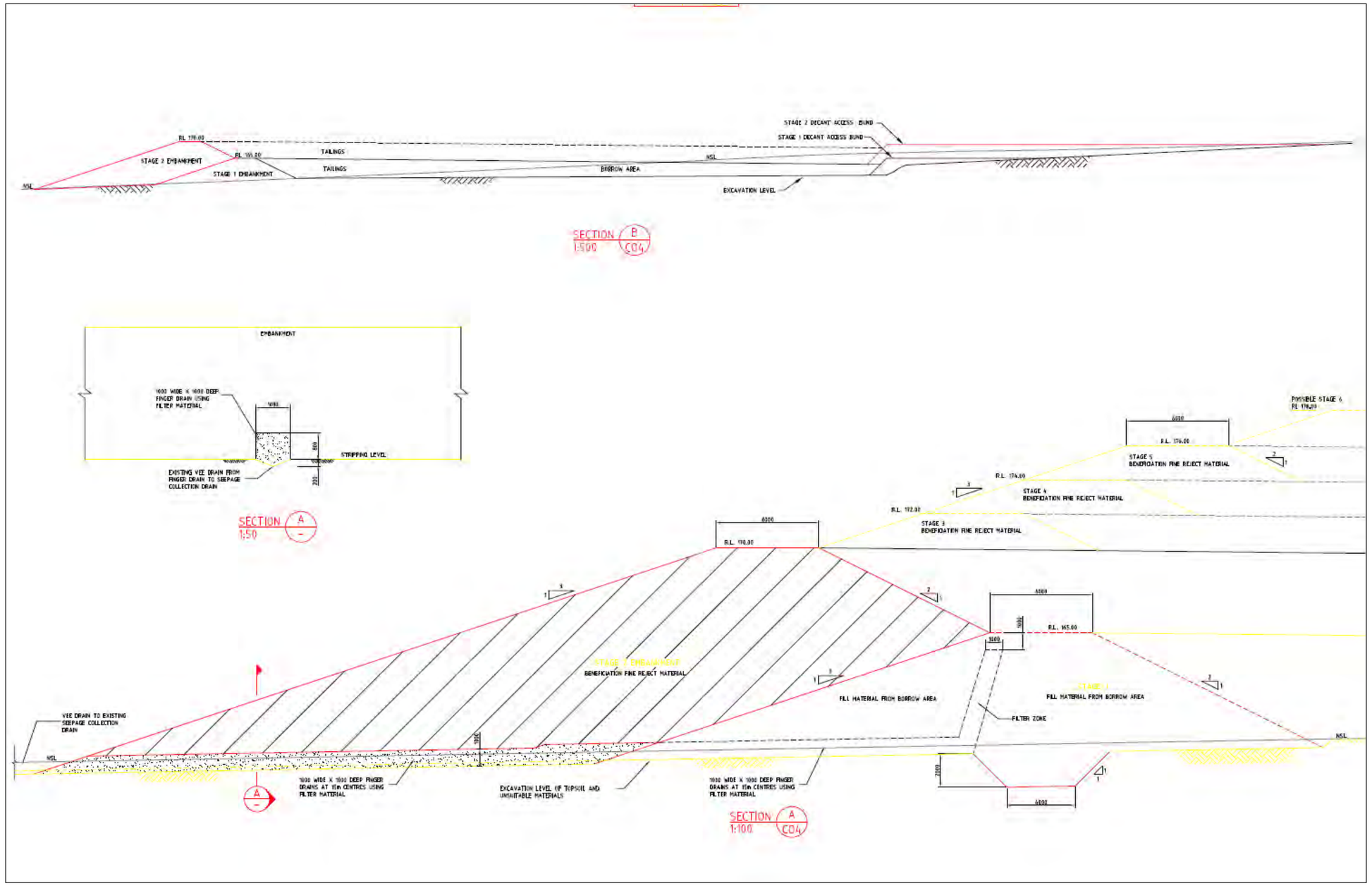
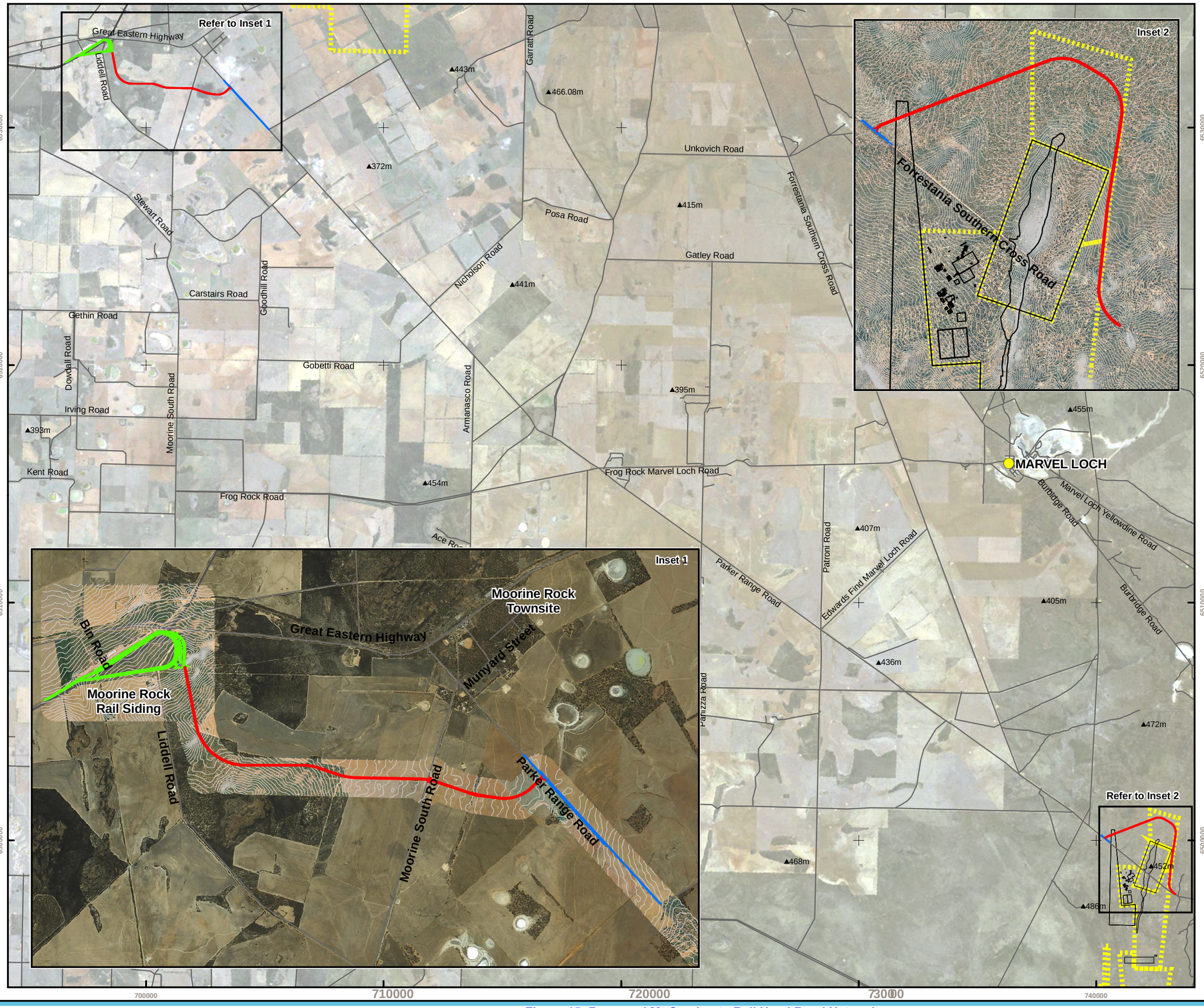


Figure 14: Proposed TSF Design – Embankment Section



CAZALY Resources Limited

0 1 2 3 4 5 6 7 8
Kilometres
1:150,000 (A3)

Datum: GDA94 Projection: MGA z50

LEGEND

- Design
- 90 degree Intersection
- Moorine Rock Rail Siding
- Plant Site
- Tenements

AECOM

Figure 15: Proposed Mt Caudan to Rail Head Road Network

4.11 Ore Haul Road

The proposed 57 km ore haul road is proposed on an existing gazetted public access road (i.e. Parker Range Road) and a new proposed private access road (Lots 59 and 61) (Figure 15). No additional clearing or widening of Parker Range Road is proposed. The private road corridor is on existing agricultural land and requires low impact clearing of a maximum 6.8 ha.

The public haulage road will be upgraded to cater for on-highway road trains in conjunction with the Shire's long term works program as follows:

- 23 km gravel section of Parker Range Road between the mine site and Panizza Road intersection is to be sheeted and bitumen sealed to Shire standards. No additional edge clearing is envisaged as the road is already formed to a 14 m width.
- 28 km sealed section of Parker Range Road-Moorine South Road (between Panizza Road intersection and Liddell Road intersection) is to be widened from 6.3 m to a fully sealed 7 m width.
- 6 km new private road from a new intersection on Parker Range Road (approximately 1.75 km before the Moorine Rock Township) along a new private road Lot 61, to a new intersection crossing Moorine South Road, to a new private road on Lot 59 to a proposed rail terminal location at Moorine Rock. The new private road will be constructed on existing agricultural land with clearing required to a maximum 14 m width for the road corridor and a 7 m fully sealed width.

The proposed Moorine Rock rail siding is excluded from this assessment.

4.12 Workforce

The Project construction workforce is estimated to peak at 250 persons, with an ongoing operations workforce of 159 persons comprising Cazaly staff and contractor personnel on a rotating shift basis. Approximately 114 people will be on-site at any one time. These estimates exclude third party, Project and operational personnel associated with downstream rail and port enhancements.

Personnel involved at Parker Range will be accommodated at Marvel Loch in both existing accommodation (currently managed by St Barbara Gold Mines) and a new 172 person accommodation village, proposed to be built at the old Marvel Loch School Site. The old school site is substantially established with infrastructure, materially cleared and deemed suitable for development.

Personnel involved in rail siding construction will be accommodated in the existing township of Southern Cross or Marvel Loch, as determined by accommodation availability during construction.

The development of the proposed Marvel Loch accommodation village is excluded from this assessment.

4.13 Project Footprint

Cazaly have completed a vegetation clearance estimate for the Project (Figure 16) which estimates approximately 421 ha of native vegetation will be cleared (Table 8).

Table 8: Proposed Disturbance for the Project

Element	Clearing required (ha)
Pit	58.8
Pit Edge Protection	58.4
Waste Rock Landform	119.8
Process Plant and Associated Infrastructure	89.5
Mine Haul Roads and Pipeline Corridors	42.0
Parker Range Bypass Road	10.3
Power Line	14.6
Site Access Road	2.5
TSF	17.4
Stormwater Diversion Levee	0.7
Upper Haul Road (near Moorine Rock)	6.8
TOTAL	420.8

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LEGEND

LOCATION	AREA
PLANT	89.497 ha
WASTE DUMP	119.842 ha
PIT	58.778 ha
PIT EDGE PROTECTION	58.378 ha
HAUL ROADS & PIPELINE CORRIDORS	41.973 ha
PARKER RANGE RD ROAD DIVERSION	10.284 ha
TRANSMISSION LINE (FUTURE)	14.650 ha
ACCESS ROAD (FUTURE)	2.500 ha
EVAP. & PROCESS WATER PONDS	17.406 ha
STORMWATER DIVERSION	0.700 ha
TOTAL	= 414.008 ha

TENEMENT LINE
ROAD DIVERSION = 5.947 ha
MALLEE FOWL NEST INACTIVE
MALLEE FOWL NEST INACTIVE
TRAPDOOR SPIDER COLONY
PARKER RANGE ROAD DIVERSION
PARKER RANGE ROAD
500m EXCLUSION ZONE FROM PIT
400m RADIUS FLORA EXCLUSION ZONE
400m RADIUS FLORA EXCLUSION ZONE
30m CLEARING CORRIDOR
TOE
WASTE DUMP 119.842 ha
VEGETATION SURVEY NEW AREA 09
MINESITE VEGETATION SURVEY REGION
FLORA
PIT EDGE 45.45 ha
PIT
PRODUCTION BORE PB01
PRODUCTION BORE PB04
PIT 49.773 ha
HAUL & ACCESS ROADS = 3.632 ha
ACCESS ROAD
ENVIRONMENTAL MONITORING STATION
400m RADIUS FLORA EXCLUSION ZONE
1 km LINE FROM PIT
MAGAZINE
742000mE
HAUL ROAD & CORRIDOR = 38.341 ha
PIT EDGE 9.644 ha
PIT EDGE 3.500 ha
PIT EDGE 2.783 ha
PIT 9.005 ha
PIT EDGE 0.635 ha
60m LINE FROM PIT
VEGETATION SURVEY NEW AREA 09
HAUL ROAD
STOCKPILE
STOCKPILE
VEGETATION SURVEY NEW AREA 09
ACCESS ROAD
STORMWATER DIVERSION 0.7 ha
EVAPORATION TSF & PROCESS WATER PONDS 17.406 ha
500m EXCLUSION ZONE FROM PIT
ROAD DIVERSION = 4.178 ha
PARKER RANGE ROAD DIVERSION
741000mE
MALLEE FOWL NEST DECONSTRUCTED
PLANT AREA 89.497 ha
MALLEE FOWL NEST ACTIVE
ENVIRONMENTAL MONITORING STATION
TENEMENT LINE
33kV TRANSMISSION LINE (12m CORRIDOR)
FUTURE TRANSMISSION LINE (20m WIDE CORRIDOR) = 3.5 ha
FUTURE ACCESS ROAD (20m WIDE CORRIDOR) = 2.5 ha
TENEMENT LINE
PARKER RANGE ROAD
6500000mN
6498000mN
6496000mN
6494000mN
NORTHING & EASTING COORDINATES ARE MGA ZONE 50

33kV TRANSMISSION LINE.
TO MARVEL LOCH YELLOWDINE RD.

CLEARING AREA CALCULATION
INCLUDES FOR
1.27km LENGTH x17m WIDE ALONG NORTH OF PARKER RANGE RD = 2.15ha
4.5km x 20m WIDE ALONG EAST OF EMU FENCE ROAD = 9ha.
9.0km ALONG EMU FENCE RD IS ALREADY CLEARED.

REV	DATE	DESCRIPTION	BY	CHK	CIVIL/STR	MECH	E/I	PROCESS	APPROVED
C	12.7.10	REISSUED FOR INFORMATION	CH						
B	2.7.10	REISSUED FOR INFORMATION	CH						
A	30.6.10	ISSUED FOR INFORMATION	CH						

REFERENCE

DRAWING NUMBER | TITLE

HWE MINING
ABN 44 117 175 67 2
55 Broadway Nedlands WA 6009
PO Box 1166 Nedlands WA 6909
Ph: +61 (8) 9389 4717
Fax: +61 (8) 9389 4949

LEIGHTON

CONTRACT No.
ENG DESIGN BY
DRAWN C.HUNTER 28.6.10
CHECKED
CIV & STRUCT DESIGN APPD
MECHANICAL DESIGN APPD
ELECT & INSTR DESIGN APPD
PROCESS DESIGN APPD

CLIENT
PARKER RANGE PROJECT
MINE SITE
CLEARING AREAS
GENERAL ARRANGEMENT

SCALE 1:5000 A0
DRAWING No. M8521-P00-GE-DR-0003
REV C

Figure 16: Clearing Area Estimate Mt Caudan Impact Area

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5.0 EXISTING NATURAL AND HUMAN ENVIRONMENTS

The natural and human environments of the Yilgarn region have been described in various environmental and planning documents, including studies undertaken by DEC, St Barbara Mines, Cliffs Natural Resources, Polaris Metals, Southern Cross Goldfields and Western Areas. In the Southern Yilgarn (particularly BIF ranges), no recent relevant regional studies have been completed.

Cazaly engaged several environmental consultants to undertake necessary field work and studies within the regional and local Project area. This chapter summarises the existing natural and human environments with a regional and local area context, as is relevant to the Project.

5.1 Climate

Hot, dry summers and mild, wet winters characterise the Project region's climate (Beard, 1990). The nearest official meteorological station is located at Southern Cross. The major climatic features (BOM 2009a; BOM 2009b) of the Parker Range region are:

- Maximum temperature peaks (greater than 30ºC) occur between December and March;
- Rainfall occurs throughout the year (on average) with approximately 43 days of rainfall. The wettest months (greater than 30 mm) occur between May and August, and the driest months (less than 20 mm) occur between October and January; and
- Winds between January and April are predominately in a north-east, east or south-east direction during both mornings and afternoons. During July to October the wind is predominantly in a north-west, west or south-west direction during the mornings, with afternoon winds showing variable directions. Periods of calm (no wind and wind less than 10 km/hr) occur during the mornings between May to July, with the strongest winds occurring in the afternoons from July to November.

5.2 Biogeographic Region

The Interim Biogeographic Regionalisation for Australia (IBRA) divides the Australian continent into 85 bioregions and 403 subregions (Department of the Environment, Water, Heritage and the Arts, 2008). The Project tenements are located within the Coolgardie 2 (*COO2 – Southern Cross*) and Avon Wheatbelt (*AW1 – Ancient Drainage*) IBRA subregions (Cowan *et al*., 2001; Beecham, 2001), and are further described within the following sections.

5.2.1 Coolgardie 2 (COO2 – Southern Cross)

The Coolgardie Southern Cross subregion lies on the 'Southern Cross Terrane' of the Yilgarn Craton. The subregional area covers 6,010,834 ha.

This subregion is characterised by gently undulating uplands dissected by broad valleys with bands of low greenstone hills (Cowan *et al*., 2001). The granite strata of the Yilgarn Craton are interrupted by parallel intrusions of Archean Greenstone. Drainage in this area is occluded.

Valleys have quaternary duplex and gradational soils, and include chains of saline playa-lakes. Diverse *Eucalyptus* woodlands, rich in endemic eucalypts occur around these salt lakes, on the low greenstone hills, valley alluvials and broad plains of calcareous earths. The granite basement outcrops support swards of *Borya constricta* with stands of *Acacia acuminata* and *Eucalyptus loxophleba*. Upper levels in the landscape are the eroded remains of a lateritic duricrust yielding yellow sandplains, gravelly sandplains and lateritic breakaways.

The subregion is recognised as a centre of endemism for banded-ironstone hill flora, sandplain *Acacia*, *Myrtaceae*, Goldfield woodlands and one sandplain skink (*Ctenotus xenopleura*). High species and ecosystem diversity includes Banded ironstone ranges, ephermeral flora communities of Tertiary sandplain scrubs and of valley floor woodlands.

5.2.2 Avon Wheatbelt (AW1 – Ancient Drainage)

The Avon Wheatbelt is an area of active drainage dissecting a Tertiary plateau in the Yilgarn Craton and consists of gently undulating landscape of low relief.

Within this bioregion, AW1 is an ancient peneplain with low relief, gently undulating landscape. There is no connected drainage; salt lake chains occur as remnants of ancient drainage systems that now only function in very wet years. Lateritic uplands are dominated by yellow sandplain (Beecham 2001).

Vegetation includes proteaceous scrubheaths, rich in endemics, on residual lateritic uplands and derived sandplains; mixed eucalypt, *Allocasuarina huegeliana* and *Acacia acuminata,* Jam Wattle and *Eucalyptus loxophleba* York Gum woodlands on Quaternary alluvials and eluvials. Total area is 6,524,190 ha.

5.3 Land Systems

The Project area is located within the Southern Cross Zone of the Kalgoorlie Soil-Landscape Province. A laterised plateau on Precambrian gneisses and granites with greenstone belts characterise this area. The surface of the Southern Cross Zone consists of rises and low hills on Archean greenstones. Broad valleys occurring in the area often contain salt lake chains (Schoknecht *et al.* 2004).

The surface of the plateau is flat to gently undulating, below which shallow valley plains are formed on Quaternary alluvium and colluvium (Tille 2006). These plains show little defined drainage with some seasonal lakes and claypans with isolated granitic and basic rock outcrops. Saline flats and chains of salt lakes occur lower in the landscape in broad flat valleys (Tille 2006).

The Southern Cross Zone lies on a deeply weathered mantle with red, loamy to clayey and calcareous soils (Schoknecht *et al.* 2004).

A major valley incised in the less resistant granitoid dome dominates the general morphology of the Parker Range area. The valley is bounded by erosionally resistant ridges of the BIF with silica enrichment, which rises gently above the plain to 475 m ASL. The local Project area is characterised by BIF landform with the eastern face rising from 405 m to 453 m ASL at the Mt Caudan deposit area. The Project area is flanked by laterite and BIF ridges: Parker Range extension to north, British Hill to the south and Toomey Hills to the east.

The Project area is dominated by a low north-south striking ridge line containing the iron ore deposit (48 m local relief). This ridge is flanked on both sides by moderately sloping sideslopes (10-15%) formed from alluvial and colluvial processes.

These sideslopes decrease in gradient to drainage plains of very low gradient. There are no distinct drainage (incised) lines within the broad areas. These drainage areas have low rates of water runoff with periods of soil accumulation exceeding periods of erosion.

Appendix 15 provides a photographic depiction of the surrounding landform environment.

5.4 Geology

5.4.1 Regional Geology

The Project area overlies part of the southern extension of the Southern Cross Greenstone belt on the western side of the Parker Dome granitoid, on the Yilgarn Goldfields Province. This region is typically Archaean granite-greenstone terrane, characterized by large areas of granitoid and narrow linear belts of greenstone. The greenstones are heterogeneously deformed and metamorphosed to lower amphibolite facies. They comprise thick mafic to ultramafic volcanic sequences, felsic to intermediate sequences comprising pelites, psammites, BIFs and shale. Later granitoid intrusion and deformation have disrupted the greenstone sequence. Markwell (2003) described a domain of amphibolite facies metamorphism, where the primary rock types are tremolite-chlorite schist (after komatiite), plagioclase-hornblende schist (after tholeiitic basalt) and BIF.

5.4.2 Local Geology

The Project area is predominantly underlain by the metasedimentary sequence of the western side of the Parker Dome granitoid. A strongly magnetic sequence underlies the north-eastern part of the Project area at Spring Hill West and weakly magnetic granitic rocks, containing xenoliths of assimilated greenstone units, underlie the western part of the tenement. Several magnetic units have been identified within the western metasedimentary sequence, including a thin sulphide-rich chemical sediment unit described as a metabasalt komatiite horizon in Bisset (1996) which can be traced with little discontinuity from the Great Victoria Mine to Mt Caudan, through the Project area and on to Pointer 7 in the south (Eclipse 1995). Localized decreases in magnetism observed along the length of this unit are thought to be the result of late stage porphyry/felsic intrusives (Bisset 1996).

A second northward trending aeromagnetic anomaly within the western metasedimentary sequence corresponds to a prominent sulphidic BIF horizon. This unit is discontinuous, possibly due to its removal by the adjacent granite. The British Hill BIF, to the south of the Project area is interpreted to be part of this BIF horizon. A northerly trending discontinuous magnetic horizon at Parker Range lies to the south of the strongly magnetic sulphidic BIF horizon. A later aeromagnetic interpretation across this area suggested that the underlying (granitic) rocks contained a substantial amount of variably assimilated, relict greenstone material (Bisset 1996).

Other linear magnetic anomalies identified within the Project area are associated with altered ultramafics in the form of magnetite bearing serpentinite. At the Mt Caudan deposit the host BIF forms a ridge (453 m ASL) raising from the natural plain (405 m ASL), dips approximately 50º to the northwest and pinches and swells from 10 m to 70 m in thickness (majority under groundcover). There is a small amount of low-grade canga and detrital mineralisation (secondary iron rich mineralisation) at surface shed from the BIF ridge. A known fault has occurred in the BIF ridge in the mid-pinch point of the Mt Caudan deposit in the approximate location of the Parker Range Road. The local geology is characterised by folded interruption of the host BIF and ground conditions of a broken, vuggy nature. The folded fault is not associated with any recent recorded seismic activity in the region and can be considered inactive and stable.

5.5 Surface Hydrology

5.5.1 Regional Surface Hydrology

The drainage is approximately north-south and flows into Lake Eva and Lake Seabrook further to the north. A series of perennial lakes are located approximately 3.2 km east of the mine site (Figure 17). Drainage in the Project area comprises several ephemeral drainage lines, with no permanent surface water bodies.

5.5.2 Local Surface Hydrology

Rockwater (2010b - Appendix 3) have undertaken a local Project area surface water study to further understand local Project area surface water hydrology.

Four local water catchment areas, derived from a hydrological and hydraulic analysis of the surface water regime, have been identified and represent headwaters to drainage lines (Rockwater 2010b – Appendix 3). Sub-catchment areas vary from 0.6 km^2 to 2.0 km^2 with estimated natural 100 year average reoccurrence interval (ARI) rainfall flow rates between 2.5 - 5.54 m^3/s (Figure 18). Rockwater (2010) further describes the local surface hydrology in Appendix 4.

5.6 Groundwater

5.6.1 Regional Groundwater

The Project is located on the western boundary of the Goldfields Water Management area and the Yilgarn sub-catchment area.

Rockwater (2009) has undertaken a review of previous and existing groundwater usage in the Marvel Loch – Parker Range regional area. The review identified five major geographic groups of bores within a 25 km radius of the Project (Figure 19).

The five groups of bores are located within a variety of aquifers including weathered to fresh metasediment, coarse-grained palaeochannel deposits and weathered granite (Rockwater 2009).

The groundwater yields from these bores are related to the aquifer type and range from an average of 400 kL/day at Southern Star and Great Victoria to 2,400 kL/day at Yilgarn Star. Surficial yellow sand deposits and weathered granite are also exploited and yields of less than 1 L/s and 95 kL/day respectively have been recorded (Rockwater 2009a).

The closest known existing regional groundwater bores to the local Project area are the Southern Star borefield (to the east) and low yield pastoral bores (to the west), which are at least 7 km away. Potential regional water sources are situated within fractured bedrock in high landscape positions, or the headwaters of palaeochannels located to the south west of the Project area.

A remnant 1900s registered Water Supply Reserve #13208 for a Shire town planning water scheme is located along the Project area's southern boundary (Figure 9).

5.6.2 Local Groundwater

Rockwater (2010a) (Appendix 4) has undertaken field investigations to further understand the local Project area groundwater hydrogeology.

Mineral exploration drilling data (core photos and drill cuttings) show that the basal, saturated part of the goethite-hematite orebody is commonly vuggy and broken, and therefore likely to be permeable and porous. This is confirmed by the results of falling-head (slug) and pumping tests (Table 9) which show that the orebody has a hydraulic conductivity of about 1.5 m/d and an unconfined storage coefficient of about 0.15. The hydraulic parameters of the weathered footwall and hanging-wall rocks adjoining the orebody have not been determined, but are likely to be low owing to the fine-grained nature of the materials and the absence of major fractures in mineral and groundwater exploration holes. The overall hydrogeological setting of the deposit is therefore a thin, steeply-dipping zone of moderately permeable and porous goethite-hematite ore, sandwiched between weathered footwall and hanging-wall rocks of low permeability and porosity.

The standing water level in the deposit lies at about 360 - 365 mAHD, which corresponds to a depth from natural surface of about 60 m (varies between 45 - 65 m). The base of the orebody occurs at about 300 mAHD, resulting in the lower half of the deposit below the water table (Rockwater 2010a - Appendix 4).

Table 9: Results of Hydrogeology Permeability Tests

Hole	mE	mN	Collar RL	SWL	SWL	EC	K	Material
	MGA (Zone 50)		(mAHD)	(mbgl)	(mAHD)	(mS/cm)	(m/d)	
PKRC0129	741913	6497641	426	64.67	361.33	11.45	5.0	Goethite ore, meta sed.
PKRC0138	742034	6498226	423	59.48	363.52	17.41	0.5	Goethite ore, meta sed. (clay)
PKRC0145	742125	6498716	424	56.26	367.74	20.10	100	Fault zone, goethite ore, meta sed. (clay), chert
PKRC0157	742374	6499394	409	48.50	360.50	14.50	0.001	Footwall meta sed. (clay)
PKRC0154	742387	6499721	408	40.27	367.73	41.40	0.01	BIF (clay), goethite, chert
PKPB01	742368	6499462	408	47.92	360.44	51.10	1.2	
PKPB02	741966	6497811	-	64.93	-	24.70	-	
PKPB03	741889	6497202	423	63.91	359.65	40.90	2.5	
PKPB04	742152	6498516	-	56.36	-	22.50	-	

SWL = standing water level; EC = electrical conductivity; K = hydraulic conductivity

The groundwater salinity within the Project area has been determined based on samples collected spatially spanning the mineralised banded iron zone (Figure 20) and is summarised in Table 10.

Table 10: Summary of Water Quality Project Bores

Bore Location	EC (µS/cm @ 25ºC)	TDS (mg/L @ 18 ºC)	pH
PKPB01	55,400 to 60,100	54,800 to 59,200	6.96 to 6.96
PKPB02	23,300 to 23,600	18,800 to 20,200	7.34 to 7.37
PKPB03	41,300	35,800	7.01
PKPB04	44,900 to 53,600	44,900 to 53,600	6.91 to 7.09
Average Measured	42,938	40,388	7.08

The average salinity of the bore water samples tested is approximately 41,000 mg/L TDS with all samples being less than 60,000 mg/L TDS. The groundwater beneath the BIF laterite ridge is brackish at the water table (approximately 20,000 mg/L TDS) and becomes saline at the base of the deposit (approximately 60,000 mg/L TDS). From regional hypersaline water sources (typically greater than 150,000 mg/L TDS), the salinity in the Project area appears to be lower than that which occurs in the regional country rocks, but is still saline (Rockwater 2010a – Appendix 4).

The most likely source of reasonable quality water lies within the BIF mineralised deposit. Four groundwater exploration holes (PKPS26, PKPS27, PKPS29, PKPS13) were drilled outside the proposed mine area (Rockwater 2010a - Appendix 4). The holes intersected weathered bedrock showing no development of a shallow or deep aquifer. These results coupled with geological knowledge suggest the mine aquifer is bounded by rock types with low permeability and porosity.

In this regard, Cazaly has constructed four water bores per groundwater license CAW171206 granted by DOW. Table 11 presents test bore results (Rockwater 2010a – Appendix 4).

Table 11: Summary of Test Bore Results

Test Bore Location	Bore depth	Step Rates (L/s)	Constant Rate Test (CRT 48 h)	Expected Yield*
PKPB01	120 m	7, 9, 11, 14	10 L/s (0.9 ML/day)	10 L/s (up to 0.9 ML/day)
PKPB02	114 m	6, 9, 12, 14	10 L/s (0.9 ML/day)	10 L/s (up to 1.3 ML/day)
PKPB03	126 m	6, 8, 10	-	5 to 10 L/s (up to 0.9 ML/day)
PKPB04	144 m	10, 11, 12, 14	14 L/s (1.26 ML/day)	14 to 20 L/s (up to 1.8 ML/day)
		Total Water	+34 L/s (+3.1 ML/day)	39 to 50 L/s (up to 4.3 ML/day)

* Expected yield based on field observations from test pumping as test bores and equipment were limited to 14 L/s constant test rate.

An application for a groundwater extraction licence is to be submitted to DOW for an expected requirement of 321 ML/year (year 1) and 506 ML/year (year 2+).

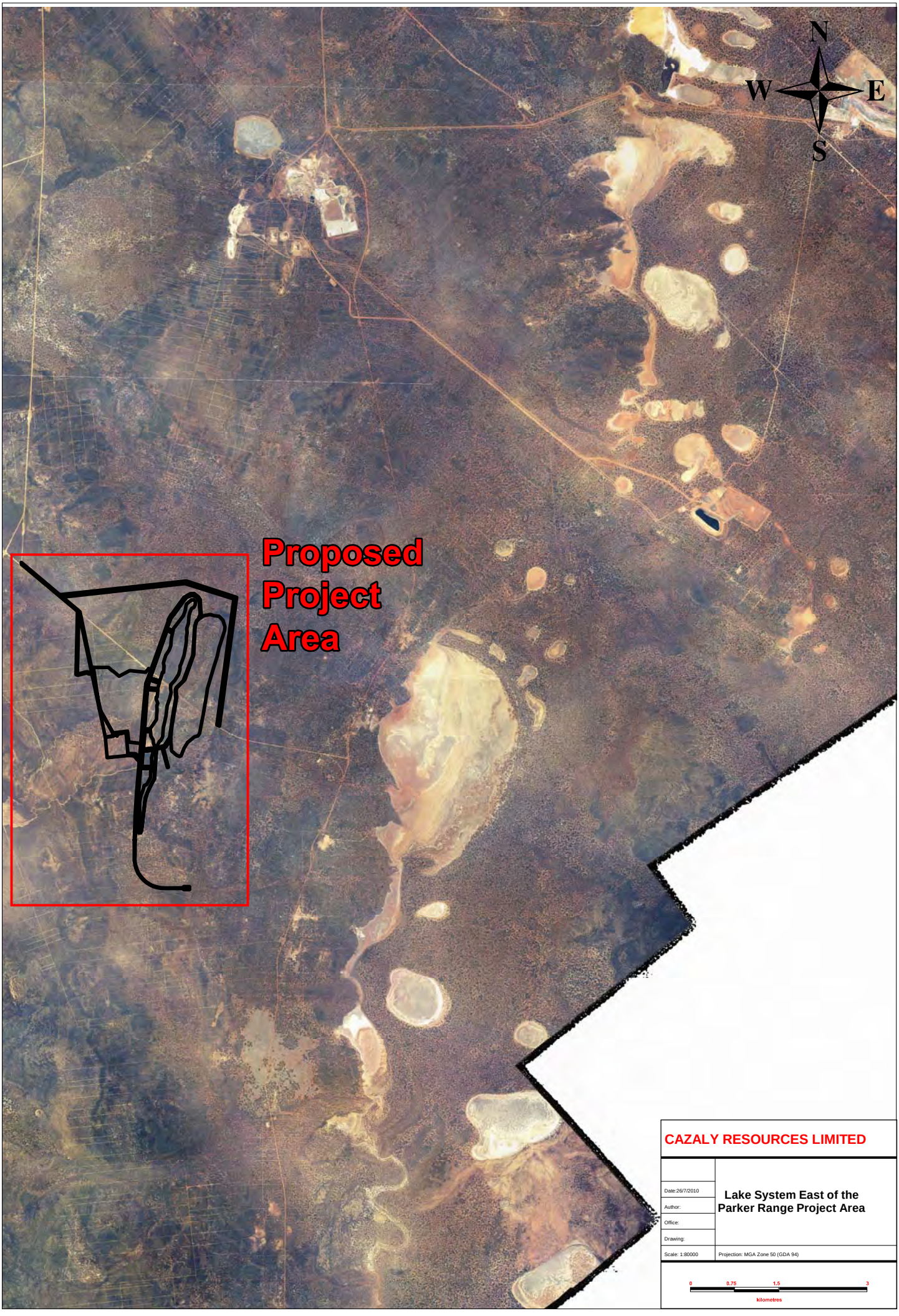


Figure 17: Lake System East of Mt Caudan Project Area

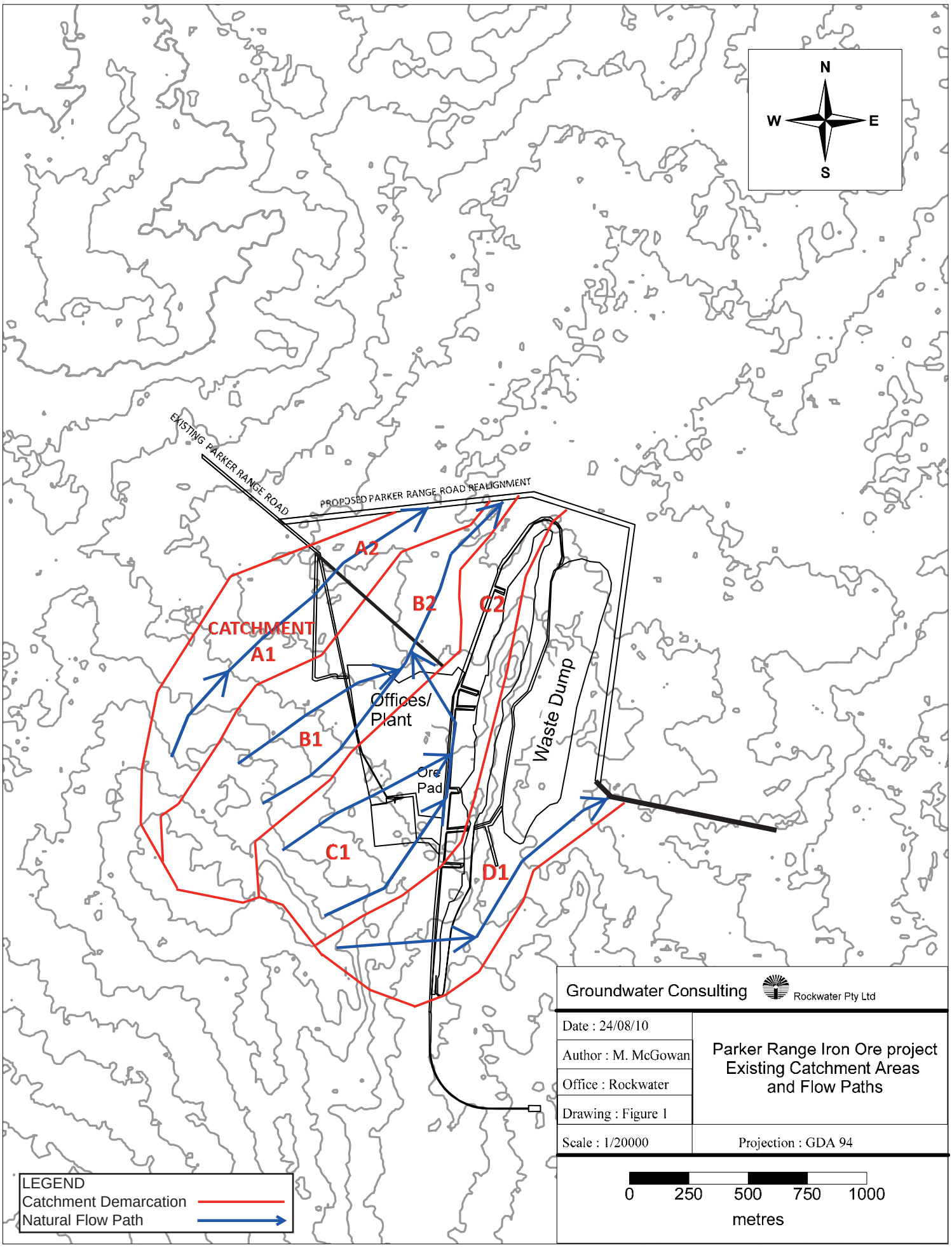
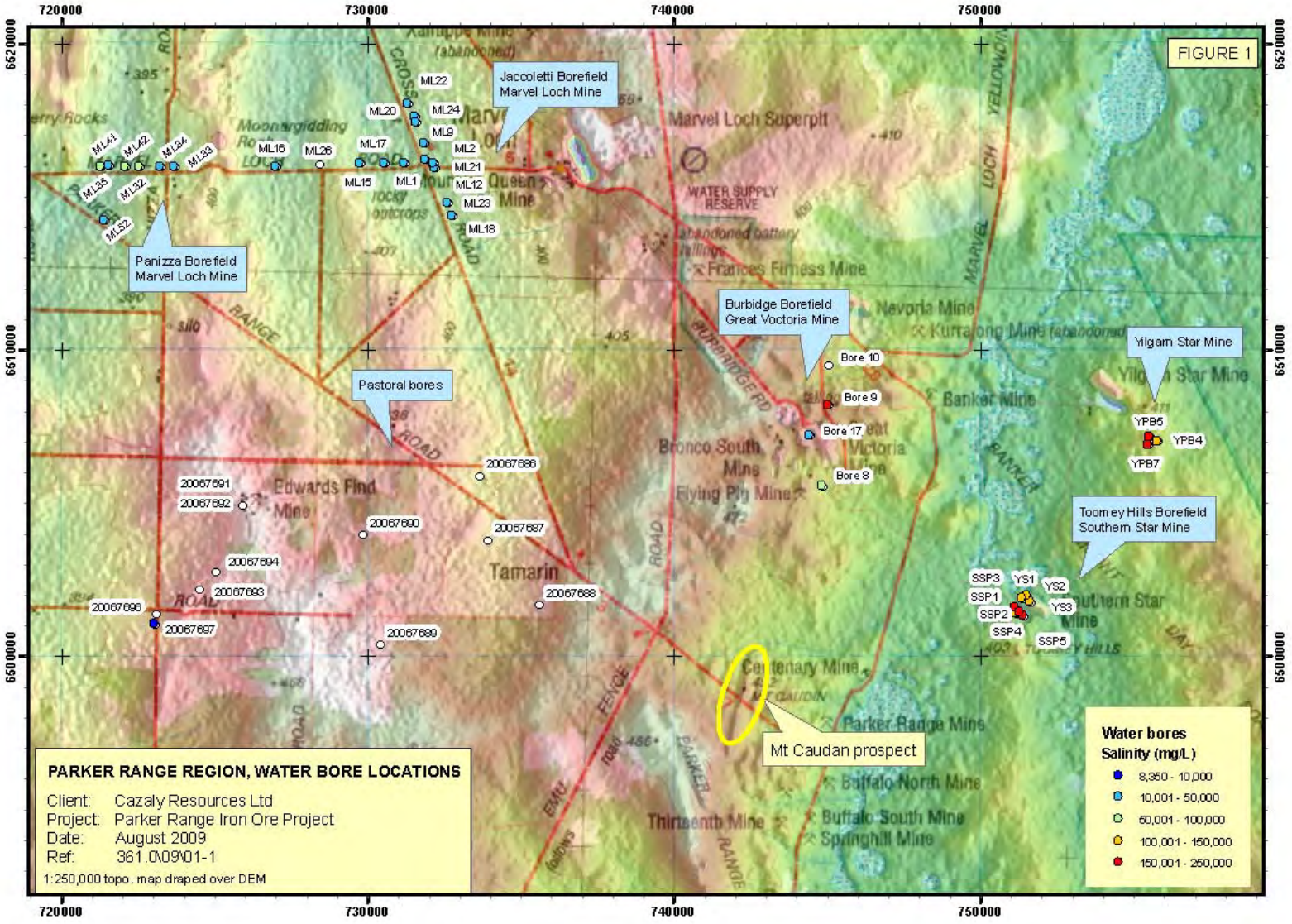


Figure 18: Existing Surface Water Catchment Areas and Flow Paths

Figure 19: Location of Regional Water Bores and their Salinity



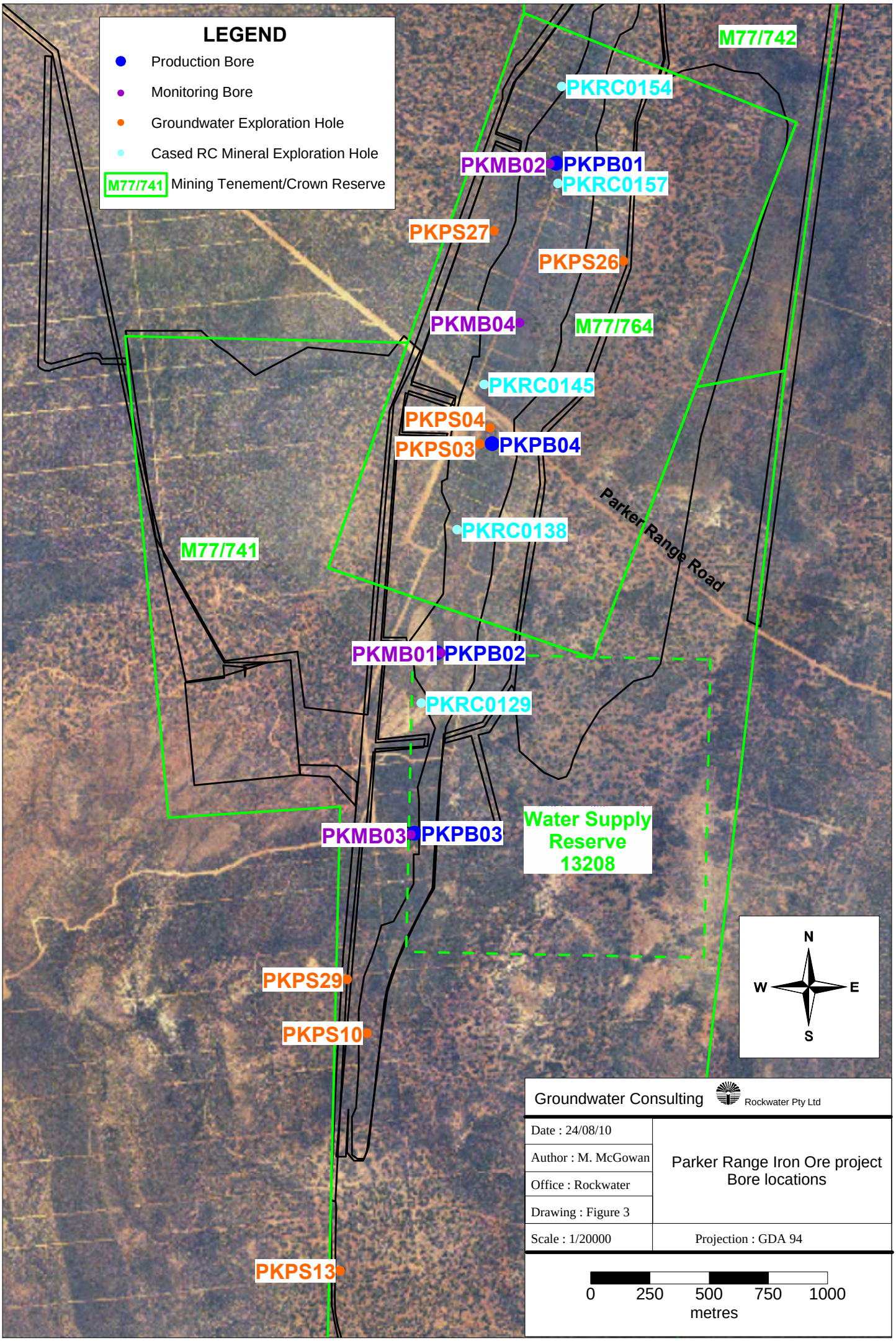


Figure 20: Groundwater Test Bore Locations

5.7 Soils

5.7.1 Regional Soils

The Southern Cross Zone is described as gently undulating plains and uplands with broad valley areas over greenstone and granitic rocks on the Yilgarn Craton (Tille 2006). Soils are formed on colluvium and alluvium on a deeply weathered mantle.

Calcareous loamy earths are common in the Southern Cross Zone. Red and Yellow loamy earths, and deep and shallow sandy duplexes with some Yellow sandy earths are also present, with some Yellow deep sands and Red shallow loamy duplexes (Tille 2006).

Broad valley plains of the Kalgoorlie Province have Red loamy earths and Calcareous loamy earths, with Red/brown non-cracking clays and Red-brown hardpan shallow loams. Gently sloping uplands on granite characteristically have Yellow loamy earths and Yellow sandy earths, with some Yellow deep sands and Ironstone gravelly soils (Tille 2006).

5.7.2 Local Soils

Keith Lindbeck and Associates (KLA) completed a soil and landform survey of the local Project area to improve the understanding of local soils (KLA 2010A - Appendix 5).

Soil pits were excavated using a backhoe at 20 sites across the Project area (Figure 21). Excavations occurred to depths of refusal or down to 2 m. Three different soil profiles were identified during the survey (Figure 22). Appendix 5 provides a full description of these profiles.

In general, the soils are sands to fine sandy clay loam with these soil types being consistent throughout the profile. The soils were uniform to gradational with laterite nodules (pisolite) present in varying percentages (KLA 2010a – Appendix 5).

Of particular note was the presence of calcareous material throughout the majority of the horizons of most profiles. The carbonate was either dispersed (i.e. not visible to the naked eye but effervesced with application of hydrochloric acid) or clearly visible (i.e. usually deeper in the profile). The soil profiles also contained high percentages of lateritic gravel (pisolite).

The three different soil profiles were analysed for their chemical properties (Table 12). Site 1 was slightly acidic until 15 cm where the profile soils then become alkaline. Site 3 was neutral on the surface (pH 7.4 – 7.2) to alkaline (pH 8.3) in the subsoils (25 – 60+ cm). These alkaline soils were caused by the presence of carbonate throughout the profile. Site 5 was acidic through all horizons.

All soils are non-saline except for the B2 horizon at Site 1. Soils in this horizon are slightly saline but are at a depth of 80 to 100 cm (Table 12) (KLA 2010a – Appendix 5).

In relation to sodicity, all soils had a sodium adsorption ratio of less than six. Therefore, these horizons (and soils) were non-sodic.

All horizons have medium levels of nitrogen, phosphorus, potassium and manganese and high levels of calcium and magnesium (Table 12). The measured levels of calcium and magnesium are due to the presence of carbonates throughout the soils. As calcium levels in the horizons are high, it is likely that calcium carbonate is the principal salt as this salt usually produces pHs between 7.3 and 8.4.

The results for the Emmerson Aggregate Test (EAT) indicate that Class 3 soils disperse after being re-worked. Class 5 soils are dispersive and Class 6 soils flocculate.

Consequently, the soil horizons that indicated dispersion after being re-worked were found at sites 1 and 3. Site 5 had horizons that were dispersive and have a potential to flocculate. None of these parameters would have an adverse impact on the soils even after being re-worked.

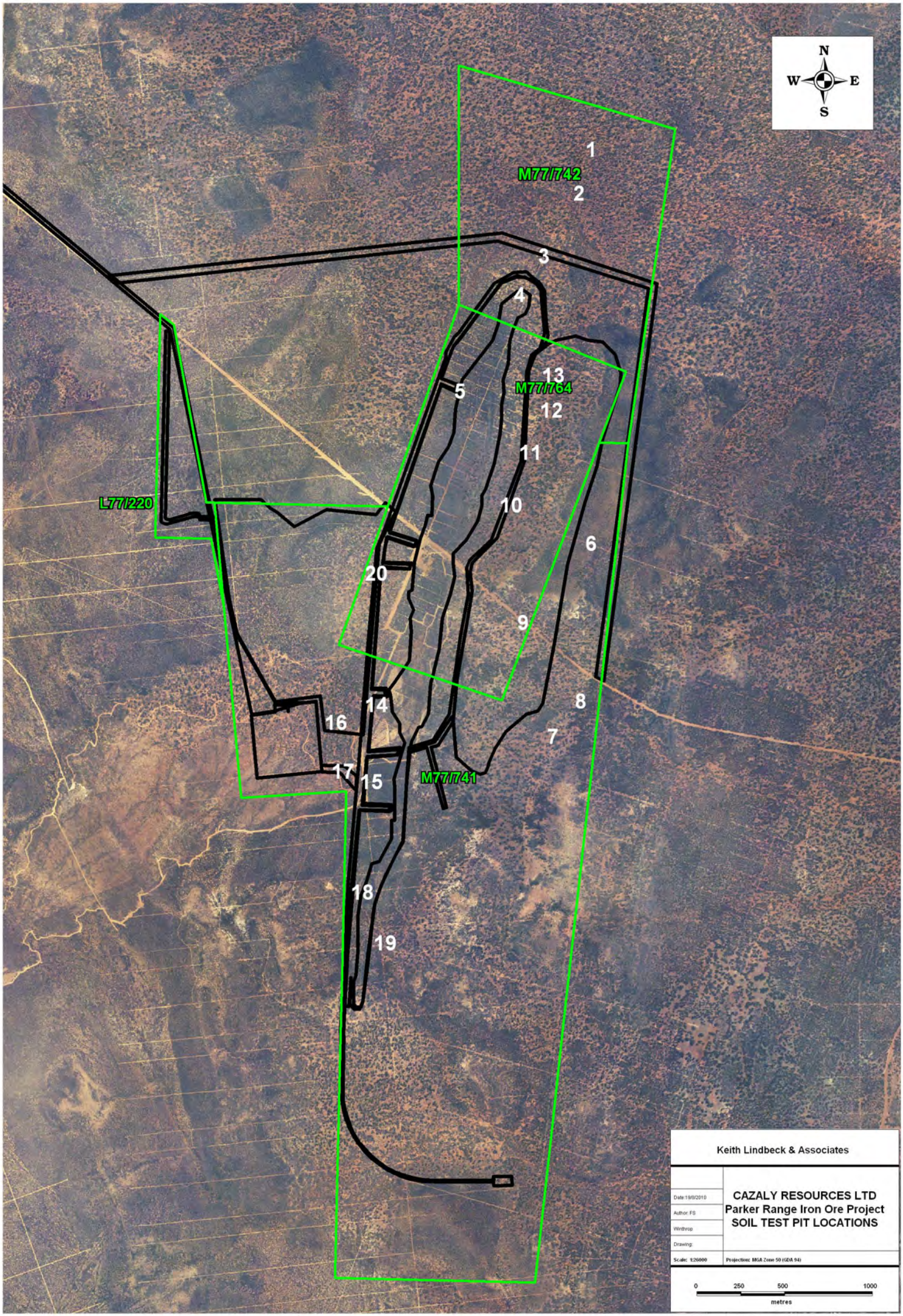


Figure 21: Location of Soil Test Pits at Mt Caudan Project Area

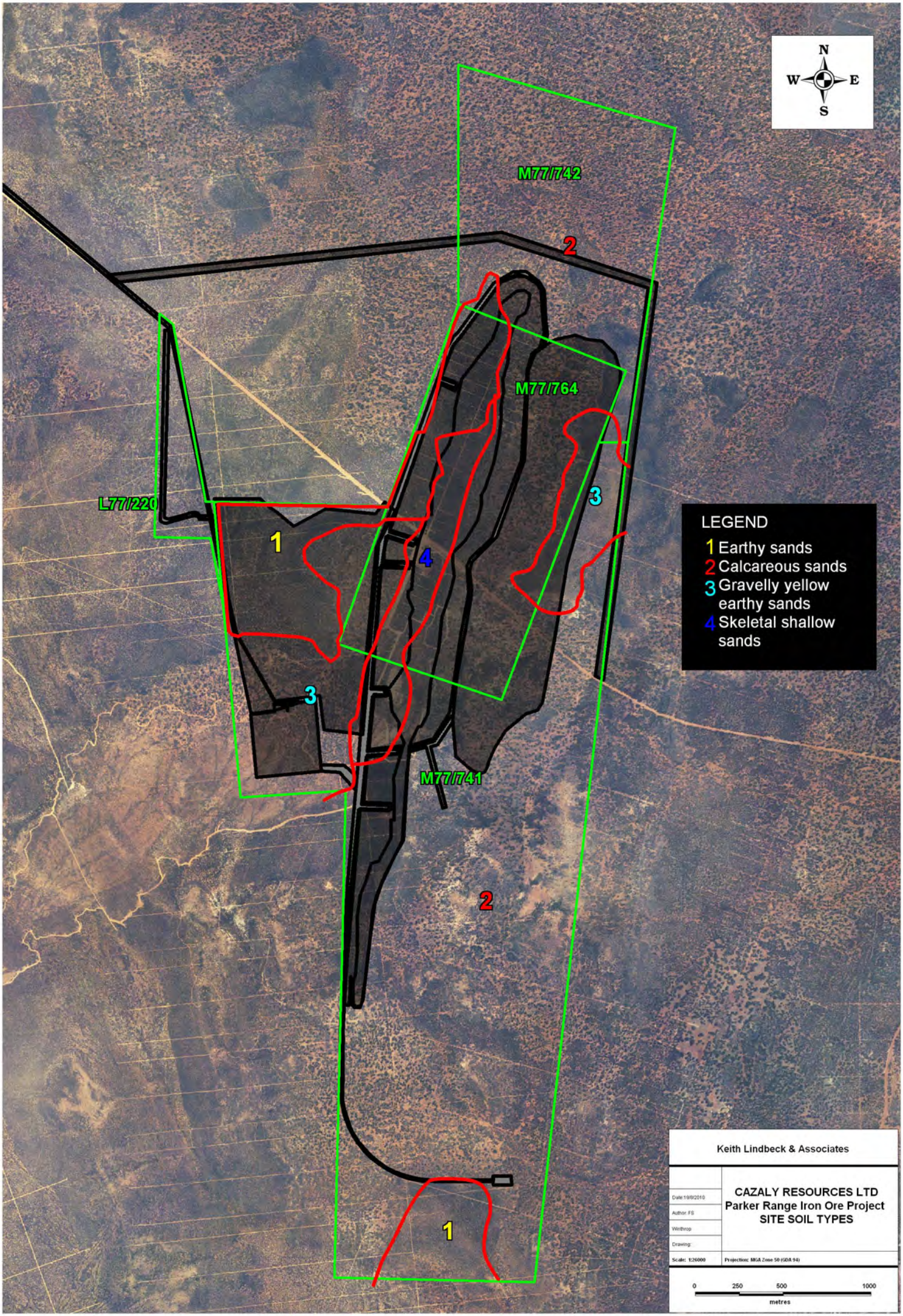


Figure 22: Soil Types at Mt Caudan Project Area

Table 12: Results of Chemical Analysis of Soils

SITE	pH (DI)	Chlorine	Sodium Adsorption Ratio	EC	TDS	Nitrogen	Phosporous	Sodium	Potassium	Calcium	Magnesium	Manganese	Sulphur
	-	mg/kg		µS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%
Site 1 0-15 cm	6.8	31	<1	81	51	430	42	160	1,100	1,200	920	130	<0.005
Site 1 15-40 cm	8.3	190	<1	270	170	320	28	880	1,500	3,400	2,100	270	<0.005
Site 1 40-80 cm	8.8	540	3	630	410	180	25	1,300	2,100	6,500	2,900	200	<0.005
Site 1 80-100+ cm	8.5	1,100	3	1,200	770	260	27	2,100	2,500	55,000	4,500	180	0.007
Site 3 0-12 cm	7.4	6	2	21	14	170	24	67	1,200	1,200	690	190	<0.005
Site 3 12-25 cm	7.2	10	<1	23	15	160	16	95	1,200	1,200	680	310	<0.005
Site 3 25-60+ cm	8.3	44	<1	150	96	230	28	360	2,100	18,000	1,500	320	0.007
Site 5 0-20 cm	6.3	6	<1	25	16	230	13	17	180	170	120	31	0.006
Site 5 20-40 cm	5.3	5	<1	38	24	210	6.3	34	140	120	90	9	0.008

5.8 Vegetation and Flora

5.8.1 Regional Vegetation

The regional vegetation at Parker Range is located within a Priority 3 Priority Ecological Community (PEC) (Figure 23).

Beard (1979) first described the major structural formations in this area, grouping the structural units into vegetation systems and defined the vegetation of the Parker Range, Toomey Hill and Harris Find as forming the Parker Range system. The system described the woodlands of the bottom lands being commonly dominated by *Eucalyptus longicornis*, *E. salmonophloia* and *E. salubris* with three types of understorey: *Atriplex, Melaleuca* or a mixed understorey of *Eremophila*, *Acacia* and *Olearia muelleri*. On rising ground there are mallee or thicket communities with ridge tops being dominated by thickets of *E. redunca*, (*E. capillosa* subsp. *polyclada*), *Allocasuarina campestris* and a variety of other species.

The Project lies on the border of the Avon and Coolgardie Botanical Districts of the South-west Botanical Province (Beard 1990). However, the vegetation is more representative of the Coolgardie Botanical District (Botanica Consulting (BC), 2010). The dominant families include the Myrtaceae, Asteraceae, Chenopodiaceae and Poaceae.

In the Boorabbin-Southern Cross report of the eastern goldfields regional survey, Newbey *et al*. (1995) noted that the gossanous cap (massive ironstone) of Mt Caudan and nearby ridges in the Parker Range supported a distinctive *Hakea pendens* tall shrubland.

Gibson and Lyons (1998) undertook a study of the flora and plant communities of the Parker Range greenstone belt in 1994. The study involved the establishment of 61 sites across the range, with 6 located at/or in the Mt Caudan vicinity (Figure 24). Six community types were identified across the range:

- Community type 1 occupies the sandy soils at the base of ridges and low rises. It had the highest mean species richness of 17.4 taxa /plot. It is generally dominated by *Eucalyptus sheathiana* with *E. transcontinentalis* and/or *E. eremophila* as co-dominants. The most typical understorey species were *Daviesia argillacea* and *Grevillea huegelii*. Species groups I and J were the most faithful to this community type. It also shared species of group A with the three upland community types (types 4 to 6).
- Community type 2 was generally dominated by *Eucalyptus longicornis*. Other eucalypts that occurred as co-dominants included *E. corrugata* and *E. salubris*. At one site this community was dominated by *E. myriadena*. This community occupied the broad flats with species from group G being the most typical. Mean species richness was quite low at 10.0 taxa /plot.
- Community type 3 also occurred on the broad flats within the greenstone belt. It was usually dominated by *Eucalyptus salmonophloia* and *E. salubris*. Typical understorey species of this community include *Eremophila oppositifolia*, *Acacia concolorans* ms, *Dodonaea stenozyga* and *Scaevola spinescens*. It had a higher mean species richness (12.9) than type 2 (10.0). Species patterning in groups A and G suggests that further subdivision into a northern and a southern subgroup is possible. The three remaining community types are those typical of the lateritic and greenstone ridges. Differences in species frequency in species groups A, B, C, D and F differentiate between them. Community type 4 tends to occur on the deeper sandy soils, type 5 on somewhat more skeletal soils and type 6 on massive greenstone. Mean species richness was similar in community types 4 and 5 (14.8 and 15.5) but quite low in type 6 (9.5 taxa /plot).
- Community type 4 was generally dominated by *Allocasuarina acutivalvis* and *Allocasuarina corniculata*. At some sites *Eucalyptus capillosa* subsp. *polyclada* also occurred, but this species was more typical of community type 5. Other species typical of this community type included *Baeckea elderiana* and *Thryptomene kochii*, further illustrating the sandy nature of these sites.
- Community type 5 almost totally lacked *Allocasuarina corniculata* (cf type 4), being replaced by *A. campestris*, while *Allocasuarina acutivalvis* was still a common element. *Eucalyptus capillosa* subsp. *polyclada* and/or *Eucalyptus loxophleba* tended to dominate these sites while *Hakea pendens*, *Phebalium tuberculosum*, and *Westringia cephalantha* were common understorey elements. This community type was associated with laterites, breakaways and the massive gossanous caps of the Mt Caudan area.
- Community type 6 was restricted to a small area of a massive decomposing laterite and granite in the Parker Range. The area was dominated by low trees of *Callitris glaucophylla* (now *C. columellaris*) and the previously unknown *Isopogon robusta* ms (now *I. robustus*) (Gibson and Lyons 1998).

The distribution of these groups appears to be primarily controlled by edaphic factors including water holding capacity (Gibson and Lyons 1998).

A total of 254 native taxa were recorded. The study concluded that flora and community types of the Parker Range are significantly different from the Bremer Range (100 km to the southeast) (Gibson and Lyons 1998).

Regional search requests with the DEC revealed previous flora and vegetation studies within the Parker Range region. This included a flora and vegetation survey conducted by Recon Environmental (2007) in the Burbridge region for St Barbara Limited and flora and vegetation surveys conducted by BC within the Southern Cross Goldfields. A location map of these previous surveys in relation to the Project area is provided in (Figure 25). In addition, biological surveys conducted by Newbey *et al.* (1988, 1995) within the Lake Johnston-Hyden region (107 km South-West of the Project area) and Southern Cross region (47 km North-West of the Project area) were also used to determine similarities between vegetation identified within the Parker Range region (Figure 25).

Table 13 presents all vegetation communities identified by BC in the Parker Range region and the corresponding community types as described by Gibson and Lyons.

Table 13: Regional Vegetation Associations (Gibson & Lyons and Botanica Consulting)

Survey area	Vegetation code	Vegetation Community	Gibson & Lyons vegetation community type
Mt Caudan/Powerline	MallH	Mallee heath	Type 4: *Allocasuarina acutivalvis* and *A. corniculata* shrubland. Sometimes *E. capillosa* subsp. *polyclada*
Mt Caudan/Parker Range bypass road/Powerline	OMallW	Open mallee woodland	Type 4: *Allocasuarina acutivalvis* and *A. corniculata* shrubland. Sometimes *E. capillosa* subsp. *polyclada*
Mt Caudan/Parker Range bypass road	EsalmW	*Eucalyptus salmonophloia* woodland	Type 3: *E. salubris* and *E. salmonophloia* over *Eremophila oppositifolia, Acacia concolorans, Dodonaea stenozyga* and *Scaevola spinescens*
Mt Caudan/Parker Range bypass road/Powerline	EsaluW	*Eucalyptus salubris* woodland	Type 3: *E. salubris* and *E. salmonophloia* over *Eremophila oppositifolia, Acacia concolorans, Dodonaea stenozyga* and *Scaevola spinescens*
Mt Caudan/Parker Range bypass road	AsMeS	*Acacia* sp. narrow phyllode and *Melaleuca eleuterostachya*	N/A
Mt Caudan/Parker Range bypass road	AlloS	*Allocasuarina* shrubland	Type 4: *Allocasuarina acutivalvis* and *A. corniculata* shrubland. Sometimes *E. capillosa* subsp. *polyclada*
Mt Caudan	MallWAlloS LatR	Mallee woodland/*Allocasuarina* shrubland on Laterite ridge	Type 5: *A. campestris* and *A. acutivalvis* over *Hakea pendens, Westringia cephalantha*
Mt Caudan/Parker Range bypass road/Powerline	AlloT	*Allocasuarina* thicket	Type 4: *Allocasuarina acutivalvis* and *A. corniculata* shrubland. Sometimes *E. capillosa* subsp. *polyclada*
Mt Caudan/Parker Range bypass road/Powerline	BMallWAlloS	Burnt Mallee/ *Allocasuarina* shrubland*	N/A
Mt Caudan	MixSRehab	Mixed shrub rehabilitation within gravel pit*	N/A
Mt Caudan/Powerline	MixEW	Mixed *Eucalyptus* woodland	Type 1: *Eucalyptus sheathiana* with *E. transcontinentalis* and *E. eremophila* over *Daviesia argillacea* and *Grevillea huegelii*
Parker Range bypass road	EsaluWMp	*Eucalyptus salubris* woodland over *Melaleuca pauperiflora*	N/A
Parker Range bypass road	EsaluEsalmW	*Eucalyptus salubris/Eucalyptus salmonophloia* woodland	Type 3: *E. salubris* and *E. salmonophloia* over *Eremophila oppositifolia, Acacia concolorans, Dodonaea stenozyga* and *Scaevola spinescens*
Parker Range bypass road	AcT	*Acacia* thicket	N/A
Parker Range bypass road	EtW	*Eucalyptus transcontinentalis* woodland	Type 1: *Eucalyptus sheathiana* with *E. transcontinentalis* and *E. eremophila* over *Daviesia argillacea* and *Grevillea huegelii*
Parker Range bypass road/Powerline	EcW	*Eucalyptus capillosa* subsp. *polyclada* woodland	Type 4: *Allocasuarina acutivalvis* and *A. corniculata shrubland.* Sometimes *E. capillosa* subsp. *polyclada*
Parker Range bypass road	EoWMel	*Eucalyptus oleosa* woodland over *Melaleuca*	N/A
Powerline	ElW	*Eucalyptus longicornis* woodland	Type 2: *Eucalyptus longicornis* with co-dominants *E. corrugata* and *E. salubris.*

* represents those vegetation communities previously cleared or disturbed.

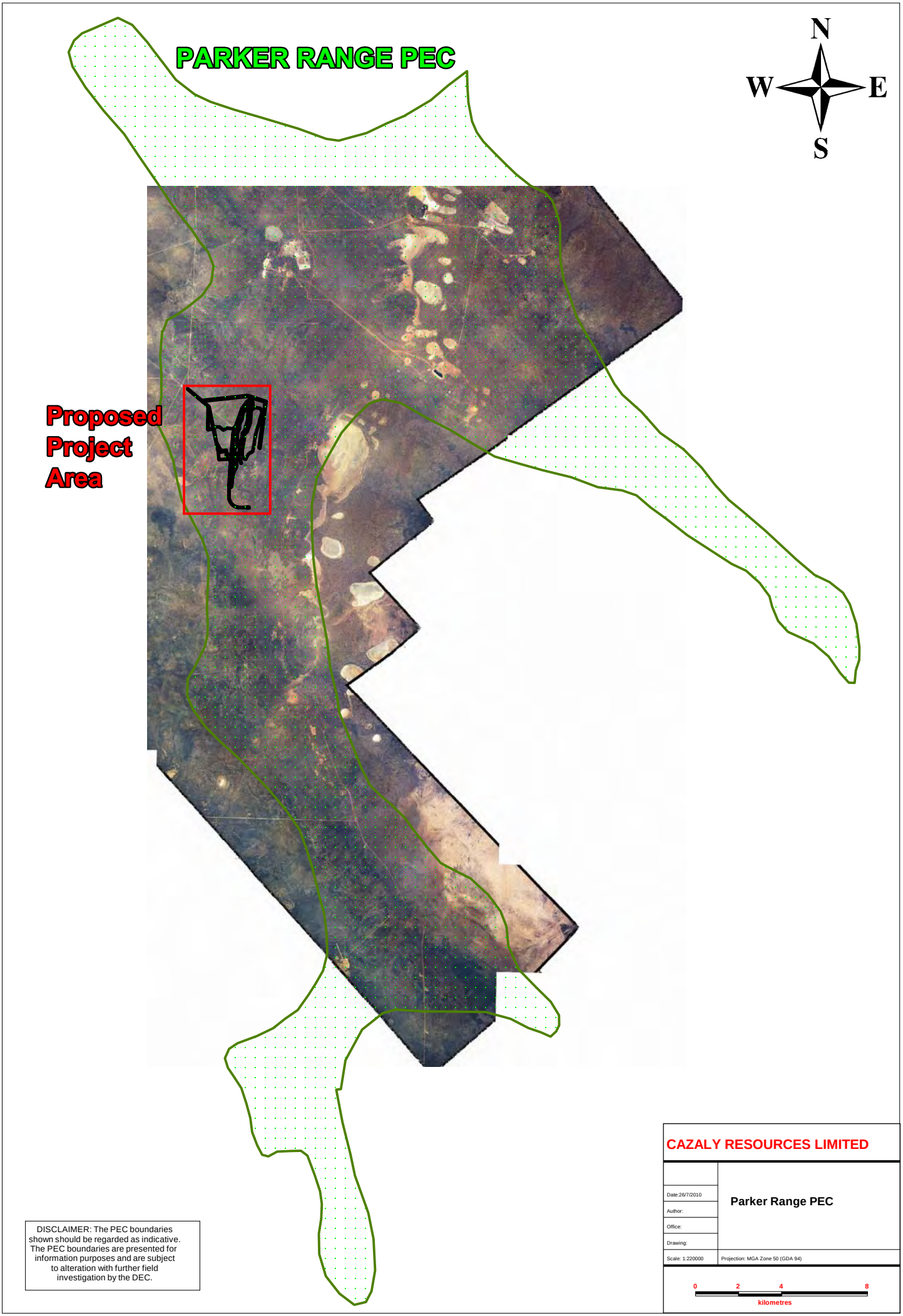


Figure 23: Extent of Parker Range PEC

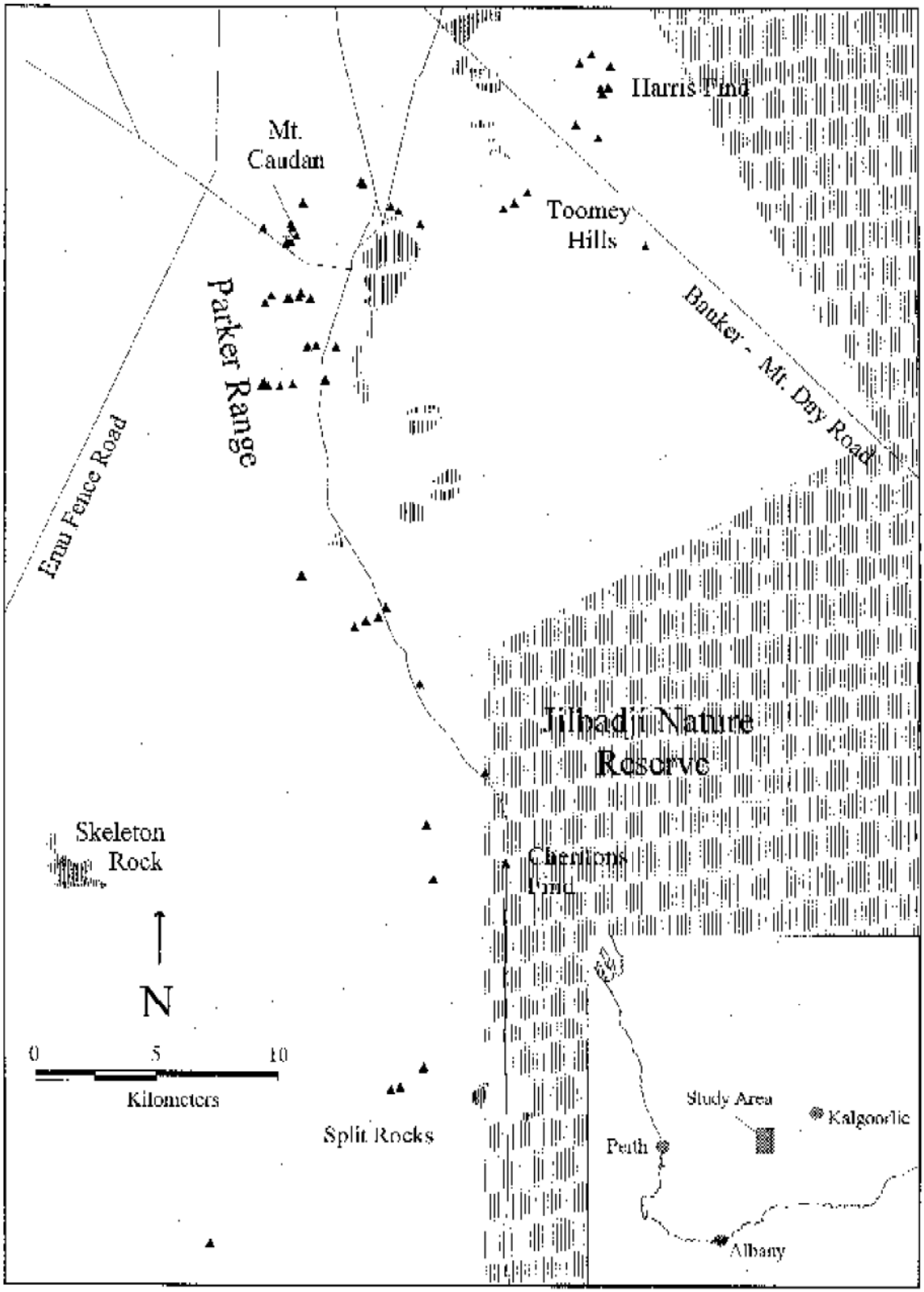


Figure 24: Location of Gibson and Lyon (1998) Study Sites on Parker Range

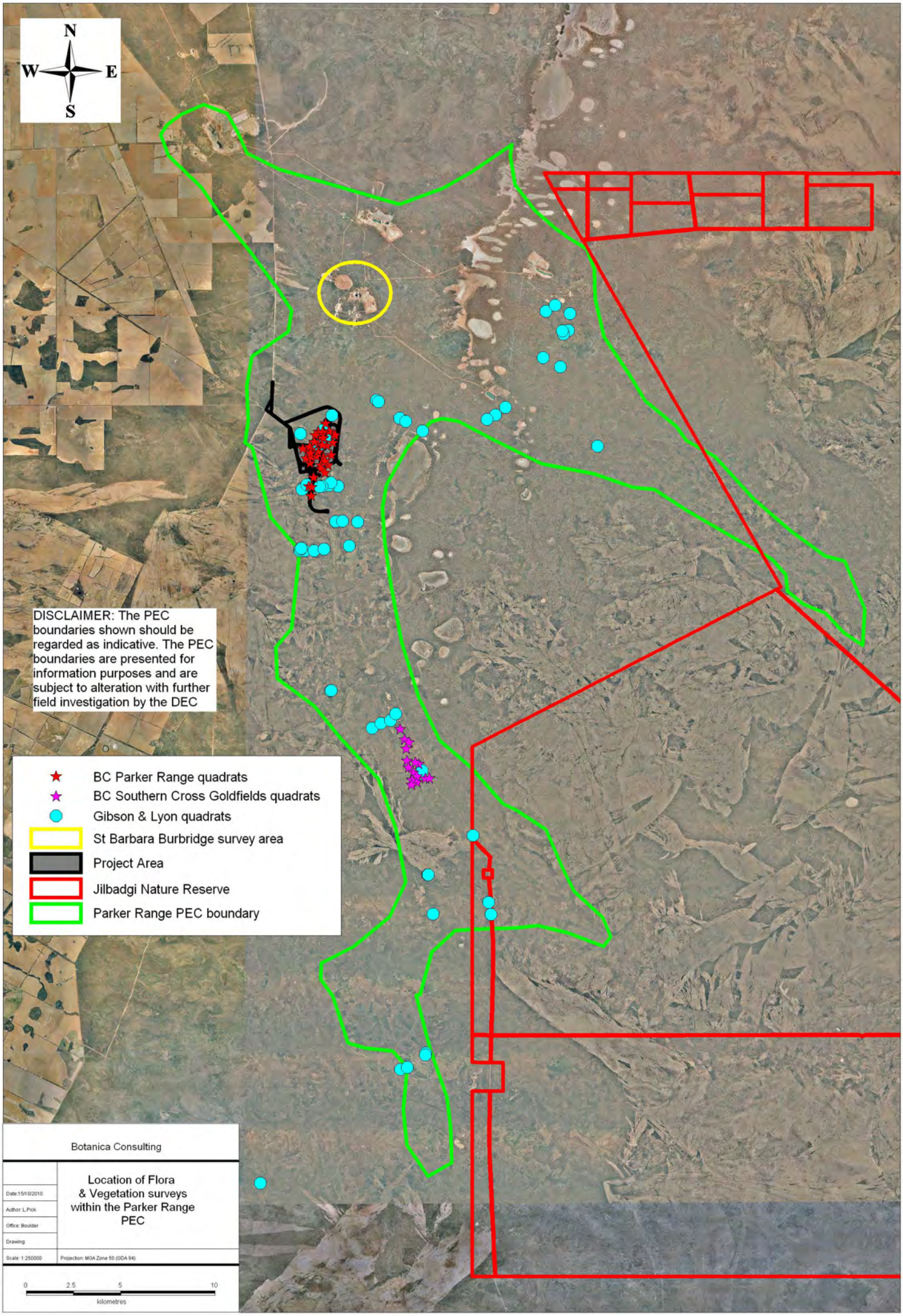


Figure 25: Regional Vegetation and Flora Studies in Parker Range PEC

Parker Range Priority Ecological Community (PEC)

The local Project area is regionally located within a Priority 3 Priority Ecological Community (PEC) vegetation complex, which encompasses an area of approximately 55,960 ha (Figure 23). The PEC boundaries are indicative only, are provided for information purposes and are subject to alteration by the DEC as more regional information becomes available. Notwithstanding this, the Project area covers a small percentage (~0.7%) of the PEC total area.

Priority 3 PECs are "Poorly known ecological communities" and are defined as:

- Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
- Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
- Communities made up of large, and/or widespread occurrences which may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

The *Hakea pendens* tall shrubland is considered to be of particular significance along with (as described by Gibson and Lyons (1998)):

- *Eucalyptus sheathiana* with *E. transcontinentalis* and/or *E. eremophila* woodland on sandy soils at the base of ridges and low rises.
- *E. longicornis* with *E. corrugata* and *E. salubris* or *E. myriadena* woodland on broad flats.
- *E. salmonophloia* and *E. salubris* woodland on broad flats.
- *Allocasuarina acutivalvis* and *A. corniculata* on deeper sandy soils of lateritic ridges.
- *E. capillosa* subsp. *polyclada* and/or *E. loxophleba* over *Hakea pendens* thicket on skeletal soils on ridges.
- *Callitris glaucophylla* low open woodland on massive greenstone ridges.

Three of these floristic communities have some representation in the conservation reserves (Gibson and Lyons 1998). The vegetation community *Isopogon robustus* on decomposing Laterite/Granite has significance due to the presence of DRF *Isopogon robustus* in this community.

Great Western Woodlands

The local Project area is regionally located in the Great Western Woodlands which encompasses an area of approximately 16 million ha from Kalgoorlie to Salmon Gums to the south, and from the wheatbelt in the west to the Nullarbor in the east in south-western Australia. In relative terms the region is twice the size of Tasmania and larger than England.

No specific management strategy applies to the Great Western Woodlands, rather an approach to conservation which occurs across all land tenures and when different stakeholders work together with biodiversity in mind. The central component of this approach is to identify and conserve key large-scale, long term ecological processes that drive connectivity between ecosystems and species. The Great Western Woodlands currently includes towns, highways, roads, railways, private property, Crown Reserves, agricultural activities and mining tenements.

Regional Vegetation Communities

PATN analysis was conducted on surrounding/regional vegetation assemblages to determine whether the vegetation composition of the Parker Range region is similar to that of surrounding regions (Figure 26). PATN is a statistical computer program which generates a quantitative estimate of association (e.g. resemblance, affinity, distance) between any set of objects (i.e. quadrats) described by a suite of variables (i.e. species). It then classifies the objects (quadrats) into groups producing a dendrogram enabling the grouping of objects to be viewed graphically. This allows a comparison of delineations of vegetation communities completed in the field against quantitative data of how vegetation groups (and floristic quadrats) should be separated according to similarities in species composition. It also facilitates the ability to rigorously compare the differences between vegetation communities.

PATN analysis captures the species composition of an area at that moment of time when the survey was conducted. As a result, the PATN program does not account for any changes over periods of time. In conjunction with the DEC, BC has commissioned an independent statistical analysis to further understand the influences on time between recent survey data and previous survey data collected +16 years ago.

PATN analysis results of the quadrat flora and vegetation survey (BC, 2010) revealed that despite the similarities in vegetation assemblages across the Parker Range and Southern Cross-Hyden region the vegetation composition of the Parker Range region differs to surrounding area vegetation. Eight vegetation communities (mixed *Eucalyptus* woodland, *Eucalyptus salmonophloia* woodland, *Eucalyptus salubris* woodland, *Allocasuarina* shrubland, Mallee woodland/*Allocasuarina* shrubland over Laterite ridge, Open Mallee Woodland, Mallee Heath and *Allocasuarina* laterite) identified during BC's survey were also identified by Gibson and Lyons (1998) as occurring outside of the survey area; however, there was only a small number of species these vegetation communities had in common. This result was also seen for the Newbey *et al.* (1995) biological surveys of the Southern Cross and Lake Johnston-Hyden region. It is important to note that the Gibson and Lyons survey was conducted 16 years prior to the current Parker Range regional surveys and the vegetation has since been subjected to fire damage which may have resulted in changes to vegetation composition. Newbey *et al.*'s (1995) biological surveys within the Southern Cross and Lake Johnston-Hyden region were also conducted several years prior to the current Parker Range survey which may account for the difference in vegetation composition between the Project area and the surrounding region.

To address the regional differences of species composition of vegetation communities identified within the local Project area, BC have composed a regional vegetation assemblage within the PEC based on aerial imagery (Landgate, 2010) and targeted field quadrat validation.

The regional vegetation results are presented in (Figure 27) and summarised in Table 14.

Within the PEC, there are 30 vegetation communities belonging to five major vegetation groups within the PEC.

Table 14: Vegetation Associations Identified for PATN Analysis

Vegetation group	Code	Vegetation community
Tall *Eucalyptus* woodlands	EsalmW*	*Eucalyptus salmonophloia* woodland
	ElW*	*Eucalyptus longicornis* woodland
	EsaluW	*Eucalyptus salubris* woodland
	MixEW	Mixed *Eucalyptus* woodland
	Esalm/EsaluW*	*E. salmonophloia/E. salubris* woodland
	EWAs	*Eucalyptus* woodland over *Acacia steedmanii*
	EoWMel*	*Eucalyptus oleosa* woodland over *Melaleuca*
	EsaliWMp	*Eucalyptus salicola* woodland over *Melaleuca pauperiflora*
	EsaluWMp*	*Eucalyptus salubris* woodland over *Melaleuca pauperiflora*
Mallee woodlands	EtW*	*Eucalyptus transcontinentalis* woodland
	MallWAsMh	Mallee woodland over *Acacia sp.* narrow phyllode and *Melaleucahamata*
	OMallW*	Open Mallee woodland
	MallH*	Mallee Heath
	BMallW	Burnt Mallee woodland
	EcRise	*Eucalyptus capillosa* subsp. *polyclada* on Rise
	EcW*	*Eucalyptus capillosa* subsp. *polyclada* woodland
	ElSampV	*Eucalyptus longicornis* over Samphire Vegetation
Salt Lake vegetation	SampV	Samphire vegetation
	EoWSampV	*Eucalyptus oleosa* over Samphire Vegetation
	AlloS*	*Allocasuarina* shrubland
Shrublands/Thickets	AsMeS*	*Acacia* sp. narrow phyllode and *Melaleuca eleuterostachya* shrubland
	AlloT*	*Allocasuarina* thicket
	AcaT*	*Acacia* thicket
	IrobLatRGran	*Isopogon robustus* on decomposing Laterite/Granite
Rocky outcrops	MallWAlloSLatR*	Mallee woodland/*Allocasuarina* shrubland on Laterite ridge
	CNV*	Cleared Native Vegetation

Vegetation group	Code	Vegetation community
Disturbed vegetation	reEsaluEsalmW	Regenerating *E. salubris/E. salmonophloia* woodland
	BEW*	Burnt *Eucalyptus* woodland
	BMallWAlloS*	Burnt Mallee Woodland/*Allocasuarina* shrubland
	MixSRehab*	Mixed Shrub rehabilitation in gravel pit

* Represents vegetation groups identified within the PEC, Mt Caudan Mine Area / bypass road and Powerline area

Jilbadji Nature Reserve

The Jilbadji Nature Reserve is located approximately 20 km east and 20 km south of the proposed Mt Caudan Mine Site. From vegetation mapping, 5302 ha of the Jilbadji nature reserve is estimated to be within the Parker Range PEC (Figure 27). In terms of regional vegetation mapping of the Parker PEC of the 31 vegetation communities within PEC, nine are also within the Jilbadji nature reserve; 19% of the *Eucalyptus salmonophloia* Woodland vegetation community, 35% of the *Allocasuarina* Thicket vegetation community, 7% of the Burnt *Eucalyptus* Woodland vegetation community, 3% of the Mixed *Eucalyptus* Woodland vegetation community, 89% of the *Eucalyptus* over *Acacia* vegetation community, 8% of the *Eucalyptus longicornis* Woodland vegetation community, 8% of the Open Mallee Woodland vegetation community, 5% of the *Eucalyptus salubris* over *Melaleuca* vegetation community and 99% of the Burnt Mallee Woodland vegetation community.

5.8.2 Remnant Vegetation

Native vegetation has been heavily cleared in Western Australia (WA), especially in the agricultural Southwest. Remaining remnant vegetation is important in helping to preserve native vegetation and fauna habitat. Areas with less than 30% of their pre-European extent generally experience exponentially accelerated species loss and areas with less than 10% are considered “endangered” (Shepherd *et al.,* 2001).

The Project is located within three vegetation groups as described by Beard (1979):

- Vegetation association 552 (*Casuarina/Calothamnus* and *Melaleuca* shrubland on greenstone hills);
- Vegetation association 1068 (Medium woodland: Salmon gum, morrel and gimlet); and
- Vegetation association 1413 (*Acacia*/*Casuarina* and *Melaleuca* shrublands)

None of these vegetation associations fall below the 30% pre-European vegetation extent threshold.

Within the entire Parker Range PEC approximately 7.5% of the native vegetation has been cleared for agriculture, mining operations and road construction. Table 15 lists the area of each vegetation community (grouped based on Gibson and Lyons community types) within the PEC that has been cleared.

Two pre-European vegetation associations occur within the Moorine Rock proposed haul road survey area:

- Medium woodland; Salmon gum and gimlet (Vegetation association 8).
- *Acacia*/*Casuarina* and *Melaleuca* shrublands (Vegetation association 1413).

None of these vegetation associations fall below the 30% pre-European vegetation extent threshold.

5.8.3 Dieback

Dieback (*Phytophthora* spp.) is a soil borne water mould that continually spreads by root to root growth amongst host plants and through zoospores which are motile in water and moist soil. The fungus also has two resting structures, chlamydospores and oospores, that are resistant to desiccation and can survive in dry conditions for a period of time before developing into active zoospores when wet conditions return. Soil movement is also a significant means of dieback spread, by vehicles, human activity and terrestrial mammals.

In general, dieback is restricted to areas in the southwest of the State receiving at least 400 mm of average annual rainfall although it is most active in areas receiving more than 800 mm of annual rainfall. As the Project area has a mean annual rainfall of 294.6 mm (and evaporation rate of greater than 2,400 mm), the occurrence of dieback is not anticipated.

Table 15: Cleared Vegetation Communities within the Parker Range PEC

Gibson & Lyon Vegetation communities	Area of Parker Range PEC cleared					
	Vegetation communities within PEC that have been cleared	**Area cleared for Agriculture (ha)***	**Area cleared for Mining (ha)***	**Area cleared for roads (ha)****	**Total area in PEC cleared**	**% of cleared vegetation in PEC**
Type 1: *Eucalyptus sheathiana* with *E. transcontinentalis* and *E. eremophila* over *Daviesia argillacea* and *Grevillea huegelii*	Mixed *Eucalyptus* woodland	613	239	N/A	852	1.5
Type 2: *E. longicornis, E. salubris* and *E. corrugata* on broad flats	*Eucalyptus longicornis woodland*	0	85	N/A	85	0.2
Type 3: *E. salubris* and *E. salmonophloia* over *Eremophila oppositifolia, Acacia concolorans, Dodonaea stenozyga* and *Scaevola spinescens*	*Eucalyptus salubris* woodland/ *Eucalyptus salmonophloia* woodland	515	865	N/A	1,380	2.4
Type 4: *Allocasuarina acutivalvis* and *A. corniculata* shrubland	*Allocasuarina* shrubland, Mallee Heath, *Allocasuarina* thicket, Open Mallee woodland, *Melaleuca/Acacia* shrubland	0	328	N/A	328	0.6
Type 5: *A. campestris* and *A. acutivalvis* over *Hakea pendens, Westringia cephalantha*	Mallee woodland/*Allocasuarina* shrubland over Laterite Ridge	0	0	N/A	0	0
Type 6: *Callitris glaucophylla* on decomposing laterite and granite	Decomposing laterite breakaway	0	0	N/A	0	0
N/A	Other (for roads)**	0	0	1,560	0	2.8
Total		1,128	1,517	1,560	4,205	7.5

* area of each vegetation community estimated through aerial imagery.
** road clearing for individual communities cannot be reliably estimated within the PEC.

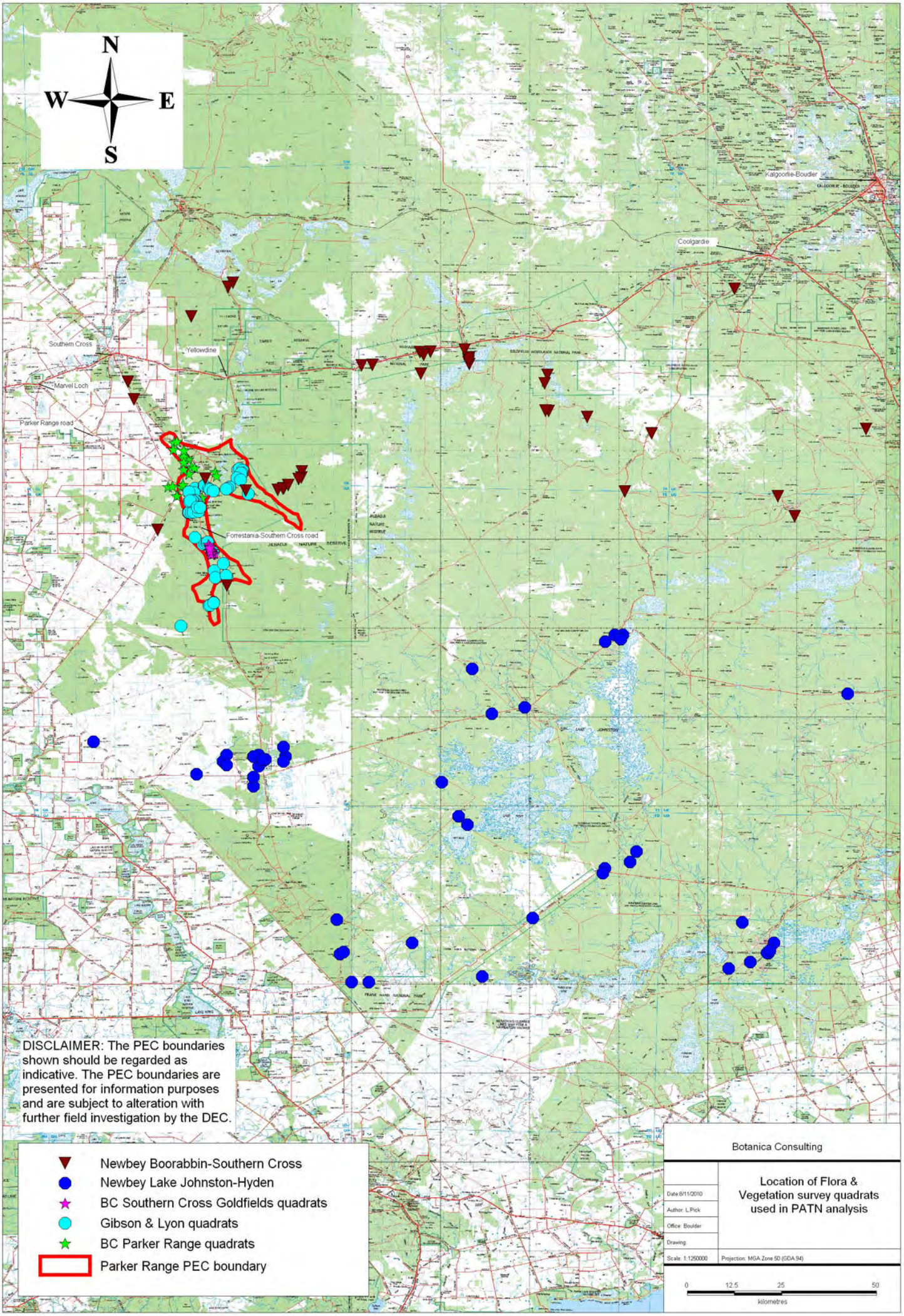


Figure 26: Location of Flora and Vegetation Surveys Used in PATN Analysis

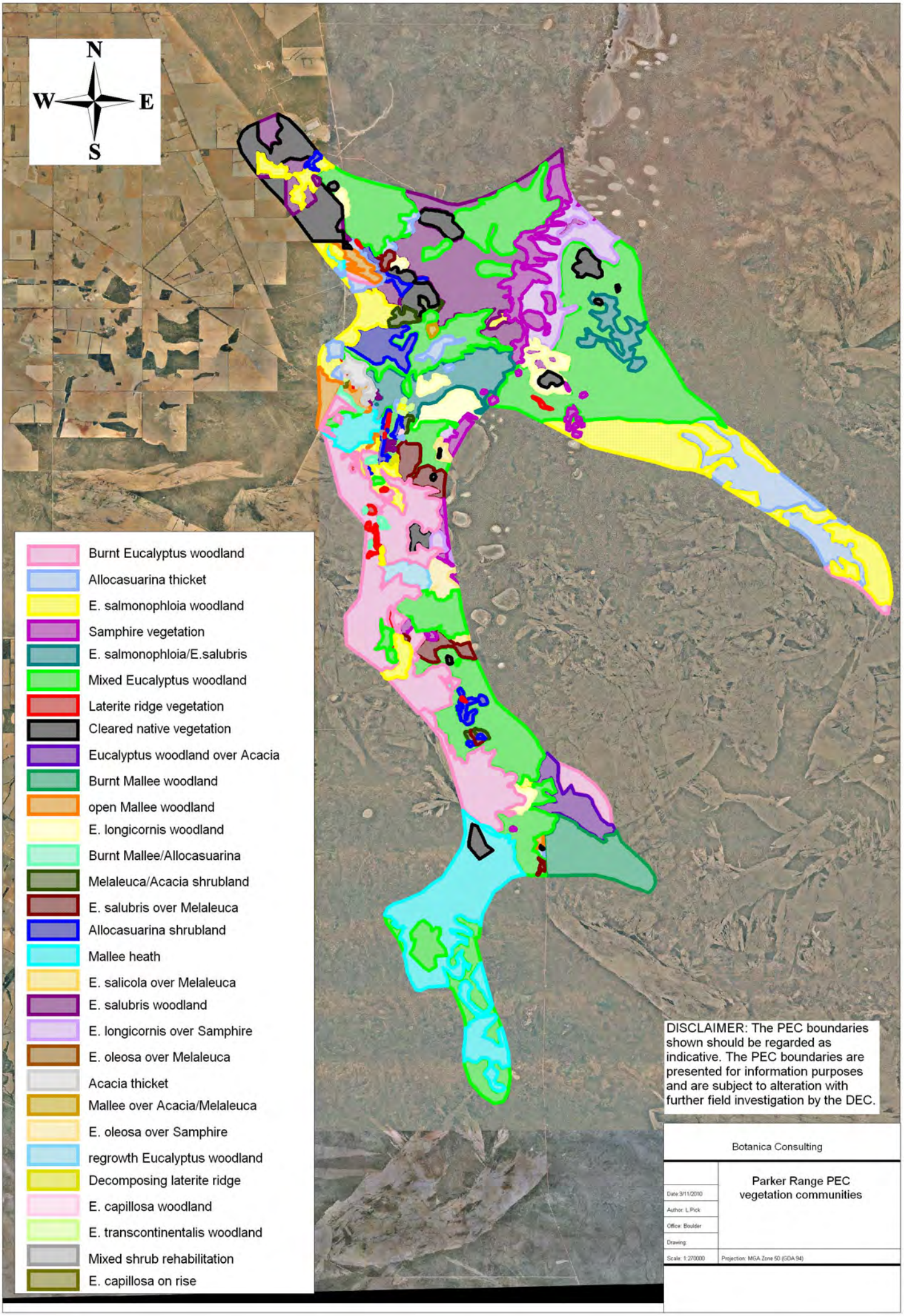


Figure 27: Regional Vegetation Communities for Parker Range PEC

5.8.4 Local Vegetation

Botanica Consulting have undertaken a variety of field surveys in the region and local Project area between 2007 and 2010 to improve the understanding of vegetation (Appendix 6).

These surveys were conducted in accordance with EPA Guidance Statement No. 51 "Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia" (EPA 2004a).

In the local area of the mine at Mt Caudan, 12 vegetation communities were identified within the survey area: Mallee Heath, Open Mallee Woodland, *Eucalyptus salmonophloia* Woodland, *Eucalyptus salubris* (Gimlet) Woodland, *Allocasuarina* shrubland, Mallee woodland/*Allocasuarina* shrubland over Laterite Ridge, Mixed shrub regrowth in Gravel Pits, Mixed *Eucalyptus* Woodland, *Allocasuarina* thicket, *Eucalyptus transcontinentalis* woodland, *Acacia* sp. narrow phyllode/ *Melaleuca eleuterostachya* shrubland, Burnt Mallee/*Allocasuarina* shrubland (Figure 28). These communities were represented by a total of 35 Families, 82 Genera and 194 Species. Forty-two quadrats were established to further investigate the species composition of the vegetation groups. The data recorded from the quadrat survey was used in a PATN analysis to group quadrats with similar species compositions.

In the local area of the Parker Range bypass road at Mt Caudan, 13 vegetation communities were identified within the survey area: Open Mallee woodland, *Eucalyptus salubris/Eucalyptus salmonophloia* woodland, *Acacia* thicket, *Eucalyptus oleosa* woodland over *Melaleuca*, *Eucalyptus salubris* woodland, *Allocasuarina* shrubland, *Eucalyptus capillosa* woodland, *Eucalyptus salmonophloia* woodland, *Acacia* sp. narrow phyllode / *Melaleuca eleuterostachya* shrubland, Burnt Mallee/*Allocasuarina* shrubland, *Eucalyptus salubris* over *Melaleuca pauperiflora* and *Allocasuarina* thicket (Figure 28). These communities were represented by a total of 28 Families, 71 Genera and 157 Species.

In the local area of the proposed powerline corridor west of Mt Caudan area, 10 vegetation communities were identified within the survey area: Mallee Heath, Open Mallee woodland, Mixed *Eucalyptus* woodland, *Eucalyptus salubris* woodland, *Eucalyptus capillosa* woodland, *Eucalyptus longicornis* woodland, Burnt Mallee/ *Allocasuarina* shrubland, *Eucalyptus salmonophloia* woodland, Mallee woodland/*Allocasuarina* shrubland over Laterite Ridge and *Allocasuarina* thicket (BC, 2010 - Appendix 6). These communities were represented by a total of 19 Families, 51 Genera and 72 Species.

In the local area of the upper truck haul road near Moorine Rock, eight vegetation communities were identified within the survey area: *Eucalyptus salubris* woodland, *Acacia* woodland over granite, *Eucalyptus capillosa/Eucalyptus salubris* mallee woodland, *Eucalyptus transcontinentalis* woodland, *Melaleuca* thicket, *Acacia coolgardiensis* woodland and *Allocasuarina* thicket (Figure 29). Approximately 4.5 ha of the eastern region of the upper haul road are located within agricultural paddock. These communities were represented by a total of 29 Families, 57 Genera and 81 Species.

No Threatened Ecological Communities (TEC) listed under the *EPBC Act 1999* or by the WA Minister for the Environment are located within the Project area.

In the upper haul road, an existing cleared creek line is listed as an Environmentally Sensitive Area (ESA), and water flows will need to be maintained with any road development. The ESA is cleared from previous developments, hence not considered significant.

No groundwater dependent ecosystems have been identified in the Project area. The water table is approximately 60 m below surface (Rockwater 2009a; 2010a – Appendix 4).

Appendix 6 provides further explanation of the vegetation communities in the local Project area.

Two pre-European vegetation associations occur within the Moorine Rock proposed haul road survey area:

- *Acacia*/*Casuarina* and *Melaleuca* shrublands (vegetation association 1413) which represents a local Project area of 2.85 ha or 0.0002% of current regional extent.
- Medium woodland; Salmon Gum and Gimlet (vegetation association 8) which represents a local Project area of 0.27 ha or 0.00001% of current regional extent.

The 0.27 ha area within the local Project area within vegetation association 8 is already heavily cleared for agricultural use including grain cropping and sheep grazing; however remanent *Eucalyptus salubris* woodland occurred within this area.

5.8.5 Condition of Local Vegetation

BC assessed the existing health and condition of local Project area vegetation was using the Keighery (1994) health rating scale. Intact native vegetation of excellent condition was located within all areas of the local Project area; however, a small section of the local area contains a remanent Shire gravel pit which is devoid of vegetation. The vegetation within the northern part of the Project area was in 'very good' condition. There have been some minor historical clearing and exploration activities within the Project area; these areas have been left to re-grow (BC 2010 – Appendix 6).

Table 16 outlines the local Project area vegetation health condition baseline (BC, 2010).

Table 16: Vegetation Condition at the Local Project Area

Vegetation Condition	Project Area (ha)	Percentage (%)
Project Area - Mt Caudan		
Excellent	323.7	83.7
Very good	55.6	14.4
Good	4.4	1.1
Degraded	2.9	0.8
Total	386.6	100.0
Project Area - Parker Range Bypass Road		
Very Good	12.9	100.0
Total	12.9	100.0
Project Area - Powerline Corridor		
Good	14.6	100.0
Total	14.6	100.0
Project Area - Upper Haul Road near Moorine Rock		
Very good	1.1	15.9
Good	4.6	65.7
Degraded	1.3	18.4
Total	7.0	100.0

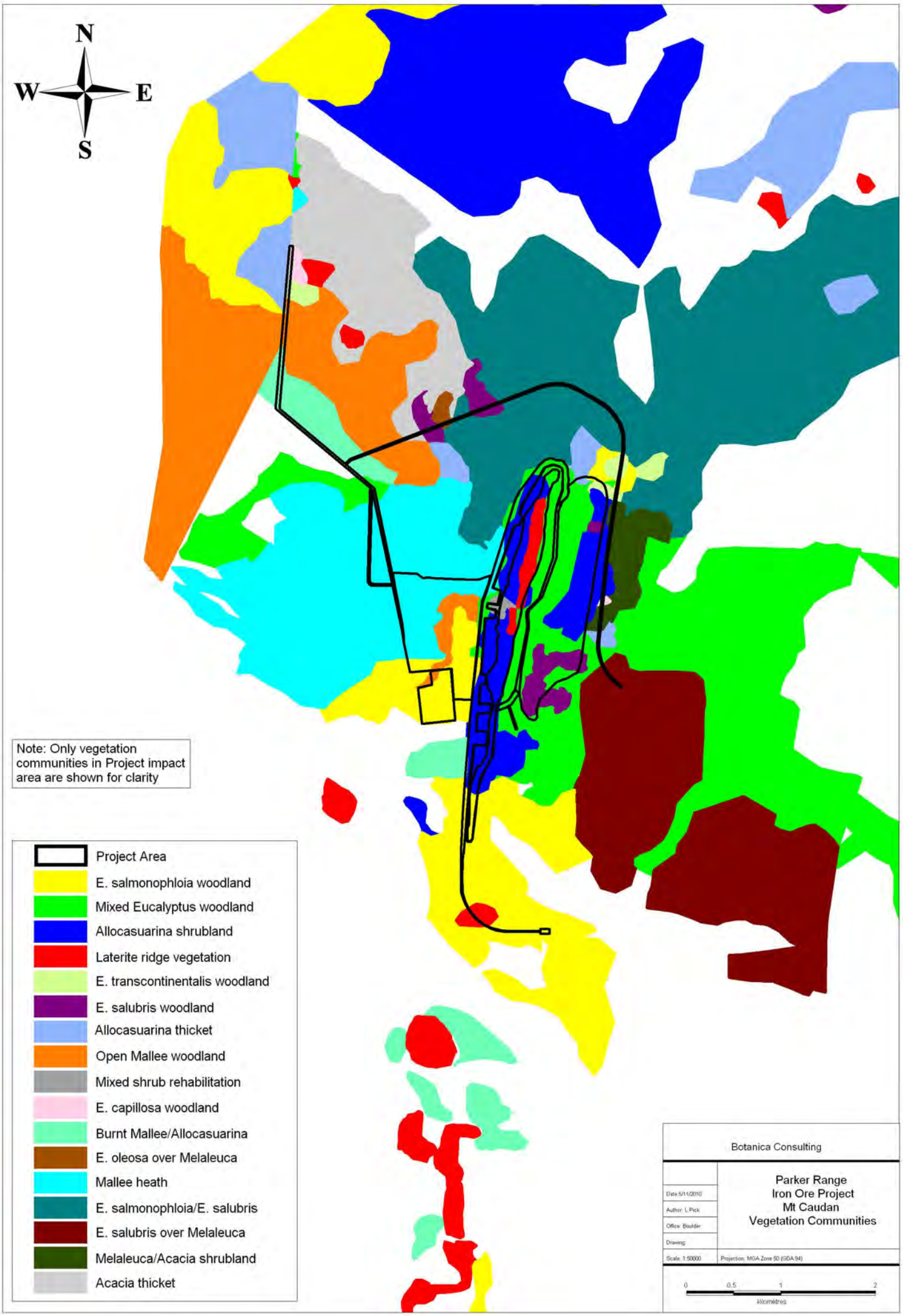


Figure 28: Vegetation Communities for the Mt Caudan Project Area

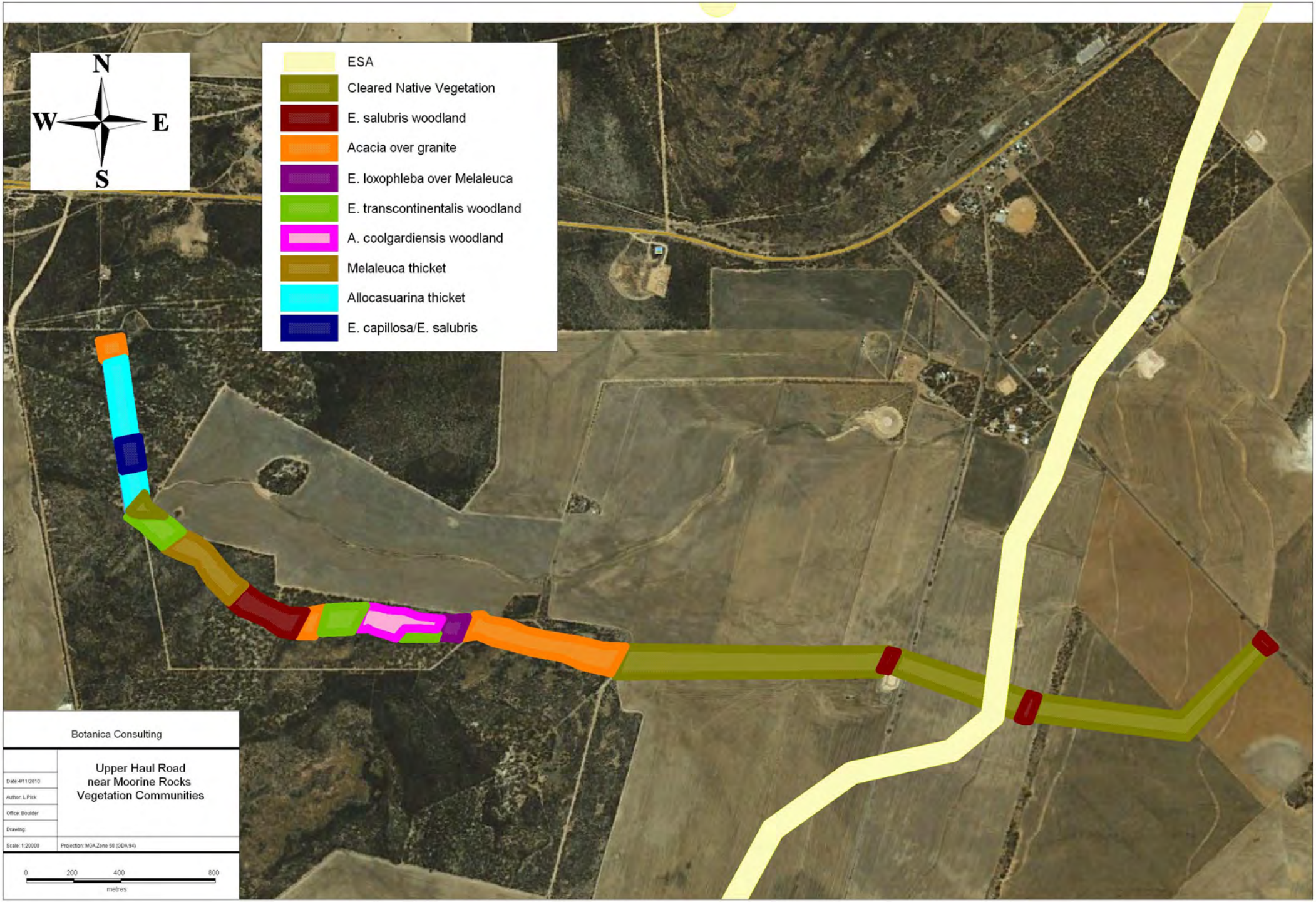


Figure 29: Vegetation Communities for the Upper Haul Road (near Moorine Rock)

5.8.6 Regional Flora

Regional flora was identified during the Gibson and Lyons 1994 survey and subsequent searches of DEC Priority and threatened florabases included identification of the following species summarised in Table 17.

Table 17: Results or Regional DRF and Priority Threatened Flora Search

Species	DEC Florabase (2009) including Gibson & Lyons (1994)	BC (2010)	DEWHA Search	Likelihood of occurrence*
DRF				
Isopogon robustus	X		X	Medium
Priority 1				
Drummondita wilsonii		X		Low
Euryomyrtus ciliata		X		Low
Goodenia heatheriana		X		Low
Lepidosperma ferricola		X		Low
Leucopogon validus		X		Low
Melaleuca grieviana		X		Low
Millotia newbeyi		X		Low
Baeckea grandibracteata subsp. Parker Range	X			High
Lepidosperma sp. Parker Range	X			High
Lepidosperma sp. Mt Caudan	X			High
Priority 2				
Eutaxia lasiocalyx		X		Low
Lepidium genistoides		X		Low
Lepidium merrallii		X		Low
Acacia concolorans	X			High
Hakea pendens	X			High
Verticordia multiflora subsp. *solox*	X			High
Priority 3				
Verticordia multiflora subsp. *solox*		X		Low
Grevillea fulgens		X		Low
Microseris scapigera		X		Low
Verticordia mitodes		X		Low
Verticordia stenopetala		X		Low
Cryptandra crispula	X			High
Euryomyrtus leptospermoides	X			High
Priority 4				
Calamphoreus inflatus		X		Low
Banksia shanklandiorum	X			Low

* Likelihood assigned based on search results, vegetation community distance and BC knowledge of existing surveys up to 2009.

One Declared Rare Flora species; *Isopogon robustus* (DRF) was identified within the region, which was in close proximity to the southern part of the Project area. A population of 377 was established from DEC information during May 2010.

Isopogon robustus is listed as critically endangered under the *EPBC Act 1999*.

5.8.7 Local Flora

Botanica Consulting have undertaken seasonal flora surveys within the region from 2007 to 2010 to improve the understanding of regional flora and the relationship with the local Project area.

The flora surveys have been undertaken in accordance with EPA Guidance Statement No. 51 “Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia” (EPA 2004a) to level 2 (Mt Caudan Area), level 1 (upper haul road near Moorine Rock) and level 2 (powerline corridor). Local Project area surveys recorded a total of 268 flora species in 120 genera representing 48 families (BC 2010 – Appendix 6).

In the Mt Caudan Project area seven Priority flora species have been recorded during the surveys (Figure 30):

- *Baeckea grandibracteata* subsp. Parker Range (Priority 1).
- *Lepidosperma* sp. Parker Range (N. Gibson & M. Lyons 2094) (Priority 1).
- *Lepidosperma* sp. Mt Caudan (N. Gibson & M. Lyons 2081) (Priority 1).
- *Acacia concolorans* (Priority 2).
- *Hakea pendens* (Priority 2).

- *Cryptandra crispula (*Priority 3).
- *Banksia shanklandiorum* (Priority 4).

The DEC lists an additional two Priority flora species as occurring within the Parker Range Project area, however, after conducting several searches BC has been unable to locate these plants;

- *Verticordia multiflora* subsp. *solox* (Priority 2).
- *Euryomyrtus leptospermoides* (Priority 3).

In addition to the 470 *Isopogon robustus* (DRF) population (DEC, 2010), BC discovered a further 790 plants in the southern parts of the Mt Caudan Project area.

A comprehensive search of the proposed development area has confirmed no other similar habitat exists, nor any further presence of *Isopogon robustus* (DRF).

The Upper Haul Road (near Moorine Rock) survey revealed no priority flora species. *Hakea pendens* (Priority 2) and *Lepidosperma* sp. Mt Caudan (Priority 1) were found along the Powerline Corridor area (near Mt Caudan) (BC 2010 - Appendix 6).

5.8.8 Local Non-native Species

The following four weed species were recorded during the vegetation and flora surveys within the local Mt Caudan Project area:

- *Sonchus oleraceus* (Common Sowthistle).
- *Ursinia anthemoides* (African Daisy).
- *Bromus rubens* (Red Brome).
- *Anagallis arvensis* (Blue Pimpernel).

All four were recorded in the Lateritic Ridge area, and *Anagallis arvensis* var. *caerulea* was also recorded in the Mixed *Eucalyptus* woodland. None of these weed species were present in Autumn 2010.

None of the species are listed as Declared Weeds as defined by the Department of Agriculture and Food (2009).

Weeds were not observed during the flora survey of the Upper Haul Road area (near Moorine Rock) despite the survey area passing through agricultural regions. This may have been due to unsuitable weed survey timing or the successful efforts of the agricultural land owner in preventing weed infestation.

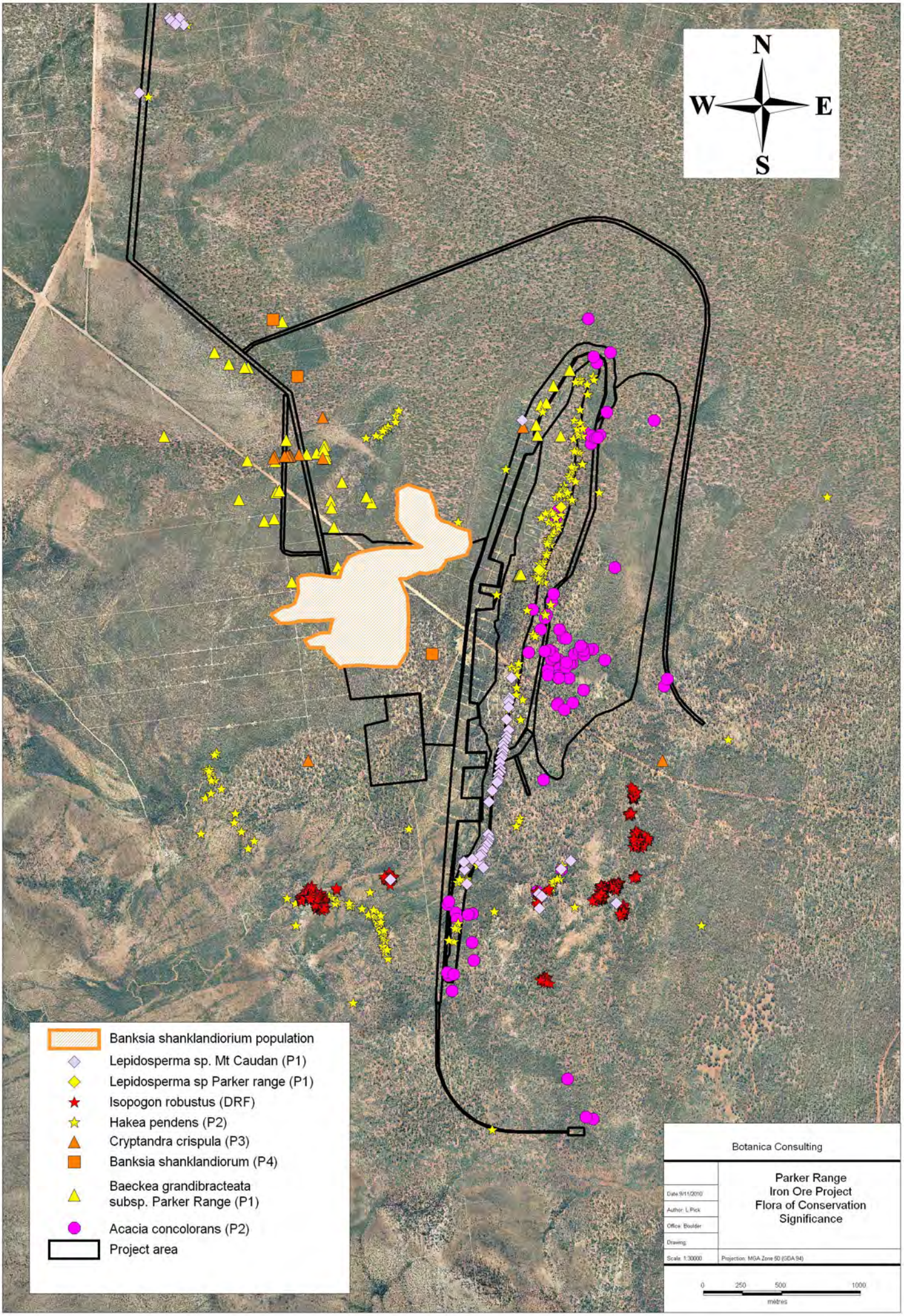


Figure 30: DRF and Priority Flora at the Mt Caudan Project Area

5.9 Terrestrial Fauna

5.9.1 Regional Terrestrial Fauna

A desktop search using the EPBC Protected Matters Search Tool and the DEC Threatened and Priority Fauna database was undertaken for the proposed Project area and surrounds. The search recorded 23 fauna species of conservation significance which could potentially occur in the Project area (Table 18).

Table 18: Results of Regional Threatened and Priority Fauna Database Searches

Species	Common Name	EPBC Search Status	DEC Search Status	Likelihood of occurrence*
Invertebrates				
Daphnia jollyi	Aquatic invertebrate		Priority 1	Low
Parartemia contracta	Aquatic invertebrate		Priority 1	Low
Aganippe castellum	Tree-stem Trapdoor Spider		Schedule 1	High
Reptiles				
Morelia spilota imbricata	Carpet Python		Schedule 4	Low
Paraplocephilus atriceps	Lake Cronin Snake		Priority 3	Low
Mammals				
Dasyurus geoffroii	Western Quoll, Chuditch	Vulnerable	Schedule 1	Low
Phascogale calura	Red-tailed Phascogale	Endangered		Low
Macropus irma	Western Brush Wallaby		Priority 4	Low
Nyctophilus timoriensis	Long-eared Bat		Priority 4	Low
Birds				
Leipoa ocellata	Malleefowl	Vulnerable	Schedule 1	High
Ardea alba	Great Egret	Migratory/Wetland-Marine		Low
Ardea ibis	Cattle Egret	Migratory/Wetland-Marine		Low
Burhinus grallarius	Bush Stone-curlew		Priority 4	Low
Calyptorhynchus latirostris	Carnaby's Cockatoo	Endangered	Schedule 1	Low
Calyptorhynchus sp.	White-tailed Black Cockatoo		Schedule 1	Low
Cacatua leadbeateri	Major Mitchell's Cockatoo		Schedule 4	Low
Ninox connivens connivens	Barking Owl (southwest pop.)		Priority 2	Low
Apus pacificus	Fork-tailed Swift	Migratory/Marine		Low
Merops ornatus	Rainbow Bee-eater	Migratory		Medium
Hylacola cauta whitlocki	Shy Groundwren (Shy Heathwren)		Priority 4	Medium
Acanthiza iredalei iredalei	Slender-billed Thornbill (western)	Vulnerable		Low
Pomatostomus superciliosus ashbyi	White-browed Babbler (western wheatbelt)		Priority 4	HIgh
Oreoica gutturalis gutturalis	Crested Bellbird (southern)		Priority 4	High

* Based on (historic) records, habitat preference and recording distance from Project Area

5.9.2 Local Vertebrates

KLA (2010b) (Appendix 7) have undertaken seasonal and targeted fauna surveys from 2007 to 2010 obtaining an understanding of the local fauna in the Project area.

The surveys were planned and implemented in accordance with EPA Position Statement No 3 "Terrestrial Biological Surveys as an Element of Biodiversity Protection" (EPA 2002a) and Guidance Statement No. 56 "Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia" (EPA 2004b).

None of the vegetation groups within the area surveyed have been recognised as Threatened Ecological Communities as defined by the *EPBC Act* 1999, or endorsed by the Western Australia State Environment Minister. Further, the Eucalypt woodlands, Mallee and *Allocasuarina* shrubland that make up a large portion of the survey area are widespread regionally, and no unique, restricted or fauna-specific habitat types were identified during the surveys. Therefore, the vegetation proposed for disturbance cannot be considered to be significant fauna habitat.

Five fauna species of conservation significance were recorded during the surveys at the Mt Caudan Project area and one in the Upper Haul Road area (Table 19):

- White-browed Babbler (*Pomatostomus superciliosus*) – At Mt Caudan 12 Babblers were recorded during the spring 2008 survey and more were seen and heard opportunistically. Only three Babblers in total were recorded during the autumn 2009 survey and two Babblers were recorded during the spring 2009 survey. The threatened classification of this species refers to its presence in the fragmented native vegetation within the agricultural landscape in the Western wheatbelt. The Mt Caudan Project area is situated east of the agricultural zone within contiguous vegetation. In the fragmented vegetation of the Upper Haul Road area up to 28 White-browed Babbler nests were recorded in proximity to proposed haul road alignment (Figure 31) (KLA 2010b – Appendix 7).
- Crested Bellbird (*Oreoica gutturalis*) – At Mt Caudan, Crested Bellbirds were heard on two separate days in one location during the spring 2008 survey. However, none were recorded during the autumn survey period and none were recorded during the spring 2009 survey. The threatened classification of this species refers to its presence in fragmented native vegetation in the southern parts of Western Australia. Mt Caudan is located in the South-West Interzone, where vegetation is not fragmented from agriculture clearing. The Crested Bellbird was not heard in the fragmented vegetation in the Upper Haul Road area.
- Rainbow Bee-eater (*Merops ornatus*) – Bee-eaters were not seen or heard during the spring 2008 and autumn 2009 surveys at Mt Caudan. Being migratory species, they were not likely to be seen during these time periods. However, they may use this area during their migration. Indeed, three birds were recorded during the survey (spring 2009) in the southern deposit area of Mt Caudan which was conducted one month later in the year (i.e. October). No Bee-eaters were seen or heard in the Upper Haul Road area.
- Malleefowl (*Leiopoa ocellata*) – During systematic and targeted surveys from September 2008 to August 2010, a total of five Malleefowl nesting mounds have been located, one moulted feather was collected in 2009 and four adult birds were sighted in the Mt Caudan area (Figure 32). A nesting mound within the proposed clearing area has been long abandoned (2008) and subsequently disturbed by other fauna (2009) (Figure 32). All other active and inactive nesting mounds are outside the proposed clearing area (Figure 32). The nesting mounds were located in vegetation communities *Acacia* sp. *Narrow phyllode*, *Melaleuca eleuterostachya* shrubland and Mallee heath. These vegetation communities are widespread within the Parker Range PEC and represent a small proportion of the inferred preferred Malleefowl habitat near the Mt Caudan project area (Figure 33). No evidence of Malleefowl presence was found in the Upper Haul Road area.
- Western Rosella (Mallee) (*Platycercus icterotis xanthogenys*) – At Mt Caudan, two birds were recorded during the Autumn 2009 survey. While this species is listed as a Schedule 1 species under the *Wildlife Conservation Act 1950*, DEC Threatened and Priority Fauna Database searches did not indicate its ocurrence in this area. Western Rosellas are rare to moderately common in the southwest of Western Australia including in the Parker Range area (R. Johnstone *pers. comm.*). The threatened classification of this species refers to its presence in the fragmented native vegetation within the agricultural landscape in the Western wheatbelt. The Mt Caudan Project area is situated east of the agricultural zone within contiguous vegetation. Western Rosella were not seen or heard in the fragmented vegetation in the Upper Haul Road area.

The KLA seasonal fauna surveys undertaken at the Mt Caudan Project area recorded a total of 73 fauna species comprising 20 reptile species, 12 mammal species including seven bat species and 42 bird species.

Five feral fauna species (in low abundance) have been identified in the Mt Caudan Project area:

- House Mouse (*Mus musculus*)
- Rabbit (*Oryctolagus cuniculus*)
- Dog (*Canis lupis familiaris*)
- Red Fox (*Vulpes vulpes*)
- Cat (*Felis catus*)

Evidence of Sheep *Ovis aries* were noted in the Upper Haul Road area which is degraded grazed vegetation adjacent to paddocks for livestock (KLA 2010b – Appendix 7).

Given the relatively small area surveyed, the survey results, considered in a regional context (Newbey *et al*. 1995), suggest that a reasonable representation of fauna was recorded.

Table 19: Assessment of Vertebrates Surveyed at Project Area

Species	***Leipoa ocellata* Malleefowl**	***Merops ornatus* Rainbow Bee-eater**	***Pomatostomus superciliosis ashbyi* White-browed Babbler (western wheatbelt)**	***Oreoica gutturalis gutturalis* Crested Bellbird (southern)**	***Platycercus icterotis xanthogenys* Western Rosella (Mallee)**
Family	***Megapodiidae***	***Meropidae***	***Pomatostomidae***	***Pachycephalidae***	***Psittacidae***
Conservation Status	Vulnerable under *EPBC Act 1999* and Schedule 1: Rare and likely to become extinct under the *Wildlife Conservation Act 1950.*	Migratory under *EPBC Act 1999.*	Priority Four: Taxa in need of monitoring on DEC Threatened and Priority Fauna Database.	Priority Four: Taxa in need of monitoring on DEC Threatened and Priority Fauna Database.	Schedule 1: Rare and likely to become extinct under the *Wildlife Conservation Act 1950*.
Distribution	Malleefowl once broadly distributed across the southern half of Australian continent but has undergone significant range reduction and now occupy semi-arid regions of southern Australia where mallee eucalypts form the dominant vegetation (Birds Australia 2010).	The Rainbow Bee-eater is distributed across much of mainland Australia, and is a common summer migrant to southern Australia. They range from scarce to common across their range depending on suitable habitat and breeding grounds.	The White-browed Babbler is endemic to mainland Australia and occurs mainly in the arid and semi-arid zones south of the Tropic of Capricorn. Scattered populations are found in outback Northern Territory and Western Australia, particularly in the south-western corner of Western Australia.	The distribution of the Crested Bellbird extends throughout the greater part of the State but not in the wetter regions (north and west Kimberley, Darling Range and deep South-West).	Occurs within the semiarid southern interior of Western Australia. Described as being rare to moderately common, this species prefers wetter areas of the south west (Johnstone and Storr 1998). Once was distributed through the wheatbelt but numbers have declined significantly since the 1930's as a result of land clearing (Johnstone and Storr 1998).
Ecology	The Malleefowl is a large, ground-dwelling bird that roosts in trees but rarely flies. Habitat: mallee eucalypt woodland, scrub and dry forest dominated by other eucalypts, Mulga and other *Acacia* spp., where they feed on seeds and herbage (Benshemesh 2005). Habitat comprises a sandy substrate and leaf litter sufficient to build nesting mounds (typically: 1 m high, and 3 m to 5 m in diameter). Pairs occupy permanent territories, incubating 16 eggs (average) (Benshemesh 2005). Breeding: September to April, with chicks approximately seven weeks after laying. Threats: clearing of habitat, fox predation, fire and overgrazing by feral livestock.	Rainbow Bee-eaters are very social birds and when not breeding roost together in large groups in dense understorey or large trees. They generally migrate south at the beginning of spring and breed from November to January. They require open areas with loamy soft soils soft enough for nest tunneling yet firm enough to support the tunnel.	The White-Browed Babbler is a gregarious bird that travels in flocks and has a strong community affinity. It is found in dry sclerophyll woodlands with a shrubby understorey, mulga, acacias, mallee, cypress pine scrubs, timber, scrub along watercourses and saltbush, and forages on or near the ground for insects and seeds.	This sedentary and solitary species inhabits the drier mallee woodlands and heaths of the southern parts of Western Australia. It forages mainly on the ground, primarily for insects, and breeds from March through to December across the State.	Primarily inhabits eucalypt and casuarina woodlands especially Salmon Gum (*Eucalyptus salmonophloia*), wandoo (*E. wandoo*) and tall mallees which they also utilise for nesting hollows during the breeding season between July and December.

Species	***Leipoa ocellata* Malleefowl**	***Merops ornatus* Rainbow Bee-eater**	***Pomatostomus superciliosis ashbyi* White-browed Babbler (western wheatbelt)**	***Oreoica gutturalis gutturalis* Crested Bellbird (southern)**	***Platycercus icterotis xanthogenys* Western Rosella (Mallee)**
Family	***Megapodiidae***	***Meropidae***	***Pomatostomidae***	***Pachycephalidae***	***Psittacidae***
Likelihood of Occurrence-Regional	An intensive biological survey of the Eastern Goldfields was conducted from 1979 until 1993 covering an area of 27,780 km^2 that included the Southern Cross and Marvel Loch area (Newbey *et al*. 1995). A total of four mounds were recorded during that time and not one bird was sighted. One mound was identified in *Eucalyptus salubris* Low Woodland and the remaining three in *Acacia* Tall shrubland. These results suggest that there are very few Malleefowl within the regional area.	Species or species habitat may occur in the area.	The most recent recordings of the Babbler are in 2007 at Marvel Loch.	The most recent recording of the Crested Bellbird is in 2007 at Marvel Loch.	The Western Rosella was not listed on the DEC Threatenend and Priority Fauna Database for the Parker Range area.
Likelihood of Occurrence-Local	The most recent Malleefowl sighting in the local area as recorded on the DEC Threatened and Priority Fauna Database list was at Marvel Loch in 2008 with tracks recorded at Skeleton Rock (~30 km south) in 2009. Four active/inactive mounds and the remains of an old, abandoned mound, one recently moulted feather and four adult birds were recorded in the local area during surveys from 2008 to 2010.	The Rainbow Bee-eater usually migrates south in late September early October and north from February to April (Johnstone and Storr 1998). Given the timing of the seasonal surveys at the northern and central deposit areas of Mt Caudan (September 2008 and May 2009), it was not unexpected that no Rainbow Bee-eaters were seen or heard. However, three Bee-eaters were recorded during the Spring 2009 survey in the southern deposit area in October 2009. While the Impact Area does not comprise preferred breeding habitat for this species, it is not unlikely that Bee-eaters are seen in the area within their migratory path.	Numbers of White-browed Babblers were seen and heard during the surveys in the contiguous vegetation at Mt Caudan where their conservation status is not threatened. Babblers were seen and up to 28 nests recorded in the Upper Haul Road where fragmentation poses a threat to this species.	The characteristic call of the Crested Bellbird was heard during the spring 2008 seasonal survey but not during the autumn 2009 or spring 2009 surveys. While the Crested Bellbird was not heard or seen in the Upper Haul Road area, it would not be surprising that this mobile species would utilise this area within its large home range.	Two Western Rosellas were recorded during the .Autumn 2009 survey. None were seen or heard in the Upper Haul Road area.

Figure 31: White-browed Babbler Nests at Upper Haul Road Project Area

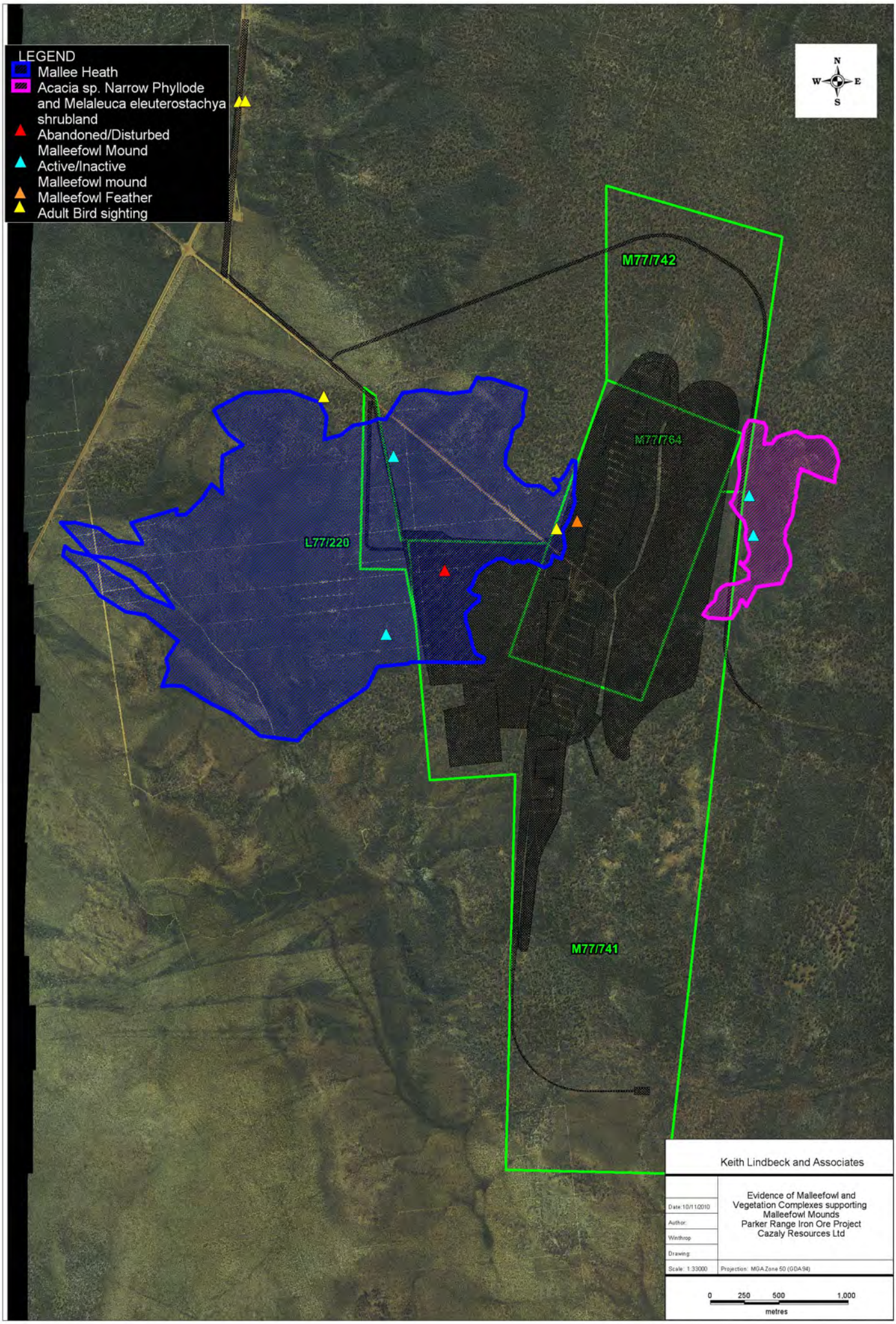


Figure 32: Location of Malleefowl Recorded at Project Area

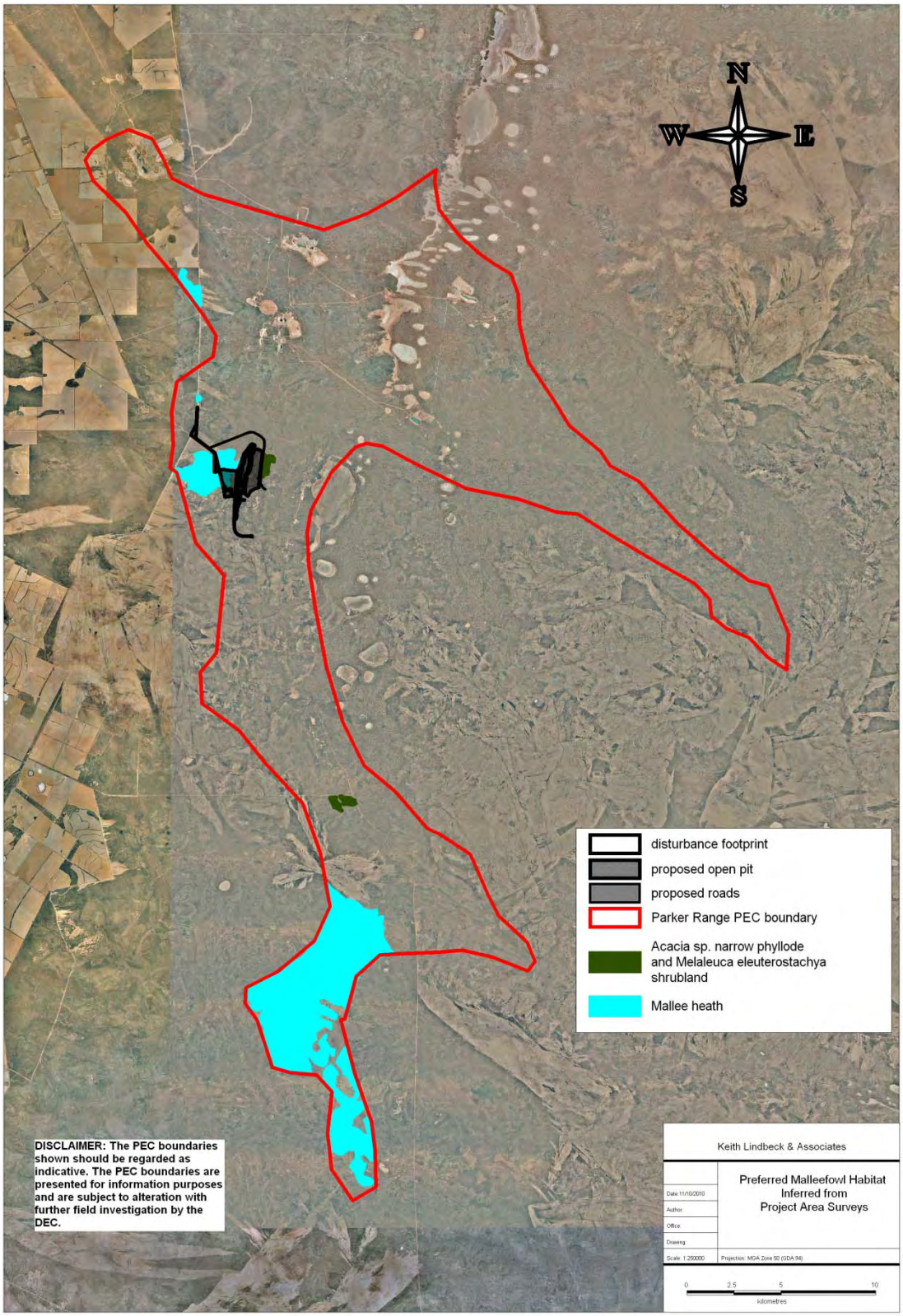


Figure 33: Inferred Preferred Malleefowl Habitat Within Parker Range PEC

5.9.3 Local Invertebrate Terrestrial Fauna

KLA has completed systematic and targeted seasonal surveys for invertebrate terrestrial fauna since 2008 (KLA 2010b - Appendix 7). These were conducted in accordance with EPA Guidance Statement No. 20 "Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia" (EPA 2009b).

Visual searching of likely invertebrate habitats included under rocks, under bark, under logs, in hollows of logs and in other leaf litter and debris lying on the ground. In addition, samples of decaying leaf litter and soils where collected from each trapping site and transferred back to Perth for examination. All invertebrate fauna or parts thereof were collected, preserved and sent as per guidelines to appropriate specialists at the Western Australian Museum and University of Western Australia for identification.

Foraging was conducted for up to one hour per site during the course of each seasonal survey. Opportunistic searches were also carried out when on site and during spotlighting forays.

A total of six spiders, including two mygalomorph spiders, 14 trapdoor lids and burrows or parts thereof, four scorpions, two pseudoscorpions and 25 land snails were collected and submitted to respective specialists for identification. Results of all specimens identified indicated that none were Short Range Endemic invertebrates (SRE) (KLA 2010b – Appendix 7).

Upon review of these reports, the DEC requested a targeted SRE survey be conducted with particular reference to *Aganippe castellum,* the Tree-stem Trapdoor spider, which is known to occur within the Yilgarn Craton area. At that time while *A. castellum* was not considered a SRE, it was listed on Schedule 1 of the *Wildlife Conservation Act 1984* which classifies it as "fauna that is rare or likely to become extinct".

A targeted invertebrate terrestrial fauna survey (including SREs) was conducted over a 4-day period from 19 April to 21 April 2010 inclusive (KLA 2010b). Advice from the Office of the EPA (OEPA) concurred with the program to undertake examination of 10 m x 10 m quadrats in SRE preferred habitat with replicate quadrats in different vegetation communities.

Forty-one 10 m x 10 m quadrates in SRE preferred habits and different vegetation communities were examined for up to one hour each during the four-day sampling period.

No invertebrates or potential SREs were recorded in 19 of the 41 quadrats examined. Six *A. castellum* spiders were recorded with four intact and attached to host trees, one intact in an area that had had a fire through it and was not attached to a host tree and one (empty) lid and burrow (collected) that had exuded onto the track. Of the *A. castellum*, all six were recorded outside the mining activity footprint. However, two were recorded in the vicinity of the proposed Parker Range bypass road. A targeted survey has established the preference of *A. castellum* for a specific vegetation type *Eucalyptus capillosa* subsp. *polyclada* woodland found to the east of the waste landform. The targeted survey identified 17 *A. castellum* in four 200 m x 15 m transects in the Parker Range bypass road Project area with ten viable and seven noted as old or abandoned (KLA 2010b – Appendix 7).

In addition to the *A. castellum*, two spiders were excavated and submitted to the Western Australia Museum for identification together with their burrows and trapdoors. An additional five burrows and trapdoors were also vouchered to the Museum. As the Museum requires males for accurate assessment, the two spiders were identified as *Aganippe* spp. and no further identification was made.

Putative identifications of mygalomorph spiders based on location and design of the burrow and configuration of the trapdoor lid resulted in the recordings of ten *Aganippe "jessupi"* and two *Aganippini* sp. that were apparently occupied, and many more of both species that were old, abandoned or predated (KLA 2010b – Appendix 7). The trapdoors of *Missulena* spp. were also identified.

In addition to the spiders, four pseudoscorpions, five millipedes, 187 land snails, one slater and one insect larvae were collected and submitted to the Western Australia Museum for identification.

Of all specimens submitted to the Western Australian Museum, no SREs were identified. Taxonomic revision is required for one of the pseudoscorpions (*Beierolpium* (sp. 8/4': Family Olpiidae) and the millipedes (Family Siphonotidae) in order to determine their conservation status. However, the vegetation groups in which they were collected are well represented locally.

5.10 Subterranean Fauna

5.10.1 Regional Subterranean Fauna

Subterranean fauna includes stygofauna and troglofauna. The distinction between these two types of subterranean fauna is the niche they occupy below the ground surface. Stygofauna are aquatic subterranean fauna inhabiting groundwater aquifers of varying depths and quality across a diverse range of geologic/geomorphic settings. Troglofauna are found in air-filled humid subsurface cavities (vadose layer) above the groundwater table (Eberhard 2007).

According to the Draft EPA Guidance Statement No 54a (2007a) " it should be assumed that all sites in the Pilbara and Yilgarn/Goldfields will support significant stygofauna and troglofauna assemblages, unless there is strong evidence that subterranean habitats lack pore spaces, have a geology that renders conditions completely anoxic, or contain groundwater of salinity greater than 60,000 mg L^{-1}".

Additional advice recently received from the DEC indicates that the subterranean fauna have been found in groundwater with a salinity of 100,000 mg/L TDS.

Sampling of BIF and other mineralised habitats in the Yilgarn and Goldfields has produced few stygofauna species (Rockwater 2010c – Appendix 8). The geology of the Parker Range Project area is not considered to provide core habitat for stygofauna. However, groundwater salinities at Mt Caudan have been measured to be in the range 18,000 to 60,000 mg/L TDS (Rockwater 2009b), which is within the documented range for potential stygofauna occurrence. Nearby water sources in the region have groundwater of hyper-saline quality; exhibiting salinity levels of 50,000 mg/L to 70,000 mg/L TDS.

Subterranean fauna knowledge within the Southern Yilgarn region is still developing with regional studies by Western Areas the most recent (Rockwater 2009c).

A study of comparable BIF habitat by Bennelongia (Bennelongia 2009a) recorded 10 troglofaunal species for the Yilgarn Iron Ore Project, with an overall animal capture rate of 0.15 animals per sample. In that study, 60% of the species recorded were singletons. The study also suggested that, where present, troglofauna were not necessarily restricted to BIF geology and may use habitat in surrounding rock types where it is suitably weathered or fractured. Nineteen troglobitic species were recorded in the south-eastern part of the Koolyanobbing Range (Bennelongia 2009b), with a capture rate of 1.59 animals per sample (high by Yilgarn standards).

Rockwater has undertaken extensive regional sampling for troglofauna within a 50 km distance of the Project. Figure 32 shows the 171 regional sites, from which 192 samples were taken. The results of the regional sampling are detailed in Section 5.10.2.

5.10.2 Local Subterranean Fauna

Rockwater has undertaken subterranean fauna surveys during 2010 for both stygofauna and troglofanua. An initial pilot field study was undertaken for in accordance with EPA Guidance Statement No 54 (2003) and Draft EPA Guidance Statement No 54a (2007).

Rockwater conducted a pilot study to assess subterranean fauna occurrence in February 2010. The study results suggested that stygofauna were not present, however, troglofauna were identified in three of the 16 sites sampled.

Following a review of the pilot results and discussions with the DEC, it was confirmed that stygofauna habitat was unlikely to exist in the local Project area. Additional consultation also confirmed that further surveys for troglofauna were required; these were subsequently completed by Rockwater during April-August 2010.

Both scraping and trapping techniques were used during the survey, to increase capture rates and document the troglofauna community.

Sampling for troglofauna at 206 sites (171 regional, 35 Project area) recorded 54 troglofaunal animals from eight orders (Table 20) (Figure 35). The troglofaunal groups recorded by the surveys included Araneae (three species), Cephalostigmata (two species), Chilopoda (one species), Coleoptera (four species), Diplura (two species), Isopoda (five species), Pseudoscorpionida (four species) and Thysanura (one species).

Eight species in total were recorded in the impact area, with four of these also being known from regional sites that range from 0.4 km south of the planned mine pit (*Tyrannochthonius* sp. B15) to 3.3 km east (*Hanseniella* sp. B5) and 46 km northwest of it (*Austrochthonius* sp. B1).

Table 20: Results of Troglofauna Sampling at Parker Range

Order	Family	Taxa	Number	Impact (Mine Pit)	Reference
Araneae	-	*Araneomorphae sp. B13**	1	PKRC0039	-
Araneae	-	*Araneomorphae sp. B16*	1	PKRC0044	-
Araneae	-	*Araneomorphae*	1	-	PKRC0172
Cephalostigmata	Scutigerellidae	*Hansenie*	1	-	09CTRC018
Cephalostigmata	Scutigerellidae	*Hanseniella sp. B5*	8	PKRC0091, PKRC0122	GVRC019, PATH05, PKRCT02, SB09
Chilopoda	-	*Chilopoda*	1	-	09SHRC010
Coleoptera	-	*Curculionidae Genus 3 sp. B6*	1	-	GVRC019
Coleoptera	Staphyliinidae	*Pselaphinae sp. B6*	1	-	SB31
Coleoptera	Staphyliinidae	*Pselaphinae sp. B7*	1	-	SB5
Coleoptera	Staphyliinidae	*Staphyliinidae sp. B2*	4	-	GVRC019
Diplura	Campodeidae	*Campodeidae sp. B3*	1	-	PATH05
Diplura	Heterojapygidae	*Heterojapygidae sp. B1*	1	-	GVRC002
Isopoda	Armadillida	*Buddelun sp.B3*	1	-	PKRC0077

Order	Family	Taxa	Number	Impact (Mine Pit)	Reference
Isopoda	Armadillidae	*Buddelundia sp. B4*	1	PKRC0079	
Isopoda	Armadillidae	*Troglarmadillo sp. B16*	1	-	SB17
Isopoda	Platyarthridae	*Trichorinae sp. B6*	7	-	09SHRC002, MTRK01, SB031, SPR03
Isopoda	Armadillidae	*Philosciidae sp. B14*	3	PKRC0193	SB17
Pseudoscorpionida	Chthoniidae	*Chthoniidae sp.*	1	-	09SHRC017
Pseudoscorpionida	Chthoniidae	*Austrochthonius sp.B1*	14	PKRC0018	MTRK02, SB25, SB30, SB31
Pseudoscorpionida	Chthoniidae	*Tyrannochthonius sp. B13**	1	PKRC0044	-
Pseudoscorpionida	Chthoniidae	*Tyrannochthonius sp. B15*	3	PKRC0038	PKRC0124, PKRCT01
Thysanura	Nicoletiidae	*Hemitrinemura sp. B3*	2	-	SB12, SB31

* collected as by-catch during stygofauna sampling

5.11 Noise and Vibration

5.11.1 Regional Noise and Vibration

The regional existing environment within the community co-exists with noise generation from farming activities, mining activities (Marvel Loch), heavy farm machinery movements and truck haulage activities (mainly grain and stock transport). Haulage activities are undertaken on a combination of sealed and unsealed public roads, controlled and maintained by the Shire of Yilgarn.

Residences in Moorine Rock and Southern Cross townships are in proximity to the main east-west freight corridor of the Great Eastern Highway.

Vibration within the region is limited to mining activities principally in Marvel Loch township due to active gold mining operations.

5.11.2 Local Noise and Vibration

Herring Storer Acoustics (HSA) has undertaken a baseline noise survey to establish the background noise level in the local Project area (HSA 2010 – Appendix 9).

In consultation with the community, identification of noise receptors was completed by Cazaly and the noise level was monitored at designated noise receptor locations along the proposed truck haul route (Figure 36 and Figure 37). HSA established automatic noise data loggers to record sound pressure levels in accordance with Australian Standard 2702-1984: Acoustics - Method for Measurement of Road Traffic Noise, for minimum monitoring periods of seven days at each noise receptor location.

From the logger data, the Leq(16hour) and Leq(8hour) were calculated, which are defined below:

- Leq(16hour) is the logarithmic average of the hourly Leq values between 0600 hours and 2200 hours.
- Leq(8hour) is the logarithmic average of the hourly Leq values between 2200 hours and 0600 hours on the same day.
- LAmax. is the maximum A-weighted sound pressure level occurring in a specific time period.

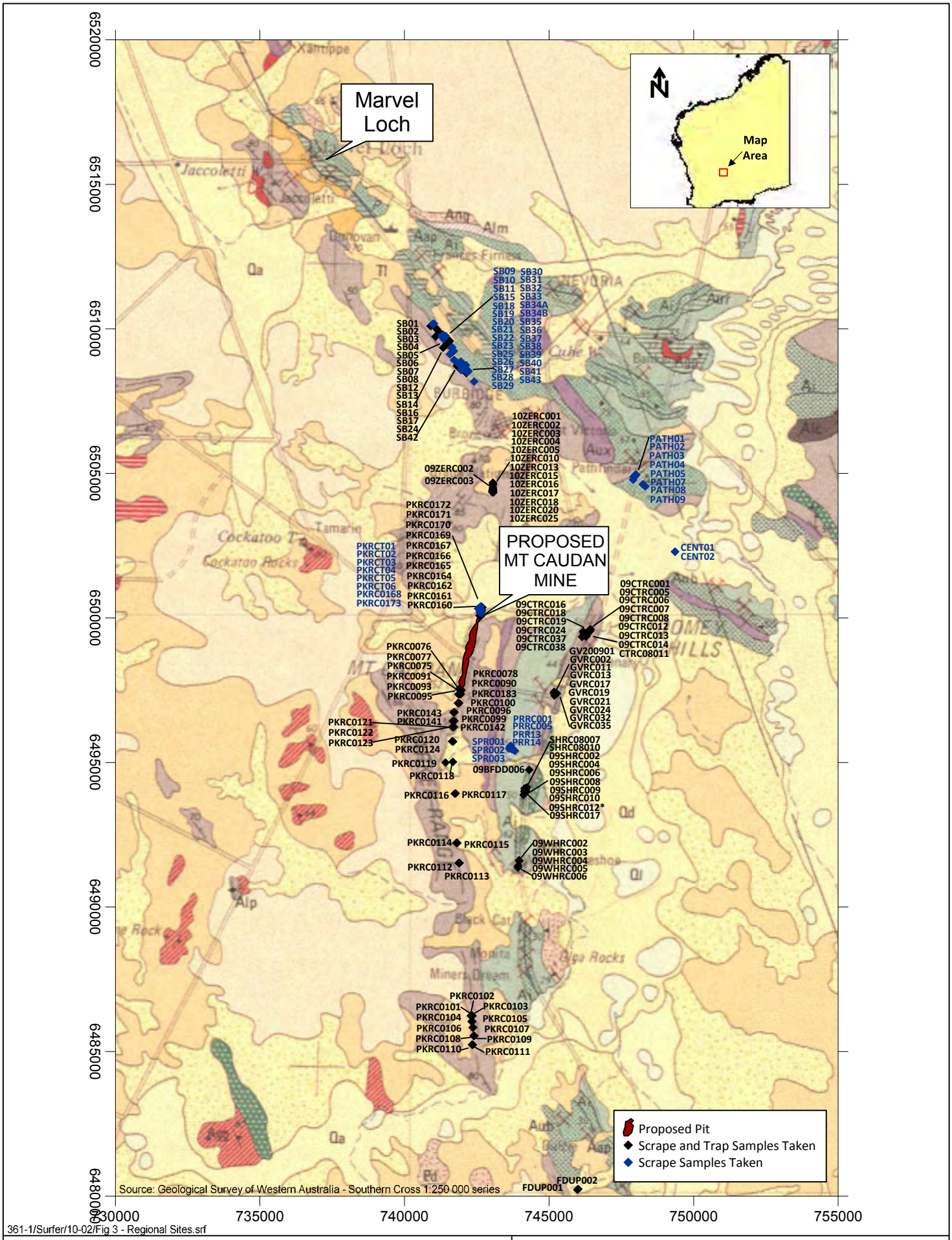
Resultant noise levels from each of the monitoring locations have been summarised in Table 21.

Table 21: Resultant Noise Level Summary - Baseline Monitoring

Noise Receptor	GPS Reference	Monitoring Period	LAeq, day (06:00 to 22:00)	LAeq, night (22:00 to 06:00)	LAmax. day (06:00 to 22:00)	LAmax. night (22:00 to 06:00)
Lot 638	6533021.70N / 98175.99E	1-6 May 2010	43 dB(A)	38 dB(A)	76 dB(A)	64 dB(A)
Moorine Rock Primary School	6533594.36N / 702291.14E	1-12 May 2010	53 dB(A)	49 dB(A)	87 dB(A)	75 dB(A)
Lot 59	6533649.92N / 702346.88E	1-12 May 2010	49 dB(A)	45 dB(A)	85 dB(A)	70 dB(A)
Lot 59A	6533002.21N / 702508.66E	13-20 May 2010	46 dB(A)	38 dB(A)	80 dB(A)	63 dB(A)
Lot 61	6532885.12N / 702536.64E	13-24 May 2010	48 dB(A)	40 dB(A)	83 dB(A)	72 dB(A)
Lot PP	6515235.89N / 723654.19E	12-23 May 2010	55 dB(A)	48 dB(A)	85 dB(A)	69 dB(A)

The baseline noise monitoring indicated background noise levels of between 43 to 55 dB(A) for day periods and between 38 to 49 dB(A) for night periods with maximum sound pressure levels measured between 76 to 87 dB(A) for day periods and between 63 to 75 dB(A) for night periods.

Further details of the baseline noise monitoring program are provided in Appendix 9.



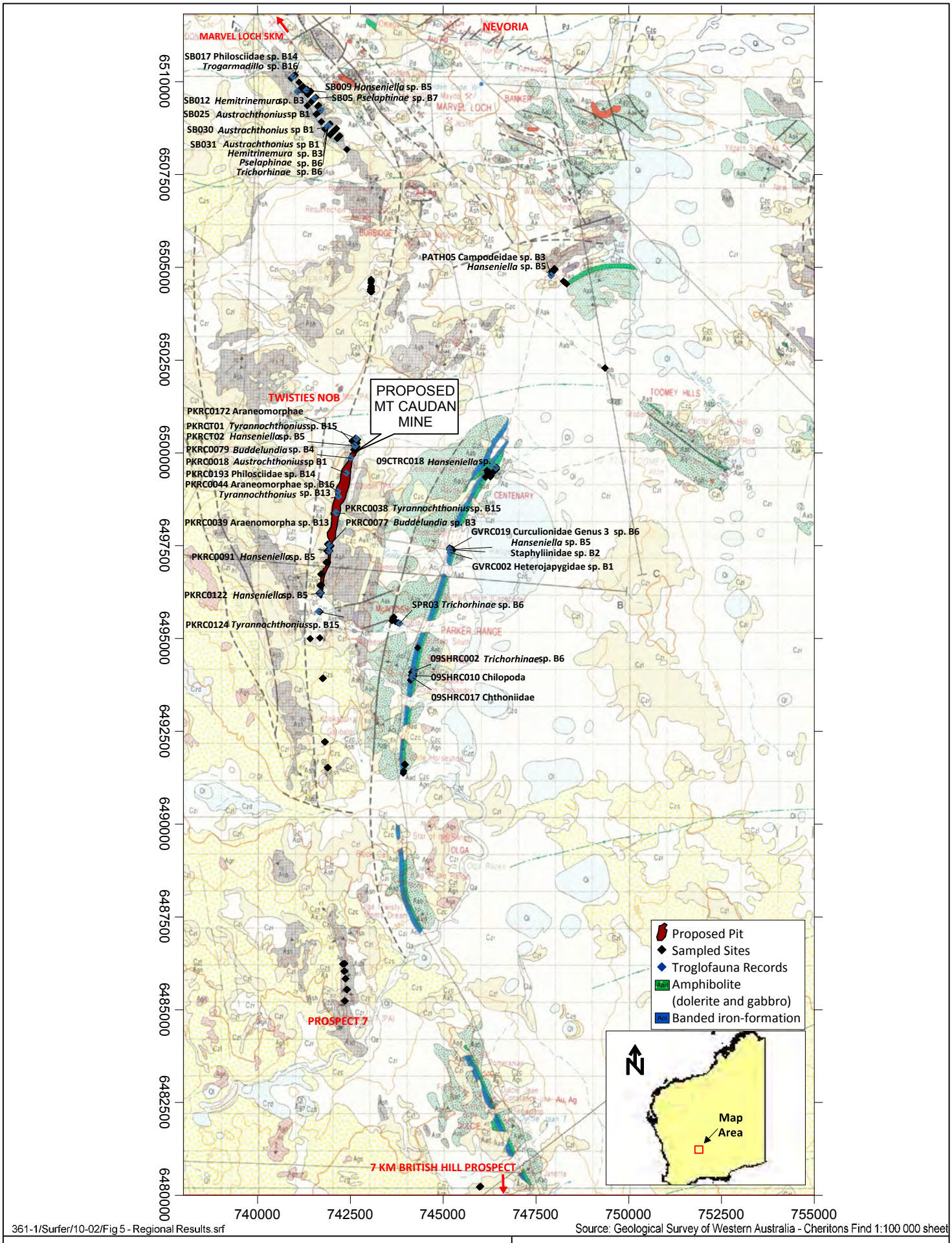
361-1/Surfer/10-02/Fig 3 - Regional Sites.srf

CLIENT:	Cazaly Resources
PROJECT:	Parker Range Subterranean Fauna Sampling
DATE:	July 2010
Dwg. No:	361-1/10/2-3

PARKER RANGE
REFERENCE SITES

Rockwater

Figure 34: Regional Subterranean Fauna Sample Sites



361-1/Surfer/10-02/Fig 5 - Regional Results.srf

Source: Geological Survey of Western Australia - Cheritons Find 1:100 000 sheet

CLIENT:	Cazaly Resources
PROJECT:	Parker Range Subterranean Fauna Sampling
DATE:	July 2010
Dwg. No:	361-1/10/2-5

PARKER RANGE
RESULTS OF REGIONAL
TROGLOFAUNA SAMPLING

Rockwater

Figure 35: Regional Troglofauna Sampling Results

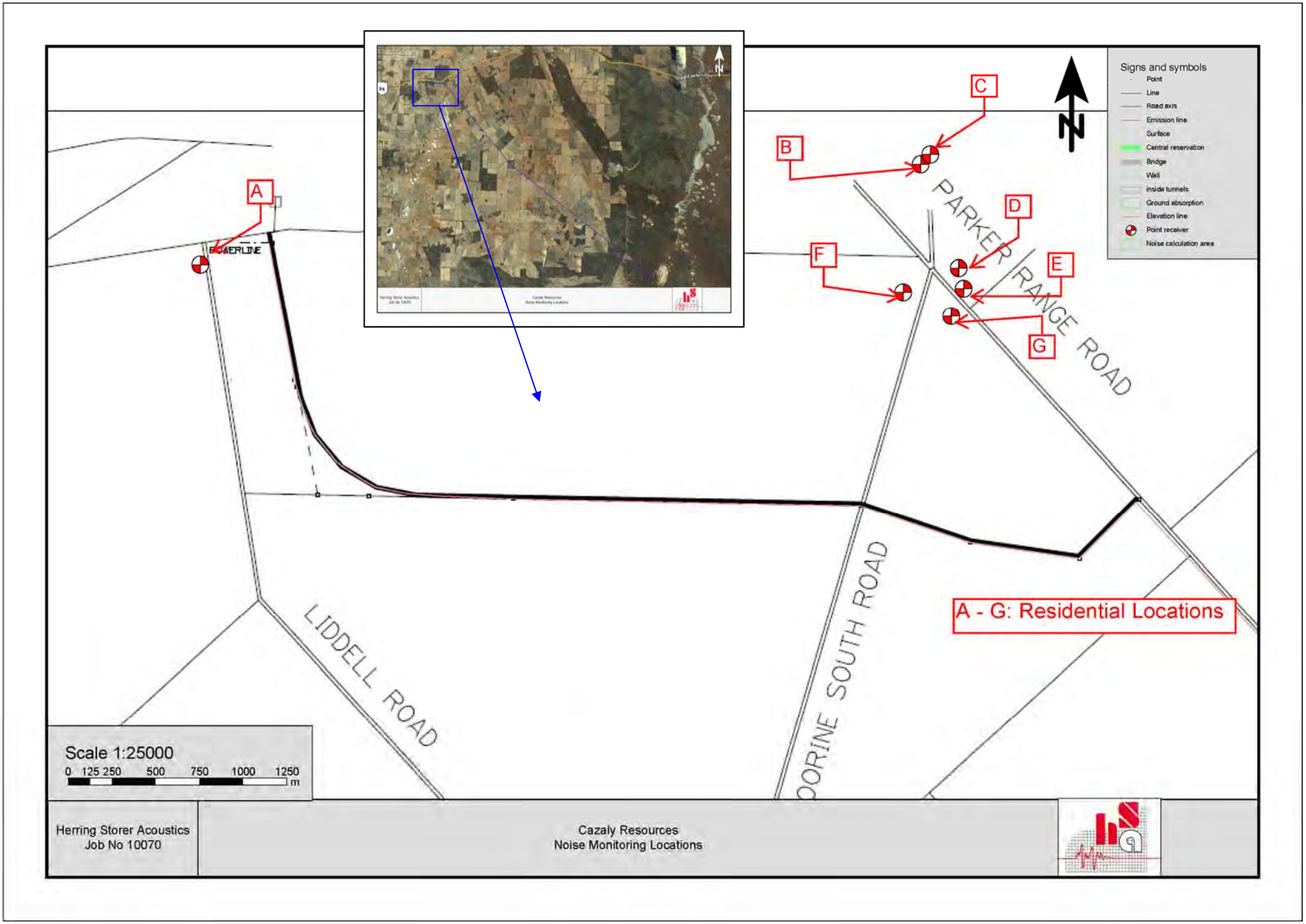


Figure 36: Noise Monitoring Locations Upper Haul Road (Moorine Rock) Project Area

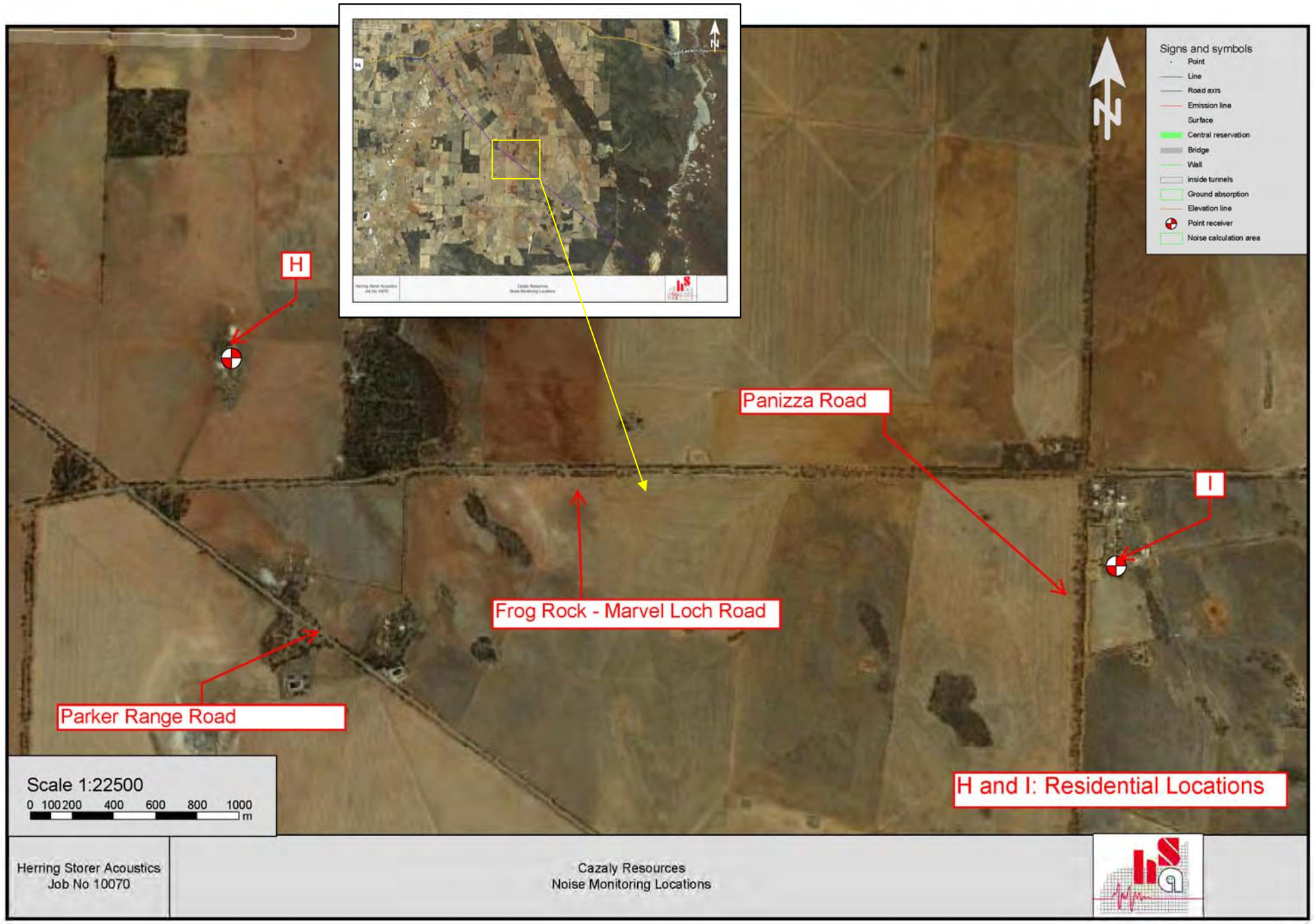


Figure 37: Noise Monitoring Locations Along Parker Range Road

5.12 Dust

5.12.1 Regional Dust

The regional existing environment within the community co-exists with dust generation from farming activities, mining activities (Marvel Loch), heavy farm machinery movements and truck haulage activities (mainly grain and stock transport). Haulage activities are undertaken on a combination of sealed and unsealed public roads, controlled and maintained by the Shire of Yilgarn.

Dust on unsealed roads is common in the region with principal control being to limit vehicle speed in these regions.

5.12.2 Local Dust

Ecotech Pty Ltd (Ecotech) has undertaken a baseline dust survey to establish the background dust levels in the local Project area (Ecotech 2010 - Appendix 10).

In consultation with the community, identification of dust receptors was completed by Cazaly and the dust levels were monitored at designated receptor locations along the proposed truck haul route (Table 22). Ecotech established dust deposition gauges (DDG) and automatic constant flow sampling devices (PN10) for sensitive community receptors in accordance with NEPC (2003) - Air Quality Measurement requirements. The initial dust monitoring program has been undertaken during winter. However, it is recognised that dust generation is the highest during summer months where approximately twice the dust levels of winter months may occur (Cliffs 2009).

Table 22: Dust Monitoring Results (Deposition) for Project Area

Site Description	GPS Reference	Monitoring Period	Dust Results (mg)	Result Equivalent g/m^2/month
DDG Site 1 – Corner Liddell Rd and Prospector Access Rd intersection.	Lat – 31 18'55.34"S Long – 119 5'5.20"E	1 to 31 July 2010	27	1.5
DDG Site 2 – Lot 638 residence, south of house	Lat – 31 13'13.54"E Long – 119 4'56.97"S	1 to 31 July 2010	29	1.6
DDG Site 3 – Haul road intersection on Moorine South road (Lot 59/61)	Lat – 31 19'55.48"E Long – 119 7'20.97"S	1 to 31 July 2010	21	1.2
DDG Site 4 – Lot 59 property, south-west of buildings	Lat – 31 19'17.84"E Long – 119 7'23.98"S	1 to 31 July 2010	46	2.6
DDG Site 5 – Lot 61 residence on Parker Range Rd.	Lat – 31 19'14.68"E Long – 119 7'42.31"S	1 to 31 July 2010	23	1.3
DDG Site 6 – T intersection Lot 61 private haul road and Parker Range Rd.	Lat – 31 19'53.11"E Long – 119 8'21.37"S	1 to 31 July 2010	65	3.7
DDG Site 7 – Intersection Parker Range road and Southern Cross road (Lot 272).	Lat – 31 27'1.69"E Long – 119 16'10.66"S	1 to 31 July 2010	38	2.2
DDG Site 8 –Intersection Frog Rock and Parker Range roads (Lot 401)	Lat – 31 28'10.36"E Long – 119 18'35.78"S	1 to 31 July 2010	91	5.2
DDG Site 9 – Intersection Patroni road and Parker Range road (Lot 425/426)	Lat – 31 31'58.82"E Long – 119 24'21.14"S	1 to 31 July 2010	40	2.3
DDG Site 10 –Property 200 m from bushland, Parker Range road (Lot 453)	Lat – 31 34'43.92"E Long – 119 29'2.18"S	1 to 31 July 2010	43	2.4
DDG Site 11 – Plant site at Mt Caudan	Lat – 31 37'45.68"E Long – 119 32'57.10"S	1 to 31 July 2010	350	19.8
DDG Site 12 – Plant site at Mt Caudan	Lat – 31 37'25.18"E Long – 119 33'2.80"S	1 to 31 July 2010	17	1.0

The background dust deposition rates for winter vary from 1.0 to 19.8 g/m^2/month, with the highest reading measured along the Mt Caudan exploration tracks and unsealed sections of Parker Range Road (proposed for road train haulage). Baseline dust levels will be significantly reduced following the sealing of the Parker Range road. A subsequent background dust survey is planned in 2010 during summer months, with the results expected to be approximately twice the winter baseline measurements due to drier conditions.

Two continuous dust sampling devices were installed at the CBH rail siding and Primary School at Moorine Rock for the measurement of baseline dust levels. Table 23 indicates a higher existing dust concentration at CBH rails siding than the Primary School which is anticipated due to the unsealed roadways at the CBH siding.

Table 23: Dust Monitoring Results (PM10) for Project Area

Site Description	GPS Reference	Monitoring Period	Dust Reading (µg/m³)
PM 10 Teom/WS/WD* – CBH storage and rail siding (Moorine Rock)	Lat – 31 19'4.51"S Long – 119 4'24.06"E	1 to 31 July 2010	3.0 to 9.8
PM 10 Teom – Moorine Rock Primary School	Lat – 31 18'51.63"S Long – 119 7'29.94"E	1 to 31 July 2010	0.3 to 3.3

* PM10 Teom – automated dust gathering device with GSM for downloading of data daily, measuring wind speed (WS) and wind direction (WD).

5.13 Conservation Reserves

The nearest conservation reserves to the local Project area are:

- Jilbadji Nature Reserve – 18 km east.
- Yellowdine Nature Reserve – 29 km north.
- Wockalarry Nature Reserve – 30 km north-northwest.
- Frog Rock Nature Reserve – 31 km northwest.

There are no conservation reserves or DEC managed lands in the Project area.

5.14 Pastoral Leases

The local Project area of Mt Caudan is situated on Crown Reserve and hence no pastoral leases exist in this area. West of Emu Fence Road, pastoral leases and freehold landholders co-exist with shire roadways proposed to be used by the Project.

The most northern part of the project area of the truck route near Moorine Rock is situated on freehold agricultural land which has been grazed and cropped for over 50 years.

5.15 Demography

The Parker Range Project is located within the Shire of Yilgarn. The Shire of Yilgarn encompasses an area of approximately 3.1 million ha and is centred on the town of Southern Cross, situated 370 km east of Perth and 52 km south-south-west of Koolyanobbing.

Mining and agriculture are the two major industries of the Shire of Yilgarn (Shire of Yilgarn 2010; ABS 2007). Mining is undertaken for iron ore, gold, gypsum and salt, and agriculture is undertaken for grains, wool, sheep, cattle and pigs (Shire of Yilgarn 2010).

The Shire of Yilgarn has a population of approximately 1,400 people, comprising approximately 55% male persons. Approximately 3% of the population are Aboriginal (indigenous) Australians (ABS 2007). Of the approximately 750 working persons in the Shire of Yilgarn, approximately 28% are employed in agriculture and approximately 16% are employed in the mining industry (ABS 2007).

5.16 Aboriginal Heritage

5.16.1 Regional Aboriginal Heritage

Western Heritage Research Pty Ltd (Western Heritage) conducted a search of the Department of Indigenous Affairs (DIA) database in order to identify both relevant reports of surveys undertaken within the tenements and previously recorded Aboriginal heritage sites near to the survey area. As a result of the search, no previously identified sites are located within the survey area.

In addition, there are no reports detailing previous research conducted within the survey area.

5.16.2 Local Aboriginal Heritage

Western Heritage conducted aboriginal heritage surveys in November 2009 (Mt Caudan) and May 2010 (upper haul road) for both ethnographic and archaeological components.

Three possible interested parties were identified through the *Commonwealth Native Title Act* 1993, as follows:

- The Gubrun People, represented by the Champion family.
- The Central West People, represented by the Sambo family.
- The Ballardong People, represented by the Hayden and Nelson families.

Mt Caudan project area ethnographic field surveys were conducted with each group separately between 3 and 9 November 2009. Upper haul road project area ethnographic field surveys were conducted with each group separately between 15 and 20 May 2010.

Mt Caudan project area archaeological surveys were completed from 5 to 7 November 2009. Upper haul road project area archaeological surveys were completed on the 27 May 2010.

A copy of the Aboriginal Heritage survey reports are attached as Appendix 12.

Aboriginal Heritage – Ethnographic

Western Heritage anthropologist Wayne Glendenning conducted the ethnographic survey was conducted by between 3 and 9 November 2009 (Mt Caudan) and 15 and 20 May 2010 (upper haul road) with three separate survey groups representing three Aboriginal groups who have an interest in the area.

Representatives of the following groups attended the survey: the Gubrun People, the Central West People and the Ballardong People.

No ethnographic sites were identified by any individual or group during the ethnographic surveys within the survey area (Western Heritage Research Pty Ltd 2009 and Wayne Glendenning 2010 – Appendix 12).

Aboriginal Heritage - Archaeological

Western Heritage archaeologists Alyssa Gilchrist and Renee Gardiner conducted the archaeological survey of the Mt Caudan survey area between 5 and 7 November 2009. Wayne Glendenning archaeologist conducted the archaeological survey of the upper haul road area on 27 May 2010.

Initial inspection of the Mt Caudan survey area revealed it was characterised by raised areas of yellow sandy soils with thick scrub and poor ground-surface visibility in the west; by a prominent range containing rocky outcrops, caves and overhangs extending north-south across the site and areas to the east and far west of flat, open woodland with red, gravely soils.

Very thick vegetation was present across much of the study area, and in particular on elevated land. Ground surface visibility in general was very poor and largely confined to areas of recent ground disturbance associated with drilling and tracks construction.

The archaeological survey involved the following methodology:

- The survey strategy was informed by the accessibility of the study area. Due to dense vegetation over much of the subject land, accessibility was generally confined to a series of existing tracks/drill lines, which ran approximately east-west across the property. The drill lines were assessed by pedestrian survey, with the archaeologists inspecting the tracks themselves, as well as areas of ground surface visibility within 20 to 50 m each side of these tracks.
- Where woodland was open, additional sample areas were walked off the line of existing tracks. These additional survey areas were generally not undertaken in linear transects as existing vegetation did not allow a survey of straight lines.

Initial inspection of the upper haul road area (near Moorine Rock) indicated that is has been subjected to disturbance over many years from escavation for a gravel pit, construction of roads and power transmission lines, including installation of nearby transmission tower.

Archaelogical visibility within the survey area ranged from less than 5% in area of thick vegetation and detritus to greater than 90% in cleared areas.

The archaeological survey methodology comprised pedestrian transects spaced 10 m apart across the entire survey area.

No archaeological sites or archaeological material were identified during the surveys (Western Heritage Research Pty Ltd 2009 and Wayne Glendenning 2010 – Appendix 12).

Native Title

The Department of Indigenous Affairs holds records of registered native title claimants (DIA 2010). A search of the DIA database revealed no registered native title claimants within the local Project area.

5.17 European Heritage

The Shire of Yilgarn maintains a Municipal Heritage Inventory of heritage sites in accordance with the *Heritage of Western Australia Act 1990* (WA). Table 24 reveals the search results of Municipal Heritage Inventory listing four European heritage sites (one outside the Mt Caudan project area and three outside the haulage road route area).

Table 24: Search Results of the Shire of Yilgarn Municipal Heritage Inventory

Inventory	Locations Description	Significance
Reserve 13208 Lot 1011	Water reserve to South of Mt Caudan.	Dingo tank – was built by miners.
Reserve 6608 Lot 1009	Water supply south of intersection of Parker Range and Forrestania Southern Cross Roads.	Parker Range Tank – supplied water to mining settlements in early part of twentieth century.
Reserve 13268 (Tamarin)	Water supply south of Parker Range and Forrestania Southern Cross Roads and west of Emu Fence Road.	Cockatoo Tank – built at turn of century, used by gold miners.
A Class Reserve 29537 Lot 915	Granite near Parker Range Road and Frog Rock Road intersection.	Strawberry Rocks – large flat expanse of granite. Popular recreation destination in early times. Two stone wells exist at base of rock.

6.0 ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT RESPONSES

6.1 Environmental Management Plan

Cazaly has developed an Environmental Management Plan (EMP) that outlines the objectives, performance indicators and required actions to achieve the objectives and the responsibilities for actions for the development of the Parker Range (Mt Caudan) Iron Ore Project (HWE Mining 2010 - Appendix 13). Cazaly has developed a Conceptual Rehabilitation and Closure Plan (CRCP) for the mine (Cazaly 2010 - Appendix 14).

Cazaly utilise an internal risk assessment process based on Australian/New Zealand Standard (AS/NZS) 4360:2004 Risk Management, as an assessment tool for the evaluation of safety, health, environmental, project, operations and closure risks in key facets of business.

Both the EMP and CRCP included risk assessments of the potential environmental impacts, including indirect and cumulative environmental impacts of the Project and the management measures that will be implemented to mitigate these impacts (HWE Mining 2010 - Appendix 13 and Cazaly 2010 – Appendix 14).

Environmental management actions and incidents will be retained and managed in the Project ISO 14001 certified Environmental Management System (EMS) which includes recording, administration of environmental incidents and status of corrective actions in the 'Cintellate' software package.

As development activities differ in scale and nature of impact, control measures are tailored to ensure they are relevant and effectively mitigate the identified impacts. Specific management actions have been developed and recommended for factors where the possible impact may be significant if uncontrolled.

In addition to EPA principles, management actions have been guided by a hierarchy of principles being:

- Avoidance – avoid areas of conservation significance.
- Minimise – limit impact area to only that required.
- Rectify – progressively rehabilitate as opportunities are presented.
- Reduce – monitor to ensure effectiveness.

6.2 Key Environmental Factors

6.2.1 Vegetation

EPA Objective

- Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.
- Maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge.

Applicable Guidelines, Standards and Legislation

- EPA Guidance Statement No 51 (2004). Terrestrial Flora Surveys for Environmental Impact Assessment in Western Australia.
- DEC (2005). Recommended Interim Protocol for Flora Surveys for Banded Ironstone Formations (BIF) of Yilgarn Craton.
- EPA Position Statement No 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection.
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004
- NBSR (2009). Australia's Biodiversity Conservation Strategy 2010-2020, Consultation draft.
- DME (1998). Mineral exploration and mining within conservation reserves and other environmentally sensitive lands in Western Australia.
- DITR (2007). Biodiversity Management.
- *Conservation and Land Management Act 1984.*

- *EPA Act 1986.*
- *EPBC Act 1999.*

Potential Impacts

Key issue: **Loss of vegetation communities**	▪ Direct or indirect impacts leading to a loss or a fragmentation of vegetation community biodiversity within the natural environment.

Impact Assessment

Impact Summary	▪ Vegetation communities (12 Mt Caudan, 14 Parker Range bypass road, 10 Powerline Corridor) impact <10.7% on any individual community estimated within the regional area (PEC) after impact area is cleared. ▪ Vegetation communities after clearing 421 ha which represents less than 0.31% of any single vegetation community of Pre-European communities. ▪ Vegetation covering 0.7% of PEC and 0.003% of the Great Western Woodlands will be cleared.

Reduction in Vegetation Communities

The quadrat survey of the Mt Caudan Project area revealed 12 vegetation communities, 14 Parker Range bypass road and 10 vegetation communities were identified along the proposed powerline corridor. In the event of proposed clearing at Mt Caudan, less than 10.7% impact is estimated to ocurr on any individual vegetation communities based on known local Project area and estimated regional assemblages within the PEC. Table 26 defines the impact of the proposed clearing on the vegetation communities in the Project area based on known and estimated assemblages, which are widely distributed outside the area of impact.

None of the clearing will have an impact on any “critical assets” as defined in EPA Position Statement 9 – Environmental Offsets (EPA 2006a).

Six vegetation communities are not in regional conservation reserves.

Pre-European Threshold

Pre-European vegetation associations and their extent are a dataset of broadly categorised major vegetation groups across Western Australia used as a baseline for managing issues including land clearing. BC field mapping of vegetation communities encompassed a more detailed approach and as a result the number of pre-European vegetation associations in the area is lower than those communities mapped by BC hence more than one BC mapped vegetation community falls into one pre-European vegetation association.

The following presents a simple broad overview of the Project area and reduction in the extent of pre-European vegetation from proposed clearing impacts.

Three pre-European vegetation associations occur within the Mt Caudan Project area:

- *Casuarina/Calothamnus* and *Melaleuca* shrubland on greenstone hills (Vegetation association 552) will have 99 ha impacted which is 0.31% of its current extent.
- Medium woodland: Salmon gum, Morrel and Gimlet (Vegetation association 1068) will have 260 ha impacted which is 0.19% of its current extent.
- *Acacia/Casuarina* and *Melaleuca* shrublands (Vegetation association 1413) will have 41 ha impacted which is 0.003% of its current extent.

Five pre-European vegetation associations occur within the Powerline Corridor Project area:

- Medium woodland; Salmon gum and Gimlet (Vegetation association 8) will have 1 ha impacted which is 0.0001% of its current extent.
- Bare areas; rocky outcrops (Vegetation association 128) will have 1 ha impacted which is 0.0003% of its current extent.
- *Casuarina/Calothamnus* and *Melaleuca* shrubland on greenstone hills (Vegetation association 552) will have 1 ha impacted which is 0.003% of its current extent.
- Medium woodland: Salmon gum, Morrel and Gimlet (Vegetation association 1068) will have 5 ha impacted which is 0.004% of its current extent.

- *Acacia*/*Casuarina* and *Melaleuca* shrublands (Vegetation association 1413) will have 6 ha impacted which is 0.0005% of its current extent.

Two pre-European vegetation associations occur within the proposed Upper Haul Road (near Moorine Rock) Project area:

- Medium woodland; Salmon gum and Gimlet (Vegetation association 8) will have 1 ha impacted which is 0.00018% of its current extent.
- *Acacia*/*Casuarina* and *Melaleuca* shrublands (Vegetation association 1413) will have 6 ha impacted which is 0.00045% of its current extent.

The 1 ha area within the local Upper Haul Road Project area within vegetation association 8 is already heavily cleared for agricultural use including cropping and sheep grazing. There were, however, a few small areas of remnant *Eucalyptus salubris* woodland within this area.

A summary of the current extent and representation of these associations in DEC managed lands is presented in Table 25.

Table 25: Extent of Vegetation Communities for the Project Area

Vegetation Group	Current Extent (ha)	% Original Extent Remaining	Area In Reserves (ha)	% In DEC Managed Lands	Area proposed to be impacted (ha)	% Impact on remaining vegetation
Project Area - Mt Caudan & Bypass Road						
552	31,732	93	300	0.9	99	0.31
1068	135,868	50	16,715	12.3	260	0.19
1413	1,247,101	74	216,322	17.4	41	0.003
Project Area – Powerline Corridor						
8	694,638	47	45,770	6.6	1	0.0001
128	302,558	60	59,418	18.7	1	0.0003
552	31,732	94	300	1.0	1	0.003
1068	135,868	51	16,715	12.3	5	0.004
1413	1,247,101	74	216,322	17.4	6	0.0005
Project Area – Upper Haul Road (near Moorine Rock)						
8	694,638	47	45,770	6.6	1	0.00018
1413	1,247,101	74	216,322	17.4	6	0.00045

Although adversely impacted, no significant loss of pre-European communities would result from Project clearing.

PEC Cummulative Impacts and Great Western Woodlands

Based on 414 ha of estimated clearing at Mt Caudan, the Project will result in the disturbance of a small percentage of the PEC (i.e. approximately 0.7%) based on an indicative boundary area and 0.003% of the Great Western Woodlands.

The Project will adversely affect all of the vegetation communities excluding community type 6 (i.e. decomposing laterite and granite where *Isopogon robustus* is known to occur), as defined by Gibson and Lyons (1998) in the PEC. The adverse impacts will be upon the *Allocasuarina* shrublands and laterite ridges as they lie where the proposed open pit is to be developed. Several *Hakea pendens* tall shrubland populations will also be adversely affected as they are also located within the proposed open pit site.

Previous clearing associated with mining, agriculture and roads total approximately 7.5% of the PEC in the Project region. The cumulative impact of additional clearing at Mt Caudan would result in an estimated 8.2% of the total PEC being cleared (Table 26).

Other impacts associated with weed/dieback introduction, changes to surface water natural flows, groundwater drawdown and dust deposition are assessed separately within the EIA.

Management Strategies

Key Mitigation:	▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001) sub-plan Land Disturbance and Rehabilitation (Appendix 13).

EMP Disturbance Management Actions

Vegetation management actions are provided in the Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation, and are in summary;

- Prior to any clearing being undertaken, a Project/operations clearing permit will be prepared in consultation with the Cazaly environmental department. Cazaly Environmental staff will supervise vegetation clearing works.
- Field survey will define the proposed clearance limits, prior to commencement, to avoid over-clearing.
- Significant vegetation and Priority flora groups or fauna habitat will be identified by way of tagging prior to disturbance. A targeted search will be undertaken in known areas of significance prior to disturbance, and these areas will be avoided (where practicable).
- Personnel involved in clearing activities will be trained in clearing permit processes to enable disturbance to be confined to authorised field areas.
- Vegetative material and topsoil will be collected and correctly stockpiled for later use at selected sites.
- Vegetation to be cleared will be clearly marked prior to clearing works to avoid over-clearing.
- All staff and contractors will attend compulsory environmental inductions to advise them of Impact Assessment and
- Environmental Management responsibilities (including DRF and Priority species management – Section 6.2.2) and to raise their awareness of vegetation and flora at the site and the habitat it provides for fauna.
- Cazaly personnel will provide information to construction and operations staff at toolbox meetings as well as regular (bi-monthly) presentations at site meetings.
- Traffic will be restricted to established roads and parking areas so as not to disturb vegetation.
- Vegetation clearance will be limited to the minimum necessary for Project development.
- Disturbed areas from construction not required for ongoing operations and maintenance will be rehabilitated.
- Only local native plant species and local provenance seed will be used for rehabilitation.

Commitments

6.2.1 Vegetation

6.2.1-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Clearing and Rehabilitation for the management of vegetation assemblages during mine operations, closure and rehabilitation.

Predicted Outcome

Conclusion:	▪ Clearing will reduce vegetation communities, but not below threshold levels defined by the EPA. Reduction in native vegetation area from proposed clearing in PEC and Great Western Woodlands is a very low proportion of the total areas. Vegetation seed to be collected and rehabilitation can be managed. ▪ Project presents a Non-Significant impact for vegetation.

Table 26: Impacts to Vegetation Communities as a result of the Proposal

Gibson & Lyon vegetation communities	**Parker Range PEC**		**Area of Parker Range PEC cleared**				**Mt Caudan Mine site Project area**			
Vegetation in PEC	**Vegetation in PEC***	**Total area (ha)***	**Vegetation cleared in PEC**	**Total area in PEC cleared**	**% of each vegetation community cleared**	**% of cleared vegetation in PEC**	**Vegetation in project area**	**Total area impacted (ha)**	**% of each vegetation community to be impacted**	**% of entire PEC to be impacted**
Type 1: *Eucalyptus sheathiana* with *E. transcontinentalis* and *E. eremophila* over *Daviesia argillacea* and *Grevillea huegelii*	Mixed *Eucalyptus* woodland	22,147	Mixed *Eucalyptus* woodland	852	3.85	1.5	*Mixed Eucalyptus* woodland	138.3	0.60	0.20
Type 2: *E. longicornis, E. salubris* and *E. corrugata* on broad flats	*Eucalpytus longicornis* woodland	*584*	*Eucalpytus longicornis* woodland	85	14.55	0.2	*Eucalyptus longicornis* woodland	8.0	1.4	0.01
Type 3: *E. salubris* and *E. salmonophloia* over *Eremophila oppositifolia, Acacia concolorans, Dodonaea stenozyga* and *Scaevola spinescens*	*Eucalyptus salubris* woodland/ *Eucalyptus salmonophloia* woodland	10,556	*Eucalyptus salubris* woodland/ *Eucalyptus salmonophloia* woodland	1,380	13.07	2.4	*Eucalyptus salubris* woodland & *Eucalyptus salmonophloia* woodland	93.9	0.90	0.20
Type 4: *Allocasuarina acutivalvis* and *A. corniculata* shrubland	*Allocasuarina* shrubland, Mallee Heath, *Allocasuarina* thicket, Open Mallee woodland, *Melaleuca*/*Acacia* shrubland *E. capillosa* woodland	9,750	*Allocasuarina* shrubland, Mallee Heath, *Allocasuarina* thicket, Open Mallee woodland, *Melaleuca*/*Acacia* shrubland *E. capillosa* woodland	328	3.36	0.6	*Allocasuarina* shrubland, Mallee Heath, *Allocasuarina* thicket, Open Mallee woodland, *Acacia* thicket, *E.capillosa* woodland	165.8	1.70	0.30
Type 5: *A. campestris* and *A. acutivalvis* over *Hakea pendens, Westringia cephalantha*	Mallee Woodland/*Allocasuarina* shrubland on Laterite Ridge	75	Mallee Woodland/ *Allocasuarina* shrubland on Laterite Ridge	0	0	0	Mallee Woodland/ *Allocasuarina* shrubland on Laterite Ridge	8.0	10.7	0.01
Type 6: *Callitris glaucophylla* on decomposing laterite and granite	*Isopogon robustus* on Decomposing Laterite/ Granite	64	*Isopogon robustus* on Decomposing Laterite/ Granite	0	0	0	-		0	0

Gibson & Lyon vegetation communities	Parker Range PEC		Area of Parker Range PEC cleared				Mt Caudan Mine site Project area			
Vegetation in PEC	**Vegetation in PEC***	**Total area (ha)***	**Vegetation cleared in PEC**	**Total area in PEC cleared**	**% of each vegetation community cleared**	**% of cleared vegetation in PEC**	**Vegetation in project area**	**Total area impacted (ha)**	**% of each vegetation community to be impacted**	**% of entire PEC to be impacted**
N/A	Samphire vegetation, *E. capillosa* on rise, *E. oleosa* over Samphire, *E. longicornis* over samphire, regeneration *E. salubris/E. salmonophloia, Eucalyptus* over *Acacia steedmanii,* Burnt Mallee woodland, Burnt *Eucalyptus* woodland*, E. salicola* over *Melaleuca, Burnt Allocasuarina* shrubland	12,784	Other	0	0	0			0	0
N/A	Other (for roads)**			1,560	N/A	2.8				
		55,960		**4,205**	**N/A**	**7.5**	**-**	**414.0*** **	**N/A**	**0.7**

*Vegetation community identifications and area are subject to change following further surveys.

**Road clearing for individual communities cannot be reliably estimated within the PEC.

***Area 414 ha excludes Upper Haul Road area not within PEC.

6.2.2 Flora

EPA Objective

- Maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge.

Applicable Guidelines, Standards and Legislation

- EPA Guidance Statement No 51 (2004). Terrestrial Flora Surveys for Environmental Impact Assessment in Western Australia
- DEC (2005). Recommended Interim Protocol for Flora Surveys for Banded Ironstone Formations (BIF) of Yilgarn Craton.
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004.
- *EPA Act* 1986.
- *EPBC Act* 1999.

Potential Impacts

Key issue: **Loss of DRF or Priority flora**	▪ Direct or indirect impacts leading to a loss or reduction of DRF or Priority threatened flora affecting the biodiversity of the natural environment.

Impact Assessment

Impact Summary	▪ No populations of *Isopogon robustus* (DRF) will be impacted. ▪ Reduced populations of priority flora impacted based on known regional populations are: 13.9% *Baeckea grandibracteata* subsp. Parker Range (P1), 1.6% *Lepidosperma* sp. Parker Range (P1), 4.7% *Lepidosperma* sp. Mt Caudan (P1), 1.3% *Acacia concolorans* (P2), 12.6% *Hakea pendens* (P2), 6.5% *Cryptandra crispula* (P3), and 1.0% *Banksia shanklandiorum* (P4).

Isopogon robustus (DRF)

The DRF species *Isopogon robustus* is endemic to Western Australia and is only known to occur at a single location within the Parker Range region. Four separate populations have been identified with a total of 1020 mature plants (949 in good health, 36 medium condition, 35 poor condition plants) and 206 healthy seedlings and 21 dead plants (Figure 30).

The Project impact area does not involve any clearance of *Isopogon robustus* plants.

The indirect impacts associated with dust and saline water will not have any effect upon *Isopogon robustus*, due to a minimum 350 m buffer distance from any land disturbance area or operational activity associated with the Project (Figure 41 and Figure 44).

Baeckea grandibracteata subsp. Parker Range *(P1)*

DEC listed species; *Baeckea grandibractea* subsp. Parker Range is located within the proposed open pit area.

With assistance from the DEC (Merredin Office), BC located the species, sample confirmed by the Western Australian Herbarium as *Baeckea grandibracteata* subsp. Parker Range which is located in several areas within the Project area; the edge of and within the proposed open pit, within the plant area, along the site access road and west of the Parker Range road. A total of 158 plants of this species have been located of which 136 will not be directly impacted.

A targeted search for this species was conducted in October 2010 to obtain flowering samples of this species, but due to low rainfall in the region no *Baeckea grandibractea* subsp. Parker Range was in flower.

The removal of 22 plants represents disturbance to 13.9% of the population; this is regarded as a moderate level of impact to the conservation significance of this species.

Lepidosperma sp. Parker Range *(P1)*

The previously only known population of the Priority 1 flora species *Lepidosperma* sp. Parker Range (N. Gibson and M. Lyons 2004) will be directly impacted from the construction of the iron ore open pit. A total of 219 plants of this species were identified within the Parker Range Project area all of which occur within the proposed open pit across an impact area of 3.2 ha.

BC conducted targeted searches of this species outside of the Parker Range region to determine whether this species occurs outside of the survey area. *Lepidosperma* taxonomic expert Russel Barrett has undertaken genetic testing of specimens collected during the survey and the results have shown that there are seven populations of this species; two populations within the Parker Range region (416 plants), one at Mt Finnerty (3,167 plants), two at Bremer Range (200 plants) and the final two populations 15-30 km south of Yellowdine (9,939 plants) (BC 2010 – Appendix 6). Information on those populations not recorded by BC surveys was provided by Western Botanical and Paul Armstrong on advice from Russel Barrett (Barrett *et al.* 2010). A total of 13,722 plants are known to occur within the region (including the Parker Range PEC and Project impact area). This population includes 1,591 plants which were extrapolated over an area of 318 ha due to the high species density encountered during surveys.

The removal of 219 plants for the development of the Project represents 1.6% of the known population and is not anticipated to impact the conservation significance of this species (Table 27).

Lepidosperma sp. Mt Caudan (P1)

A population of the Priority 1 flora species *Lepidosperma* sp. Mt Caudan (N. Gibson and M. Lyons 2081) will also be directly impacted as a population identified by BC is located within a 3.7 ha area proposed for development of the open pit/haul road. This species is endemic to the Parker Range area. BC identified 3,629 *Lepidosperma* sp. Mt Caudan plants within the proposed open pit/haul road.

There are five known populations of this species which have been identified by Gibson and Lyons (1998), Barrett and Wallace (2007), and R. Barrett and M. Barrett (Barrett *et al.* 2010) within the survey area. Two additional populations outside the survey area have been identified (BC 2010). One population of 300 plants may be indirectly impacted by the mining development as it occurs within close proximity to the survey area (14 - 400 m). Development is not proposed for the south-east corner of the Project area near where this species occurs. BC has also identified another population of 30 *Lepidosperma* sp. Mt Caudan (N. Gibson & M. Lyons 2081) plants approximately 5.8 km north of the Project area. The Project will not directly or indirectly affect this population. Additional populations of this species have been identified near the Project area, specifically 5,349 plants within the 175 ha of Decoposing Laterite/Granite ridges (where all four *Isopogon robustus* (DRF) populations are located). An estimated total of 73,144 plants (based on extrapolated population numbers as populations are very dense) are estimated to occur outside the Project impact area.

The removal of 3,629 plants for the development represents 4.7% of the known population and is not anticipated to impact the conservation significance of this species (Table 27).

Acacia concolorans (P2)

One hundred and twenty *Acacia concolorans* (P2) plants have been identified within the Project area; Parker Range bypass road, open pit and waste landform. BC has identified 671 plants outside of the Project area. There are 15 DEC known locations of this species outside of the Project area with a total of 35 plants from these locations. A total of 9,039 plants of this species were identified by Recon Environmental during a survey conducted for St Barbara in 2007. Of these 211 plants were cleared from the development of the St Barbara mine site. A total of 9,361 plants of this species are known to occur outside of the Project impact area. This species will be indirectly impacted by dust as populations occur within 40 m of the open pit and waste landform.

The proposed disturbance to120 plants represent 1.3% of the known population of this species. The Project development is not anticipated to impact the conservation significance of this species (Table 27).

Hakea pendens (P2)

Six hundred and thirty *Hakea pendens* (P2) plants were identified by BC within the Parker Range Project area; majority (600) within the open pit. BC have identified 1,681 plants outside of the Project area and the DEC lists 43 locations of this species outside of the Project area. The number of plants identified at these locations is unknown as the DEC records of all information for this species as requested by BC did not contain population size data. In 2007 Recon Environmental surveyed 2025 ha of the Burbidge area for St Barbara mine which is located approximately 7.5 km north of the Parker Range Project area and lies within the Parker Range Priority Ecological Community (PEC). A total of 3,840 *Hakea pendens* plants were identified during this survey. Of these 547 plants were cleared from the development of the St Barbara mine site. A total of 4,974 plants of this species are known to occur outside of the Project impact area. In addition to these populations, further populations exist at Mt Holland and Windy Hill, with two populations occurring on laterite ridges according to Florabase records.

The proposed disturbance to 630 plants represent 12.6% of the known population of this species. The proposed disturbance is not anticipated to impact the conservation significance of this species (Table 27).

Verticordia multiflora subsp. *solox* (P2)

Based on DEC information, *Verticordia multiflora* subsp*. solox* (P2) is located within the area proposed to be developed for the TSF. BC searched the location of this species in October 2008 and was unable to identify it. There are 26 DEC known locations of this species outside of the Project area. It has been recorded in a variety of places including east of Hyden, Yellowdine and Skeleton Rock. Its main distribution according to the DEC database is near the rabbit-proof fence at Norseman-Hyden. The DEC record relates to a specimen collected in 1981 and it appears to no longer exist at this location.

Cryptandra crispula (P3)

Forty-six plants of the Priority 3 species *Cryptandra crispula* have been identified within the Project area; three plants impacted by the site access road. The species will be indirectly impacted from dust as it is within 20 m of haul roads, the open pit and the site access road. There are only six known DEC locations of this species and it was not previously known by the DEC to occur near the Parker Range area. The closest known DEC location of this species is approximately 127 km east of the Parker Range area. This species is not restricted to the Parker Range region with DEC records showing that the species is distributed east of Norseman and at Queen Victoria Rocks. A formal request was made to the DEC for all information relating to this species, however, the DEC has no records of plant numbers. A specimen of this plant was sent to the Western Australian Herbarium for further identification. The sample submitted was identified as *Cryptandra crispula.*

A targeted search for this species was conducted in October 2010 to obtain flowering samples of this species, but due to low rainfall in the region no *Baeckea grandibractea* subsp. Parker Range was in flower.

The proposed disturbance to three plants represent 6.5% of the known population of this species. The proposed disturbance is not anticipated to impact the conservation significance of this species (Table 27).

Euryomyrtus leptospermoides (P3)

Based on DEC information, *Euryomyrtus leptospermoides* (P3) is located within the area proposed to be developed for a TSF. BC searched the location of this species in October 2008 and was unable to identify it. Population sizes of these species are unknown. *Euryomyrtus leptospermoides* (P3) was collected in 1971 and it appears to no longer exist at this location.

Banksia shanklandiorum (P4)

A large population of the Priority 4 species *Banksia shanklandiorum* will be directly impacted by the Project area; 7,293 plants at the proposed plant and Parker Range bypass road encompassed within 21.0 ha. This species may also be indirectly impacted by the mining as it has been identified at two locations within the Project area, one of which is located approximately 180 m west of the proposed process plant and the other located approximately 180 m south of the proposed boundary haul road. Additional population of 10,519 plants of this species encompassing a 28.1 ha is estimated outside the Project impact area (based on extrapolated population size due to density). The species is not restricted to the Project area and is widely distributed across the South-West Botanical Province and Avon Wheatbelt with populations of this plant extending further south towards the Hyden region.

By way of vegetation association with Mallee heath within the PEC, BC has estimated a regional population of 698,122 plants of this species outside the Project area. Historical accounts by the DEC indicate the species is widespread, by way of example in the Shire of Harembeen (DEC 2010).

The proposed disturbance to 7,293 plants represent 1.0% of the estimated population of this species. The proposed disturbance is not anticipated to impact the conservation significance of this species (Table 27).

Table 27 provides a summary of impact assessment on threatened flora in the project area.

Management Strategies

Key Mitigation:	▪ Project design 'footprint' to be optimised during construction and operations phase to minimise impact to Priority flora. ▪ Extensive and varied management measures detailed in M8521-G00-EN-PL-001 sub-plan Robust Coneflower (Appendix 13). ▪ Extensive and varied management measures detailed in M8521-G00-EN-PL-001 sub-plan Land Disturbance and Rehabilitation (Appendix 13).

Table 27: Impact Assessment DRF and Priority Flora Mt Caudan Project Area

Species / Community	Conservation Code	Number of plants and parts of plants likely to be taken OR area of community likely to be cleared (noting if this is buffer or actual community)	Approx total number of mature plants in population OR total area of community at that location	Approx other populations/ communities in total (and within 10 km of activities)	Comments on populations regarding proximity to Project impact area	% of total known and estimated population impacted
Isopogon robustus	DRF	No plants will be taken and the community will not be cleared	Approximately 206 juveniles and1,020 mature plants exist in 4 populations	The 4 populations are the only known communities but will not be cleared	4 populations to south east and south west Mt Caudan (<10 km)	0
Hakea pendens	P2	Approximately 630 plants	Approximately 30 juvenile plants, all other plants mature	Approximately 4,974 plants (6 populations >3,000 plants within 10 km)	Populations to north and south Parker Range extensions	12.6
Acacia concolorans	P2	Approximately 120 plants	All mature	Approximately 9,361 plants (5 populations within 10 km)	5 populations at Mt Caudan and large population north at Burbridge area (all within 10 km)	1.3
Lepidosperma sp. Parker Range	P1	Approximately 219 plants	All mature	Approximately 13,722 plants* (1 population 197 plants within 10 km)	1 population 7km to north east, Mt Finnerty (north west 90 km), Maggie Hays (south west 150 km) and Mt Palmer (20 km north)	1.6
Banksia shanklandiorum	P4	Approximately 7,293 plants (extrapolated)	All mature	Approximately 698,122 plants** (1 population 10,519 plants within 10 km)	Populations south to Hyden and widely distributed in south west province	1.0
Lepidosperma sp. Mount Caudan	P1	Approximately 3,629 plants (one location with 1,413 plants extrapolated no. not actual count)	All mature	Approximately 73,144 plants* (4 populations 5,349 plants within 10 km)	4 populations to south east and south west Mt Caudan (<10 km) with Isopogon robustus (DRF)	4.7
Cryptandra crispula	P3	4 plants	All mature	Approximately 43	Populations at Mt Caudan area (<10 km)	6.5
Baeckea grandibracteata subsp. Parker Range	P1	Approximately 22 plants	All mature	Approximately 158	Populations at Mt Caudan area (<10 km)	13.9

*number of plants recorded within the entire PEC (extrapolated).
** extrapolated based on the total area of Mallee heath vegetation (469.5 ha) surrounding the *B. shanklandiorum* population identified.

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Design Footprint

The design footprint for the Project is based on the preliminary mine site and infrastructure layouts and designed cognisant of known GPS locations of DRF and Priority flora species.

EMP Management Actions

Flora management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Robust Coneflower, and are in summary;

- Avoiding the population.
- Raising personnel awareness of the species.
- Restricting access to the population by closing access areas (i.e. levee bunds on all access tracks with signage).
- Managing indirect impacts including dust emissions.
- Implementing fire management strategies.
- Collecting seed for the Threatened Flora Seed Centre in liaison with DEC.
- Undertaking annual monitoring of the population during spring in the month of September.
- External annual reporting of monitoring survey results to DEC (with subsequent review and audits).

Flora management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation, and are in summary;

- Development and implementation of 'Permit to Clear' procedures.
- Priority flora clearing procedures (involving consultation and approval from DEC) to ensure unauthorised clearing is avoided.
- Prior to vegetation clearing, a targeted search will be undertaken in known areas of Priority flora and these areas will be avoided (where practicable).
- Clearing procedures will clearly mark Priority flora in proximity surveyed to vegetation clearing boundaries.
- Ensuring all staff and contractors attend compulsory environmental inductions to be advised of Impact Assessment and Environmental Management responsibilities (including DRF and Priority species management) and to raise the awareness about the vegetation and flora at the site and the habitat it provides for fauna.
- Supervision of any authorised Priority flora clearing activities will be undertaken by the Cazaly Environmental staff.
- Restricting traffic to established roads and parking areas so as not to disturb flora.
- Where Priority flora is to be cleared, native seed to be collected to be used in rehabilitation.

Commitments

6.2.2 Flora

6.2.2-1 Cazaly will implement actions detailed in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface Water Management, sub-plan Flora and Fauna Management, sub-plan Robust Coneflower Management, sub-plan Land Disturbance and Rehabilitation for the management of flora during mine operations, closure and rehabilitation.

Predicted Outcome

Conclusion:	▪ Nearby DRF *Isopogon robustus* will be unaffected. Established populations of Priority flora outside the impact area of the Project indicate no loss of biodiversity for any species taxa. Native seed will be collected for rehabilitation. ▪ Project presents a Non-Significant impact for flora.

6.2.3 Terrestrial Fauna

EPA Objective

- Maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge.
- Protect specially protected (threatened) fauna consistent with the provisions of the *Wildlife Conservation Act 1950*.

Applicable Guidelines, Standards and Legislation

- EPA Position Statement 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002a).
- EPA Guidance Statement 56: Guidance for the Assessment of Environmental Factors – Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b).
- China-Australia Migratory Bird Agreement 1986.
- Japan-Australia Migratory Bird Agreement 1974.
- Republic of Korea-Australia Migratory Bird Agreement 2007.
- Convention on the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention).
- *Wildlife Conservation Act 1950.*
- *EPBC Act 1999.*

Potential Impacts

Key issue:

Loss of terrestrial fauna habitat

- Direct or indirect impacts leading to a loss or reduction of significant terrestrial fauna species in the natural environment.
- Direct or indirect impacts leading to a loss or reduction of fauna habitat in the natural environment.

Impact Assessment

Impact Summary

- One abandoned Malleefowl mound, 49 ha habitat loss, no effect upon population with four mounds undisturbed and suitable habitat in area.
- No impact on Western Rosella and White-browed Babbler populations.
- No effect upon mammals or birds, with part loss of reptiles and invertebrates (low mobility) in impact area.
- Indirect impact upon nearby fauna habitat in close proximity to the Project area.

Malleefowl (Leipoa ocellata).

Targeted surveys have established that Malleefowl exist in the Mt Caudan Project area and wider Parker Range region (KLA 2010b and Newbey *et al*. 1995). Targeted surveys have identified five Malleefowl nesting mounds, with the remains of only one of the five mounds in the impact area (Figure 32). This nesting mound is abandoned and disturbed by other fauna activity. Four other breeding mounds occur in the Project area and have a minimum 50 m buffer from the proposed disturbance impact area.

Parts of the Project area provide preferred habitat for mound-building and foraging for the local Malleefowl population, with inferences of preferred habitat (based on nesting mound locations) being; vegetation types *Acacia* sp. narrow phyllode, *Melaleuca eleuterostachya* shrubland and Mallee heath. Clearing of vegetation for the proposed mining activities will reduce the amount of native vegetation available for both foraging and mound building. Based on vegetation inferences 2 ha of *Acacia* sp. narrow phyllode and *Melaleuca eleuterostachya* shrubland and 47 ha of Mallee heath will be impacted by the Project at Mt Caudan. However, based on the results of all the surveys conducted in the area, while the Malleefowl does utilise the Project area, they are particularly sparse both in the local and regional context. Of the four Malleefowl mounds with recent evidence of occupation, none were in the impact area of the Project.

The regional and local cumulative impacts to Malleefowl and inferred preferred habitat loss of 49 ha are non-significant given the abundance of habitat types in the Parker Range PEC. The inferred preferred habitat impacted by clearing represents only 0.5% of the total 93 ha of *Acacia* sp. narrow phyllode and *Melaleuca eleuterostachya* shrubland and 8% of the total 4,771 ha of Mallee heath within the Parker Range PEC (Figure 33) (KLA 2010b – Appendix 7). Overall, the proposed mining activity in the Project Area is unlikely to alter Malleefowl conservation status.

There was no evidence of Malleefowl presence in the Upper Haul Road Project impact area.

Other Terrestrial Fauna

Four other terrestrial fauna of conservation significance are identified within habitat of the Mt Caudan Project area: Rainbow Bee-eater (*Merops ornatus*), Crested Bellbird (*Oreoica gutturalis*), White-browed Babbler (*Pomatostomus superciliosus*) and Western Rosella (Mallee) (*Platycercus icterotis xanthogenys*).

The Rainbow Bee-eater is likely to utilise the area within its migratory route, but conservation status is unlikely to be altered by the Project.

The Crested Bellbird is not threatened in the contiguous vegetation within the Mt Caudan area and was not found at the Upper Haul Road area. The conservation status is unlikely to be altered.

The White-browed Babbler is not threatened in the contiguous vegetation within the Mt Caudan area, however is threatened in the Upper Haul Road Project area. During surveys at the Upper Haul Road Project area 28 White-browed Babbler nests were found in Lot 59 in the area of the proposed haul road corridor. Through final road alignment selection a buffer distance of 20 m will limit impact on known nests in the Upper Haul Road area. Conservation status is unlikely to be altered.

The Western Rosella is not threatened in the contiguous vegetation witin the Mt Caudan area, however is threatened in the Upper Haul Road Project area. During the surveys at Mt Caudan, two Western Rosellas were recorded in autumn 2009. Western Rosellas favour Eucalypt woodlands which are widespread (38,000 ha) in the Parker Range PEC. The Western Rosella was not found at the Upper Haul Road area. The conservation status is unlikely to be altered.

Seasonal surveys conducted in the Parker Range area (KLA 2010b – Appendix 7) identified numerous reptiles, mammals and birds in the area. Removal of remnant vegetation as proposed will destroy fauna habitat and fragment remaining vegetation locally. However, it is noted that the habitats present in the Parker Range Project area including the Eucalypt woodlands, Mallee heath and *Allocasuarina* shrubland that make up a large portion of the survey area are widespread regionally. Further, no unique, restricted or fauna-specific habitat types were identified during the surveys. While the Laterite Ridge supported the greatest flora diversity, very few mammals were captured or seen in this area and this habitat did not support many mammals.

Five feral fauna species (in low abundance) have been identified in the Mt Caudan Project impact area: House Mouse (*Mus musculus),* Rabbit (*Oryctolagus cuniculus),* Dog *Canis (lupis familiaris)*, Red Fox (*Vulpes vulpes)* and Cat (*Felis catus).* Evidence of Sheep *(Ovis aries)* was detected at the Upper Haul Road Project impact area.

Major impacts on all fauna can be reasonably expected to occur during land clearing, with the greatest impacts expected on fauna species with low mobility (e.g. small reptiles) and lesser impacts on highly mobile fauna (e.g. large macropods and birds).

As the reptile, mammal and bird fauna recorded are likely to be widely distributed in the region, and the area of impact for the Project is a limited proportion of the larger Parker Range area, significant impacts on the long-term viability of fauna populations as a result of the proposed disturbance is unlikely.

Notwithstanding this, it is considered unlikely that the disturbance and removal of native vegetation as proposed will alter the conservation status of any fauna or fauna species of conservation significance.

Impacts associated with fire, noise, vibration, light and dust are discussed separately within the EIA.

Management Strategies

Key Mitigation:	▪ Project design 'footprint' to be optimised during construction and operations phase to minimise impact to fauna. Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Malleefowl Management Plan (Appendix 13). ▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Flora and Fauna Management Plan (Appendix 13).

Design Footprint

The design footprint for the Project is based on the preliminary mine site and infrastructure layouts and designed cognisant of known GPS locations of conservation significant habitat for fauna. A buffer distance of 50 m will be provided for all active/inactive Malleefowl mounds at the Mt Caudan area and a buffer distance of 20 m from the trunk of trees supporting known White-browed Babbler nests in the Upper Haul Road area. Any newly discovered nests which cannot be avoided will be GPS located and details reported to the DEC.

EMP Management Actions

Terrestrial fauna management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Malleefowl, and are in summary;

- A targeted Malleefowl survey will be undertaken immediately prior to disturbance in event of migration into the impact area (post current surveys).
- In the event further Malleefowl nesting mounds are discovered in impact area, the DEC will be consulted. If endorsed via DEC consultation, a possible mitigation measure may involve removal of the eggs, incubation and return of the chicks to the Parker Range area.
- Clear marking of mounds near clearing lines prior to clearing commencing so disturbance to this species habitat is avoided.
- Signage and a buffer distance of at least 50 m will be established around Malleefowl mounds by closing access to area (i.e. levee bunds on all access tracks).
- Known Malleefowl nesting mounds near Project area will be monitored annually.
- Any discovered active Malleefowl nesting mounds near the Project will be monitored biannually for signs of breeding success.
- Induction awareness and training regarding the conservation significance of Malleefowl and importance of reporting any sightings in the area to Environmental staff.
- Vehicle speed limit restrictions in Project area where Malleefowl may occur.
- Annual review and updates of the Malleefowl sub-plan to evaluate adopted strategies and effectiveness.

Terrestrial fauna management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Flora and Fauna, and are in summary;

- Ensuring all staff and contractors attend compulsory environmental inductions to advise of Impact Assessment and Environmental Management responsibilities (including fauna species management) and to raise the awareness about the significance of regional fauna.
- Engineering design to include perimeter fence protection around TSF and water storage facilities to prevent ingress of fauna. All steep walled and/or lined facilities will include egress structures for the escape of terrestrial fauna.
- Cazaly personnel will provide fauna and fauna habitat information to construction and operations staff at toolbox meetings as well as regular (bi-monthly) presentations at site meetings.
- Cazaly Environmental staff will supervise vegetation clearing activities.
- A buffer distance of 20 m from base of tree trunks supporting known Western-browed Babbler nests in the Upper Haul Road area will be established from clearing activities.
- Restricting traffic to established roads and parking areas so as not to disturb fauna habitat.
- Restricting vehicle speeds on all roads within the mining footprint and erecting signage accordingly.
- Prohibition on bringing pets, firearms, projectile weapons or traps into the Project area.
- Prohibition of interacting with (e.g. feeding or sheltering) fauna, including introduced feral and native animals.
- Provision of covered waste bins to contain domestic waste from crib and office facilities.
- Ensuring all domestic waste at the mine site is removed regularly so as to not attract fauna (including feral animals).

Cazaly is committed to ensure that the Project does not encourage feral fauna presence with management actions presented in Waste Products within the EIA.

Commitments

6.2.3 Terrestrial Fauna

6.2.3-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Flora and Fauna Management, sub-plan Malleefowl Management for the management of terrestrial fauna during mine development, operations, closure and rehabilitation.

Predicted Outcome

Conclusion:

- Terrestrial fauna habitat has been established outside of Project impact area, with targeted searches having identified suitable habitat for Malleefowl (widespread in region). Project has avoided known threatened fauna locations. Fauna management actions identified.
- Project presents a Non-Significant impact for terrestrial fauna.

6.2.4 Subterranean Fauna

EPA Objective

- To maintain the abundance, diversity, geographic distribution and productivity of fauna, at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

Applicable Guidelines, Standards and Legislation

- EPA Position Statement 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002a).
- EPA Guidance Statement No 54: Sampling of subterranean fauna in Western Australia (EPA 2003).
- Draft EPA Guidance Statement No 54a: Sampling methods and survey considerations for subterranean fauna in Western Australia (EPA 2007).
- *Wildlife Conservation Act 1950.*

Potential Impacts

Key issue:

Loss of subterranean fauna species

- Open pit mine excavations and dewatering leading to loss or reduction in subterranean fauna species from the natural environment.
- Open pit mine excavations and dewatering leading to loss or reduction in subterranean fauna habitat from the natural environment.

Impact Assessment

Impact Summary

- No impact upon stygofauna as not known to occur in the Project area.
- Removal of 58 ha of troglofauna habitat impacting eight species of four orders (2 *Araneae*, 1 *Cephalostigmat*a, 2 *Isopoda*, 3 *Pseudoscorpionida*) in the mine impact area. Four singletons identified in Project area.
- Indirect impacts from dewatering, blasting operations, surface water flows and water quality.

Stygofauna Impact Assessment

The results of the pilot study undertaken in February 2010 indicated that stygofauna were not present. This may be due to the local and regional water quality being hypersaline. Stygofauna populations are therefore not impacted by the Project.

Troglofauna Impact Assessment

The direct impact upon troglofauna is associated with the loss of habitat from the proposed development of the open pit.

Troglofauna surveys by Rockwater within the local and regional areas recorded a total of 22 species of eight orders. The eight orders are: Araneae (3 species), Cephalostigmata (2 species), Chilopoda (1 species), Coleoptera (4 species), Diplura (2 species), Isopoda (5 species), Pseudoscorpionida (4 species) and Thysanura (1 species) (Table 20).

Eight species were recorded from impact sites of which four were singletons (*Araneomorphae* sp. B13, *Araneomorphae* sp. B16, *Buddelundia* sp. B4 and *Tyrannochthonius* sp. B13) (Figure_38). Regional surveys for the Project have found that two of the four singleton species (*Buddelundia* sp. B4 and *Tyrannochthonius* sp. B13) have related species with demonstrated ranges of up to 52.5 km (*Trichorinae* sp. B6) and 46 km (*Austrochthonius* sp. B1) respectively (Rockwater 2010c). The two remaining singleton records within the impact area (*Araneomorphae* sp. B13, *Araneomorphae* sp. B16), represent species which are likely to be present in low abundance throughout the Parker Range region rather than just being restricted to the Mt Caudan impact area (Rockwater, 2010c - Appendix 8). Taxa from both arachnid orders (*Pseudoscorpionida* and *Araneae*) have been recorded over broader ranges than single deposits in previous Yilgarn studies (e.g. Bennelongia 2009b).

Troglofauna sampling results for the Project have identified troglofauna from regional sites comprising BIF and mafic units, indicating a wider potential habitat in differing rock types (Figure_35). These regional troglofauna sites confirm habitat at Pathfinder (to the north east), Great Victoria Range (to the north), Regional Parker Range (to the east and south east) and Mt Rankin (to the north-west).

Given the range of rock types that appear to provide suitable troglofauna habitat in the region and the extent to which these have been mapped to the north and south of the Project area, there appears to be a high likelihood that the Parker Range troglofauna community and its constituent species are also widespread (although in low abundance) within these habitats.

Indirect Impacts on Troglofauna

Ecological impacts of blasts and other mining activities (such as vibration) on troglofauna habitat in voids and fractures at depth have the potential to cause collapses of strata and other features such as mesocaverns in the rock formation. There is also the possibility of physical affects, although sensitivity or otherwise of troglofauna to these effects is unknown. The scale and geometry of the Project will not allow large amplitude blast vibrations during mining by industry standards. Although physical effects from blasting on troglofauna habitat are not well understood, in comparison with other mining peers, the Project is less likely to impact troglofauna with the proposed controlled blasting techniques.

Previous studies at Balmoral South in the Pilbara suggest that drawdown of the water table is unlikely to affect the humidity of troglofauna habitat (voids and fractures at depth) (Rockwater 2010c - Appendix 8).

Reduced infiltration of rainfall and nutrients (e.g. organic carbon) below the waste landform are not expected to have any material effect upon core troglofanua habitat. Waste rock landforms and ore stockpiles are planned to be constructed off the BIF laterite ridge.

Indirect impacts associated with troglofauna habitat are not expected to have an effect upon troglofanua habitat in voids and fractures within BIF at depth.

Management Strategies

Key Mitigation:	▪ Sampling, recording and documenting BIF laterite habitat within Parker Range area and region to further assess the distribution of troglofauna. ▪ Drill and blasting techniques will be of moderate vibration intensity due to scale of mining and geometry of deposit.

Further Troglofauna Studies

Cazaly proposed ongoing troglofauna studies in the BIF laterite habitat within the Parker Range area and region according to the following mitigation strategy;

- Complement the existing four sampling rounds in the area and region with a further round designed to target prospective BIF laterite ridge and other habitats for troglofauna.
- Lodgement of representative animals collected by the subterranean fauna survey with the WA Museum following the identification process.

Drill and Blasting Vibrations

Blast fragmentation modelling using KUZRAM™ predicts blast induced ground vibration of less than 2 mm/s measured at 500 m, which is low by industry standards based on rock properties and mine geometry at Mt Caudan. The proposed mining scale and geometry of the deposit is not conjunctive to large blast induced ground vibrations as may be applicable in other larger scale iron ore mining within Pilbara or Midwest regions of Western Australia. In comparison with industry peers the relative impacts of blast induced vibrations on troglofauna at the Project will be lower than other comparable iron ore operations.

Commitments

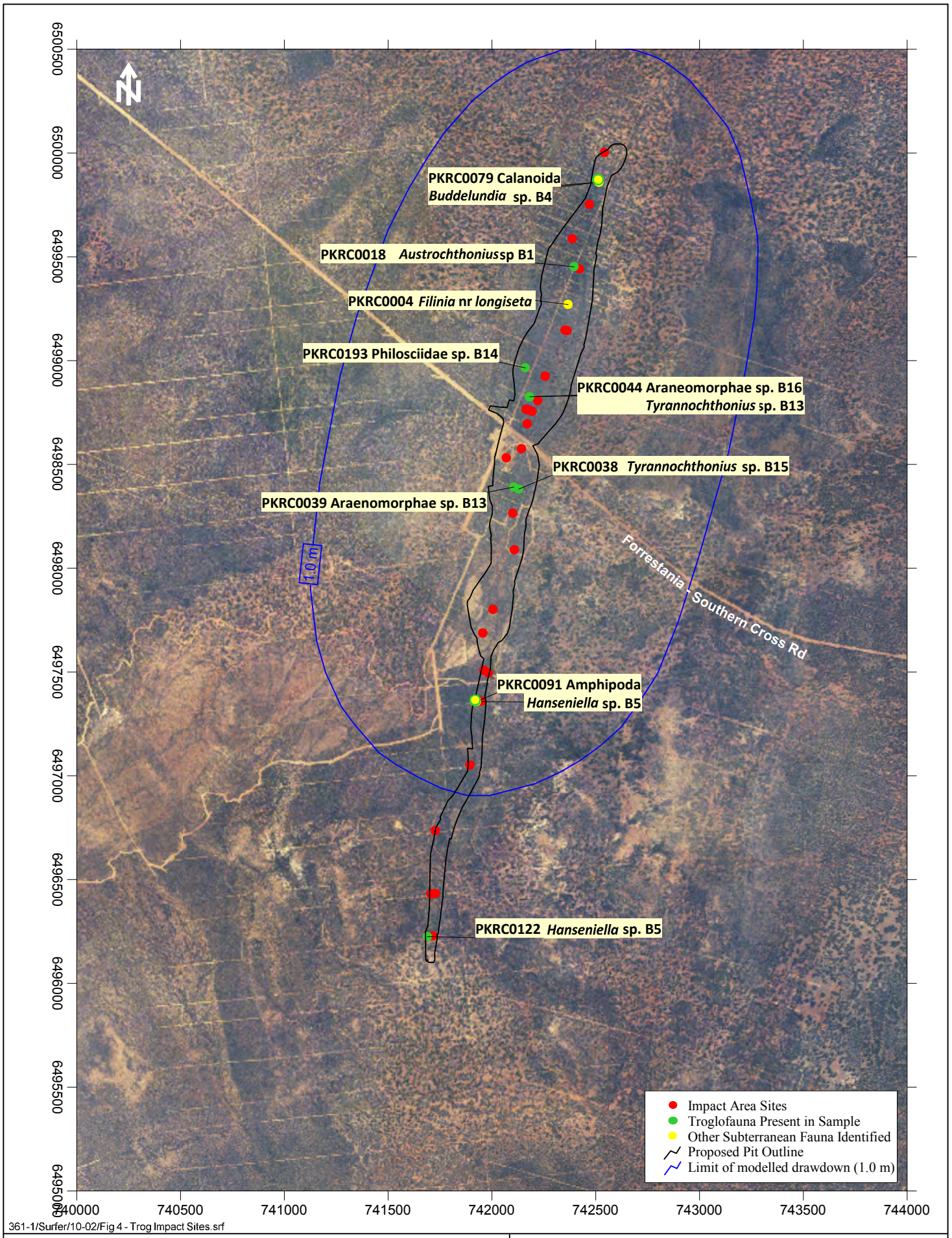
6.2.4 Subterranean Fauna

6.2.4-1 Cazaly will commit to further field survey (scrape and trapping) of troglofauna within local Project area and regionally within suitable habitat of the PEC to improve the understanding of the species distribution and abundance within 12 months of operations commencement.

Predicted Outcome

Conclusion:

- The knowledge base for subterranean fauna species in the Yilgarn region is immature. Stygofauna are not known to occur in the impact area. Eight troglofauna species exist within the impact area, however habitat in BIF and other rock types locally and regionally is highly likely to be available to support the species detected (including the four singleton species not yet established outside the impact area). Management action identified.
- Project presents a Non-Significant impact for subterranean fauna.



361-1/Surfer/10-02/Fig 4 - Trog Impact Sites.srf

CLIENT:	Cazaly Resources
PROJECT:	Parker Range Subterranean Fauna Sampling
DATE:	July 2010
Dwg. No:	361-1/10/2-4

PARKER RANGE
RESULTS OF SUBTERRANEAN FAUNA SAMPLING AT MT CAUDAN

Rockwater

Figure 38: Troglofauna Impact Sites at Mt Caudan Mine

6.2.5 Invertebrate Terrestrial Fauna

EPA Objective

- Maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge.
- Protect specially protected (threatened) fauna consistent with the provisions of the *Wildlife Conservation Act 1950.*

Applicable Guidelines, Standards and Legislation

- EPA Position Statement 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002a).
- EPA Guidance Statement No 20: Sampling of Short Range Endemic invertebrate fauna for environmental impact assessment in Western Australia.
- *Wildlife Conservation Act 1950.*

Potential Impacts

Key issue:

Loss of SRE species and loss of habitat

- Fire, modified surface water flows, dust deposition or vibration leading to loss or reduction of invertebrate/SRE species in the natural environment.
- Fire, modified surface water flows, dust deposition or vibration leading to loss or reduction of invertebrate/SRE habitat in the natural environment.

Impact Assessment

Impact Summary

- No known impact on SRE species
- Indirect impact on terrestrial invertebrate fauna habitat.
- Minor impact on *Aganippe castellum* Tree-stem Trapdoor Spider (P4).

Direct Impacts on Terrestrial Invertebrates

The Project area does not support the preferred terrain or habitat for SRE's as there is no significant elevation, south facing slopes or isolated areas of habitat (KAL 2010b – Appendix 7).

Systematic and targeted invertebrate terrestrial fauna surveys (including SREs) were undertaken over 13,070 m^2 of the Project area. The systematic surveys collected six spiders, with only two being mygalomorphs, 14 trapdoor lids and burrows, four scorpions, two pseudoscorpions and 70 land snails (KLA 2010b - Appendix 7). Of those identified by the Western Australian Museum, none were considered to be SREs (KLA 2010b - Appendix 7).

For the targeted surveys, no invertebrates or potential SREs were recorded in 19 of 41 quadrats examined. Six *A. castellum* spiders were recorded, and all were recorded outside the mining activity footprint. However, two were recorded in the vicinity of the proposed Parker Range bypass road. A subsequent targeted survey established the preference of a discrete population of *Aganippe castellum* for a specific vegetation type *Eucalyptus capillosa* subsp. *polyclada* woodland in this area to the east of the waste landform (KLA 2010b – Appendix 7). The bypass road will be realigned to avoid this population.

As known populations are established in habitat outside the impact area within the wider area, it is unlikely that the Project will have any direct effect upon the current *Aganippe castellum* populations.

Two spiders together with their trapdoors and burrows, an additional five trapdoors and burrows, four pseudoscorpions, five millipedes, 187 land snails, one slater and one insect larvae were collected from 22 of the 41 quadrats and submitted to the Western Australia Museum for identification.

Of the specimens submitted to the Museum, no SREs were identified. The two spiders submitted were identified as female *Aganippe* spp. However, as males are required for accurate assessment, no further identification was made. Putative identifications of mygalomorph spiders based on location and design of the burrow and configuration of the trapdoor lid resulted in the recordings of ten *Aganippe "jessupi"* and two *Aganippini* sp. that were apparently occupied, and many more of both species that were old, abandoned or predated (KLA 2010b – Appendix 7). The (double) trapdoors of *Missulena* spp. were also identified.

Taxonomic revision is required for one of the pseudoscorpions (*Beierolpium* sp. 8/4': Family Olpiidae) and the millipedes (Family Siphonotidae) in order to determine their conservation status. However, the vegetation groups in which they were collected are well represented locally.

Other Impact on Invertebrates and Threatened Species

Altered fire regimes can have a detrimental effect on Threatened Species, including terrestrial Invertebrates, their habitat and refuges. For those flora species that harbor seed in collections of decaying leaf litter, for example, the premature destruction of this leaf litter may reduce regenerative potential of selected flora species that shape such communities. In the case of the *A. castellum* for example, if some individuals survive fire and reproduce, fire may remove suitable host stems and suitable twig line material which are fundamental to their ability to survive.

The redirection of surface water may cause the inundation of Threatened Species and their habitat. For example, the attribute of the aerial tube of *A. castellum* is purportedly an evolved strategy to survive a flooding event. However, the aerial tube, trapdoor and twig lines of *A. castellum* are unlikely to survive the drowning by redirected surface water.

Clearing and mine operational activities produce dust which can fall on Threatened Species and their habitat, including mygalomorph burrows and trapdoors.

Blast induced vibration can cause flight fright risk associated with mygalomorph spiders. Blast vibration will be limited, given constraints on mine scale, and that greater than 50 m separates the mine pit operations from nearest known habitat (KLA 2010b - Appendix 7).

Indirect impacts of fire, surface water hydrology, dust and blast vibration are further assessed in other sections within the EIA.

Management Strategies

Key Mitigation:	▪ Project design 'footprint' to be optimised during construction and operations phase to avoid all known *Aganippe castellum* (Tree-stem Trapdoor Spider). ▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Fire, sub-plan, Land Clearing and Rehabilitation, sub-plan Air Quality, sub-plan Surface Water Management (Appendix 13).

Design Footprint

The design footprint for the Project is based on the preliminary mine site and infrastructure layouts and is designed cognisant of known GPS locations of Threatened Species, particularly *A. castellum*. The Parker Range bypass road will be realigned to avoid the *A. castellum* population within the discrete *Eucalyptus capillosa* subsp. *polyclada* woodland.

EMP Management Actions

Management actions for Priority Species are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Fire, sub-plan, Land Clearing and Rehabilitation, sub-plan Air Quality, sub-plan Surface Water Management, sub-plan Flora and Fauna which is discussed in other sections of the EIA.

Commitments

6.2.5 Invertebrate Terrestrial Fauna

6.2.5-1 Cazaly will implement clearing controls to avoid all known *Aganippe castellum* Tree-stem Trapdoor Spider for the management of this Priority Species during mine development, operations, closure and rehabilitation.

Predicted Outcome

Conclusion:	▪ Invertebrate terrestrial fauna habitat and populations (including *Aganippe castellum* Tree-stem Trapdoor Spider) established outside of Project impact area. Development has minimised impact on known *Aganippe castellum* Tree-stem Trapdoor Spider in local area. ▪ Project presents a Non-Significant impact for invertebrate terrestrial fauna.

6.2.6 Groundwater

EPA Objective

- Maintain the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected.
- Ensure that emissions do not adversely affect the environment values or health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Applicable Guidelines, Standards and Legislation

- Draft EPA Guidance Statement No 48: Groundwater Impact Assessment and Environmental Management Areas.
- WRC Guideline No 10: Above Ground Fuel and Chemical Storage.
- WRC (2003). Mine void water resources issues in Western Australia.
- *Rights in Water and Irrigation Act 1914*.
- *Health Act 1911.*

Potential Impacts

Key issue:

Loss of groundwater water table

- Mine dewatering leading to a depression in groundwater water table supporting vegetation and habitat.
- Mine dewatering leading to a reduction or loss of water to other users in the local area.
- Reduced quality of groundwater through migration of pollutants from the surface and mining operations into the groundwater system through infiltration.

Impact Assessment

Impact Summary:

- Localised groundwater drawdown within maximum extent of 1 km from open pit edge during mine dewatering.
- Water balance is demand driven, hence no excess water from mine dewatering activity.
- No impact on other groundwater users from mine dewatering.
- No impact on groundwater quality from ARD, metalliferous drainage, TSF and process water storage.
- Groundwater table will recover, open pit void to act as sink.

Groundwater Drawdown

The presence of an aquifer within the Project resource has been established at approximately 60 m below natural surface level. Hydrogeological modelling and exploration by Rockwater has indicated that the groundwater supply for the Project will be met by dewatering of the orebody itself, expanded along the mineralised zone as demand for water increases. The four groundwater exploration holes drilled outside the proposed mine area intersected weathered bedrock, which displayed no evidence of a shallow or deep aquifer in near proximity to the Mt Caudan BIF laterite ridge. There is unlikely to be a perched aquifer in the area.

Figure 39 shows the lowering of groundwater levels throughout mining and dewatering for the first 5 years of operation. The modelled drawdown estimates a 65 m lowering of the natural groundwater level in the open pit area, to 1 m at about 0.8 km away from the open pit boundary. Beyond 250 m from the pit boundary the aquifer drawdown is restricted to 10 m or less.

In the presence of saline groundwater, vegetation root systems close off at depth (Short and McConnell 2000). The groundwater table at the Project is saline with salinity measured between 20,000 to 60,000 mg/L TDS (Rockwater, 2010a – Appendix 4). It is highly unlikely there is any groundwater dependent vegetation present in the region, given the groundwater salinity and depth of the existing water table. Native vegetation is most likely to be sustained from surface water supply alone.

The aquifer is expected to naturally recharge after the completion of pit dewatering and mining, so no adverse impacts are expected on the Water Supply Crown Reserve located on M77/741. Local area groundwater flows shall recover with rising natural aquifer recharge at the end of mining and dewatering.

Modelling completed coupled with understanding of surrounding aquifer rock types with low permeabilities suggests no significant drawdown of a regional aquifer is anticipated.

The Project received permission to mine on the 100 year old Water Supply Crown Reserve 13208 on 20 March 2010 from the DMP.

Demand Driven Water Balance

The peak demand for water for the site is estimated to be 1.8 ML/day, with Rockwater hydrogeological modelling estimating a mine dewatering rate of 1.1 ML/day (year 1) and 1.8 ML/day (year 2+).

Based on the availability of supply from production bore yields and groundwater modelling, the water balance for the Project is in deficit (i.e. not driven by mine vertical advancement). As such there will be no additional impacts of overwatering mine haulage roads with saline water. The Project demand can be met by progressive development of in-pit and perimeter bores in advance of mine dewatering requirements.

Other Groundwater Users

The closest known groundwater bores to the Project are dewatering and production bores at Southern Star and pastoral bores to the west of Emu Fence Road, which are at least seven km away. Groundwater modelling indicates that drawdown impacts will be restricted to one km from the ultimate pit void boundary. Given the low permeabilities of the surrounding rock types of the aquifer with localised drawdown effects at the Project, it is considered highly unlikely that existing groundwater users will be affected by any groundwater extraction.

Groundwater Quality

The groundwater beneath the BIF laterite ridge is brackish with the salinity at the water table to base of the deposit varying from approximately 20,000 mg/L to 60,000 mg/L TDS. Removal of the fresher groundwater beneath the BIF laterite ridge will have no impact on the quality of surrounding groundwater.

Infiltration of impurities into the groundwater table affecting the quality of groundwater is potentially possible from waste leachate (e.g. acidic rock drainage materials, heavy metal leaching) and/or emissions from storage facilities (e.g. process water, tailings or hydrocarbons).

The iron tailings storage facility (TSF) will be an unlined engineered structure, however, it will have a 10^{-08} m/s permeability constructed from rolled and formed clayey gravels. The iron tailings will be nominally fine material of less than 150 microns and have similar chemical characteristics of the lower grade ore material, with elevated silica and alumina levels of approximately 1% each. Results of water analysis (Table 10) indicate the ground water is neutral (pH 6.96 – 7.37) with no elevation in acidity levels within tailings material expected.

The process water storage facility will be lined and only used to store and recirculate saline water from the mine and process facility. It is unlikely hypersaline water will be of sufficient salinity and quantity to reach the groundwater table.

Impacts from the storage of hydrocarbons and any leakage to unsealed ground is unlikely to be of sufficient quantity to reach the groundwater table, given the design and operating standard to be adopted for these facilities.

Acid rock drainage and metaliferrous leaching are not likely to be present; however, each potential impact is further discussed within the EIA.

Recovery of Groundwater

A pit void lake will form and function as a groundwater sink, with equilibrium water level below that of the surrounding country rock area due to natural evaporation. Groundwater levels within the pit void lake will recover to be about 40 m lower than pre-dewatering (i.e. 320 mRL compared to surrounding country 360 mRL).

Preliminary modelling indicates 75% of water will recover within the first 1.5 years with equilibrium attained in about 35 years after dewatering is ceased (Rockwater, 2010a – Appendix 4).

Management Strategies

Key Mitigation:	▪ Groundwater monitoring bores (drawdown and quality) with reporting program. ▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater (Appendix 13).

Groundwater Monitoring

Groundwater drawdown and quality will be mitigated with the following groundwater monitoring program management actions;

- Monitoring bores within and adjacent to the impact area at Mt Caudan will be established and drawdown of the water table and water quality will be measured on a monthly basis. Groundwater monitoring results will be reported to DOW in accordance with regulatory requirements. Monitoring locations will include Water Reserve #13208.
- Hydrogeological model will be updated based on empirical rate of aquifer drawdown to validate and monitor dewatering impacts. Model will be updated on an annual basis.

EMP Management Actions

Groundwater management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Stormwater and Groundwater Management (Appendix 13), and in summary;

- Evaluation report and application for groundwater license from DOW (per Section 5C Rights in Waters and Irrigation Act 1914) and associated conditions on license issue.
- Water related infrastructure will be inspected as part of routine operational procedures.
- Extraction points on bores will be fitted with flow meters which will be routinely calibrated and recorded.
- Annual reporting of groundwater monitoring results to DOW.

Management actions outlined in Section 5.8 Surface Water will apply to groundwater regarding potential emission sources to unsealed ground (e.g. hydrocarbons, wash down areas, roadways and site catchment run-off). Bioremediation of soils will be undertaken for any hydrocarbon incidents.

Commitments

6.2.6 Groundwater

6.2.6-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater, for the management of groundwater during mine development, operations, closure and rehabilitation.

6.2.6-2 Cazaly will implement a groundwater monitoring and reporting program with monitoring bores established within and adjacent to the Project impact area.

Predicted Outcome

Conclusion:	▪ Vegetation and other users will be unaffected. No groundwater dependent vegetation exists in the impact area with static water table approximately 60 m below natural surface. Groundwater levels will recover at end of mine dewatering. ▪ Project presents a Non-Significant impact to groundwater.

6.2.7 Acid Rock Drainage (ARD) and Metal Leaching

EPA Objective

- Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Applicable Guidelines, Standards and Legislation

- DITR (2007b). Managing Acid and Metalliferous Drainage.
- DoIR (2004). Guidelines for Mining in Arid Environments.
- *Contaminated Sites Act* 2003.
- *Mining Act* 1978 and *Regulations* 1981.
- *EPA Act 1986.*

Potential Impacts

Key issue: **Reduced quality of soil, surface water and/or groundwater**	▪ Release of ARD or metalliferous leachate runoff leading to a reduction in the quality of soil, surface water and/or groundwater in the natural environment.

Impact Assessment

Impact Summary	▪ Waste rock material is non-acid forming (S<0.3%) with a positive neutralising capacity and negative net acid generating capacity. ▪ Waste rock material is stable and with very low metalliferous leaching properties.

Potential Acid Forming Assessment

Materials with chemical compositions of medium to high sulphur levels are known to form acidic solutions when oxidised from fresh rock over a period of time exposure to the atmosphere and in contact with water. Rock material with sulphur content below 0.3% is regarded as non-acid forming (NAF) due to the sulphur level being too low to result in acid generation (Soregaroli and Lawrence 1997).

Cazaly commissioned IMO to undertake testwork at Ammtec Ltd laboratories on various metallurgical core samples to characterise the waste and low grade ore materials expected to be exposed to oxidation in the presence of water (IMO 2010 – Appendix 11). Waste rock samples were targeted as these contain the highest sulphur levels and would have the highest propensity to generate acidic runoff.

Testwork on 22 drill chip samples from 13 drill holes spatially spanning the Mt Caudan deposit were tested and the acid neutralizing capacity (ANC) and net acid generation (NAG) capacity of each were determined.

The laboratory found 18 samples had an acid neutralising capacity (ANC) and the remaining 4 samples had a net acid generating (NAG) capacity. The ANC grossly exceeds the NAG of the waste, with the average of the 22 samples revealing a capacity to neutralise any acid at a rate of -3.55 kg H_2SO_4 / tonne (IMO 2010 – Appendix 11). The highest sulphur level recorded was 0.24%, with the next highest sulphur level being 0.11%, so the waste is characterised as generally non-acid producing (less than 0.3% sulphur content) (IMO 2010 – Appendix 11).

The net acid producing potential calculated from the sulphur assay was slightly positive, but this measure is based on the theoretical assumption that all the sulphur present is converted to sulphuric acid. The NAG test provides a much better guide to possible acid generation, and this shows a significant acid neutralizing capacity of the waste.

It is concluded that:

- The sulphur levels in the ore samples are all less than 0.3% S and therefore the waste would be considered as NAF (non-acid-forming).
- Overall, the waste has a positive acid neutralizing capacity, and a negative net acid generation capacity.

The waste rock and low grade ore materials, when oxidised in the presence of water, will be non-acid forming. As such, no impact to wildlife (predominately bird populations), groundwater quality or pit lake toxicity is predicted from ARD.

Metalliferous Leaching Assessment

Cazaly commissioned IMO to undertake testwork at SGS Environmental Laboratories on various metallurgical core samples to test for metalliferous leaching in a similar saline environment to Mt Caudan (IMO 2010 – Appendix 11).

Leach testing were carried out on 22 samples from 13 drill hole locations on waste and low grade ore materials. The leachates after the test resulted in small increases in iron (Fe), manganese (Mn), barium (Ba) and sulphate (SO_4), with the pH ranging from 5.9 to 6.2 (not acid levels). The highest barium concentration in all samples of 0.3 mg/L is well below the Californian Waste Extraction Test regulator limit of 100 mg/L (IMO 2010 – Appendix 11).

Conclusions from metalliferous leaching are:-

- There was little or no leaching of metals from the broken solids into the groundwater.
- Groundwater salt content as sampled was less than that of seawater.

The waste rock and low grade ore materials in the presence of saline water will be non-leaching and near neutral pH levels. In saline environments, the levels of metalliferous minerals leaching will be very low concentrations. As such, no impact to wildlife (predominately bird populations), groundwater quality or pit lake toxicity is predicted from metalliferous leaching.

Management Strategies

Key Mitigation:	▪ Monitor for the presence of acid forming materials during mining. ▪ Provision for a PAF encapsulation cell in waste landform.

Monitoring for PAF Material

During mining operations, routine drill hole assays are used to ascertain definitive chemical properties of mine material. Areas within the deposit which represent elevated risk levels with sulphur content greater than 0.3% can be identified and validated by visual inspection of fresh rock condition by Cazaly geological staff. Any potential acid forming material can be identified for encapsulation during mining (on a case by case basis).

Furthermore the following mitigating actions will also be provided;

- Development of a PAF procedure to be available for mining personnel.
- Mine induction to include the identification and response processes in the event PAF material is encountered during operations.
- Training of mine personnel for the removal and encapsulation of PAF material in accordance with PAF procedure.

Further mitigation is detailed in groundwater monitoring program provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater Management (Appendix 13), discussed in other sections of the EIA.

PAF Encapsulation Cell

In the unlikely event potential acid forming material is encountered during mining, an encapsulation cell will be used to isolate mine waste material from oxygen and water to limit oxidation and propensity for acidic mine drainage to groundwater. Oxidation will be prevented by providing a depth of coverage of a minimum 10 m, with the cell elevated in the waste landform and constructed with high acid neutralising waste material in the surrounding materials. Figure 40 provides typical design for the PAF encapsulation cell, which will be constructed in the waste landform.

Commitments

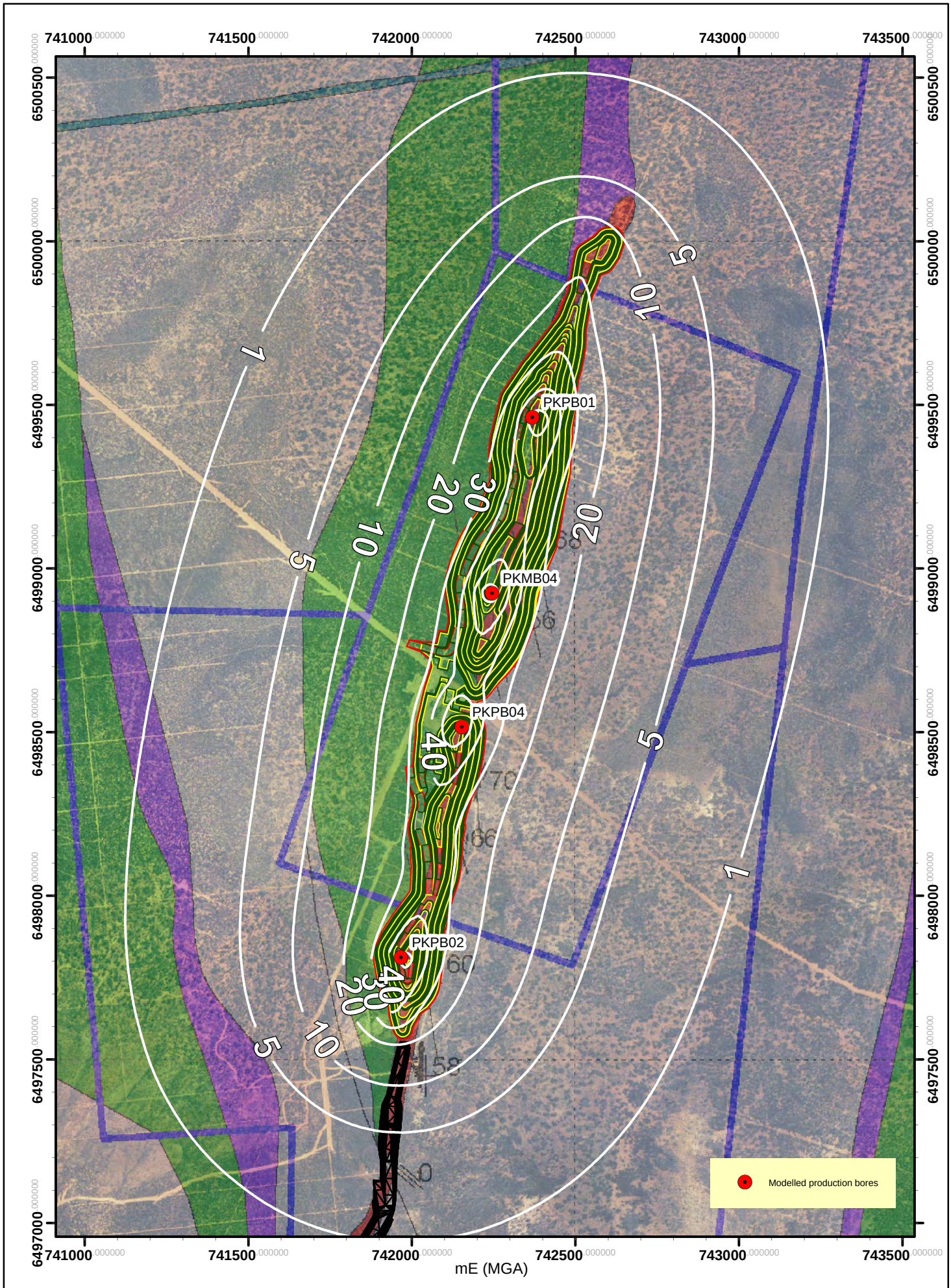
6.2.7 ARD and Metal Leaching

6.2.7-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater, for the management of ARD and metal leaching during mine development, operations, closure and rehabilitation.

6.2.7-2 Cazaly will monitor mine waste for PAF and if detected segregate in purpose designed PAF encapsulation cell within the waste landform.

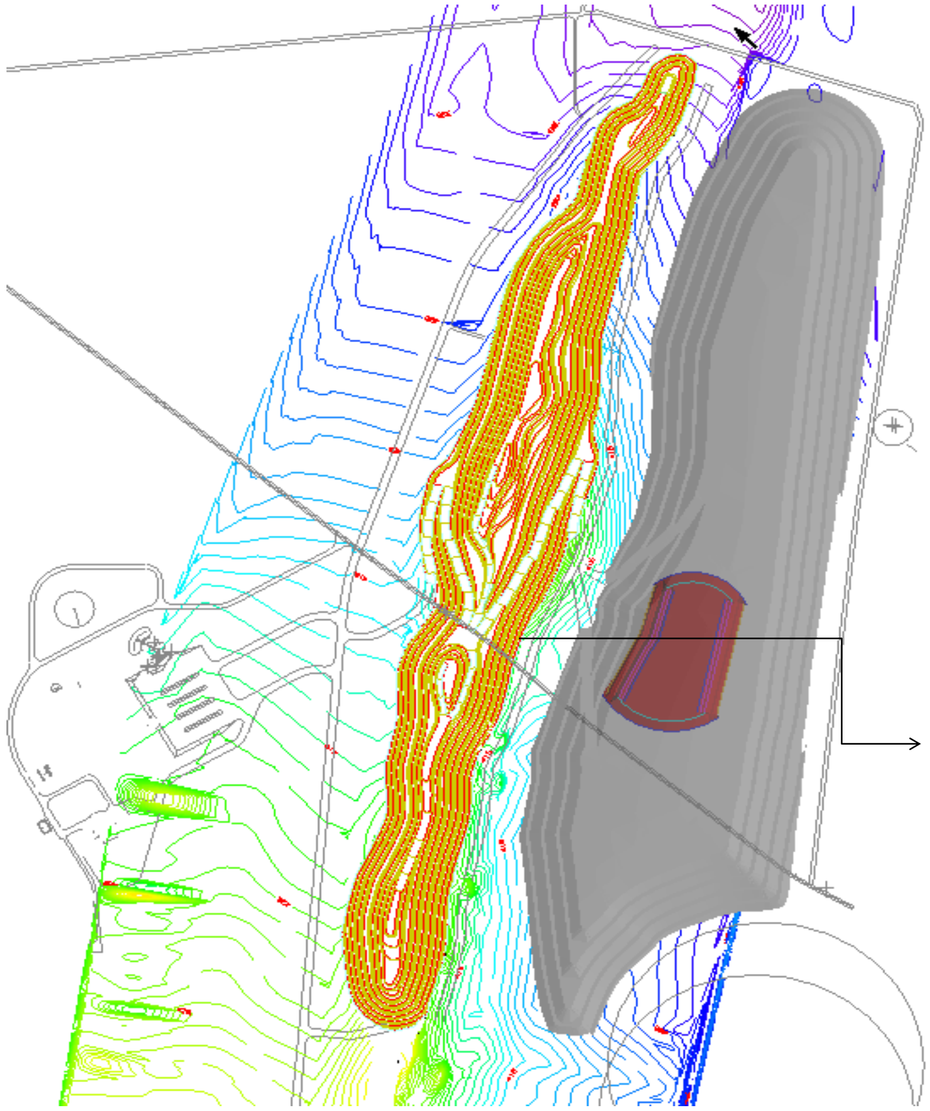
Predicted Outcome

Conclusion:	▪ Mine waste is generally characterised as non-acid forming (S<0.3%), however provision for encapsulation is included in the waste landform design. Mine waste is stable and will not leach heavy metals. Extensive and varied management measures provided. ▪ Project presents a Non-Significant impact for AMD and metal leaching.



CLIENT: Cazaly Resources Ltd PROJECT: Parker Range Project DATE: July 2010 Dwg No: 361.0/10/1-	**Mt CAUDAN** **MODELLED DRAWDOWN (m)** **AFTER 5 YEARS OF DEWATERING** Rockwater Pty Ltd

Figure 39: Results of Hydrogeological Modelling of Mine Dewatering



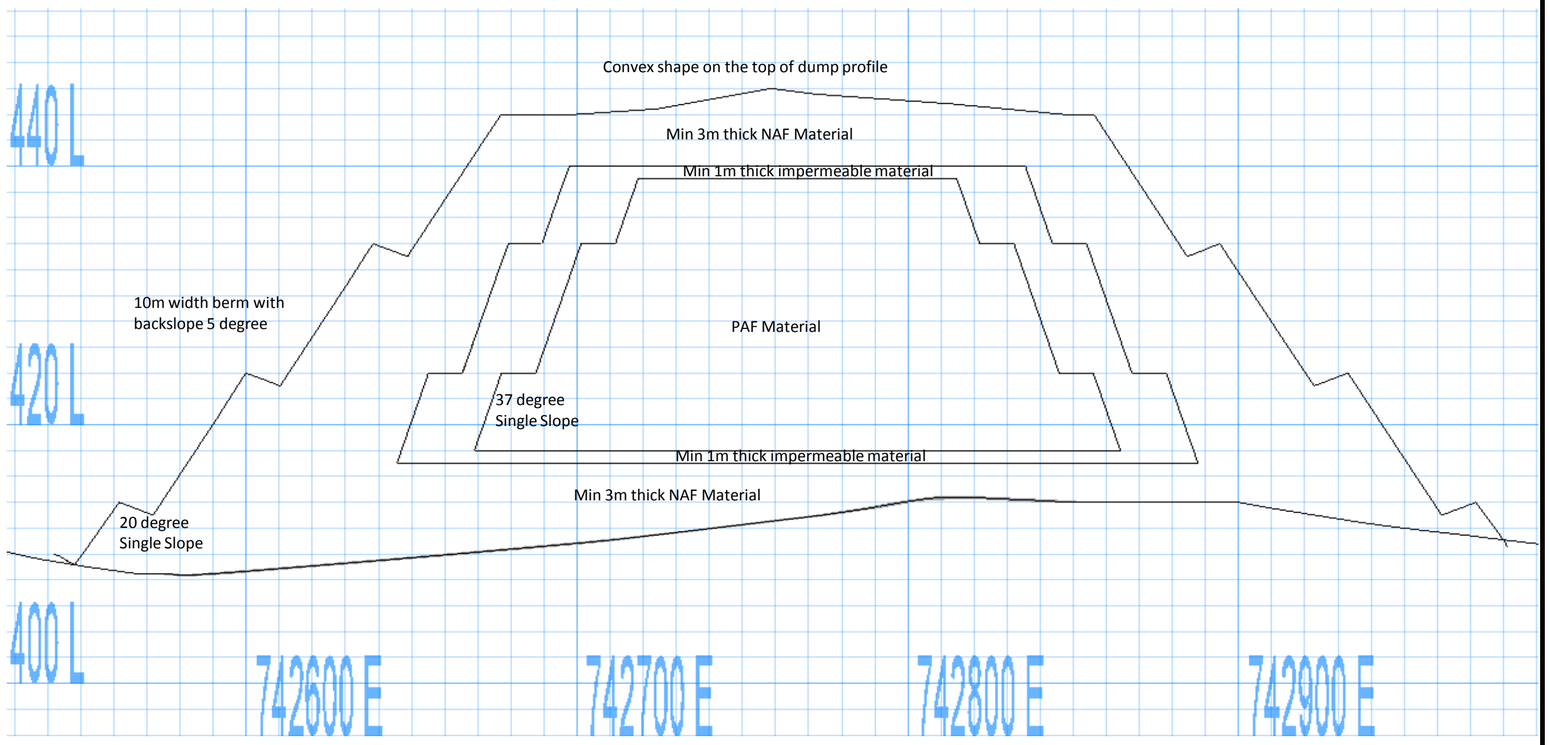


Figure 40: Design of PAF Encapsulation Cell in Waste Landform

6.2.8 Dust

EPA Objective

- Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Applicable Guidelines, Standards and Legislation

- National Environmental Protection Ambient Air Quality Measure (NEPM 2003).
- Environmental Protection Authority Guidance Statement No 18: Prevention of Air Quality Impacts from Land Development Sites (EPA 2000).
- *EPA Act* 1986.
- *Occupation Safety and Health Act* 1984.
- *Mines Safety and Inspection Act* 1994 and *Regulations* 1995.
- DEC Guidelines: A Guideline for the Development and Implementation of a Dust Management Program, 2008.
- NSW Dust Deposition Guidelines for Amenity Impacts in Coal Mining Areas.
- DEC Air Quality Guidelines.

Potential Impacts

Key issue:

Dust generation causing adverse environmental and health effects

- Mining, processing or road haulage activities generating dust leading to loss or reduction of vegetation and habitat in the natural environment.
- Mining, processing or road haulage activities generating dust leading to loss or reduction in the health of the workforce or community.

Impact Assessment

Impact Summary

- Dust losses from road haulage will be less than 0.4% and from stockpiling less than 0.05%.
- Modelling estimates highest dust deposition rates of within 100-150 m of mining and plant operations, with monthly dust deposition <5 mg/m^2 at 250 m distance (Mt Caudan) and 125 m distance (truck haul road).
- Dust levels within allowable NEPM health standards for the Moorine Rock community.

Dust Receptors

Dust will be present during construction, mining, ore haulage and operations activities.

The sources of dust generation for the proposal include:

- Removal and stockpiling of vegetation and topsoils.
- Drilling and blasting within the mine.
- Loading, hauling and unloading waste rock to the waste rock landform.
- Loading, hauling and unloading ore to stockpiles and ROM pad.
- Wind erosion of ore, waste rock stockpiles and open pit.
- Loading, road truck haulage (uncovered trailer design) and unloading of ore product from mine to rail head.

There are no areas of permanent human occupation near the Parker Range mine, with the nearest resident further than 10 km from the deposit.

Cazaly has selected a truck route which avoids residences in the community. The route does, however, pass through the adjacent wheat farming district on a public road, which could present a dust interaction between iron ore and wheat. The identified residents as possible dust receptors in the community are summarised in Table 28.

Table 28: Possible Dust Receptors Identified Along Proposed Truck Route

Resident	GPS Location	Approx Distance from Truck Route
Lot 638 (Baseline Location 2)	Lat – 31 13'13.54"E Long – 119 4'56.97"S	500 m
Moorine Rock Primary School (Baseline TEOM site)	Lat – 31 18'51.63"E Long – 119 7'29.94"S	2,000 m
Lot 59 (Baseline Location 4)	Lat – 31 19'17.84"E Long – 119 7'23.98"S	1,750 m
Lot 61 (Baseline Location 5)	Lat – 31 19'14.68"E Long – 119 7'42.31"S	1,750 m
Lot 401 (Baseline Location 8)	Lat – 31 28'10.36"E Long – 119 18'35.78"S	500 m
CBH Rail Siding (BaselineTEOM site)	Lat – 31 19'4.51"E Long – 119 4'24.06"S	1200 m

Dust can indirectly impact vegetation, flora and fauna and have negative health effects.

In vegetation and flora, dust has the potential to reduce the light intensity required for plant photosynthesis, influence gaseous exchange required for plant respiration, increase leaf temperature and increase plant transpiration (Farmer 1993; Hirano *et al*. 1995). At the Mt Caudan impact area the mine is surrounded by native vegetation.

Dust is a health issue for all fauna and the settling of dust on vegetation reduces habitat values particularly as a foraging resource. Collectively these effects have the potential to cause habitat avoidance and abandonment, reduced health and reproductive fitness.

Dust Testwork and Modelling

For Cazaly to understand the propensity of dust generation from Parker Range ore, Tunra Bulk Solids (TUNRA) has undertaken a study of the Parker Range iron ore product. TUNRA completed testwork to determine the dust extinguishment moisture (DEM) limit for the ore, and then evaluated the dust losses in a wind tunnel apparatus.

The DEM limit for Parker Range ore to minimise dust generation is 6% moisture.

Dust lift-off was tested for durations of 1 hour at 30 m/s wind speed (to simulate trucking), and 8 h at 10 m/s, then 96 h rest, then 8 h at 10 m/s (to simulate stockpiling). In each simulation, dust lift-off losses were estimated based on (a) no control, (b) water and (c) two commercially available dust surfactants with results provided in Table 29.

Table 29: Results of Wind Tunnel Testing by TUNRA

Test	Pre-Test Moisture	Dust Treatment	Lift Off Speed	Test Duration (h)	Temp (^{o}C)	Humidity	Dust Loss (% by Weight)
1	5.4%	Nil	30 m/s	1 h	20.0	50%	2.06%
2	5.4%	Water	30 m/s	1 h	20.0	50%	0.88%
3	5.4%	Surfactant 1 (3%)	30 m/s	1 h	18.0	50%	0.36%
4	5.4%	Surfactant 1 (5%)	30 m/s	1 h	18.0	65%	0.24%
5	5.4%	Surfactant 2 (0.5%)	30 m/s	1 h	22.0	60%	0.35%
6	5.4%	Nil	10 m/s	8 h, 96 h rest, 8 h	22.0	65%	1.47%
7	5.4%	Water	10 m/s	8 h, 96 h rest, 8 h	22.0	65%	0.84%
8	5.4%	Surfactant 1 (3%)	10 m/s	8 h, 96 h rest, 8 h	20.0	60%	<0.05%
9	5.4%	Surfactant 1 (5%)	10 m/s	8 h, 96 h rest, 8 h	20.0	60%	<0.05%
10	5.4%	Surfactant 2 (0.5%)	10 m/s	8 h, 96 h rest, 8 h	20.0	60%	<0.05%

The wind tunnel test results show that dust loss during stockpiling is manageable to less than 0.05% loss and trucking operations is manageable to less than 0.4% loss. These dust losses are considered upper limits as the assumptions upon which tests were completed were designed to test high wind speeds of 30 m/s (i.e. 108 km/h) during truck transport. Loaded trucks are unlikely to achieve above 60 km/h and with maximum head winds of 30 km/h expected.

To further assist Cazaly in the assessment of potential impacts associated with dust, Ecotech Pty Ltd (Ecotech) completed a modelling assessment using Ausplume^{TM} modelling software (Ecotech 2010- Appendix 10). The modelling encompassed identified dust sources at the Mt Caudan mine and associated truck haulage activities along the proposed public and private road route. The modelling was based on the proposed Project mine and infrastructure proposal and incorporated proposed Cazaly mitigation actions (refer to later section) for evaluation of dust source generation. Model results were validated based on empirical data from similar iron ore mining operations.

Atmospheric modelling was conducted for the proposed mining operations at Mt Caudan and the road train haulage route. As the distance to the nearest resident from the proposed mining operations at Mt Caudan is greater than 10 km the modelling assessment concentrated on the potential impact of dust deposition on vegetation at the mine.

The results of the dust modelling are provided in Table 30 and Figure 41 for the Mt Caudan Project area which indicates dust limits exceed the 7 g/m2/month criteria in close proximity to the ROM pad, mine pit and plant areas.

Table 30: Results of Dust Modelling for the Mt Caudan Project Area

Dust Receptor*	1 (g/m^2)	2 (g/m^2)	3 (g/m^2)	4 (g/m^2)	5 (g/m^2)	6 (g/m^2)	7 (g/m^2)	8 (g/m^2)	9 (g/m^2)	10 (g/m^2)
Jan	2.4	0.8	0.7	2.4	0.3	0.8	0.1	0.2	0.2	0.3
Feb	1.7	1.0	0.9	3.6	0.5	1.3	0.1	0.4	0.3	0.4
Mar	1.2	0.7	0.6	2.3	0.3	0.7	0.1	0.1	0.1	0.2
Apr	0.7	0.1	0.1	3.4	0.5	1.1	0.1	0.0	0.0	0.0
May	0.2	0.8	0.5	3.6	0.4	0.9	0.4	0.5	0.5	0.6
Jun	0.1	2.3	2.0	1.1	0.3	0.7	0.6	1.0	1.0	1.3
Jul	0.3	1.0	0.9	1.2	0.2	0.4	0.2	0.5	0.5	0.6
Aug	0.4	1.5	1.2	0.7	0.1	0.2	0.3	0.9	0.8	0.9
Sep	0.1	3.5	2.8	0.3	0.1	0.2	0.5	1.5	1.6	2.0
Oct	1.4	2.6	2.2	1.7	0.3	0.7	0.1	0.5	0.5	0.8
Nov	0.6	2.5	2.1	1.6	0.3	0.6	0.5	0.9	1.0	1.4
Dec	2.4	0.7	0.6	2.1	0.3	0.8	0.3	0.4	0.3	0.4
Max	2.4	3.5	2.8	3.6	0.5	1.3	0.6	1.5	1.6	2.0

* Receptors 1 to 4 are Malleefowl nesting locations and receptors 5 to 10 are *Isopogon robustus* (DRF).

Modelling for the road train haul route is based on a 144 loaded truck movements per day travelling at a 100 km/h. It is unlikely these conditions would be experienced in actual operations; hence modelling should be considered an upper prediction for dust along haul route.

Figure 42 depicts the dust modelling results for a typical area along Parker Range with areas exceeding the target criteria of 7 g/m^2/month indicated at 80 m from the road. At Moorine Rock the haul route is in proximity to residential areas and therefore the modelling included an assessment of total suspended particles (TSP) and fine particulates (PM_{10} and $PM_{2.5}$) to ensure that ambient standards are not exceeded for community health. Table 31 depicts peak dust modelling results for the Moorine Rock township associated from the Project which indicate peak dust limits below the NEPM standard criteria for health (Ecotech 2010- Appendix 10).

Table 31: Results of Dust Modelling for the Upper Haul Road Project Area

Criteria	NEPM Standard	Peak Modelling Result
$PM_{2.5}$	25 $\mu g/m^3$	9 $\mu g/m^3$
PM_{10}	*50 $\mu g/m^3$	50 (Receptor 1), others <40 $\mu g/m^3$
TSP	**150 $\mu g/m^3$	74 $\mu g/m^3$

* 5 exceedances consideration above 50 $\mu g/m^3$ per year is allowed for variability in background dust levels.
**Non-NEPM standard, derrived from Kwinana EPA criteria in WA.

Assisted by climatic rainfall events, monthly dust deposition rates of less than 7 g/m^2 will not be visible or likely to significantly affect photosynthesis of vegetation and flora (Farmer 1993). However, nominating a dust deposition limit where photosynthesis is not liklley to be affected is complicated by the drying arid cycle which the Yilgarn region is experiencing.

At Mt Caudan, the peak dust deposition is estimated to occur within 100-150 m of the mine and plant operations and a zone of influence with monthly dust deposition of less than 5 g/m^2 of approximately 150 to 250 m from operations (Figure 41).

Along the proposed truck haul route, peak dust deposition is expected to occur within close proximity to the haul road (less than 80 m) and a zone of influence with monthly dust deposition of less than 5 g/m^2 of approximately 125 m from the truck operations (Figure 42).

These results are consistent with empirical mine performance in the Yilgarn, with observed dust predominantly contained within 100 m to 150 m of a mine pit, with the greatest dust deposition generally occurring within the first 50 m (Cliffs 2009). Dry months (summer) produce the greatest mass of dust; approximately more than double the mass of wetter months (winter and spring).

Impact Assessment

Dust generation in the community from road train operations is a key impact focus for the Project. Truck route selection has been developed in consultation with the dust receptor residents and testing and modelling completed. Wind tunnel and testing conditions were arduous and dust losses observed are expected to be materially lower during actual operations. Dust modelling estimates peak dust limits which are equal to NEPM standard (receptor 1) with remaining receptors below NEPM standards for community health. The proposed indirect impacts associated with truck road haulage do not represent a health risk to the community at predicted levels.

Vegetation, flora and fauna species can all tolerate dust with varying degrees of impact. Some vegetation and flora species are able to withstand dust deposition predicted, with less tolerant flora species still able to display regrowth. In regards to fauna the effects of local disruption from dust will be relatively small and most animals will move to the vast expanses of intact, less disturbed remnant vegetation nearby. Dust modelling estimates peak dust limits of 3.6 g/m2/month receptor 4 (Malleefowl nesting mound located west of the Mt Caudan crushing plant) and 2.0 g/m2/month receptor 10 (Isopogon robustus (DRF)) which is below the target limit of 7 g/m^2/month.

Pastoral crops (mainly wheat) along Parker Range road may experience 'staining' from dust emissions, which could impact wheat quality. Propensity of 'crop staining' from truck haulage operations is not well understood, however if apparent would be localised to the impact area predicted from truck route dust modelling (i.e. less than 125 m from road).

Although some indirect impact on the vegetation, flora and fauna species is unavoidable from dust, impacts will be localised to the Project area, estimated to be 250 m for the mine and 125 m for the haul road. Populations of *Isopogon robustus* (DRF) are outside the predicted zone of indirect dust impact (with a minimum 350 m buffer zone); as such will not be adversely impacted by predicted dust deposition rates.

Management Strategies

Key Mitigation:	▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Airborne Emissions (Appendix 13). ▪ Health monitoring of vegetation, flora and fauna in impact zone. ▪ Baseline and monthly operating dust monitoring in Project area. ▪ Establishment of consultation committee between community, Shire and Cazaly.

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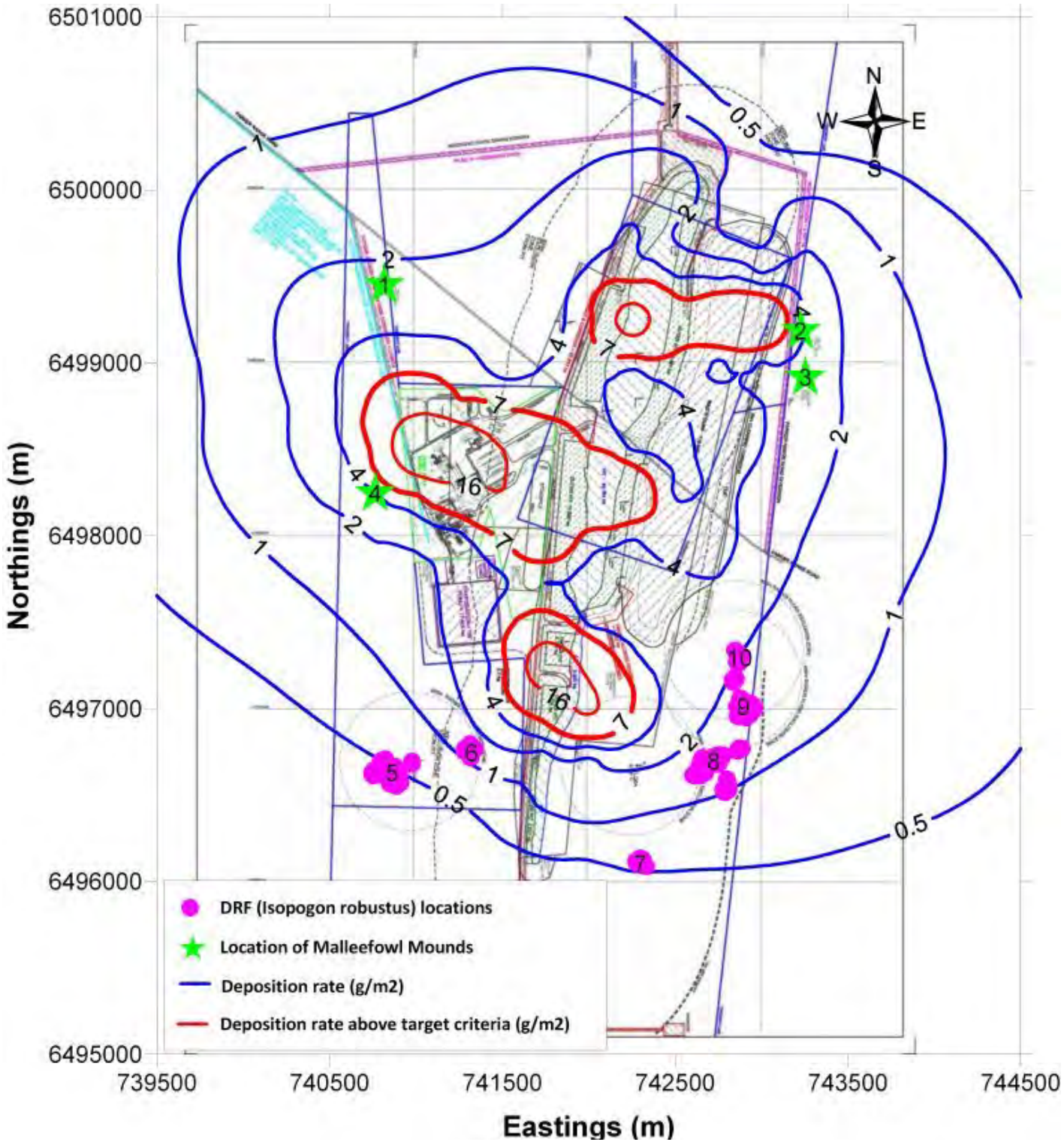

Figure 41: Results of Dust Modelling Mt Caudan Mine Operations

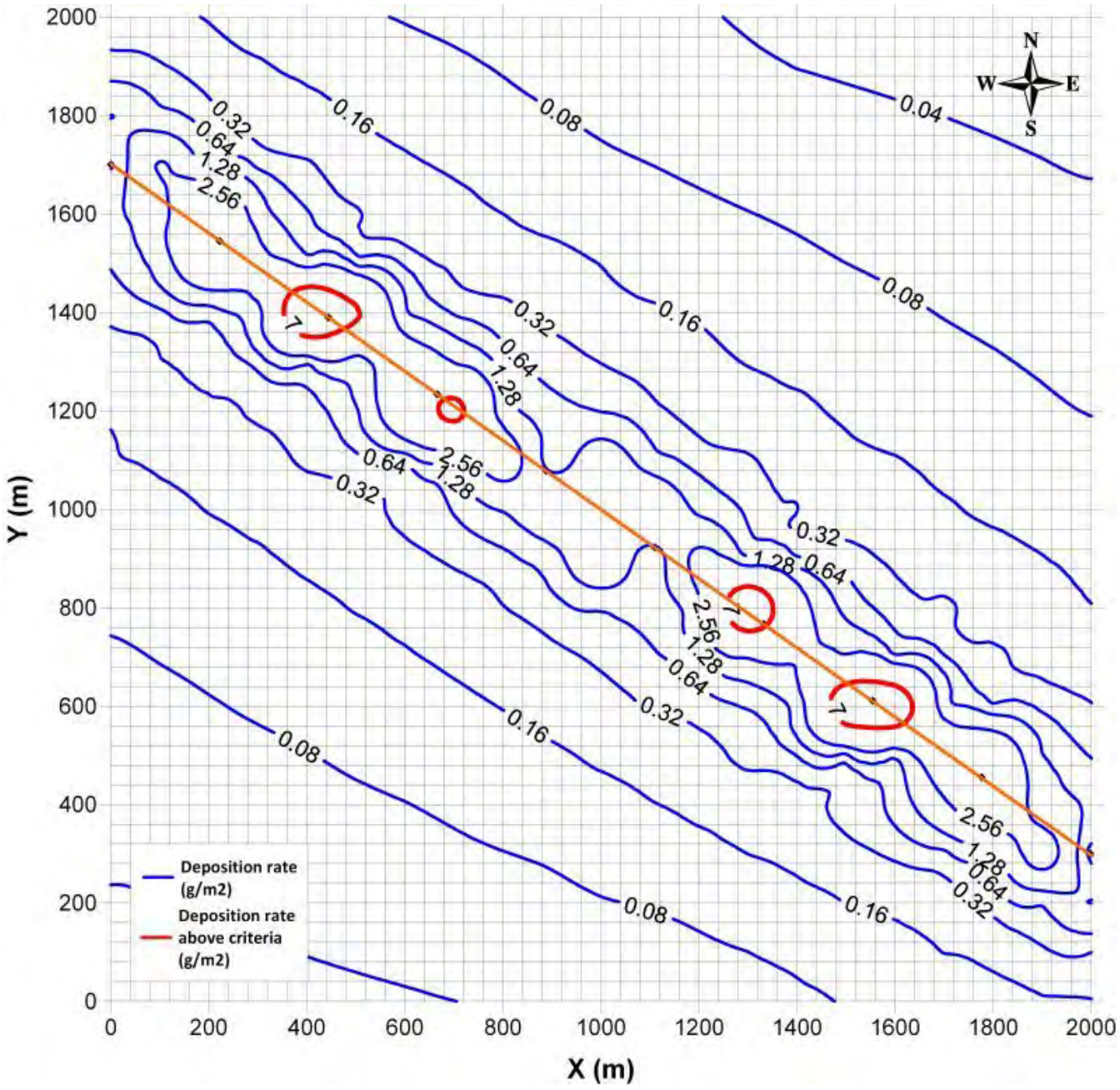

Figure 42: Results of Road Train Dust Modelling (monthly deposition rate g/m^2)

EMP Management Actions

Dust management actions are provided in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Airborne Emissions, and are in summary;

- Regular watering of all mine roads will be undertaken for dust suppression. Water carts will be utilised on in dust prone areas (e.g. local mine site roads, stockpiles and during open pit loading operations) to minimise dust generation.
- Water carts will use a dribble bar to reduce any saline water impacts to surrounding vegetation.
- Water sprays will be included in the crusher design to minimise the dust generation.
- Restriction of vehicle speeds will be required in high risk dust generation areas within the mine site.
- Road train haulage will be undertaken on upgraded sealed roadways for gazetted corridors and private haul roads to limit any impact on the community.
- Stabilisation of dust on topsoil stockpile or other earthen stockpiles with salvaged vegetation or surfactant (where required), will be undertaken.
- Control of product stockpiles moisture content with water sprays (and surfactant additives as required).
- Road train haulage leaving the plant site will have a water spray system (and surfactant additives as required) to limit potential for dust lift-off during road transport.
- Routine inspection of the truck route and periodic clean-up of any dust generating material from iron ore haulage along the route.
- Routine community meetings to present results of dust monitoring and effectiveness.
- Staff training on dust management procedures and practices.
- Minimising vegetation clearing that could create dust-prone areas.
- Use of blasting techniques that produce minimal dust in the mine. Mt Caudan southern deposit will be strip mined to eliminate need for blasting (limiting indirect impacts near DRF).
- Progressive rehabilitation of disturbed areas.
- Visual monitoring of dust generated from pits and stockpiles.
- Internal reporting of dust incidents, with external annual reporting to DEC and DMP (with subsequent review and audit by DEC and DMP).

Environmental Health Monitoring

From baseline environmental surveys, Cazaly commit to complete ongoing health monitoring and reporting of native vegetation, flora and fauna in the predicted impact zone of the Project, in summary;

- Annual vegetation, flora and fauna monitoring survey result which are to be compared to baseline, to an extent of up to 500 m distance of the Mt Caudan impact area. Reference sites will also be established and monitored to detect unrelated mining impacts (e.g. drought).
- Monitoring results to be reported to the DEC (with associated review and audits).
- Baseline and regular monitoring (or as deemed required) of dust levels at the mine site and along the ore haulage route through the community.
- Permanent monitoring stations to measure dust deposition, wind speed, temperature and humidity will be installed at 2 locations at the Mt Caudan mine site (one station is located near to the Isopogon robustus, (DRF) southern population).
- With monitoring and baseline data undertake an annual re-model of the dust generation from the Project and report to the DEC (external annual reporting). The annual re-model will include a predictive dust forecast for the upcoming year of operation and any additional mitigating controls required (not included in existing dust management actions).

In addition, the following buffer distances have been included during determination of the Project and impact area to reduce any possible impacts from indirect dust generation as follows;

- A buffer zone of minimum 350 m will be maintained between impact area of disturbance and the Isopogon robustus (DRF) populations.

- A buffer zone of will be maintained for conservation significant fauna locations (i.e. minimum 50 m for Active Malleefowl mounds and 25m for White-browed Babblers and Tree-stem Trapdoor spiders).

Dust Monitoring

From baseline dust surveys, Cazaly will undertake to complete ongoing dust monitoring and reporting of dust generation for the workforce and community in the predicted impact zone of the Project, in summary;

- Complete a summer baseline dust survey (to complement the winter survey completed 2010).
- Monthly dust monitoring of dust levels at the mine site and locations along ore haulage route through the community at sensitive dust receptor locations.
- Community incident reporting procedure for observed emissions associated with dust from mining or truck haulage operations.

Dust management actions proposed are consistent with the dust management actions implemented at mining operations throughout Western Australia.

In the event dust monitoring results in concerns regarding dust levels, the following contingency actions are available to the Project:

- Increase the application rates of water and/or concentration of dust surfactants. This could include trials with alternate and new surfactant products.
- Reduction in vehicle speeds.
- Application of dust surfactants on unsealed roads.
- Retrofit of trailer covers to road trains.

Consultation Committee

The continued consultation with the rural landholders, community and the Shire of Yilgarn is an important measure to seek feedback on Cazaly's dust performance with the proposal. Formal quarterly meetings (year 1) will be undertaken with a consultation committee (chaired by a representative of the Shire of Yilgarn) and attended by Cazaly. Meetings will revert to biannual from year 2 onwards.

Commitments

6.2.8 Dust

6.2.8-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Air Quality, for the management of dust generated during mine development, operations, closure and rehabilitation.

6.2.8-2 Cazaly will undertake annual environmental health surveys of vegetation, flora and fauna in areas within predicted dust impact zone (including reference areas outside impact zone) and report to DEC and DMP.

6.2.8-3 Cazaly will undertake monthly dust monitoring for the workforce and sensitive dust receptors within the community.

6.2.8-4 Cazaly will provide an incident reporting and corrective action investigation process for dust emissions for the community use.

6.2.8-5 Cazaly will meet quarterly (year 1), then biannual (year 2+) with a Consultation Committee to provide performance data (such as dust) and seek improvement opportunities.

Predicted Outcome

Conclusion:

- Dust generation will be localised to the mine operating areas. No material effect to vegetation photosynthesis and habitat (particularly DRF) will occur external to this area. Dust generation on the haul route is low due to road sealing. Dust management practices consistent with industry standards will be adopted.
- Project presents a Non-Significant impact for dust.

6.2.9 Noise and Vibration

EPA Objective

- Protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards.

Applicable Guidelines, Standards and Legislation

- Draft EPA Guidance Statement No 8: Environmental Noise (EPA 2007b).
- Environmental Protection (Noise) Regulations 1997.
- WAPC State Planning Policy 5.4. Night limit 50 dB(A) (10 pm to 6 am) and day limit 55 dB(A) (6 am to 10 pm).
- *Main Roads Act* 1930.
- *EPA Act* 1986.
- *Mines Safety and Inspection Act* 1994 *and Regulations* 1995.

Potential Impacts

Key issue:

Loss of quality of life to community

- Truck haulage operations generating excessive noise leading to loss of lifestyle quality to the rural landholders and the community in the existing human environment.
- Truck haulage operations generating excessive vibration leading to loss of lifestyle quality and or property damage for the rural landholders and the community in the existing human environment.

Impact Assessment

Impact Summary

- Predicted noise levels from trucking of 37 dB(A) are well below the standard of 50 dB(A) night limits.
- No impact from vibration in mining or trucking operations to the community.

Noise Impact Assessment

To assist Cazaly assess the impacts associated from noise, Herring Storer Acoustics (HSA) have undertaken noise modelling along the proposed truck route from the mine to the rail head.

Noise receptors identified along the route were identical to those for dust (refer Table 22 Section 5.12 Dust).

The noise assessment included:

- Acoustic modelling was carried out using the computer program 'SoundPlan 6.5' using the Calculation of Road Traffic Noise (CoRTN) algorithms.
- The modelling was carried out for 137 truck cycle movements per 24 hours.

To relate this to the criterion noise level the LAeq value for the day and night period has been calculated. This noise level is based on only the truck movements associated with the Project as traffic levels along Parker Range Road are minimal; this provides a worst case scenario. Resultant noise levels for this scenario have been summarised in Table 32. Receiver locations are based on existing residential and noise sensitive premises located along the propose haulage route.

Table 32: Noise Modelling Resultant Levels

Location Parameter	A	B	C	D	E	F	G	H	I
LAeq [dB(A)]	35	28	28	32	33	32	34	37	28

Based on the modelling of 137 truck movements per 24 hours, noise received at the nearest noise sensitive premise (Location H. Corner of Marvel Loch and Parker Range Road) has been calculated at 37 dB(A) for both the day and night time periods. These predicted limits are well below the WAPC standards of 50 dB(A) night and 55 dB(A) day limits. Limits do not currently address short term 'spikes' which are associated with say single pass truck events that may interrupt sleep patterns.

The accepted method to assess impacts associated with noise 'spikes' is undertaken by a social survey which requests noise reaction for different events from the community. The Department of the Environmental, Climate Change and Water of NSW completed a review of available social survey information with noise reactions and associated noise legislation which concluded that occasional single noise events between 65 – 70 dBA are not likely to affect health and wellbeing significantly (DECCW, 1999).

The Project maximum sound pressure level of a single pass truck event is estimated as LAmax less than 65 dB(A) measured at 250 m from the road (HSA, 2010). It is unlikely that the closest occupied residence to truck route at location H (greater than 250m from truck route) would experience a sound pressure level greater than 65 dBA and subsequent noise reaction. Noise levels inside residences along the proposed route will also be further attenuated due to the building construction. Noise reactions from residents will be somewhat moderated, given a pre-existing established heavy vehicle route along Parker Range Road (DECCW, 1999). Noise emissions from the transport of ore from the Project will not present a material impact on sensitive noise receptors within the community.

Vibration Impact Assessment

Vibration can potentially occur from blast percussion at Mt Caudan mining operations and ground induced vibrations from truck haulage along the road route.

The mine site of Mt Caudan is over 10 km away from the nearest resident, with public road users greater than 500 m from mine operations (i.e., proposed new Bypass Road).

Impact Assessment Truck Vibration

The trucking task (as proposed to be used for the Project) has several engineered levels of dampening for vibration during operation, including:

- Suspension systems installed on prime movers and trailers.
- Modern pneumatic tyres on prime movers and trailers.
- Sealed road surfaces of a Shire/Main Roads standard (50% of route will be new formed and sealed road).
- Natural dampening of the environment due to separation distance between truck vibration source and receptor in the community.

The WAPC Implementation Guidelines State Planning Policy 5.4, Appendix 4 states "Ground borne vibration is most commonly associated with rail transportation, where the passing of trains can result in transient vibration being experienced inside the home. It is unusual for ground-borne vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads."

Previous studies, conducted by Herring Storer Acoustics on vibration emissions from trucks and traffic along major roads, concur with the above information. Generally, a buffer of 20 m or more provides a sufficient distance to attenuate any ground-borne vibration from traffic to a residential structure.

With the level of proposed dampening for vibration in the proposal, and given no residences are located within 100 m of the haul route, ground-borne vibration impacts will not be measureable at sensitive receptors (HSA 2010).

Impact Assessment Blast Pressure

Environmental noise is governed by the Environmental Protection (Noise) Regulations 1997, Regulation 11. These regulations stipulate maximum allowable airblast levels at receiver locations on adjacent premises. The relevant airblast criteria for weekday blasting are:

"(3) No airblast level resulting from blasting on any premises or public place, when received at any other premises, may exceed –

(a) 125 dB LLinear, peak between 0700 hours and 1800 hours on Monday to Saturday inclusive; or

(b) 120dB LLinear, peak between 0700 hours and 1800 hours on a Sunday or public holiday.

(4) Notwithstanding subregulation (3), airblast levels for 9 in any 10 consecutive blasts (regardless of the interval between each blast), when received at any other premises, must not exceed –

(a) 120 dB LLinear, peak between 0700 hours and 1800 hours on Monday to Saturday inclusive; or

(b) 115dB LLinear, peak between 0700 hours and 1800 hours on a Sunday or public holiday".

Residential locations are greater than 500 m from the potential source at the mining operations, with predicted ground velocities from blast percussion less than 2 mm/s measured at this distance using KUZRAM^{TM} blast fragmentation modelling.

Blast monitoring will occur for each planned blast with results being compared to the criteria above.

Expectations are that given the large distance from the blast source, there will be no residential locations that would exceed the criterion levels stipulated. If in the event there was an exceedence then charge amounts would be altered to ensure compliance.

Management Strategies

Key Mitigation:	▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Noise and Vibration (Appendix 13). ▪ Baseline and monthly operating noise monitoring in Project area.

EMP Management Actions

Noise and vibration management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Noise and Vibration, and are in summary;

- Selection of truck haulage route which separates truck operations for sensitive noise receptors.
- Equipment will be only operated in compliance with noise regulations. Haulage trucks will be performance tested prior to acceptance by for operations.
- Individual noise testing of trucks on site prior to use along the route.
- New truck purchases to be quietest units available, with stipulated noise levels emissions outlined to the supplier.
- Internal reporting of noise incidents, with external annual reporting to DMP (with subsequent review and audit by DMP).

Noise Monitoring

From baseline noise survey (HSA 2010 – Appendix 9), Cazaly will undertake to complete ongoing noise monitoring and reporting for the workforce and community in the predicted impact zone of the Project, in summary;

- Post noise monitoring 3 months after the start of trucks transporting ore along the haul route to confirm predicted noise levels.
- Monthly noise monitoring of noise levels at mine site and period locations along ore haulage route through the community at sensitive noise receptor locations.
- Community incident reporting procedure for observed noise emissions from mining or truck haulage operations.

Commitments

6.2.9 Noise and Vibration

6.2.9-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Noise and Vibration, for the management of noise and vibration during mine development, operations, closure and rehabilitation

6.2.9-2 Cazaly will undertake monthly noise monitoring for the workforce and sensitive noise receptors within the community.

6.2.9-3 Cazaly will provide an incident reporting and corrective action investigation process for noise emissions for the community use.

Predicted Outcome

Conclusion:	▪ Noise and vibration generated from mining is not significant for the community given greater than 10 km away. Vibration from truck operation on sealed road is not significant due to limited speeds, dampening and distances. Modelling has estimated a 37 dB(A) noise level for nearest identified resident. Noise generation will be controlled, with ongoing monitoring programs beyond established baseline noise levels. ▪ Project presents a Non-Significant impact for noise and vibration.

6.2.10 Rehabilitation and Closure

EPA Objective

- To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values.

Applicable Guidelines, Standards and Legislation

- EPA Guidance Statement No 6: Rehabilitation of terrestrial ecosystems.
- ANZMEC/MCA (2000). Strategic Framework for Mine Closure.
- DITR (2006), Mine Rehabilitation.
- DITR (2006), Mine Closure and Completion.
- DME (1997), Safety Bund Walls Around Abandoned Open Pit Mines.
- WRC (2003), Hydrogeological Record Series Report No. 9: Mine Void Water Resource Issues in Western Australia.
- *Mining Act* 1978 and *Regulations* 1981.
- *Mines Safety and Inspection Act* 1994 and *Regulations* 1995.
- *EPA Act* 1986.
- *Contaminated Sites Act* 2003.

Potential Impacts

Key issue:

Inability to rehabilitate in accordance with natural environment

- Cessations of mining with an inability to rehabilitate impacting the long-term post mining environment and land use.

Impact Assessment

Impact Summary

- Open pit void with pit void lake to remain for Mt Caudan (north and central) with Mt Caudan (south) to be backfilled, approximately 333 ha of rehabilitation.
- Waste landform to maximum 45 m high, approximately 2 km long and 500 m wide.

Open Pit Void and Pit Lake

As the proposal involves bulk scale iron ore open pit mining excavation to below the natural water table, a form of pit void and pit lake is necessary for the proposal. Cazaly have investigated several alternatives for the open pit and pit void lake, which are detailed in Conceptual Mine Closure Plan provided in Appendix 14, and in summary:

- Alternative 1 - No backfilling either Mt Caudan north, central and south open pit zones.
- Alternative 2 - Backfilling Mt Caudan north and central open pit with waste rock material from Mt Caudan south open pit zone.
- Alternative 3 - No backfilling of Mt Caudan north and central, but backfilling Mt Caudan south open pit zone.
- Alternative 4 – Backfill all open pit voids (No Mining as backfilling is not a viable economic alternative for the proposal to proceed).

Alternative 3 is preferred given Mt Caudan south open pit is all above water table (no pit void lake) and thin aspect (size 1.4 km long, width approximately 90 m) which is conjunctive to strip mining and backfilling with 1.2 Mbcm of waste rock. With the exception of no mining, alternative 3 represents the best alternative to minimise impact on the natural environment (Appendix 14).

A final pit void will remain following mine closure. A pit void lake will form and function as a groundwater sink, with equilibrium water level below that of the surrounding area due to natural evaporation. Groundwater levels will recover to be about 40 m lower than existed pre-dewatering commencement (Rockwater 2010a – Appendix 4). Preliminary modelling indicates 75% of water will recover within the first 1.5 years with equilibrium attained in about 35 years after dewatering is ceased (Rockwater, 2010a – Appendix 4).

An abandonment bund will be constructed around the perimeter of the Mt Caudan north and central open pit voids to discourage the attraction of indigenous and predatory fauna to the lake water source.

Waste Landform

A waste landform is necessary with the proposal to store overburden from the mine per closure alternative 3. The waste landform is designed to be maximum 45 m high, approximately 2 km long, 500 m wide with 10 m berms, 10 m inter berm lift height and 15 degrees overall slope batter angle. The region's existing topography has laterite ridges rising up to 70 m above natural ground level, with the waste landform comparable with the existing BIF peak ridge of Mt Caudan being 48 m above natural ground level. Upon rehabilitation the waste landform will not be visually dissimilar to the surrounding regional landforms.

Stability of the waste landform and pit void was assessed using geotechnical limit equilibrium methods. The stability has been assessed as long term stable under static conditions and possibly under seismic conditions with provision of planned 100-year ARI event stormwater drainage system to provide an unsaturated waste landform. Stormwater will be drained into the pit void lake via levees and berms. The toe of the WRL will be approximately 100 m away from final pit crest (outside zone of instability). The WRL design is depicted in Figure 43.

The existing and post closure landform is conceptually depicted in Figure 44 and Figure 45.

The pit void (58 ha), Parker Range bypass road (10 ha), powerline corridor (15 ha) and upper haul road (7 ha) will not be rehabilitated (unless specifically agreed as part of infrastructure installation). Remaining Project areas of disturbance shall be subject to rehabilitation, which total approximately 333 ha.

Management Strategies

Key Mitigation:	▪ Closure of mine will be made safe through removal of infrastructure and use of abandonment bunds. ▪ Waste landform designed to promote regrowth of natural vegetation with sculptured landform consistent with the region. ▪ Progressive trial rehabilitation using performance measures (monitoring for 5 years from closure). Contingency actions are identified. ▪ Mine shall be closed and rehabilitated in accordance with Conceptual Rehabilitation and Closure Plan (Appendix 14).

Removal of Infrastructure

Cazaly will remove above-ground infrastructure from the mine area including buildings, machinery, roads, hazardous materials and equipment. This infrastructure will be re-used, recycled or disposed of (as appropriate).

Buried mine infrastructure, and mine infrastructure that has a foreseeable future use (specifically powerline and communications towers), will remain insitu. The powerline will be an asset of Western Power (future State use) and the communication towers an asset of the Communications contractor (able to expand services to farming areas). The haul road and an internal mine access road will be retained to enable long-term access for rehabilitation works, monitoring, maintenance.

The removal of mine infrastructure and making safe of any retained infrastructure is consistent with the intent of the Mines Safety and Inspection Regulations 1995 (WA) (refer Regulation 3.15).

Mines often contain localised areas of contamination at the completion of mining. Contamination can occur though a variety of sources, such as from chemical or hydrocarbon losses to unsealed ground. Potentially contaminated areas will be investigated and remediated as part of mine decommissioning to ensure that the area is left in a suitable condition for the future land use.

Cazaly will investigate potentially contaminated areas within the Project area following the completion of mining. These areas will include:

- Hydrocarbon (fuels and oils) storage areas;
- Chemical and explosives storage areas;
- Power generation facilities;
- Equipment wash-down bays; and
- Drainage sumps.

As the areas occupied by the above facilities form a small component of the mine operations, the volume of any contamination from these areas is expected to be small and manageable.

Human Safety

The Mines Safety and Inspection Regulations 1995 (WA) require that open mine pits be left in a condition that considers geotechnical aspects and precautions taken to prevent inadvertent access to open pit workings following mine abandonment. The operational method preferred by DMP to meet these requirements is to install an abandonment bund around the perimeter of open mine pits (DoIR 1997).

An abandonment bund of at least 2 m in height and 5 m base width will be constructed around the open pits.

Pit Void Management

Cazaly propose to backfill the narrow aspect Mt Caudan south pit concurrently with mining operations using a strip mining technique. As the south pit is planned to be mined at the end of the mining program (as a stand-alone stage), with modest mineralisation, this deposit is most conducive to backfilling.

The thin aspect ratio of south pit, would allow effective pit establishment, temporary stockpiling and then concurrent backfilling/mining activities with a total material movement of approximately 1.2 Mbcm of waste rock. Additional waste rock material from the waste rock landform will be used to provide additional fill to the south deposit pit returning approximately 1.4 km back to near original ground level.

The south pit is all above the natural ground water table.

A final void from the north and central deposits will remain following closure of the mine at Mt Caudan. A pit void lake will form and function as a groundwater sink, with equilibrium water level below that of the surrounding area due to natural evaporation. This ensures that salt accumulation or pH reduction (as a result of any sulphides in the pit wall) will be confined to the pit void and immediate area. Groundwater levels will re-establish to near existing levels (less the evaporation component) approximately 60 m below natural surface (slightly less than 365 mRL) (Rockwater 2010a – Appendix 4).

Cazaly will undertake to monitor the pit void lake water quality (salinity, heavy metals and acidity) and report annually the results to the DEC for review and audit. Based on waste characterisation testing the accumulation of metals in the pit lake is low impact due to the insignificant levels measured in leachates during laboratory testwork (IMO 2010 – Appendix 11).

The presence of feral fauna to the area will be monitored during the mine closure process. If the indigenous and feral fauna populations are surveyed to increase at cessation of mining, then Cazaly will undertake to install fauna exclusion fencing around the permitter of the abandonment bund for the Mt Caudan north and central pit voids at mine closure.

Waste Landform Design

The waste landform is designed as far as possible to support vegetation growth, resist erosion and be stable for the long term. A conceptual design for the waste landform and current section of Mt Caudan is provided in Figure 43.

The waste rock landform will be contour designed and shaped to form stable structures and not exceed the existing Mt Caudan peak and assimilate with surrounding area landforms (designed limited to 45 m height). The waste rock stockpile will be constructed in four 10 m high lifts.

Construction of final batter slopes will be less than 20 degrees, contoured to 15 degrees overall, separated by a back sloping 10 m wide berm between the lifts to maximise water retention.

On the crown and leading edge of the berm a 1 m high bund will be included to prevent water flowing down batter slopes. The crown will be concave profile to promote water retention and infiltration rather than water shedding.

Storm events of 100 year ARI rainfall will be included in design by the provision of overflow spillway regions and on berms to prevent break-out and erosion of the crown and berms. Such stormwater flows will be directed along berms into scour protected landform ramps and purpose designed levee drains into the pit lake void. This will assist in dilution of the gradual salinity increase from natural evaporation in the pit lake.

The PAF encapsulation cell in the waste form will be minimum 3 m from the natural ground level to prevent water ingress under the landform after closure. Construction of the encapsulation cell will be from high acid neutralising capacity waste rock material, with floor and roof to be minimum 1 m thickness and walls stable embankment design. The roof will extend 3 m past the walls of the encapsulation cell. A convex crown will be constructed from non acid forming waste rock on the roof of the encapsulation cell to shed water away from the area (Figure 40).

Stockpiled vegetation will be spread on waste landform surfaces to provide erosion protection and fauna habitat. Stockpiled topsoil will be spread on waste landform surfaces to provide seed source and microbial inoculums.

With the exception of the PAF encapsulation cell, all waste form surfaces will be deep ripped on contour to assist with water infiltration and provide seed bed (in conjunction with vegetation spreading).

Trial Rehabilitation and Performance Measures

As operational areas become available for rehabilitation, trials shall be undertaken to optimise the regrowth potential of native species from seed. The rehabilitation trials shall be ongoing and be conducted cognisant of pre-disturbance environmental factors, including records of soil condition for each vegetation and flora habitat to enhance probability of success.

Performance monitoring shall be based on Ecosystem Function Analysis (EFA) using indicators from the unaffected environment with a continuous record of ecological development. EFA will be carried out along established transects and compared to data from analogue (or reference) sites not affected by mining. Vegetation will be surveyed at established transects using 20 m by 20 m quadrats, inclusive of species density, composition and canopy cover. The selection methodlogy and final location of the quadrats will be approved by the DEC. Each tree or shrub seedling shall be identified to species genus level so that species composition and density can be determined and compared to reference sites. A photographic record will be maintained at each transect to depict the rehabilitation progress (Appendix 14).

Upon mine closure, Cazaly will monitor the rehabilitation works annually to achieve an outcomes based criteria from EFA to determine the success of rehabilitation programs and any contingency actions that may be required. Rehabilittation performance outcomes will be deemed to be complete if criteria are achieved for any two consectutive years.

Rehabilitation works for the Project will involve:

- Deep ripping of hardstand areas for improved soil condition and drainage.
- Respreading of stored topsoil and retained vegetation to provide seed and an appropriate microclimate for seed growth.
- Collection (18 months prior to closure) and spreading of local provenance native seed (in conjunction with DEC).

Progressive rehabilitation

Cazaly will undertake progressive rehabilitation as practicable within temporary access during construction and ongoing temporary clearing activities during operations.

Contingency Actions

In the event that the decommissioning and rehabilitation performance indicators have not been achieved, appropriate contingency actions or strategies will need to be implemented to achieve the performance indicators. Such actions may include:

- Review and further remediation of potentially contaminated areas.
- Re-seeding.
- Planting of seedlings.
- Importing alternative growth media.
- In regards to the use of saline water through-out the life of the mine for dust suppression on in-plant roads, soil shall be evaluated for suitability to support rehabilitation growth. In the event soil is deemed unsuitable from survey, the contingency actions shall include:
- Soil removal by excavation and placed within the WRL.
- Additional topsoil fill shall be utilised from stockpile and deep ripped for rehabilitation measures.

Cazaly will implement the above contingency actions in the event that it is identified that the decommissioning and rehabilitation performance indicators are not being achieved.

Rehabilitation will be undertaken in accordance with EPA Guidance Statement No 6: *Rehabilitation of Terrestrial Ecosystems*.

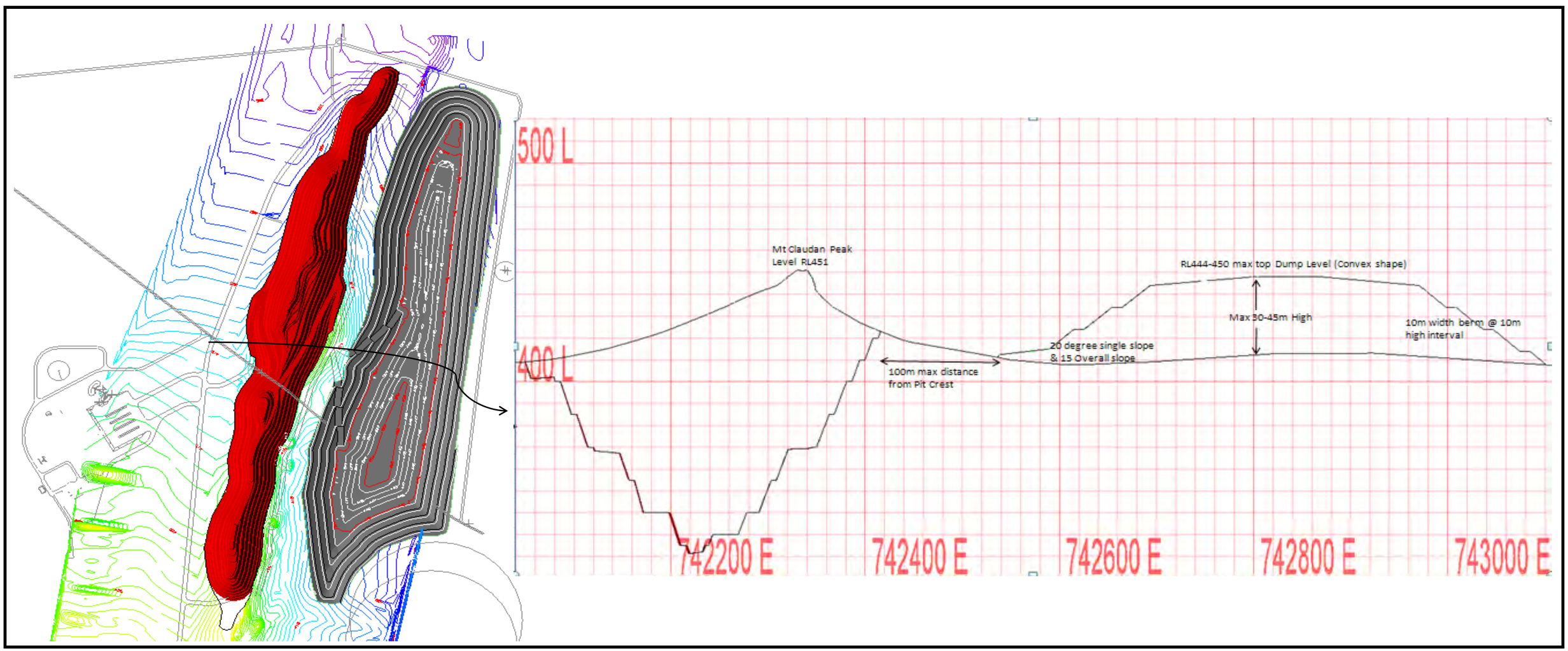

Figure 43: Conceptual Design Waste Landform

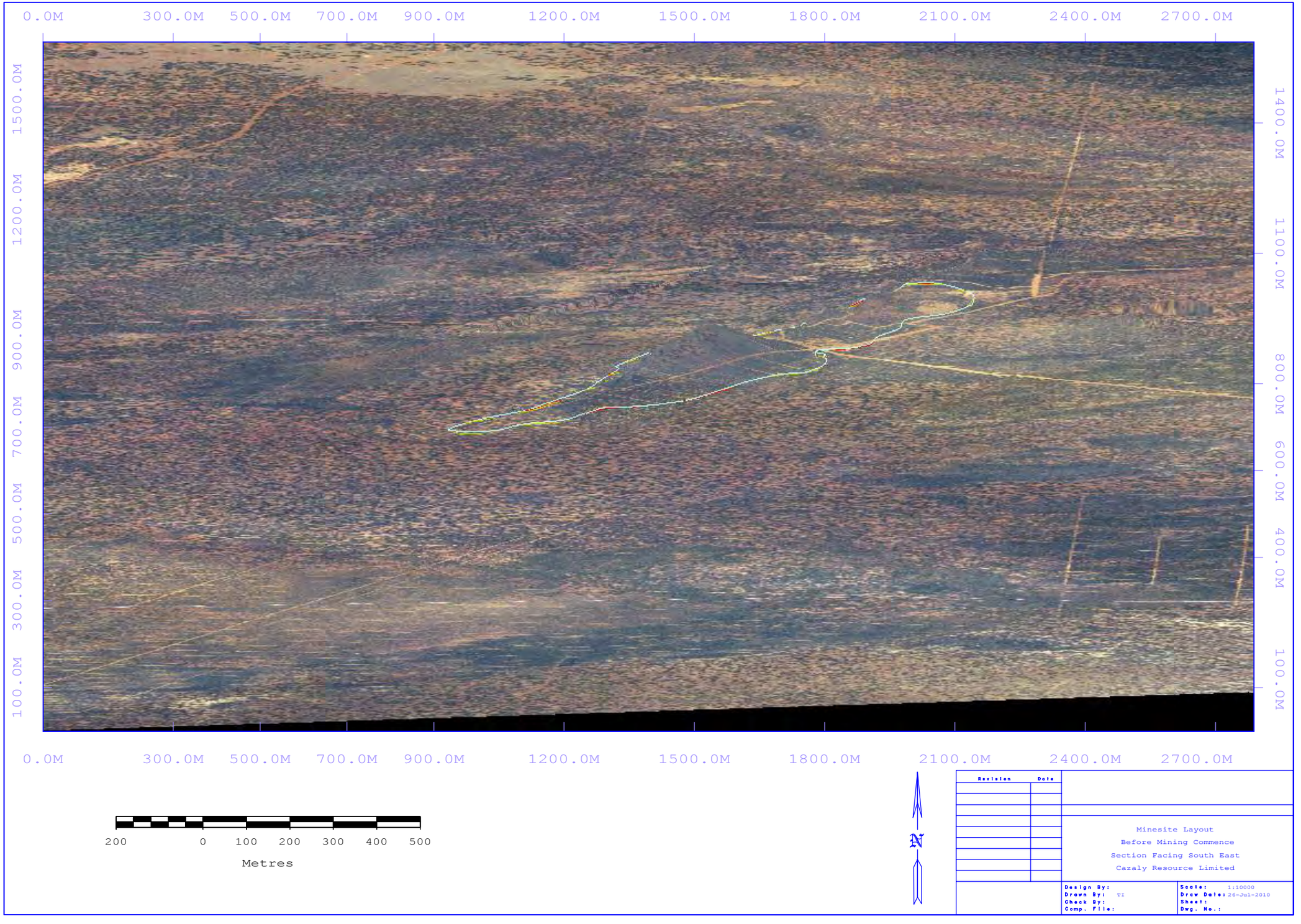

Figure 44: Landform Impact Assessment (Existing Environment)

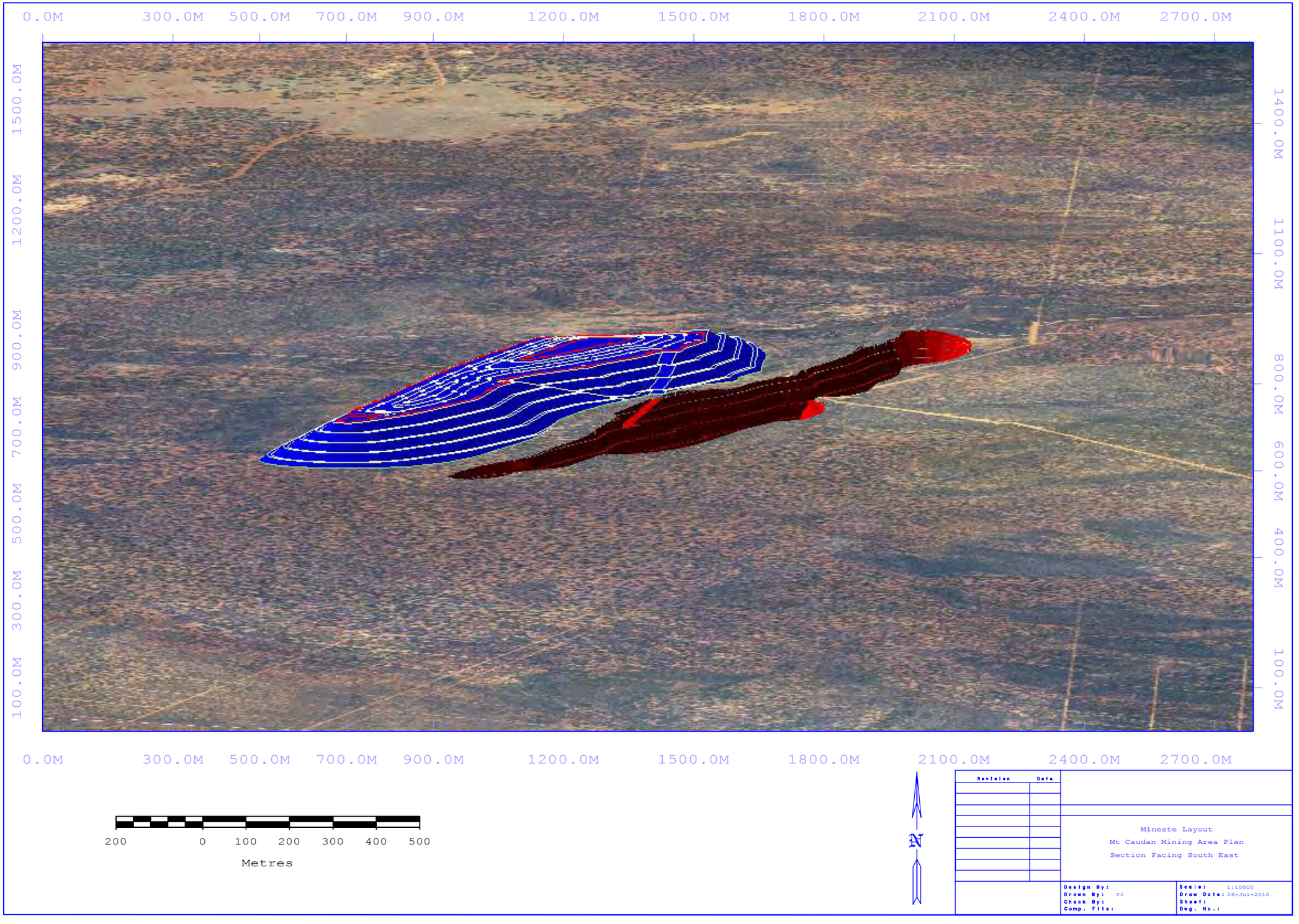

Figure 45: Landform Impact Assessment (Post-closure)

Management initiatives for rehabilitation will be guided by the following principles:

- Ensure that vegetation clearing is kept to the minimum.
- Wherever possible use areas cleared during previous mining operations.
- Minimise soil erosion particularly on the batters of the WRL.
- Collect and correctly stockpile vegetative material and available topsoil for later use at selected sites.
- Progressively rehabilitate completed areas as soon as practicable.
- Only use local native plant species.
- Undertake decommissioning and closure of the site to industry leading practice principles and to statutory requirements.

As the Project develops and results of rehabilitation trials are determined, the Conceptual Closure Plan (Appendix 14) will be periodically reviewed and updated to provide final closure plan requirements throughout the life of the Project.

Commitments

6.2.10 Rehabilitation and Closure

6.2.10-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation, for the management of mine rehabilitation and closure.

6.2.10-2 Cazaly will implement actions detailed in Parker Range Conceptual Mine Closure Plan (Appendix 14) for the management of rehabilitation and closure.

6.2.10-3 Cazaly will review and update the Parker Range Conceptual Mine Closure Plan (Appendix 14) on a 3 yearly basis throughout the life of the Project.

6.2.10-4 Cazaly will monitor the rehabilitation program of the mine annually post-closure of the mine until EFA performance outcomes are achieved for any two consecutive years.

6.2.10-5 Cazaly will monitor the indigenous and feral fauna populations during mine closure and if found to materially increase in numbers, will install fauna exclusion fencing around the perimeter of Mt Caudan north and central open pit voids.

Predicted Outcome

Conclusion:	▪ Pit void and pit void lake is necessary, but backfilling of south deposit nominated. Waste landform is a considered designed. Closure and Rehabilitation is conceptually planned. ▪ Project presents a Non-Significant impact for mine closure and rehabilitation.

6.3 Other Environmental Factors

6.3.1 Landform and Soils

EPA Objective

- To maintain the integrity, ecological functions and environmental values of the soil and landform.
- Ensure that rehabilitation achieves an acceptable standard compatible with the intended land use, and consistent with appropriate criteria.

Applicable Guidelines, Standards and Legislation

- The National Committee on Soil and Terrain (2009). Australian Soil and land Survey Field Handbook Third Edition.
- *Mining Act 1978.*
- *Soil and Conservation Act 1945.*

Potential Impacts

Key issue: **Loss of soil integrity to support rehabilitation or unnatural remnant landforms**	▪ Degradation of soil fabric and structure causing an inability to support re-vegetation from native seed. ▪ Increased soil erosion due to clearing activities. ▪ The landform appears unnatural compared with the undisturbed natural environment.

Impact Assessment

Impact Summary	▪ Disturbance of 421 ha of soil surface. ▪ Removal and storage of 0.8 Mbcm topsoil. ▪ Waste rock landform is stable.

Topsoil Clearing

Based on an average 0.2 m topsoil cover observed throughout the Project area (Appendix 5), 0.8 Mbcm of topsoil is estimated to be removed and stored for future use as a result of Project topsoil disturbance.

Soil Removal and Storage

The local surface gravelly earthy sands and earthy loams do not have any chemical or physical constraints that would prove to be adverse in the long term for either construction of infrastructure, removal into waste landforms or re-use (as topsoil for waste landforms and other disturbed areas).

The topsoil horizons are suitable for revegetation programs. Chemical attributes are typical of the soils associated with native vegetation in this area. The high calcium carbonate levels occur only in the lower soil horizons and will not be an issue.

The dispersibility ratings will not impact the Project as the soils have a low level of pedality and have massive to earthy fabric. There are low levels of clay in the horizons.

Stability of Waste Rock Landform

An unstable WRL may impact the proposed pit void and contribute to erosion. An assessment of the WRL proposed has been undertaken which determined the slope parameters adopted will ensure the WRL will be stable in the long term (refer Section 6.2.10 for details). The adopted set-back distance from the proposed Mt Caudan pit void will ensure no adverse impact on pit stability. Further discussion on the design of WRL is provided in Rehabilitation and Closure within the EIA.

Management Strategies

Key Mitigation:	▪ Soil integrity will be preserved during removal and vegetation clearance. ▪ Waste landforms will be designed to be consistent with natural topography with erosion protection structures. ▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation (Appendix 13).

Soil Integrity and Waste Landform

During the life of the operational phase approximately 55 Mt of waste rock will be mined. This waste will be disposed of in a WRL adjacent to the mine pit. Rehabilitation of the WRL will be undertaken to a height consistent with the existing peak of BIF Ridge at Mt Caudan (i.e. sculptured to 45 m above natural ground level). The WRL is designed to accommodate water retention, minimise erosion and promote native vegetation regrowth. Topsoil will be stockpiled (not exceeding 6 m in height) and placed in non-trafficable areas (i.e. around the base of the WRL). Any diverted natural water flows that traverse the impact area before development will be returned to a functional pre-disturbance condition.

The design of the WRL is further detailed in Rehabilitation and Closure within the EIA.

EMP Soils Management Actions

Soils management actions are provided in Project M8521-G00-EN-PL-001 sub-plan Land Disturbance and Rehabilitation, and are in summary;

- Topsoil management measures will be adopted during clearing activities to segregate from other stockpiles. The stockpiles will be located and constructed to a height of approximately 6 m to reduce the disturbance area for topsoil stockpiling, minimise erosion from rainfall, wind and introduction of saline dust suppression water to preserve soil integrity. Topsoil will be stockpiled in non-vehicle road areas, e.g. around the base of the mine waste landform.
- Vegetation stockpiles will be immediately upslope of the topsoil stockpiles to minimise surface water run-on to the topsoil. This stockpiling arrangement will allow minimal handling and transport of both vegetation and topsoil, hence maintaining integrity and minimising soil losses.
- Disturbed areas no longer required will be topsoiled, deep ripped on the contour and have stockpiled vegetation respread over the surface. To assist the revegetation process, the sites will be seeded with local native species.
- Topsoil condition beneath and along-side Project haul roads will be monitored for degradation as a result of saline watering used for purposes of dust suppression.
- Where necessary on long broad slope profiles, erosion control banks may be installed to control rainfall runoff from causing erosion downslope.

Further management actions are provided in Rehabilitation and Closure within the EIA.

Commitments

6.3.1 Landform and Soils

6.3.1-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation for the management of soils during mine development, operations, closure and rehabilitation.

Predicted Outcome

Conclusion:	▪ Soil integrity will be maintained to support use during rehabilitation. Waste rock landform will be constructed and rehabilitated consistent with natural environment. ▪ Project presents a Non-Significant impact for landform and soils.

6.3.2 Weed Species and Dieback

EPA Objective

- Avoid introduction of invasive weeds which may have a negative impact on native vegetation communities.

Applicable Guidelines, Standards and Legislation

- CALM (1999). Environmental Weed Strategy for Western Australia.
- *Agriculture and Related Resources Act 1976.*
- *CALM Act 1984.*

Potential Impacts

Key issue: **Introduction and spread of weed species or dieback**	▪ Introduction or spread of weed species leading to a loss, degradation or alteration of vegetation and fauna habitat from the natural environment. ▪ Introduction or spread of dieback leading to a loss, degradation or alteration of vegetation and fauna habitat from natural environment.

Impact Assessment

Impact Summary	▪ Four weeds are within the impact area; however, these weeds are not listed as declared weeds by DAFWA. ▪ Dieback is not anticipated to occur in the region due to low rainfall and a high evaporation rate in the area.

Weed Impact Assessment

Four weed species were recorded at the Mt Caudan Project area and are in the proposed impact area:

- *Ursina anthemoides* (African Daisy).
- *Sonchus oleraceus* (Common Sowthistle)
- *Bromus rubens* (Red Brome).
- *Anagallis arvensis* (Blue Pimpernel).

These are not listed as Declared Weeds by the DAF (2009).

It should be noted that none of these weed species were present in the autumn 2010 survey.

No weed species were identified at the upper haul road area near Moorine Rock.

Dieback Impact Assessment

In general, *Phytophthora* spp. is restricted to areas in the southwest of the State receiving at least 400 mm of average annual rainfall although it is most active in areas receiving more than 800 mm of annual rainfall. As the Project area has a mean annual rainfall of 294.6 mm (and an evaporation rate of greater than 2,400 mm), the occurrence of dieback is not anticipated in the Project area.

Management Strategies

Key Mitigation:	▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Weed and Dieback (Appendix 13). ▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation (Appendix 13).

EMP Management Actions

Weed management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Weed and Dieback, and are in summary;

- Identification of weed infestations or areas susceptible to infestation adjacent to or within the proposed disturbance area.
- Restriction of vehicular access to designated tracks.
- Ensure vehicles that access the Project site are free from soil and vegetation prior to arrival (weed and seed clearance procedures).
- Use existing roads to reduce the potential for weed spread.
- Eradication of weeds where necessary with approved control mechanisms.
- Clean-down of equipment and vehicles between weed-free and known weed-prone areas.
- All staff will be advised of potential weed species during the induction process and advised to report any incidence of weed establishment.
- Regular monitoring/maintenance of the mine area and road for the establishment of weed species will be undertaken during construction and operation.

Weed management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation and are in summary;

- Clearing activities associated with areas of known weed occurrence will be segregated from other topsoil stockpiles to prevent spread of the known weed.

Commitments

6.3.2 Weed Species and Dieback

6.3.2-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001) sub-plan Weed and Dieback and sub-plan Land Disturbance and Rehabilitation for the management of weeds during mine development, operations, closure and rehabilitation.

Predicted Outcome

Conclusion:	▪ Four weed species occur in the Project, but none are declared weeds by DAFWA. Dieback is not known to occur in the Project area. Weed introduction and spread can be managed. ▪ Project presents a Non-Significant impact for weed species.

6.3.3 Surface Water

EPA Objective

- Maintain the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance are protected.

Applicable Guidelines, Standards and Legislation

- WRC (2000a) Guideline No 1: Water Quality in Mining and Mineral Processing.
- WRC (2000b) Guideline No 5: Mine Site Water Quality Monitoring.
- WRC (2000c) Guideline No 10: Above Ground Fuel and Chemical Storage.
- *Rights in Water Irrigation Act 1914.*
- *Soils and Land Conservation Act 1945.*

Potential Impacts

Key issue: **Loss of vegetation and flora or loss of fauna habitat**	▪ Changing the natural surface water flow rates and flow paths which could adversely lead to loss of the natural environment. ▪ Surface water emissions from the proposal which could adversely affect quality of natural surface water.

Impact Assessment

Impact Summary	▪ Diversion of Project area surface water catchments around proposed mine infrastructure re-connecting to downstream natural flow paths. ▪ Minor reduction in local catchment area as a result of proposed mine and infrastructure local surface water containment and use. ▪ Minor emissions from mine and infrastructure for large storm events greater than 1 in 100 year return frequency.

Diversion of Water

Hydraulic analysis of the creek flow based on 5 m contour plans has determined that the greatest extent of flooding at any of the catchment streams is no more than 20 m wide. This is the most extreme assumption as only 10 - 15 m is expected. The only change to the natural regime is where the levee and drainage system are in place and briefly at location R to M (Figure 48) where the flood extent will likely stretch to the 20 m for the 1 in 100 year ARI event. No other changes to the surface water regime are expected.

Note: The southern explosive magazine access road will be installed with suitable culverts to preserve the natural surface water flow path S-T (Figure 48) from catchment D1. Figure 49 depicts the surface water flow path S-T in regards to *Isopogon robustus* (DRF) flora locations, hence no impact upon DRF health will occur from the Project.

Catchment areas and planned stormwater diversions are positioned such that threatened invertebrate habitat located to the east of the WRL are unaffected by altered surface water flows.

Local Reduction in Catchment Area

The impact area catchment is estimated at 24 ha, with the total local catchment area estimated at 5 ha. Local catchment water will be contained and diverted either back to natural surface water flow paths or retained in the open pit. The open pit represents a reduction in local catchment of 58 ha.

Local catchment flows are a relatively low proportion of the local natural water flow and are unlikely to have any material effect upon health of vegetation or fauna at downstream locations.

Emissions During Large Storm Events

During large infrequent storm events, the design of the mine and infrastructure storm water catchment will be unable to contain the quantity of water, which may contain emissions associated with mine and infrastructure. The emissions from the site during these infrequent large events will be minor given the dilution with relatively large stormwater flows.

Management Strategies

Key Mitigation:	▪ Engineered stormwater diversion levees suitable to divert 100 year ARI peak natural water flows. ▪ Engineered local stormwater containment and detention basin to capture and recover site emissions for the proposed infrastructure. ▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater Management (Appendix 13).

Engineered Stormwater Diversion Levees and Local Containment System

Rockwater Pty Ltd has completed a surface and stormwater study (Appendix 3) to assist in the identification of management initiatives to minimise impact on the natural surface water flows and catchments. The following initiatives have been identified for the Project:

- Provision for a diversion levee around plant infrastructure to maintain natural water flows (Figure 46).
- Provision of drainage culverts under roadways for magazine access, site access and bypass roads to maintain natural water flows. The natural flow rate under the magazine access road to the known Isopogon robustus (DRF) will be uninterrupted (Figure 49).
- The Parker Range Road diversion will incorporate culverts to take the more frequent flows and scour protected floodways to take the bigger and rarer storm flows of up to 5.5 m^3/s.
- Stormwater runoff inside the mine infrastructure area will be collected either within the pollution detention trap (Figure 47) or within the mine pit. Hydrocarbons will be also collected in the pollution detention trap and recovered.
- Sediment settling drains will be provided upstream of the detention trap to minimise sediment run-off from mine roads, waste landform, wash pads and hardstand areas. Wash pads for vehicles will have run-off contained.
- Contaminated soils will be remediated on-site in a bioremediation area in accordance with Contaminated Sites Management Series – Bioremediation of Hydrocarbon-Contaminated Soils in Western Australia (DEC 2004).
- Fuel and lubricants will be stored in one central facility. Bulk fuel storage tanks and drum stores will be constructed in accordance with AS 1940 Storage and Handling of Flammable and Combustible Liquids and WRC (2000c) for above ground liquids. Impervious bunds and/or linings will be used to contain any leaks and spillage.

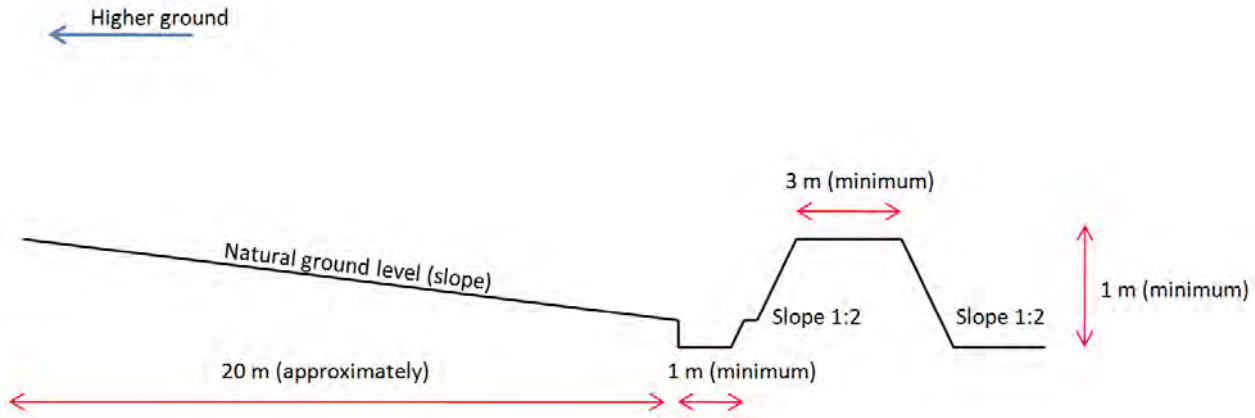

Figure 46: Cross Section of Diversion Levee (Typical)

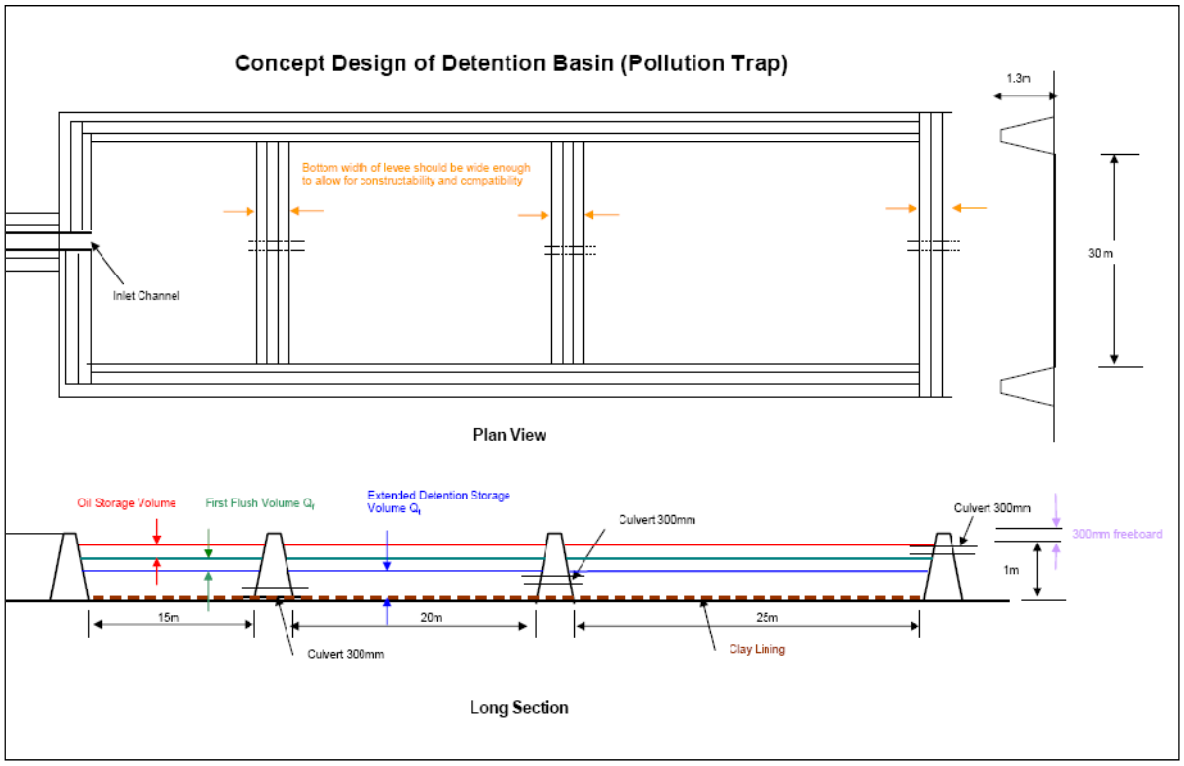

Figure 47: Conceptual Design of Detention Basin

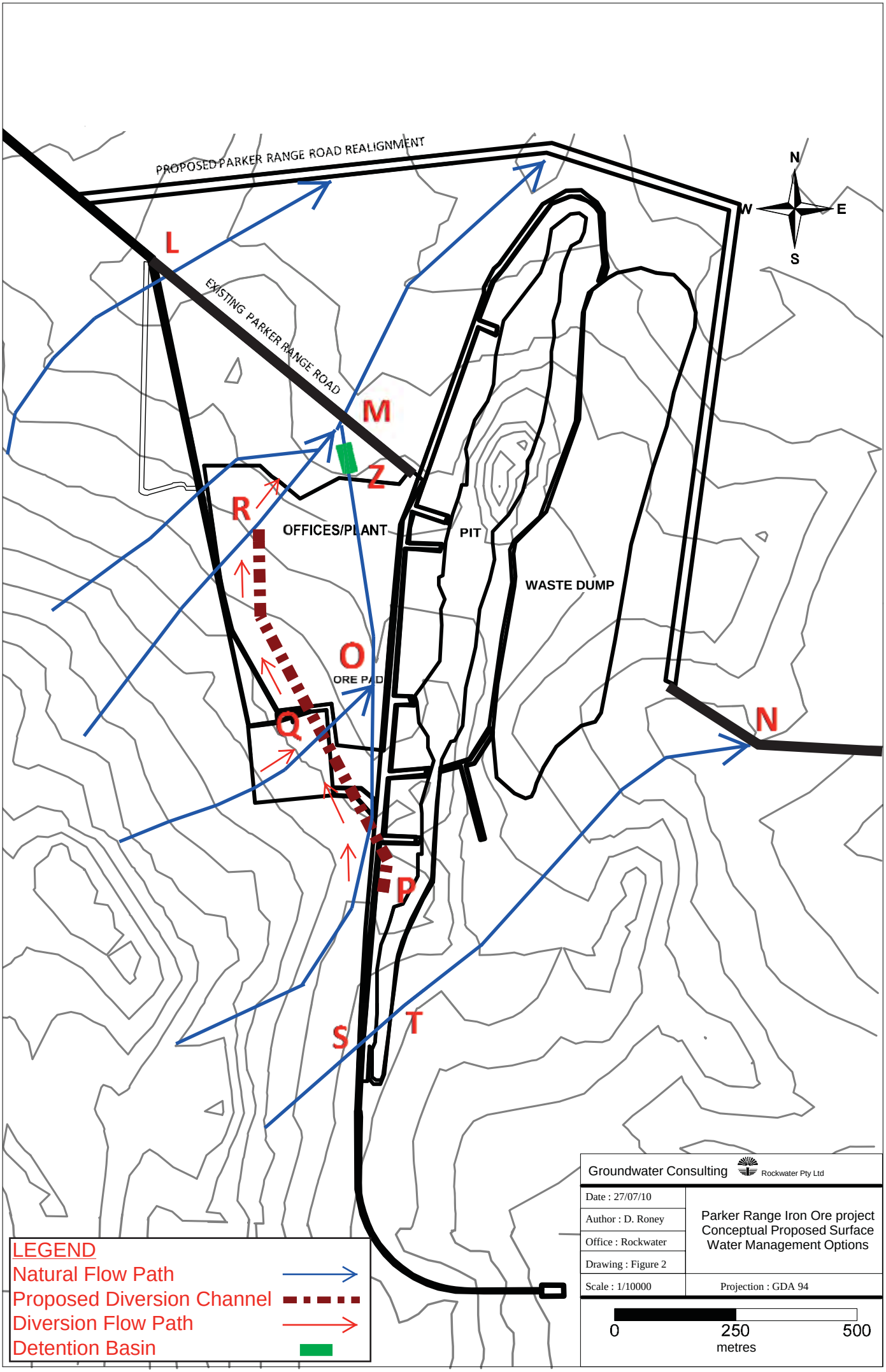

Figure 48: Proposed Surface Water Management at Mt Caudan Project Area

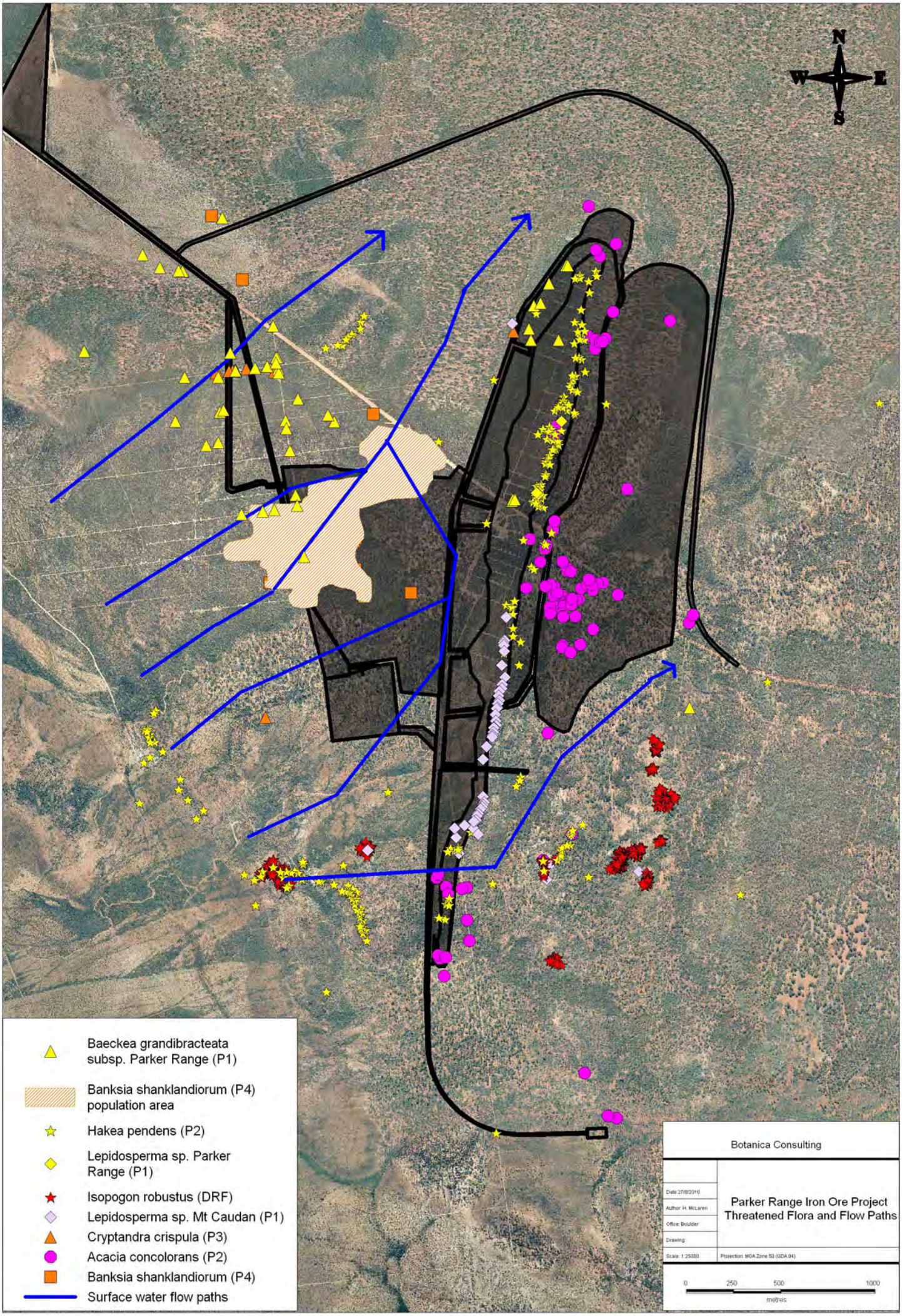

Figure 49: Threatened Flora and Proximity Surface Water Flows at Mt Caudan

EMP Stormwater Management Actions

Stormwater management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater Management (Appendix 13), and in summary;

- Minimum impact of natural hydrological regime and maintenance of a sustainable water balance onsite.
- Areas of major erosion hazard will be identified and avoided where practicable. If unavoidable, specific management measures will be implemented to reduce the erosion risk.
- Stormwater diversion structures will be constructed to control erosion and sedimentation downstream through the use of sedimentation ponds, riprap pads and maintenance excavation work to keep channels free flowing and non-eroded.
- Diversion channels will be constructed to convey a 100-year ARI event for 72 hours duration. Each channel will maintain at least a 0.3 m freeboard, have a flow velocity of less than 1.4 m/s and, where possible, mimic the hydraulic characteristics of the original streamline.
- Infrastructure that has the potential for interfering with creeks and natural flow systems will incorporate hydraulic structures such as drains, culverts and floodways into the design. These structures will be designed to mimic the hydraulic characteristics of the original streamline.
- Temporary stabilisation measures will be used in high erosion risk zones, such as creek beds and embankments, and at culvert inlets and outlets. Where appropriate, rock protection will be installed.
- Sediment control devices such as detention basins and sediment traps will be incorporated as appropriate to the specific location and routinely inspected and maintained to ensure functionality.
- Pipeline corridors will be constructed in a vee-drain or bund such that any undetected spill to unsealed ground is contained.
- Mine services area stormwater drainage containment will be based on the 1 in 100 year ARI 72- hour storm event.
- Rehabilitation will occur as soon as practicable and within 6 months of decommissioning of a work area or location.

Commitments

6.3.3 Surface Water Management

6.3.3-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater, for the management of surface water during mine operations, closure and rehabilitation.

Predicted Outcome

Conclusion:

- Natural surface water movements will be maintained, with no material effect on downstream habitat. Emissions will be contained from mine and infrastructure, with the exception of large infrequent storm events.
- Project presents a Non-Significant impact for surface water.

6.3.4 Erosion

EPA Objective

- Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Applicable Guidelines, Standards and Legislation

- EPA Guidance Statement No 6: Rehabilitation of terrestrial ecosystems (EPA 2006b).
- *Soil and Land Conservation Act 1945.*
- *Mining Act 1978 and Regulations 1981.*
- *EPA Act 1986.*

Potential Impacts

Key issue: **Increased erosion of the natural environment**	▪ Loss of soil, sedimentation or vegetation leading to an increase in erosion of the natural environment.

Impact Assessment

Impact Summary	▪ Impact through loss of soil and vegetation in natural environment through adjacent clearing activities and elevated landform construction.

Soil and Vegetation Impact Assessment

Land clearing and construction of landforms is necessary for the proposal which over the operational period of the proposal, could lead to erosion of surrounding vegetation and soil adjacent to the impact area.

Substantial clearing activities and elevated landforms (e.g. waste rock landform) can have an impact on surrounding soil and vegetation from climatic erosion, if uncontrolled.

Management Strategies

Key Mitigation:	▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Clearing and Rehabilitation (Appendix 13).

EMP Management Actions

Erosion management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Clearing and Rehabilitation, and are in summary;

- During the operational phase, high erosion potential areas will be identified by Cazaly Environmental personnel.
- High erosion potential areas will be treated with water cart sprays and/or commercially available stabilisation surfactant.
- Disturbed sites will be rehabilitated within six months of becoming available from operations to minimise erosion exposure risk (refer to Rehabilitation and Closure within the EIA for further management actions).

Commitments

6.3.4 Erosion

6.3.4-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater, sub-plan Land Disturbance and Rehabilitation for the management of erosion during mine development, operations, closure and rehabilitation

Predicted Outcome

Conclusion:	▪ Minor erosion to the natural environment will occur, however affects can be minimised with controls for surface water, clearing controls and progressive rehabilitation. ▪ Project presents a Non-Significant impact for erosion.

6.3.5 Waste Products

EPA Objective

- Ensure that wastes are contained, treated or collected so there is no long-term impact on the environment.

Applicable Guidelines, Standards and Legislation

- Environmental Protection (Rural Landfill) Regulations 2002.

- *EPA Act 1986.*
- *Local Government Act 1995.*
- *Contaminated Sites Act 2003.*

Potential Impacts

Key issue: **Reduction in soil quality and/or feral animal introduction**	▪ Wind-blown, inappropriate storage or degradation of waste leading to reduction in soil quality, breeding ground for vermin or attraction of feral animals to the environment.

Impact Assessment

Impact Summary	▪ Waste generation of general putrescible waste, tyres, concrete, steel, plastic, glass, batteries, liquid hydrocarbons, filters and toner cartridges. ▪ Threat to native fauna through population expansion of feral animals.

Waste Generation

Waste generation is necessary for the proposal and is common to requirement for mine development. The impacts of waste generation can cause emissions to unsealed ground from liquid waste, affect surface water quality and cause increased litter in the natural environment through strong winds.

Fauna Risk from Feral Animals

Feral animals of House Mouse *Mus Musculus*, Rabbit *Oryctolagus cuniculus*, Dog *Canis lupis familiarius*, Red Fox *Vulpes vulpes*, Cat *Felis catus* have been observed in the local Project area.

Uncontrolled putresible general waste will attract and have the potential to expand the population of feral animals, representing an additional unnatural predator threat to native fauna in the local Project area.

Management Strategies

Key Mitigation:	▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Waste and Pollution (Appendix 13).

EMP Management Actions

Waste management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Waste and Pollution, and are in summary;

- A waste analysis will be undertaken prior to construction commencement (refer chart FM-EN-005 in sub-plan Waste and Pollution in EMP).
- Recycling will be adopted for paper, cardboard, co-mingled containers, steel, plastics, glass and used oil.
- Inert waste recycling processes will be adopted (in conjunction with registered off-site waste disposal providers) to recycle timber into woodchips (for landscaping) and tyres into shredded rubber for retail sale.
- All putrescible domestic and industrial waste will be stored in a designated collection area on-site, until removed and disposed of in a designated approved landfill facility or recycling facility.
- Sewage will be collected and treated in leach drains, septic tanks or stored and disposed of in an approved facility.
- Waste hydrocarbons will be collected from site by a licensed contractor and transported to recycling facilities in Perth or Kalgoorlie.
- Monthly planned inspections and site specific inspections will include waste disposal and transfer areas.
- Feral fauna will be monitored and if necessary an eradication program will be implemented. Work areas will be routinely inspected to ensure putrescibles waste is stored in designated bins to discourage feral animals.
- Hydrocarbon emissions to unsealed ground will be bio-remediated in an on-site facility. Waste containing hydrocarbons (e.g. grease/oil rags and filters) will be separated and disposed in an approved off-site treatment and landfill facility.

- Records/receipts for waste management will be retained. Records should stipulate waste type, mass/volume, calculations, any assumptions made and how the waste is managed (re-used, recycled, disposal location). This includes but is not limited to controlled wastes.
- All waste will be recorded and reported on a monthly frequency. Reports will include details of general, scrap, batteries, tyres, waste oil, and hydrocarbon-contaminated waste. The reports will be available for review and audit by DEC and DMP as required.
- There will be no burning of waste on-site, unless approved prior for emergency response training.
- Work areas will have designated waste collection locations with clearly identified bins, and recycling points for collection and storage in the designated on-site storage and packaging area while awaiting dispatch.

Commitments

6.3.5 Waste Products

6.3.5-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Waste and Pollution, for the management of waste during mine development, operations, closure and rehabilitation.

Predicted Outcome

Conclusion:

- Waste generated from the Project will be appropriately stored and then disposed off-site in approved facilities within Shire of Yilgarn, Kalgoorlie and Perth. Reduce, re-use and recycle principals will be applied to limit waste generation.
- Project presents a Non-Significant impact for waste products.

6.3.6 Dangerous Goods and Hazardous Substances

EPA Objective

- Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Applicable Guidelines, Standards and Legislation

- WRC Guideline No 10: Above Ground Fuel and Chemical Storage.
- AS 1940 (2004): The Storage and Handling of Flammable and Combustible Liquids
- *Dangerous Goods Safety Act 2004* – Identification, Storage and Handling of Prescribed Dangerous Goods.
- *Mine Safety and Inspection Act 1994 and Regulations 1995.*
- *EPA Act 1986.*

Potential Impacts

Key issue:

Reduction in quality of soil, surface water, groundwater or reduced vegetation and habitat

- Incorrect storage of dangerous and hazardous substances leading to reduced quality of soil, surface water, groundwater and reduction in vegetation and fauna habitat.

Impact Assessment

Impact Summary

- Hydrocarbons and chemical emissions to unsealed ground affecting surface and groundwater quality.

Hydrocarbons and Chemical

Hydrocarbons and chemical reagents are necessary for the proposal and would include diesel fuels, engine/hydraulic oils, greases, settling flocculants and dust suppressant coagulants. Ammonium nitrate explosives will not be stored on-site, but rather sourced from an approved facility in Southern Cross. A detonator magazine will be maintained on-site.

Uncontrolled emissions to unsealed ground have the potential impact of reducing the surface water and ground water quality of the natural environment.

Management Strategies

Key Mitigation:	▪ Facilities designed to meet regulatory requirements for dangerous goods. ▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Hydrocarbon and Chemical (Appendix 13).

Facility Design

The design of suitable storage facilities for hydrocarbons and chemicals is highly prescribed in regulatory standards and guidelines. In summary the proposed facilities will be designed;

- Hydrocarbon storage areas and workshops will be bunded in accordance with DMP and DEC license to operate requirements and AS1940. All chemicals will be stored in accordance with DMP and DEC requirements. Unenclosed bunds will have a capacity of 110% of the largest storage container or vessel.
- Bulk fuel storage tanks and drum stores will be constructed in accordance with AS1940 (The Storage and Handling of Flammable and Combustible Liquids), and WRC (2000c) for above-ground storage, and will include impervious bunding and lining to prevent leakage and spillage from entering the environment. Other consumables will be stored in secured areas and due consideration will be given to the quantity to be stored and the nature of the consumable so that appropriate storage and handling is achieved.
- Refuelling facilities will not be constructed within 30 m of a known stormwater drainage system. Refuelling systems will incorporate dry-break hoses.
- A hydrocarbon recovery system will be provided to separate and store hydrocarbons recovered from rainfall and wash-down run-off from the re-fuelling, servicing areas and wash-pad. The site local stormwater detention basin incorporates the ability to recover hydrocarbons.

EMP Management Actions

Dangerous goods and hazardous substances management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Hydrocarbons and Chemical, and are in summary;

- Cazaly will ensure that suppliers meet the statutory requirements for transport of dangerous goods and will meet the same standards for storage and use. In particular, fuel and oil storage and waste oil management has and will be designed to practicably minimise risks of soil contamination from these products.
- All explosives and toxic materials will be stored in fenced and locked site storage and used in accordance with the *Mines Safety and Inspection Act 1994*, the Mines Safety and Inspection Regulations 1995 and the *Dangerous Goods Safety Act 2004.* Authorised and trained personnel for the safe handling of explosives will have controlled entry.
- Spill response equipment will be stored in all workshops and on maintenance/service vehicles. If an inadvertent spillage of hydrocarbon occurs, the spill will be contained as much as possible by the use of the spill response equipment. In the event of a large spill, earthmoving equipment will construct earthen bunds to contain the spill. Contaminated soils will be remediated onsite if possible or otherwise disposed of in appropriately licensed landfills. Bioremediation of contaminated soils would be undertaken in accordance with the Contaminated Sites Management Series - Bioremediation of Hydrocarbon-Contaminated Soils in Western Australia (DEC 2004).
- All waste hydrocarbon and hydrocarbon contaminated materials will be collected and stored in bulk containers, bins or drums and removed from site by a licensed operator for recycling, treatment or disposal at an approved landfill.

Further management actions are provided in monitoring programs detailed in Groundwater within the EIA.

Commitments

6.3.6 Dangerous Goods and Hazardous Substances

6.3.6-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Hydrocarbon and Chemical, for the management of dangerous goods during mine development, operations, closure and rehabilitation.

Predicted Outcome

Conclusion:	▪ Hydrocarbons, reagents and detonators will be contained and stored in accordance with regulatory requirements. Mine explosives will be sourced off-site. Management actions identified. ▪ Project presents a Non-Significant impact for dangerous goods and hazardous substances.

6.3.7 Light

EPA Objective

- Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Applicable Guidelines, Standards and Legislation

- Australian Standard, AS 4282-1997: Control of the Obtrusive Effects of Outdoor Lighting (AS 1997).
- *EPA Act 1986.*

Potential Impacts

Key issue: **Obtrusive lighting affects native habitat for fauna or community**	▪ Introduction of artificial lighting leading to physiological and behavioural changes to fauna. ▪ Introduction of artificial lighting leading to obtrusive or reduction in life quality for residents and community.

Impact Assessment

Impact Summary	▪ Artificial light disruption to fauna adjacent to Project area. ▪ No impact to residents or community.

Fauna

The introduction of artificial light is necessary for the proposal which includes lighting of work areas within the mine, waste landform, plant, infrastructure, equipment, light vehicles, heavy vehicles and road trains. Use of mobile lighting towers will be used within the mine and waste landform areas with fixed/mobile lighting used in the plant and infrastructure areas.

Artificial light will have detrimental effects on local fauna to greater and lesser degrees depending upon the location of the lighting in proximity to the fauna habitat surrounding the impact area of the Project. Effects on animals tend to be species specific with some species tolerating changes better than others. Effects include physiological responses and behavioural responses.

Physiological responses include short term changes as a result of the 'flight-fright' response to sudden light, for example passing vehicle lighting. Artificial impact affects upon both diurnal and nocturnal fauna in as much as, for example, diurnal fauna will need to move away from their territory in order to seek quietness, darkness and rest at night while nocturnal fauna will be prevented from sleeping during the day and from foraging in the lit areas at night.

Seasonal surveys in the Project area indicate that while there is a diversity of fauna in the area, overall populations are not abundant. Given the vastness of the area, the impacts and affects of artificial light will be relatively small on fauna and most animals will move to the vast expanses of intact, less disturbed remnant vegetation nearby.

Residents and Community

There are no residents within 10 km of the proposed Mt Caudan mine development; however one resident is located within 100 m of the proposed truck haulage route with all other residents greater than 500 m away.

Obtrusive light impacts associated with road train truck movements could be significant in the event residences are orientated towards an oncoming light direction. As the majority of the proposed truck route is an existing public road used by grain haulage and the public, the community have positioned residents set-back from the Parker Range Road and orientated away from intrusive vehicle light. Residents in the Moorine Rock township are not impacted by light, given the residences are at least 1.75 km from the nearest point of the proposed truck haulage route.

Management Strategies

Key Mitigation:	▪ Facility design will seek to limit the 'light spill' outside impact area of the Project.

Facility Design

A minimum light luminescence is required with a 24 hour operation to ensure the workforce can safely complete the tasks associated with the development. Cazaly will incorporate the following design and operational features in the proposal;

- Directional lighting will be used to minimise light spill outside of the Project area in both fixed light design and positioning of large mobile lighting towers.
- Light overspill associated with construction and operations will be managed in accordance with the Australian Standard, AS 4282-1997: Control of the Obtrusive Effects of Outdoor Lighting (AS 1997).
- Other measures will be implemented to reduce the impacts of light overspill, including downward-directed lights, shrouding and the use of 'Bug Yellow' fluorescent lighting (or similar) to limit attraction of flying insects to permanently lit areas.

Commitments

6.3.7 Light

6.3.7-1 Cazaly will implement design and position lighting to limit spill outside the Project impact area.

Predicted Outcome

Conclusion:	▪ Light is a necessary part of the proposal. No impacts from light upon residents in community. Management actions identified. ▪ Project presents a Non-Significant impact for light.

6.3.8 Greenhouse Gas Emissions

EPA Objective

- Ensure that gaseous emissions do not adversely affect the environment or health, welfare and amenity of nearby land users.

Applicable Guidelines, Standards and Legislation

- EPA Guidance Statement No 12: Minimising Greenhouse Gases (EPA 2002b).
- *EPA Act 1986.*
- *National Greenhouse and Energy Reporting Act* 2007 (DEWHA).

Potential Impacts

Key issue: **Reduction in local and regional air quality**	▪ Carbon gas emissions associated with mining, processing and road haulage leading to reduction in local and regional air quality.

Impact Assessment

Impact Summary	▪ Greenhouse gas emissions for the Project are on average 43,129 tonnes CO_2-e per year representing 0.06% of Western Australia's total per year.

Greenhouse Gas Emissions

The cumulative long-term effects of long term carbon gas emissions (known as greenhouse gases) and the contribution to global warming are widely documented and published. Greenhouse gas emissions are necessary for the Project proposal and include direct impact atmospheric emissions resulting from diesel combustion, electricity consumption and clearing activities.

An impact assessment for the Project based on initial development and first six years of operation was completed by Greenbase Pty Ltd. The assessment included estimation of carbon dioxide equivalent emissions associated with initial development, mining, processing, power and water generation from infrastructure and road haulage operations, and is summarised In Table 33.

Table 33: Anticipated Carbon Dioxide Equivalent Emissions for the Project (Tonnes CO_2-e)

Emissions Estimate	Initial Start	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Estimate from Clearing	561	2,647	3,148	3,563	3,927	4,226	4,481
Estimate from Mining Fuel	4,860	35,250	42,432	28,289	30,041	25,476	19,329
Estimate from Domestic Wastewater	20	15	15	15	15	15	15
Estimate from Explosives (ANFO)	50	300	389	403	427	196	91
Estimate from Purchased Electricity Mine	-	14,949	16,880	8,550	9,736	9,433	4,358
Estimate from Trucking Fuel	543	3,939	4,742	3,161	3,357	2,847	2,160
Estimate from Purchased Electricity Village	-	1,650	1,863	943	1,074	1,041	481
TOTAL Tonnes CO_2-e	6,034	58,750	69,468	44,925	48,578	43,234	30,915

Progressive revegetation of cleared areas is planned to be undertaken, which, taking into account carbon sequestration over time, a lower greenhouse gas estimate would be expected from the proportion assigned to clearing activities in Table 33.

Notwithstanding allowances for progressive rehabilitation, the average annual anticipated greenhouse gas emissions (CO_2-e) for the first six years of the Project is 43,129 tonnes CO_2-e. The total emissions for Western Australia based on published data in 2008 were 70.4 million tonnes CO_2-e (Department of Climate Change 2008). The impact on greenhouse gas emissions associated with the proposal represents a 0.06% of the total estimated emissions in Western Australia.

Management Strategies

Key Mitigation:	▪ 57 km truck route selected with low carbon footprint. ▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Greenhouse Gas and Energy (Appendix 13).

Truck Route Selection

Six alternatives were considered for the transport of ore through the local community to Moorine Rock which varied from 55 to 67 km in distance. In consultation with the community and local government a truck haulage route has been selected of 57 km, which represents one of the preferred alternatives with the lowest carbon footprints from a trucking perspective.

EMP Management Actions

Greenhouse gas management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Greenhouse Gas and Energy, and are in summary;

- Practices and training of personnel to minimise carbon footprint of the Project will be implemented including preventative maintenance of vehicles and machinery, maintenance of air-conditioning systems and refrigerant disposal off-site and, controls to minimise land clearing.
- All employees will be educated on energy efficient practices that can be used in their daily activities and the site induction will include a section on this issue.
- In accordance with the *National Greenhouse and Energy Reporting Act 2007*, greenhouse gases and energy consumption above the thresholds specified under the Act, will be reported.

- As part of the National Pollutant Inventory (NPI), quantities of air and ground emissions will be estimated or measured and reported under the programme. This will include emissions from various activities on-site including blasting, crushing, screening, combustion, vehicle movements and wind erosion (dust). These will be reported once the Project is in production and when reporting thresholds are met
- Future greenhouse gas emission targets will be set in accordance with measured and reported performance.

A study to consider conversion of ore haulage road train vehicles to gas fuel (in lieu of diesel fuel) is being investigated. If investigations are technically feasible and if viable, this initiative will be implemented, resulting in a reduction of CO_2-e emissions of 8-10% of overall greenhouse gas emissions annually.

Commitments

6.3.8 Greenhouse Gas

6.3.8-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Greenhouse Gas and Energy, for the management of greenhouse gases during mine development, operations, closure and rehabilitation.

Predicted Outcome

Conclusion:	▪ Greenhouse gas emissions for the Project are a small proportion of Western Australia's total. Greenhouse gas targets, management actions and statutory reporting will occur throughout the development. ▪ Project presents a Non-Significant impact for greenhouse gas.

6.3.9 Fire

EPA Objective

- Maintain the abundance, diversity, geographic distribution and productivity of vegetation, flora and fauna at species and ecosystem level through the avoidance and/or management of adverse impacts and improvement in knowledge.

Applicable Guidelines, Standards and Legislation

- Fire Management in the Kimberley and other Rangeland Regions of Western Australia. EPA Bulletin 1243 (EPA 2006c).
- *Bush Fires Act 1954.*
- *CALM Act 1984.*
- *Local Government Act 1995.*

Potential Impacts

Key issue: **Loss of vegetation or habitat**	▪ Hot work activities, vehicle exhausts, lightening strikes, unauthorised camping or discarded cigarette leading to bushfire which results in loss of vegetation or habitat.

Impact Assessment

Impact Summary	▪ Potential for bushfire which alters the Project area habitat.

Bushfire

There is potential for fire to occur associated with the proposal. The Project area at Mt Caudan has documented areas of fire which encompass parts of the impact area of the proposal. Altered fire regimes are evident with changes in vegetation and flora composition (BC 2010).

Fire is considered the greatest potential threat to fauna and fauna habitats in vast undisturbed native landscapes. However, it is well documented that adaptations of vegetation communities and flora to wildfires in Australia have evolved over millennia, with a concomitant evolution of fauna that inhabit these systems.

However, European settlement and resource development often alter fire regimes that result in changes to the structures of vegetation communities.

While the Parker Range area has had little historic anthropogenic disturbance, any change in the frequency of fire in the area as a result of mining activities could have adverse impacts on local biodiversity values.

Management Strategies

Key Mitigation:	▪ Extensive and varied management measures detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Fire (Appendix 13).

EMP Management Actions

Fire management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Fire, and are in summary;

- Establishment of fire breaks around perimeter of Project disturbance to minimise risk of fire extension originating from within the development.
- Fire prevention controls will include designated smoking areas (and cigarette disposal), safe work permits for all hot work such as welding, cutting and grinding.
- Vehicle movements will be restricted to designated site roads to minimise ignition risk from vehicle exhausts and dry vegetation.
- A site emergency response plan will be completed inclusive of response for fire, spills and personnel injury.
- Personnel will be informed of burning restrictions, fire prevention, and trained in the use of fire fighting equipment and procedures.
- The local Shire's restrictions on activities during severe fire hazard days will be observed.
- Flammable material will be cleared from the working area as soon as practical per good housekeeping practices.
- A memorandum of understanding for emergency response will be established with FESA Southern Cross and with other mining companies in the region.
- Fires will be recorded and reported to the DEC and DMP.

Flammable substances (such as diesel fuel) will be stored and handled in accordance with the management actions outlined in Dangerous Goods and Hazardous Substances within the EIA.

Commitments

6.3.9 Fire

6.3.9-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Fire, for the management of fire during mine development, operations, closure and rehabilitation.

Predicted Outcome

Conclusion:	▪ Project area has a history of altered fire regimes. Local and regional emergency response will be available. Prevention and mitigating actions identified. ▪ Project presents a Non-Significant impact for fire.

7.0 SOCIAL IMPACT ASSESSMENT AND MANAGEMENT RESPONSES

7.1 Aboriginal Heritage

EPA Objective

- Ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with the relevant heritage legislation.

Applicable Guidelines, Standards and Legislation

- *Aboriginal Heritage Act 1972.*
- EPA Guidance Statement No. 41: Guidance for the Assessment of Environmental Factors – Assessment of Aboriginal Heritage (EPA 2004c).

Potential Impacts

Key issue:

Loss or reduction of significant Aboriginal heritage sites.

- Clearing activities of significant sites or artefacts resulting in loss or reduction of Aboriginal heritage.

Impact Assessment

- No archaeological or ethnographic sites of significant in impact area.

Heritage Impact Assessment

An Aboriginal Heritage Survey has been conducted for the Mt Caudan mine and upper haul road area near Moorine Rock. No heritage sites (archaeological or ethnographic) have been identified at the Project.

Surveys of some infrastructure areas (i.e. the powerline route along Emu Fence Road) have not been completed.

Management Strategies

Key Mitigation:

- Management actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), Sub-plan Cultural Heritage. (Appendix 13).

EMP Management Actions

Aboriginal heritage management actions are provided in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Cultural Heritage and are in summary;

- Gap surveys of infrastructure areas (powerline route) and any other infrastructure will be undertaken in accordance with the *Aboriginal Heritage Act 1972.* Consultation with the same Aboriginal people per Appendix 12 will be completed.
- Inclusion of Aboriginal heritage awareness in site induction programs to aid in identification and preservation of any possible heritage sites.
- Periodic awareness training will be offered with traditional owner groups.
- Reporting of any new sites identified in compliance with Section 15 of the Aboriginal Heritage Act 1972.

Commitments

7.1 Aboriginal Heritage

7.1-1 Cazaly will consult with Aboriginal people and complete heritage survey for proposed powerline route prior to development. Results will be made public and conveyed to the EPA and DIA.

7.1-2 In the event an Aboriginal heritage site is discovered, Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Cultural Heritage, for the management of Aboriginal heritage during mine development, operations, closure and rehabilitation. Additionally, a specific Cultural Heritage Management Plan will be designed and implemented, in the event cultural material is discovered in the Project impact area.

Predicted Outcome

Conclusion:

- No Aboriginal heritage sites have been found in the Project area. In the event a site is discovered during development, the site will be preserved and managed per regulatory requirements.
- Project presents a Non-Significant impact for aboriginal heritage.

7.2 European Heritage

EPA Objective

- Ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with the relevant heritage legislation.

Applicable Guidelines, Standards and Legislation

- *Heritage Act of Western Australia 1990*.

Potential Impacts

Key issue:

Loss or reduction of significant European heritage sites

- Clearing or demolition activities of significant sites or buildings resulting in loss or reduction of European heritage.

Impact Assessment

- No sites of European heritage impacted (four sites adjacent to Project area).

No European Heritage Sites

The Shire Inventory Heritage Municipal lists four European heritage sites, all of which are adjacent to the Project area. Field investigations within the Project impact area determined there are no European heritage sites within the Project area, hence no impact is possible.

Management Strategies

Key Mitigation:

- No mitigating management strategies are proposed.

Commitments

No commitments are required for European Heritage.

Predicted Outcome

Conclusion:

- There are no European heritage sites of significance within the Project development.
- Project presents a Non-Significant impact for European heritage.

8.0 SUSTAINABILITY

8.1 Sustainability Principles

In August 2004, the EPA released its position paper on sustainability (Position Statement No. 6 'Towards Sustainability'), which outlines the EPA's views on matters of environmental importance in relation to sustainability. The position paper also defines a range of questions to be asked when proposals are undergoing environmental assessment to determine whether the proposed activities are consistent with attaining the goal of sustainability (EPA 2004d). These questions, along with Cazaly's response, are listed in Table 34.

Table 34: Sustainability Checklist (EPA 2004d)

Question	Response
Does the proposal deplete non-renewable resources significantly?	Yes. The proposal involves the mining of mineralised deposits, and diesel fuels.
Does the proposal deplete assimilative capacity significantly?	No. The Project does not significantly reduce the assimilative capacity of the surrounding environment.
Does the proposal use natural resources responsibly?	Yes. The use of natural resources has been minimised by: Design of Project within a compact footprint to minimise disturbance. Ensuring maximum water recycling from the tailings facility for use in the processing circuit. The wash down bay will include a hydrocarbon separator for re-use of 'cleaned' water. Project has chosen to transport the product to the Moorine Rock rail siding. In addition to the cost savings for haulage, transport by rail reduces greenhouse gas emissions and impacts to local road and traffic.
Does the proposal satisfactorily restore any disturbed land?	Yes (with the exception of the open pit). Vegetation and topsoil will be stockpiled during clearing activities for use in future rehabilitation works. Progressive rehabilitation will occur wherever practicable. Cazaly has developed a Conceptual Decommissioning and Closure Plan which will be progressively updated throughout the life of the Project.
Does the proposal follow the waste hierarchy and manage satisfactorily any waste produced?	Yes. All domestic and industrial waste will be disposed off site. A waste management and recycling program will be implemented from the commencement of construction and be ongoing during the Project life based on reduce, reuse and recycle.
Does the proposal incorporate best practice in water and energy efficiency?	Yes, water will be recycled through the tailings circuit and wash down bays. Use of modern equipment with high efficiency.
Does the proposal make good use of best practice to prevent pollution?	Yes, all potential pollutants will be contained and managed within the operational footprint, using concrete slabs and containment bunding; toe-drains and recovery bores to recover seepage from the TSF. No adverse reagents will be used in the process therefore minimising the risk of impacts on the environment.
Does the proposal increase use of non-renewable transport fuels?	Yes, however the impact of the use of non-renewable fuels will be minimised by: Compact site footprint to minimise vehicle movements on-site.
Does the proposal use energy efficient technologies?	Yes. Modern high efficiency drive motors. Diesel/LNG powered road train technologies may be included.
Does the proposal result in net improvements in biodiversity?	Yes, the Project has and will continue to contribute to the body of knowledge on biodiversity in the region, particularly the Parker Range PEC. Establishment of Conservation Trust will place significant areas identified of reserve for protection of biodiversity.
Does the proposal increase greenhouse gas emissions?	Yes, however this is non-significant on a regional scale within the State. Cazaly will also produce an annual NPI and NGERS report with performance targets.
Does the proposal involve acceptable levels of risk?	Yes, the Parker Range Iron Ore Project is of low risk and can be managed at an acceptable level.
Does the proposal have a secure foundation of scientific understanding of its impacts?	Yes, the ore and groundwater have undergone chemical analyses to ensure understanding of their constituents. Scientific investigations have been undertaken in relation to vegetation and flora, fauna, soils, ARD and Aboriginal heritage.
Does the proposal minimize the ecological footprint?	Yes, the Project has been designed to minimise the disturbance footprint as much as practicable. This will be further optimised during development.

Question	Response
Does the proposal avoid or minimize adverse impacts and promote beneficial impacts on the surrounding community?	Yes, consultation with local landowners has been undertaken to minimise impacts on the community. Promotion of community based programs with local shire.
Does the proposal produce sustainable net economic benefits?	Yes, sustainable net economic benefits as described in Section 2.4.
Does the proposal produce sustainable net social benefits?	Yes, there will be employment opportunities for local indigenous people where practicable, and direct and indirect benefits for the local communities, particularly the township of Marvel Loch.
Does the proposal add to heritage protection and provide a sense of place?	Yes, the Project has developed a Cultural Heritage Management Plan to ensure heritage protection (Note: No significant sites have been detected in the impact area).
Does the proposal produce net environmental benefits?	Yes, the Project has and will continue to contribute to the understanding of the biodiversity and ecology of the region. Areas disturbed by the Project will be rehabilitated using native species to the area. Environmental offset offered for key residual impacts.
Does the proposal contribute to a more equitable and just society?	Yes, local communities and local indigenous people will have the opportunity to benefit either directly or indirectly from this Project, which may include job opportunities and improved resources.
Does the proposal interact positively with other likely developments?	Yes. The Project will re-invigorate existing infrastructure at Marvel Loch and improve standards of roads for grain haulage activities and other users on Parker Range Road. In addition, improved utilisation of key infrastructure (Rail and Port) is a further downstream benefit.
Does the proposal provide new opportunities (social, economic or environmental)?	Yes, described throughout the table above.

8.2 Environmental Issues in relation to Environmental Principles

The *EPBC Act 1999* (Section 3A) lists five principles of ecologically sustainable development:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- The principle of inter-generational equity - that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;
- Improved valuation, pricing and incentive mechanisms should be promoted.

The *Environmental Protection Act 1986* (Section 4A) requires that the EPA take into account the following principles in the assessment of development proposals:

Cazaly believes that consideration of alternative designs for the Project, the extent of environmental investigations undertaken and proposed, the level of stakeholder and community consultations and the commitment to environmental awareness training of all personnel involved in the construction and operation phases of the Project demonstrates these principles have been addressed.

The DEC will be consulted on advice for preservation and/or conservation Projects to which the proponent can contribute as primary and secondary offsets to Project impacts. Offset possibilities are being discussed with DEC and DEWHA.

In addition, the proponent has developed and will implement an Environmental Management Plan (EMP) for this Project. The EMP provides a systematic process for ensuring compliance with legal requirements, minimisation of environmental impacts, and continual improvement in environmental performance.

Table 35 lists the Environmental Issues and Factors associated with the Project in relation to the Principles outlined in Section 4A of the *Environmental Protection Act 1986.*

Table 36 lists the lists the Environmental Issues and Factors associated with the Project in relation to the Principles and Section 3A of the *EPBC Act 1999*.

A summary of the environmental issues and impacts and the management strategies that will be used by Cazaly to mitigate those impacts and issues is presented in the Executive Summary.

Table 35: Environmental Principles (*EPA Act 1986* Section 4A)

Principle	Relevant (Yes/No)	If yes, consideration	Addressed (Yes/No)	Section(s) in PER
1.The precautionary principle Where there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by: Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and An assessment of the risk-weighed consequences of various options.	Yes	Cazaly have considered a number of alternatives and have chosen the current proposal that provides them with a suitable option that has the least environmental impact. All environmental investigations have been undertaken to ensure adverse environmental impacts are minimised. Comprehensive studies have been undertaken to provide detailed information to address potential environmental impacts. Cazaly have undertaken detailed flora and fauna surveys and hydrological assessments to be able to provide a detailed assessment of what occurs in the Project area, and the management measures to be implemented to protect any flora or fauna species of conservation significance or significant habitat that may occur. Where a lack of full scientific certainty arises, the precautionary principle has been applied through adopting a risk-based approach to address the uncertainty and by adopting cost-effective measures to minimise the risk of impacts.	Yes	Section 2.6
2. The principle of intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.	Yes	The only emissions produced will be those from vehicles and equipment. Given the timeframe and scale of the Project these are considered insignificant on a regional scale. No significant long term emissions or greenhouse gas emissions will be produced for the Project. Vegetation clearing and loss of biodiversity is expected to be at a minimum on this Project, due to a small impact footprint and that disturbed areas are used where possible, including the reinstatement of pre-existing pits. Mine closure will be conducted to ensure that disturbed areas are fully rehabilitated to resemble the original composition, noting a 58 ha impact area of pit void will remain. The risks to threatened & restricted species have been assessed within this proposal and are not expected to be significant. Loss of habitat will be minimised and returned to species of conservation or concern once rehabilitation has been completed. Landscape scale impacts will be most evident with respect to WRL development and pit excavation/void. The design of WRL has taken into account the need to blend such structures into the existing environment and has also considered the adequate flow of local drainage channels.	Yes	Section 6.0
3. The principle of the conservation of biological diversity and ecological integrity The conservation of biological diversity and ecological integrity should be a fundamental consideration.	Yes	The Project will involve the disturbance of 421 ha of native vegetation. Flora, fauna and hydrological surveys have been completed. Vegetation communities are well represented in the wider known region (largest impact is 10.7% of any single community type and 13.9% of any single Priority Flora type).	Yes	Section 6.0

Principle	Relevant (Yes/No)	If yes, consideration	Addressed (Yes/No)	Section(s) in PER
4. Principles relating to improved valuation, pricing and incentive mechanisms (a) Environmental factors should be included in the valuation of assets and services (b) The polluter pays principle – those who generate pollution and waste should bear the cost of containment , avoidance and abatement (c) The user of goods and services should pay prices based on the life cycle of providing goods and services, including the use of natural resources and assets and the ultimate disposal of waste (d) Environmental goals, having been established, should be pursued in the most effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximize benefits and/or minimise costs to develop their own solution and responses to environmental problems.	Yes	The project development has been proposed with recognition of environmental values through-out. Project footprint areas will be minimised and area of conservation significance avoided or offset. Costs associated with the development and operation of the Project, including decommissioning and rehabilitation will be borne by Cazaly. Project funding will be obtained from customers purchasing the mining product. Cazaly has undertaken to dispose of waste through-out mine operations in off-site facilities. Cazaly's commitment to continual improvement and ongoing license to operate environmental approval is reflected in Environmental Policies and Management Plans. Regulator reporting and transparency is offered through-out these policies, plans and management commitments.	Yes	Section 2.5 Section 4.0 Section 6.0 Appendix 2 Appendix 13
5. The principle of waste minimisation All reasonable and practicable measures should be taken to minimize the generation of waste and its discharge to the environment.	Yes	Cazaly has addressed the management measures to minimise the production of waste in this PER. All project waste shall be management and disposed in an off-site facility. Management measures to reduce, re-use and re-cycle have been proposed. Stormwater will be captured in dedicated system to prevent waste emissions and surface water hydrocarbon emissions in cases (excluding large infrequent storm events).	Yes	Section 4.0 Section 6.0 Appendix 13

Table 36: Environmental Principles (*EPBC Act 1999* Section 3A)

Principle	Relevant (Yes/No)	If yes, consideration	Addressed (Yes/No)	Section(s) in PER
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;	Yes.	Environmental impacts have and will continue to be taken into consideration at all stages of the design, construction and operational phases of the Project.	Yes	Section 6.0 Appendix 2
If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;	No.	The Project will minimize impacts through appropriate design of facilities with a focus on limiting vegetation loss. Detailed scientific investigations into existing environment to accurately assess potential impacts have and will continue for the Project area. Best industry practices will be applied throughout the design, construction and operational phases of the Project. Detailed preparation of management plans for key environmental factors will be developed prior to Project commencement.	Yes	Section 5.0 Section 6.0 Appendix 13
The principle of inter-generational equity - that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;	Yes	Detailed investigations will occur into existing environment for reporting purposes and will become part of the environmental management plans. Cazaly will employ ongoing management and monitoring of the surrounding environment where required. Appropriate decommissioning and rehabilitation will be considered and developed throughout the Project, including progressive rehabilitation of disturbed areas.	Yes	Section 6.0 Appendix 13 Appendix 14
The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;	Yes	Investigations into terrestrial ecology will be commissioned as required. A flora and vegetation assessment of the Project area has been completed meeting the requirements of Guidance Statement 51 (EPA 2004a). Prior to disturbance, Cazaly Environmental staff will manage and control searches and clearing activities. Environmental offsets and future study contribute to the conservation of biodiversity within the PEC. Specific environmental management plans have been developed to ensure the ongoing protection of biological and ecological diversity.	Yes	Section 5.0 Section 6.0 Appendix 13
Improved valuation, pricing and incentive mechanisms should be promoted.	Yes	Cazaly demonstrated commitment in management actions and policies.	Yes	Section 6.0 Appendix 2

8.3 Environmental Offsets

EPA Objective

- To compensate for any significant residual impacts of the proposed development which target matters of national and state environmental significance (where impacts cannot be avoided or managed).

Applicable Guidelines, Standards and Legislation

- *EPA Act, 1986:* Environmental Offsets.
- EPA Guidance Statement No. 19: Guidance for the Assessment of Environmental Factors – Environmental Offsets – Biodiversity No. 19 (EPA, 2008a).
- EPA Position Statement No. 9 – *Environmental Offsets* (EPA, 2006d).

Potential Impacts

Key issue:

Offsets to preserve conservation and biodiversity principals

- Project development results in reduction in conservation of vegetation and habitat and/or biodiversity of the area and/or region.

Impact Assessment

Impact Summary

- Vegetation communities (13 Mt Caudan, 9 Upper Haul Road, 6 Powerline Corridor) cleared totalling 421 ha.
- Seven priority flora species cleared.
- Indirect dust impacts associated with *Isopogon robustus* (DRF).
- Approximately 49 ha of preferred Malleelfowl habitat cleared.
- Loss of low mobility vertebrates and invertebrates associated with clearing.
- 58 ha reduction in troglofauna habitat associated with pit void and pit lake.

Overview of Impacts

Project key impacts (direct and indirect) identified in the EIA will be summarised herein and a proposed environmental offset for each impact discussed.

Vegetation communities (12 Mt Caudan, 14 Parker Range bypass road, 10 Powerline Corridor) will be directly impacted by the 421 ha of estimated clearing associated with the Project. The EIA has identified six of these vegetation communities which are not in current nature reserves. However none of the vegetations communities impacted would be considered critical assets as defined in EPA Guidance Statement No 9 – Environmental Offsets (EPA 2006a).

The vegetation community type 6 for *Isopogon robustus* (DRF) (*Callitris glaucophylla* on Decomposing Laterite and granite) is indirectly affected from dust associated with the Project. The 1,020 mature plants are unlikely to be affected from dust emissions.

Preferred Malleefowel habitat *(Acacia* sp. Narrow phyllode and *Melaleuca eleuterostachya* shrubland and Mallee heath) will be directly impacted by clearing associated with the Project. Known active and inactive nesting mounds will be indirectly affected from dust associated with the Project.

Priority flora species *Baeckea grandibracteata* subsp. Parker Range (P1), *Lepidosperma* sp. Parker Range (P1), *Lepidosperma* sp. Mt Caudan (P1), *Acacia concolorans* (P2), *Hakea pendens* (P2), *Cryptandra crispula* (P3), and *Banksia shanklandiorum* (P4) will be directly impacted by clearing associated with the Project.

Vertebrates and invertebrates which have low mobility will be impacted directly from clearing activities associated with the Project.

A pit void and pit void lake is necessary with the proposal. The Mt Caudan north and central mine areas represent a 58 ha footprint, which will result in loss of eight troglofauna taxa identified in habitat.

Table 37 provides a summary of the key Project impacts and proposed environmental offsets.

Table 37: Summary of Key Project Impacts and Proposed Environmental Offsets

Matter of Environmental Significance	Decription Key Project Impact	Estimated Impact	Environmental Offset Target Outcome
Vegetation Communities	Clearing of vegetation communities (12 Mt Caudan, 14 Parker Range bypass road, 10 Powerline Corridor) totalling 421 ha.	421 ha (direct)	Acquisition of fragmented (pastoral land) and poorly understood (PEC) naitive vegetation, particularly focussed on the six vegetation types not in conservation. Research and project programs to be instigated.
Fauna Habitat - Malleefowell	Preferred habitat *Acacia* sp. Narrow phyllode and *Melaleuca eleuterostachya* shrubland (2 ha) and Mallee heath (47 ha).	49 ha (direct)	Acquisition fragmented naitive vegetation habitat (pastoral land), preferred by Malleefowl. Focus on linking and rehabilitation of fragmented vegetation. Conservation reserve creation and research programs to be instigated.
Flora – *Isopogon robustus*	Approx 64 ha of preferred floralistic habitat Decomposing laterite breakaway identified in PEC. The 1020 mature plants unlikely to be indirectly impacted by dust.	64 ha (indirect)	Surveys of Decomposing laterite breakaway in PEC and identification of further *Isopogon robustus* populations. Acquisition of vegetation type for conservation and research programs to be instigated (including re-growth trials from seed).
Flora – Prioirty species	Seven Prioirty flora species (3 x P1's, 2 x P2's, 1 x P3, 1 x P4).	11,916 plants (direct)	Survey and research programs for the PEC to improve understanding of biodiversity of flora in the region. Particular focus on Lepidsperma sp. taxa for genetic identification.
Fauna - Terrestrial	Invertebrates and vertebrates with low mobility.	Cannot be estimated.	Survey and research programs for the PEC to improve understanding of biodiversity of terrestrial fauna in the region. Particular focus on invertebrates for genetic identification.
Fauna - Troglofauna	Eight troglofauna taxa associated with BIF laterite ridge habitat (58 ha)	8 taxa 58 ha (direct)	Acquisition of established BIF laterite and other rock type habitat preferred by troglofauna in PEC. Research into identification and understanding of regional troglofauna (within 50 km), with focus on four singletons identified.

Management Strategies

Key Mitigation:

- Establishment of the Parker Range Conservation Trust.
- Acquisition of asset areas for conservation, study and research within PEC and fragmented naitive vegetation in Yilgarn of importance to state and nation.

Parker Range Conservation Trust and Mandate

The Parker Range PEC represents a region of documented biodiversity which is of significant conservation interest for both the State and the nation. The biodiversity of Priority and threatened declared rare flora and Priority fauna is documented in studies underpinning this EIA and further works undertaken by DEC. The area is also part of the Great Western Woodlands, which encourages a collaborative objective towards conservation and biodiversity of the greater region.

Cazaly undertakes to establish the Parker Range Conservation Trust (PRCT), which will be initially funded from the Parker Range Operation. Cazaly will adopt the following initial strategy for the PRCT;

- Establish PRCT (trust legal operating entity) and Board of Trustees (Board) within six months of Parker Range Operations commencement with Board representatives from Cazaly (1) and DEC (1). The Cazaly Board Representative will assume the role of Chairperson for formal meetings. The Board will be advised by a Committee which will include (but not necessarily limited) to representative's from the Conservation Council (1), Great Western Woodlands (1), Mallelfowl Preservation Group of WA (1), Wildflower Society (1) and other non-government organisations at invitation of the PRCT. The Board may also invite participation or appoint to the advisory Committee government organisations from Western Australian Museum, Botanic Garden and Parks Authority, DEC Science Division and academic advisors as required for specialst advice.
- PRCT to identify target areas of fragmented threatened naitive vegetation and areas within the PEC which represent bioregions to contribute to the medium and long term conservation and biodiversity for the state and national interest per Table 37. Existing understanding within this EIA will be used as basis for initial target area identification.

- PRTC to fund acquisition of crown reserve or freehold pastoral land up to a target area of 4 times the forecast impact area of the Project for conservation. Based on a total impact area clearing of 421 ha, this represents a target area for acquisition of 1684 ha. Acquisition of land exceeding this target may be undertaken; on the proviso no additional financial commitment from Cazaly is necessary.
- The PRTC will invite proposals for projects, prioritise, cost, fund and manage conservation and research initiatives to a Board approved annual budget.
- Cazaly's financial commitment to the PRCT will be determined based on a rate per hectare associated with project clearing payable for the life of mine inclusive for the period of mine closure and rehabilitation (i.e. 10 years+). The financial contribution by Cazaly (i.e. $ / ha) is to be determined in consultation with OEPA (on behalf of the State) and DEWHA (on behalf of the Commonwealth). The contribution for funds would be in proportion to the Project actual measured area of disturbance in the 4:1 ratio.
- The PRCT will provide an annual report to the DEC and/or EPA and be subject to review and audit.

A Charter for the PRCT is provided as Appendix 16.

Although initially established by Cazaly, the PRCT could continue conservation initiatives beyond the Parker Range Project, with sufficient funding from industry and government groups.

Commitments

8.3 Environmental Offsets

8.3-1 Cazaly will establish and fund the Parker Range Conservation Trust (to be set-up within 6 months of first ore from Parker Range operations) with a mandate to acquire asset areas for conservation, study and research within Parker Range PEC and fragmented native vegetation in the Yilgarn.

Predicted Outcome

Conclusion:	▪ A new Trust will be established to with a mandate to acquire asset areas for conservation, study and research in the Parker Range region. The Trust will be guided by conservation of biodiversity in the State and Nation's interest. ▪ Cazaly presents an environmental offset package to compensate for key Project residual impacts.

9.0 ENVIRONMENTAL MANAGEMENT COMMITMENTS

Commitments with respect to Project development, operation and closure made throughout the PER are presented in summary:-

6.2.1 Vegetation

6.2.1-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Clearing and Rehabilitation for the management of vegetation assemblages during mine operations, closure and rehabilitation.

6.2.2 Flora

6.2.2-1 Cazaly will implement actions detailed in Project Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface Water Management, sub-plan Flora and Fauna Management, sub-plan Robust Coneflower Management, sub-plan Land Disturbance and Rehabilitation for the management of flora during mine operations, closure and rehabilitation.

6.2.3 Terrestrial Fauna

6.2.3-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Flora and Fauna Management, sub-plan Malleefowl Management for the management of terrestrial fauna during mine development, operations, closure and rehabilitation.

6.2.4 Subterranean Fauna

6.2.4-1 Cazaly will commit to further field survey (scrape and trapping) of troglofauna within local Project area and regionally within suitable habitat of the PEC to improve the understanding of the species distribution and abundance within 12 months of operations commencement.

6.2.5 Invertebrate Terrestrial Fauna

6.2.5-1 Cazaly will implement clearing controls to maintain a 25 m buffer distance from known *Aganippe castellum* (Tree-stem Trapdoor Spider) for the management of this Rare Species during mine development, operations, closure and rehabilitation.

6.2.6 Groundwater

6.2.6-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater, for the management of groundwater during mine development, operations, closure and rehabilitation.

6.2.6-2 Cazaly will implement a groundwater monitoring and reporting program with monitoring bores established within and adjacent to the Project impact area.

6.2.7 ARD and Metal Leaching

6.2.7-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater, for the management of ARD and metal leaching during mine development, operations, closure and rehabilitation.

6.2.7-2 Cazaly will monitor mine waste for PAF and if detected segregate in purpose designed PAF encapsulation cell within the waste landform.

6.2.8 Dust

6.2.8-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Air Quality, for the management of dust generated during mine development, operations, closure and rehabilitation.

6.2.8-2 Cazaly will undertake annual environmental health surveys of vegetation, flora and fauna in areas within predicted dust impact zone (including reference areas outside impact zone) and report to DEC and DMP.

6.2.8-3 Cazaly will undertake monthly dust monitoring for the workforce and sensitive dust receptors within the community.

6.2.8-4 Cazaly will provide an incident reporting and corrective action investigation process for dust emissions for the community use.

6.2.8-5 Cazaly will meet quarterly (year 1), then biannual (year 2+) with a Consultation Committee to provide performance data (such as dust) and seek improvement opportunities.

6.2.9 Noise and Vibration

6.2.9-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Noise and Vibration, for the management of noise and vibration during mine development, operations, closure and rehabilitation

6.2.9-2 Cazaly will undertake monthly noise monitoring for the workforce and sensitive noise receptors within the community.

6.2.9-3 Cazaly will provide an incident reporting and corrective action investigation process for noise emissions for the community use.

6.2.10 Rehabilitation and Closure

6.2.10-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation, for the management of mine rehabilitation and closure.

6.2.10-2 Cazaly will implement actions detailed in Parker Range Conceptual Mine Closure Plan (Appendix 14) for the management of rehabilitation and closure.

6.2.10-3 Cazaly will review and update the Parker Range Conceptual Mine Closure Plan (Appendix 14) on a 3 yearly basis throughout the life of the Project.

6.2.10-4 Cazaly will monitor the rehabilitation program of the mine annually post-closure of the mine until EFA performance outcomes are achieved for any two consectutive years.

6.2.10-5 Cazaly will monitor the indigenous and feral fauna populations during mine closure and if found to materially increase in numbers, will install fauna exclusion fencing around the perimeter of Mt Caudan north and central open pit voids.

6.3.1 Landform and Soils

6.3.1-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Land Disturbance and Rehabilitation for the management of soils during mine development, operations, closure and rehabilitation.

6.3.2 Weed Species and Dieback

6.3.2-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001) sub-plan Weed and Dieback and sub-plan Land Disturbance and Rehabilitation for the management of weeds during mine development, operations, closure and rehabilitation.

6.3.3 Surface Water Management

6.3.3-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater, for the management of surface water during mine operations, closure and rehabilitation.

6.3.4 Erosion

6.3.4-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Surface and Groundwater, sub-plan Land Disturbance and Rehabilitation for the management of erosion during mine development, operations, closure and rehabilitation.

6.3.5 Waste Products

6.3.5-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Waste and Pollution, for the management of waste during mine development, operations, closure and rehabilitation.

6.3.6 Dangerous Goods and Hazardous Substances

6.3.6-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Hydrocarbon and Chemical, for the management of dangerous goods during mine development, operations, closure and rehabilitation.

6.3.7 Light

6.3.7-1 Cazaly will implement design and position lighting to limit spill outside the Project impact area.

6.3.8 Greenhouse Gas

6.3.8-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Greenhouse Gas and Energy, for the management of greenhouse gases during mine development, operations, closure and rehabilitation.

6.3.9 Fire

6.3.9-1 Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Fire, for the management of fire during mine development, operations, closure and rehabilitation.

7.1 Aboriginal Heritage
7.1-1 Cazaly will consult with Aboriginal people and complete heritage survey for proposed powerline route prior to development. Results will be made public and conveyed to the EPA and DIA.
7.1-2 In the event an Aboriginal heritage site is discovered, Cazaly will implement actions detailed in Environmental Management Plan (M8521-G00-EN-PL-001), sub-plan Cultural Heritage, for the management of Aboriginal heritage during mine development, operations, closure and rehabilitation. Additionally, a specific Cultural Heritage Management Plan will be designed and implemented, in the event cultural material is discovered in the Project impact area.
8.3 Environmental Offsets
8.3-1 Cazaly will establish and fund the Parker Range Conservation Trust (to be set-up within 6 months of first ore from Parker Range operations) with a mandate to acquire asset areas for conservation, study and research within Parker Range PEC and fragmented naitive vegetation in the Yilgarn.

10.0 COMMUNITY AND OTHER STAKEHOLDER CONSULTATION

10.1 Consultation Undertaken

Table 38 lists the groups and organisations Cazaly have consulted with in relation to the Project since 2009.

Table 38: Consultation Register

Meeting Date	Stakeholder (Attendees)	Parker Range Project Attendees	Meeting Purpose / Consultation Discussion
31 August 2009	CBH Group (M.Johnson, E.Kalajzic)	M.Timbrell	Discussions regarding shared synergies at CBH Grain Terminals with the Project at Southern Cross, Moorine Rock, and Bodallin).
2 September 2009	Shire of Yilgarn (P.Clarke, R.Bossenberg)	M.Timbrell, M.Walker(Lycopodium), J.Shaw (Lycopodium, A.Harvey(Lycopodium)	Discussion Project issues from mine development to truck routes and existing commerce / infrastructure in Shire.
2 September 2009	CBH Group (A.Walker)	M.Timbrell, M.Walker(Lycopodium), J.Shaw (Lycopodium, A.Harvey(Lycopdoium)	Site inspection of regional CBH Grain rail sidings and discussion technical issues.
11 September 2009	Main Roads of Western Australia (D. Morgan)	M. Walker (Lycopodium)	Government policy associated with RAV trucking, concessional loading schemes (West of Kalgoorlie) and Project freight task (use Shire roads).
3 to 9 November 2009	Traditional Land Owners (Gubrun People, Central West People, Ballardong People)	W.Glendenning(WHR)	Site visit and discussions regarding Project area. No areas/sites of significance identified by any group.
12 October 2009	Western Power (T. Linley)	J. Shaw(Lycopodium)	Discussions regarding Marvel Loch power system and capacity for supply to Project.
16 October 2008	Department of Environment and Conservation (S.Thomas, D.Coffey)	K.Lindbeck(KLA)	Discussion regarding fauna surveys and further work for Project.
20 November 2009	St Barbara Mines Ltd (K.Payne, R.Parray, D.Rose)	M.Timbrell, B.Osmetti(Lycopodium)	Discussion synergies between Marvel Loch and Airport between Marvel Loch Gold Operations and the Project.
13 November 2009	Shire of Yilgarn (Councillors)	M.Timbrell, N McMahon, C.Jones	Presentation of Project and discussion on key issues.
4 December 2009	Shire of Yilgarn (P.Clarke)	J. Shaw(Lycopodium)	Discussion on water and health requirements and building code requirements.
15 December 2009	Dept of Mines and Petroleum / Department of Environment and Conservation (A.Bartleet, D.Coffey)	M.Timbrell, K.Lindbeck(KLA)	Discussions regarding mining and environmental impact assessment for Project (including mine closure, water and flora/fauna)
19 January 2010	Department of Education (P.Newnham)	M.Timbrell	Discussion and finalise approach development approach for Marvel Loch School Site.
8 February 2010	Office of EPA (H.Dagnall, P.Tapsell)	M.Timbrell, K.Lindbeck(KLA)	Discussions regarding review of ESD submission for Project
20 February 2010	CBH Group (A.Walker, G.Smallman, E.Kalajzic)	M.Timbrell	Discussions regarding proposed rail terminal locations and grain siding proximity for the Project.
24 February 2010	Australian Railroad Group (I.McLeod,T.Stratton, M.Jones)	M.Timbrell, J.Goodall(BRS)	Discussions regarding rail freight requirements for Project.
24 February 2010	Department of Environmental Conservation & EMB (D.Coffey, S.Thomas, N.Caporn)	M.Timbrell, J.Williams(Botanica), K.Lindbeck(KLA)	Discussions regarding the vegetation, flora, fauna and water surveys at the Project.
26 March 2010	Office of EPA / Department of Environment and Conservation / Environmental Management Branch (H.Dagnall, P.Tapsell, N.Caporn, D.Coffey, S.Thomas)	M.Timbrell, J.Williams(Botanica), K.Lindbeck(KLA)	Discussion regarding ESD and alignment on key environmental criteria for impact assessment.
15 April 2010	Department of Indigenous Affairs (S.McGann, C.Rodregez)	M. Timbrell, W.Glendenning(WHR)	Consult findings Heritage Surveys and discuss Cultural Management Plan requirements.
16 April 2010	Various Yilgarn Rural Landholders	M. Timbrell	Consult on various truck route options to propose Moorine Rock Rail Terminal.

Meeting Date	Stakeholder (Attendees)	Parker Range Project Attendees	Meeting Purpose / Consultation Discussion
20 April 2010	Truck Route Stakeholders & Shire of Yilgarn Councillors	M. Timbrell, N. McMahon	Present findings of truck route options and seek feedback for recommended truck route.
5 May 2010	Various Yilgarn Rural Landholders	M. Timbrell, R. Haigh (Cardno)	Consult on various truck route options to propose Moorine Rock Rail Terminal.
2 June 2010	Department of Environment and Conservation (S.Thomas, D.Coffey, M.Smith), Office EPA (H.Dagnall)	M.Timbrell, J.Williams (Botanica)	Overview of studies and impact assessment discussion on flora.
3 June 2010	Shire of Yilgarn (E.Piper, W.Dallywater, R.Bossenberg, V.Murphy)	M. Timbrell, I Jaeche	Consult on various issues for truck route, Rail Terminal and Village Development.
11 June 2010	Conservation Council (G.Rundall), Greater Western Woodlands (P.Price), Wildflower Society (B. Moyle)	M.Timbrell, J.Williams (Botanica)	Site visit to Parker Range and field observation/discussion on Priority vegetation and flora in impact area.
15 June 2010	T.Wibisono (DOW)	M.McGowan (Rockwater)	Discuss water bores and water exploration.
7 July 2010	Office of EPA (H.Dagnall, J.Dell, P.Tapsell, C.Murray), DEC (S.Thomas, D.Coffey)	M.Timbrell, C.Jones J.Williams (Botanica) K.Lindbeck, V.Saffer (KLA)	Site visit to Parker Range and field inspection vegetation, flora and fauna
19 August 2010	DEC (S.Thomas, D.Coffey), DOW (J.Rose, Y.Brookes, R.Short), DMP (E. Bouwhuis)	M.Timbrell, J.Williams (Botanica), K.Lindbeck, V.Saffer (KLA), N.Everlegh (Rockwater)	Discussion on PER and consultation on key environmental factors and impacts. Mining discussion on closure and rehabilitation proposed.
9 September 2010	DEWHA (L.Butterfield, T.English)	M.Timbrell, N.McMahon, K. Lindbeck (KLA)	Discussion on PER and consultation on controlling actions.
24 September 2010	Malleefowl Preservation Society (S.Dennings, A.Dennings)	M.Timbrell V.Saffer (KLA)	Discussion on Malleefowl impacts and consultation for preservation initiatives.

10.2 Future Consultation

Cazaly will continue to consult widely throughout the Project development with existing network of stakeholders.

Cazaly will facilitate periodic working group meetings and workshops to seek feedback on proposed development and potential adverse impacts.

Cazaly will aim to maintain a high level of communication throughout the Project and to obtain input from stakeholders in relation to all aspects of the development, emphasising environmental management options and seeking improvements in performance.

Future consultation proposed for rehabilitation and closure is provided within the Conceptual Rehabilitation and Closure Plan (Appendix 14).

11.0 STUDY TEAM

11.1 Parker Range Study Team

Cazaly Resources Limited has assembled and experienced study team to evaluate the Project and develop the EIA approach, planning and delivery framework. The team is led by Cazaly, whom has commissioned various external consultants to undertake specialist investigations and provide advice. Table 39 provides a summary of the study team members.

Table 39: Project Study Team

Key Team Member	Position Title	Organisation	Experience
Mr Matt Timbrell	Senior Project Manager	Cazaly Resources Limited	Mining, Operations and Project Delivery. Major Project delivery experience from Study to Implementation (recent Hope Downs Stage 2 Iron Ore Development, for Rio Tinto)
Mr Greg Miles	Exploration Manager	Cazaly Resources Limited	Geology & Resources. Extensive experience in exploration for iron ore and resource definition (in association with Runge Ltd)
Mr Keith Lindbeck	Principal Consultant	Keith Lindbeck & Associates	Approvals, Environmental & Landform/Soils. Ex DMP Manager of Environmental Division, extensive experience in Commonwealth and State approvals and required environmental evaluation for major Projects.
Dr Vi Saffer	Senior Zoologist	Keith Lindbeck & Associates	Terrestrial Fauna. Extensive experience in fauna surveys for major Projects.
Mr Jim Williams	Director	Botanica Consulting	Vegetation & Flora. Extensive experience in the Goldfields region for major Projects with vegetation and flora surveys.
Mr Nick Evelegh	Principal Environmental Scientist	Rockwater Pty Ltd	Subterranean Fauna. Extensive experience in sampling on major Projects (in association with Bennelongia Environmental Consultants) in Goldfields.
Mr Peter de Broekert	Principal Hydrogeologist	Rockwater Pty Ltd	Hydrology. Extensive experience in hydrology modelling and field testing for major mining Projects in Goldfields
Mr Paul Daley	Principal Consultant	Herring Storer Acoustics	Noise Assessment and Modelling – extensive experience in baseline surveys & simulation
Mr Raz Vlad	Principal Consultant	Ecotech Pty Ltd	Dust Assessment and Modelling – extensive experience in baseline surveys and simulation.

11.2 Peer Review

Cazaly has engaged the services of Golder and Associates Pty Ltd, environmental division to undertake a peer review of the Project PER, per the following terms of reference:

- Audit the PER Report with respect to compliance to EPA Guideline for PER compilation.
- Audit of the PER document and appended reports with respect to compliance with the environmental scoping document and EPA Guidance Statements, Positions Statements and Policies.
- Review consultant study reports and EMP (Appendices to PER) compiled by the Project study team to assist the EIA for the Project.
- Proofreading of the document to ensure quality control including ensuring the document is complete and checking for typographical and formatting errors.

The peer review team consisted of the following Golder and Associates Pty Ltd personnel;

- Mr James Holme, 10 years' experience, Peer Review Leader, various major project and previous Government roles.
- Dr Rob Jessop, 16 years' experience, major project approvals including international experience.
- Jaclyn Goad, 6 years' experience in approvals, previously with DEC.

A letter was prepared by Golder and Associates for Cazaly on 5 August 2010 indicating this PER was compliant with the terms of reference provided for the peer review. A subsequent peer review report was received on 19 August 2010.

12.0 CONCLUSION

This PER has provided detail on the existing natural and human environment within the region and Project area, detailed the proposal, considered alternatives and evaluated impacts and management actions for the development.

The PER has assessed the significance of impacts and provided plans to control and manage those impacts for all probable environmental and social factors.

The Project will be undertaken in accordance with the EPA's Principles of Environmental Protection. The objectives and principles set out in Section 4A of the *Environmental Protection Act 1986* have been incorporated into Project planning and development. Cazaly has;

- Designed the Project to minimise the environmental footprint. Vegetation clearance will be kept to a minimum outside required areas.
- Undertaken baseline surveys to assess the environmental and social values of areas that could be impacted by the Project.
- Undertaken specialist surveys and modelling to assess the existing environment and determine potential impacts.
- Developed specific management plans for implementation as part of risk-based impact avoidance and prevention. Management actions identified throughout the PER indicate Cazaly's commitment to construct, operate, close and rehabilitate in an environmentally responsible manner.

Cazaly believes that the proposed management measures are sufficient to ensure the Project complies with relevant legislation.

Cazaly is committed to minimising, mitigating and offsetting environmental impacts that cannot be practicably avoided and will ensure potential impacts associated with construction and operation of the proposal will be managed as described in the PER and accompanying management plans.

Through Cazaly's environmental offset commitment (the PRCT), significant vegetation and habitat within the PEC will be preserved and guided by State and National interests.

The Project development will provide a number of significant benefits including the following:

- Creation of approximately 750 construction jobs, with a peak workforce of 250 persons over a 12 month period.
- Creation of 159 permanent operational jobs for life of mine, with preference to employ local community workers.
- Extensive commerce benefits to Shire of Yilgarn and local businesses situated within close proximity to Marvel Loch, Southern Cross and Moorine Rock.
- Anticipated revenue of A$1.8 billion generated through iron ore exports over the initial life of mine.
- State royalties on export sales estimated to be A$100 million over the initial life of mine.
- Investment to enhance Local Government and State infrastructure inclusive of roads, rail and port.
- Community participation and support programs within the Shire of Yilgarn.

In conclusion, this EIA has indentified that the Project will have a non-significant impact on environmental and social factors. The Project has substantially increased the State's biological knowledge base and contributed to the conservation of threatened species following extensive survey activities. The Project also has positive benefits on economic factors associated with the proposal.

Overall, Cazaly believe the Project will have a net gain for the environment, society and the economy.

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Appendix 1: Letters of Assessment Advice

(OEPA, DEWHA)

Electronic copy of Appendix provided on CD

Appendix 2: Cazaly and HWE Mining Environmental Policy

Electronic copy of Appendix provided on CD

Appendix 3: Surface Water Management and Flood Protection Plan

Rockwater (May 2010)

Electronic copy of Appendix provided on CD

Appendix 4: Hydrogeological Ground Water Report

Rockwater (August 2010)

Electronic copy of Appendix provided on CD

Appendix 5: Soil and Landform Survey Report

Keith Lindbeck & Associates (July 2010)

Electronic copy of Appendix provided on CD

Appendix 6: Vegetation and Flora Report

Botanica Consulting (November 2010)

Electronic copy of Appendix provided on CD

Appendix 7: Fauna Survey Report

Keith Lindbeck & Associates (August 2010)

Electronic copy of Appendix provided on CD

Appendix 8: Subterannean Fauna Survey Report

Rockwater (September 2010)

Electronic copy of Appendix provided on CD

Appendix 9: Baseline Community Noise Survey

Herring Storer Acoustics (July 2010)

Electronic copy of Appendix provided on CD

Appendix 10: Air Quality Survey and Dust Modelling Report

Ecotech (October 2010)

Electronic copy of Appendix provided on CD

Appendix 11: Acid Mine Drainage and Leach Testing (IMO)

Independent Metallurgical Operations (May 2010)

Electronic copy of Appendix provided on CD

Appendix 12: Aboriginal Heritage Survey Report

Western Heritage Research (December 2009 and June 2010)

Electronic copy of Appendix provided on CD

Appendix 13: Environmental Management Plan (M8521-G00-EN-PL-001)

HWE Mining (July 2010)

Electronic copy of Appendix provided on CD

Appendix 14: Conceptual Rehabilitation Closure Plan (Draft)

Cazaly Resources (November 2010)

Electronic copy of Appendix provided on CD

Appendix 15: Mt Caudan Photographs of Existing Environment

Electronic copy of Appendix provided on CD

Appendix 16: Parker Range Conservation Trust Charter

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