July 2010

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BROCKMAN MINE CLOSURE

Closure Plan and Costs

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REPORT

Report Number. 097641382-012-R-Rev0

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Executive Summary

This report provides an estimate of the cost to close the mine while meeting the mine closure commitments and concepts for the Brockman Resources Pty Ltd Marillana Iron Ore Project (the Project) documented in the Conceptual Closure Plan. A Definitive Feasibility Study for the Project is currently being drafted and this report reflects the current status of the Project. Recommendations are made for the updating of closure planning and costing as the Project progresses.

The Project is located within the Hamersley Iron Province of Western Australia, 100 km north-west of Newman. The groundwater within and around the orebody is predominantly fresh to brackish (salinities of <3,000 mg/L TDS) and a potential post-mining water resource.

Brockman Resources Pty Ltd intends to relinquish its mining tenements as soon as practicable after mining has been completed and have adopted the precautionary principle in determining their closure objectives and commitments. At completion of mining, the mine site will be returned to functions and conditions similar to those which existed pre-mining by dismantling and removing all built infrastructure and configuring the landforms to allow pre-existing native vegetation units to be established. Surface drainage will be a close approximation of the drainage patterns that existed before mining.

The overarching closure design is to backfill the open pit, which will avoid potential groundwater issues that could arise from leaving the final void open.

The two management objectives in the Brockman Resources Pty Ltd Conceptual Closure Plan are:

- To ensure that rehabilitation achieves a long term safe, stable and functioning landform, which is consistent with the surrounding landscape and other environmental values
- To fulfil commitments made to stakeholders and regulators regarding closure outcomes

Closure objectives have been considered in all aspects of mine planning, from construction through to decommissioning. Preliminary closure criteria and interim rehabilitation targets for the Project, as detailed in the Conceptual Closure Plan and Public Environmental Review, are as follows:

Table 1: Marillana Project Preliminary Closure Criteria and Interim Rehabilitation Targets

Aspect	Criteria	Interim Rehabilitation Target
Contamination	C1. There shall be no contamination of ground or surface water from inappropriate storage or handling of chemicals and hydrocarbons. C2. Known contaminated sites shall be remediated to agreed levels as soon as possible and prior to site handover.	An ongoing life of mine surface monitoring program demonstrates that pollutant levels at potential contaminated sites are within regulatory requirements.
Decommissioning	C3. Project infrastructure that is not required for post-closure land use will be removed or disposed of appropriately.	Infrastructure has been removed and rehabilitation commenced to simulate the pre-disturbance state as closely as possible.
Final Landforms	C4. Above-ground waste storage will be minimised by utilising the pit for waste storage. C5. Final landforms will be developed such that they will remain structurally and chemically stable, safe to humans and fauna and self-sustaining. C6. Landforms conform to the requirements of agreed post-closure land use. C7. The pit will not adversely affect groundwater quality by ensuring that no	Safety and abandonment structures are in place and final landforms have been shaped to agreed design criteria.

	permanent open water voids result from the project.	
Surface Water	C8. No change in the long term quantity or quality of surface water reaching the Weeli Wolli Creek as a direct result of operations at the Marillana project site.	Monitoring program for surface water indicates no significant change in level and quality as compared to pre-disturbed state. Photographic evidence that diversions of surface water flow have been returned to a state consistent with the pre-disturbed state.
Groundwater	C9. The quality and quantity of groundwater has been maintained, so that existing and potential environmental values, including ecosystem maintenance, are protected.	The life of mine monitoring program for groundwater indicates no significant change in level and quality as compared to pre-disturbed state.
Native Vegetation and Topsoil	C10. Impacted areas will be returned to self-sustaining vegetation communities and fauna habitats that reflect pre-disturbed state. C11. Noxious weeds will be managed in line with mining best practice in the Pilbara. C12. Topsoil remains viable and has the capacity to support a safe, stable and functioning ecosystem that meets the requirements of the post-mining land use.	Deep ripping and//or moonscaping have been conducted in rehabilitation areas. Flora species have been identified for use in rehabilitation and seed collection, and reflect principles of vegetation succession. Permanent photographic record points and monitoring/analogue transect locations have been defined. Rehabilitation areas have been closed to traffic access and signposted. Adequate topsoil//alternate subsoil material has been provisioned and stored in advance of mine closure.
Aesthetics and Heritage	C13. Ensure that aesthetic values and public experience of the landscape are considered, and measures are adopted to reduce the visual impacts on the landscape. C14. Maintain and protect any significant landscape, indigenous heritage and geo-heritage values.	GPS photographic monitoring locations are established and show progressive integration of rehabilitated areas with the natural environment.
Subterranean Invertebrate Fauna	C15. Restore the Project area to a condition that supports subterranean fauna as soon as possible after infrastructure is no longer required.	Monitoring programme demonstrating the return of subterranean fauna species.
Terrestrial Fauna	C16. Restore the Project area to a condition that supports terrestrial fauna as soon as possible after infrastructure is no longer required.	Monitoring programme demonstrating the return of terrestrial fauna species.

It is estimated that the cost for closure of the Project will be approximately $204,600,000. The Net Present Cost, calculated at a discount rate of 8%, is approximately $44,100,000. The costs includes the cost of a caretaker (Years 26 to 34) to manage the rehabilitation, monitoring efforts and site maintenance, and assumes decreasing maintenance costs (e.g. roads, tracks, fencing, etc) from Year 33 until relinquishment (at the end of Year 38). The costs are in Australian dollars and are based on information available as at 31 May 2010. Mining Lease fees across the closure years were based on 2010/2011 levels.

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1.0 INTRODUCTION

A closure plan for a mining operation is a progressive, interactive and iterative process that commences at the earliest stage of development and continues until the operation is finally closed and the land affected by the operation is relinquished by the mine owner.

The Public Environmental Review (PER) (*Ecologia* Environment, 2010) and documentation submitted by Brockman Resources Pty Ltd (Brockman) as part of the application process for Mining Leases M47/1414 and M47/1419 contains a Conceptual Closure Plan (CCP) (Appendix A) and commitments relating to closure. This Report incorporates the commitments and closure concepts in those documents with the most recent mine planning, as well as providing an estimate of the cost to close the mine.

2.0 PURPOSE AND SCOPE

Brockman is seeking approval from the Minister for the Environment to develop the Marillana Iron Ore Project (the Project) which consists of a 1.1-1.2 Bt iron ore mine, processing facility and associated infrastructure located within the Pilbara of Western Australia. It is proposed that traditional open pit mining methods of excavating, load and haul will be utilised for the initial pit development, and that the mine will produce approximately 1.1 Bt of beneficiated ore and 49.7 Mt of direct shipping ore.

At completion of mining operations Brockman will remove all built infrastructure, backfill the open pit and rehabilitate all land disturbed by the Project, allowing the land to revert to its pre-mining land use.

3.0 PROJECT LOCATION

The Project is located within mining leases M47/1414 and M47/1419 which have been granted. The Project area (encompassed by E47/1408) is located approximately 100 km north-west of the township of Newman, covers 96 km^2 of the Fortescue Valley, borders the Hamersley Range and lies approximately 15 km south of the Fortescue Marsh. It is intersected by tributaries of the Weeli Wolli Creek delta. Figure 1 shows the mining leases, site access and the surrounding infrastructure and tenement

The main access to the Project area is via the Great Northern Highway and the unsealed Munjina-Roy Hill Road. Approximately 58 km along the Munjina–Roy Hill Road the BHPB rail line into the Yandi Mine intersects the road. The western boundary of the tenement is a further 1 km east of this rail line intersection.

4.0 PROJECT COMPONENTS

Brockman proposes to develop the Project which consists of a 1.1-1.2 Bt iron ore mine, processing facility and associated infrastructure. The Project will comprise:

- An open cut iron ore mine producing 1.1-1.2 Bt of ore
- Above-ground overburden and fines rejects storage facilities
- In-pit disposal of mine waste
- In-pit disposal of fines rejects after year five of operations
- Crushing, screening and processing facilities
- A train loading facility
- An accommodation camp for 570 permanent personnel
- A bore field to supply potable water to the accommodation and offices
- Offices, workshops, a laboratory and supporting infrastructure including an explosives facility, water treatment plant and bulk fuel storage

5.0 BASIS OF CLOSURE DESIGN

The Marillana Project is located on the northern flank of the Hamersley Range and the groundwater within and around the orebody is predominantly fresh to brackish (salinities of <3,000 mg/L TDS) and therefore considered to be a higher priority water resource than if the water quality was in the saline to hypersaline range.

The Western Australian Government has published two water related guidelines, one “Pilbara Water In Mining Guideline” published in 2009 addresses appropriate mine water management for the life of the mine and the other, “Mine Void Water Issues” published in 2003 discusses the management of water remaining in pit voids after mine closure.

These two guidelines indicate a strong desire on the part of the Western Australian Government to protect the beneficial use of the water resource. The CCP and PER documentation have stated that the final void will be backfilled at the cessation of mining. This is because of the potential issues that could arise from an open final void arrangement at mine closure due to the combination of low groundwater through-flow and high evaporation at the site. These issues are as follows:

- Lower groundwater levels in the void (compared to surrounding landforms) will mean that the final void acts as a groundwater sink
- An ongoing concentration of salts in the water of the pit void (due to high evaporation rates)
- Over time, density-driven flows could develop, and the pit void would be a source of saline water which would develop a plume downgradient of the pit, affecting water quality in the Fortescue valley

Brockman has adopted the precautionary principle for mine closure and the overarching design basis for the closure plan is to backfill the open pit and minimise any possible impacts on the future use of groundwater in and around the mine site after mining is completed.

Traditionally, State and Federal Governments have not set any design life expectations for post-mining landforms, but increasingly the mining industry worldwide sees extended periods being nominated as the design life of post-mining structures (Waggitt, 1994).

In the long-term the final landforms will be subjected to a wide variation of climatic situations, similar to, but probably more extreme than the range of climatic variations that have occurred over the last millennium. The use of the Probable Maximum Flood (the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in this mine site) as the design flood will avoid, to the greatest degree practicable, the potential impact of uncontrolled flood waters eroding man-made landforms.

From a geotechnical perspective the above ground landform designs should withstand a Maximum Credible Earthquake, the largest earthquake magnitude that could occur within that particular region.

6.0 CLOSURE OBJECTIVES

Brockman intends to relinquish its mining tenements as soon as practicable after mining has been completed.

To achieve this overarching objective in an environment of increasing regulatory and stakeholder expectations, superior outcomes will need to be developed and implemented in consultation with relevant stakeholders, including local communities. It is also important to recognise that mining is not scheduled to cease until approximately 2040, 30 years into the future, when relinquishment requirements will almost certainly have become more stringent.

Brockman state two management objectives in their CCP, namely:

- Ensure that rehabilitation achieves a long term safe, stable and functioning landform, which is consistent with the surrounding landscape and other environmental values
- Fulfil commitments made to stakeholders and regulators regarding closure outcomes

In addition, Brockman has made four closure and rehabilitation commitments in the PER documentation, namely:

- Twenty-four months prior to mine closure, a Mine Closure Plan will be finalised in consultation with the Department of Environment and Conservation (DEC) and the Department of Mines and Petroleum (DMP). This plan will define appropriate closure criteria necessary for the establishment of safe landforms and self-sustaining ecosystems, and set out procedures for monitoring in order to meet compliance with the closure criteria
- A rehabilitation programme will be developed within the first two years of mining in liaison with the DEC
- Rehabilitation will occur progressively as disturbed areas no longer required for mining activities become available
- Soil characterisation assessments will be conducted to determine topsoil suitability for supporting rehabilitation

6.1 Closure Schedule

The closure schedule is shown in Figure 2a.

7.0 LEGAL OBLIGATIONS

7.1 Legislation

Mine closure is subject to both Federal and State legislation and Brockman is required to meet legal obligations during design, operation, and closure phases of the Project.

Table 2 outlines the legislation applicable to the Project, the responsible Government Authority and the aspect the legislation pertains to.

Table 2: Legislation Applicable to Closure

Legislation	Responsible Government Authority	Aspect
Commonwealth Legislation		
Environment Protection and Biodiversity Conservation Act 1999	Department of Environment, Water, Heritage and the Arts	Rare flora and fauna
Native Title Act 1993	National Native Title Tribunal	Aboriginal rights
Protection of Moveable Cultural Heritage Act 1986	National Cultural Heritage Committee	Protection of moveable cultural artefacts
National Greenhouse and Energy Reporting Act 2007	Department of Climate Change	Climate change
State Legislation		
Aboriginal Heritage Act 1972	Department of Indigenous Affairs	Archaeological and ethnographic heritage
Agricultural and Related Resources Protection Act 1976	Department of Agriculture, Western Australia	Weeds and feral pest animals
Bush Fires Act 1954	Bush Fires Board	Wild fire control
Conservation and Land Management Act 1984	DEC	Flora and fauna/habitat/weeds/ pests/diseases
Contaminated Sites Act 2003	DEC	Management of pollution
Country Areas Water Supply Act 1947	Department of Water (DoW)	Water resources supply
Dangerous Goods Safety Act 2004	Department of Consumer and Employment Protection	Dangerous goods management

Legislation	Responsible Government Authority	Aspect
Environmental Protection Act 1986	DEC	Environmental impact assessment and management, Ministerial Conditions, Works Approval and operating licence
Explosives and Dangerous Goods Act 1961	Department of Consumer and Employment Protection	Explosives and dangerous goods transport and management
Health Act 1911	Department of Health	Human health management
Heritage of Western Australia Act 1990	Heritage Council of Western Australia	European heritage management
Local Government Act 1995	Shire of East Pilbara	Development approvals and management
Local Government (Miscellaneous Provisions) Act 1960	Shire of East Pilbara	Community issues/resources/facilities
Mining Act 1978	DMP	Tenement granting and lease conditions, environmental management and Unconditional Performance Bond
Mines Safety and Inspection Act 1994	DMP	Mine operational safety, geotechnical issues
Occupational Health and Safety Act 1984	Department of Consumer and Employment Protection	Occupational health and safety
Public Works Act 1902	Department of Housing and Works	Development approvals and management
Soil and Land Conservation Act 1945	Department of Agriculture	Protection of soil resources
Rights in Water and Irrigation Act 1914	DoW	Access to and use of water resources
Water and Rivers Commission Act 1985	DoW	Protection of surface and groundwater
Waterways Conservation Act 1976	DoW	Protection of surface and groundwater
Wildlife Conservation Act 1950	DEC	Protection of indigenous wildlife

7.2 Guidelines

The Guidelines outlined below (Table 3) contain material relevant to this closure plan.

Table 3: Guidelines and Codes of Practice Applicable to Closure

Title	Reference
General Closure	
Strategic Framework for Mine Closure	Australian and New Zealand Minerals and Energy Council, and Minerals Council of Australia, 2000
Mine Closure Guidelines for Mineral Operations in Western Australia	Chamber of Minerals and Energy of Western Australia Inc, 1999
Guidelines for Mining in Arid Environments	Department of Industry and Resources, 2006
Guidelines for Mining Proposals in Western Australia	Department of Industry and Resources, 2006

Title	Reference
Code for Environmental Management	Minerals Council of Australia, 2000
Mine Closure and Completion: Leading Practice Sustainable Development Program for the Mining Industry	Department of Tourism, Industry and Resources, 2006
Mine Closure Guidelines	Association of Mining and Exploration Companies, 2000
Strategic Framework for Tailings Management	Ministerial Council of Minerals and Petroleum Resources, Minerals Council of Australia, 2003
Guidance Statement No. 33 – Environmental Guidance for Planning and Development	Environmental Protection Authority, 2008
Geotechnical Consideration for Open Pit Mining	Department of Minerals and Energy, 1999
Safety Bund Walls around Abandoned Open Pit Mines	Department of Mines and Energy, 1997
Planning for Integrated Mine Closure: Toolkit	International Council on Mining and Metals, 2008
Water	
Mine Void Resource Issues in Western Australia	Water and Rivers Commission, 2000
Pilbara Water in Mining Guideline, Report 34 (Draft)	Department of Water, 2009
Australian Drinking Water Guidelines	National Health and Medical Research Council, 2004
Australian and New Zealand Guidelines for Fresh and Marine Water Quality	Australian and New Zealand Environment and Conservation Council, 2000
Statewide Policy No. 5 – Environmental Water Provisions for Western Australia	Water and Rivers Commission
Position Statement No. 4 – Protection of Wetlands	Environmental Protection Authority, 2004
Rejects and Waste	
Environmental Notes on Mining Waste Rock Dumps	Department of Mineral and Petroleum 2009
Environmental Notes on Mining- Acid Mine Drainage	Department of Mineral and Petroleum 2009
Guidelines on the Safe Design and Operating Standards for Tailings Storage	Department of Industry and Resources, 1999
Tailings Management	Department of Tourism, Industry and Resources, 2007
Water Protection Guidelines No. 2 – Mining and Mineral Processing – Tailings Facilities	Water and Rivers Commission, 2000
AS1940 – The Storage and Handling of Flammable and Combustible Liquids	Australian Standards, 1993
Rehabilitation	
Mine Rehabilitation Handbook	Australian Mining Industry Council, 1989
Mine Rehabilitation: Leading Practice Sustainable Development Program for the Mining Industry	Department of Tourism, Industry and Resources, 2006
Landform Design for Rehabilitation	Environment Australia, 1998
Guidance Statement No. 6 – Rehabilitation of Terrestrial Ecosystems	Environmental Protection Authority, 2006
Bond Policy Effective 1 July 2008	Department of Mines and Petroleum, 2008
Flora and Fauna	
National Strategy for Ecologically Sustainable Development	Commonwealth of Australia, 1992
Position Statement No. 6: Towards Sustainability	Environmental Protection Authority, 2004

Title	Reference
Guidance Statement No. 55 – Implementing Best Practice in proposals Submitted to the EIA Process	Environmental Protection Authority, 2003
Position Statement No. 3 – Terrestrial Biological Surveys as an Element of Biodiversity Protection	Environmental Protection Authority, 2002
Position Statement No. 2 – Environmental Protection of Native Vegetation in WA	Environmental Protection Authority, 2000
Position Statement No. 9 – Environmental Offsets	Environmental Protection Authority, 2006
Guidance Statement No. 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in WA	Environmental Protection Authority, 2004
Guidance Statement No. 54 – Consideration of Subterranean Fauna in Groundwater and Caves during EIA in WA	Environmental Protection Authority, 2003
Guidance Statement No. 3 – Separation Distances between Industrial and Sensitive Land Uses	Environmental Protection Authority, 2005
Guidance Statement No. 56 – Terrestrial Fauna Surveys for Environmental Impact Assessment in WA	Environmental Protection Authority, 2004

8.0 PRE AND POST-MINING ENVIRONMENT

Figure 3 shows the Pre-mining and Post-mining drainage layout and general configuration of the mine site.

8.1 Existing Environment

The PER states *"The project area lies on a landscape that is still being utilised for pastoralism and is significantly degraded in some areas. …. eight vegetation units were identified … associated with the following landforms: Creekline, minor drainage channels on footslope, clay pan, minor channel/depression, floodplain, longitudinal sand dunes, swale between dunes, and sandy plain/minor footslope."*

For further information on the Existing Environment refer to Appendix B.

8.2 Post-Mining Environment

After the Project has been successfully completed, the land affected by its operations will be expected to become available for subsequent users of the land.

At completion of mining, the mine site will be returned to functions and conditions similar to those which existed before the operation commenced. The post-mining land use is dependent on the State Government's intention to either continue leasing the land for pastoralism or allow the land to become de-stocked and revert to its pre-pastoral wilderness status.

The mine site will have the same number of major drainage lines crossing it (with the exception of the lower course of the drainage line truncated by the Fines Residue Storage (FRS) 1). To minimise sedimentation loads, the drainage lines will have similar gradients and bed loads as the pre-mining drains. Local native vegetation similar to that existing pre-Project will form the basis for development of a self-sustaining ecosystem in the longer term.

There are four broad types of mining disturbed land remaining at the cessation of productive mining, namely:

- Infrastructure improvements such as some of the mining roads, railway structures and other services (water supply, power generation, etc)
- Rehabilitated back filled mined-out pits, including in-pit placed rejects
- Rehabilitated footprints of mining infrastructure including camp facilities, plant and stockpile/loadout areas
- Rehabilitated above-ground rejects storage facilities

All of these disturbances will be managed and rehabilitated to allow the land to return to its pastoral use or revert to its pre-pastoral wilderness status by dismantling all built structures and configuring the landforms to allow pre-existing vegetation units to be established.

Any other land uses, including future mining activities, will involve the future developer modifying the land to suit the required purpose and is not considered further in developing the closure and completion requirements for Marillana.

9.0 STAKEHOLDER CONSULTATION

Stakeholder consultation refers to a two-way, mutual process where information is provided to participants and new information and views are absorbed (AS HB 203:2006). Consultation can add significant value to the risk identification process in major projects by highlighting information about the local and historical context and how proposed activities are likely to affect stakeholders (AS HB 203:2006).

Brockman commenced consultation with community and government during the Project scoping stage, and have continued to seek input in an ongoing and proactive manner. The objectives of consultation and engagement to date have been to:

- Inform stakeholders of the Project scope, highlight potentially significant issues and possible solutions
- Gather specialist knowledge of the area and potential environmental and other impacts resulting from the Project
- Determine the relative significance of environmental and social issues and develop acceptable management strategies

Methods of consultation have included letters to neighbouring tenement and land holders, meetings and one-on-one discussions with key government agencies, website updates, newsletters, site visits, community meetings and public presentations.

Brockman has actively sought to involve key stakeholders such as the MIB and Nyiyaparli Native Title Claimants in the heritage surveys and development of a Cultural Heritage Management Plan (CHMP).

Key government stakeholders have been, and continue to be, regularly consulted to ensure that concerns are identified and proactively addressed.

A summary of the consultation activities and issues raised to date is provided below in Table 4.

Table 4: Summary of Stakeholder Consultation

Issue	Stakeholder	Outcomes
Subterranean Fauna		
Sampling regime (troglofauna)	DEC (EMB, Brad Durrant)	Sampling requirements met and exceeded although capture rate is very low. Off tenement sampling could not be undertaken
Sampling regime (stygofauna)	DEC (EMB, Brad Durrant)	Sampling requirements met. Off tenement sampling also undertaken
Troglofauna habitat boundaries and percentage impact	DEC (EMB, Brad Durrant)	Reasonable approach adopted to quantify level of impact
Subterranean fauna sampling (access)	FMG, BHP Billiton Iron Ore, Rio Tinto, Marillana Station	No useful access arrangements could be negotiated
Groundwater		
Modelling	DoW (Head office, Pilbara region)	The proposed approach was accepted by the DoW
Potential water disposal options	DoW (Head office, Pilbara region)	The proposed approach was accepted by the DoW

Issue	Stakeholder	Outcomes
Groundwater abstraction, water use, management	DoW	DoW is comfortable with the level of understanding exhibited to date
Groundwater abstraction, water use, management	DEC (EMB)	The proposed approach was explained to the DEC
Surface Water		
Surface water diversions	DEC	The proposed approach was explained to the DEC
Waste water disposal	DEC, Department of Health	Department of Health guidelines incorporated into wastewater treatment design and disposal
Mine Planning and Closure		
Positioning of infrastructure	DEC	The justification was explained to the DEC
Accommodation village, waste water treatment plant, road re-alignment, traffic consideration	SoEP	The appropriate process will be followed regarding seeking approval of works from the local shire
Pit backfilling	DoW, DEC	The proposed approach was explained to the DEC and DoW
Acid rock drainage potential	DMP, DEC	Appropriate guidelines have been addressed. Classed as Non-Acid Forming
Indigenous Heritage		
Botanical (bush tucker) surveys	MIB, Nyiyaparli	No surveys conducted
Heritage surveys, Cultural Heritage Management Plan	Department of Indigenous Affairs, MIB, Nyiyaparli	Interim CHMP presented in the PER, with a full plan under development in liaison with Native Title Claimants
Native Title agreement. Heritage sites, surveys	MIB, Nyiyaparli	Native Title Claimants undertook heritage surveys. No sites identified. CHMP to be developed

The key outcomes from the consultation process to date are as follows:

- Brockman has incorporated stakeholder feedback into the design of investigations where required, and commissioned additional investigations to provide appropriate information to inform the PER
- Brockman has formed partnerships with MIB and Nyiyaparli Native Title groups and will continue to collaborate on cultural heritage matters throughout the life of the Project
- Brockman has addressed all issues and concerns raised within the scoping phase of the Project
- Brockman has proactively sought advice and input from government departments and knowledgeable individuals
- Brockman has ensured that the appropriate guidelines and 'best practice' techniques have been incorporated into the design of the Project

Brockman will continue to engage with and consult relevant stakeholders and key interest groups throughout the public review period and beyond into the construction, operation, and decommissioning phases of the Project.

10.0 PLANNING

Recent environmental approval documents submitted to the Environmental Protection Authority (EPA) relating to proposed iron ore operations in the Pilbara frequently make reference to the Leading Practice Sustainable Development Program for the Mining Industry (LPSDP) series of guidelines. One of the guidelines "Mine Closure and Completion" (2006) defines 'mine closure' and 'mine completion' as follows:

- *Mine closure* is a process that happens in the period of time when the operational stage of a mine is ending or has ended, and the final decommissioning and mine rehabilitation is being undertaken. In this sense, the term mine closure encompasses a wide range of drivers, processes and outcomes
- *Mine completion* is the goal of mine closure. A completed mine has reached a status where mining lease ownership can be relinquished and responsibility for the land accepted by the next land user

A Mine Closure Plan should be a progressive, interactive, and iterative process that commences at the earliest stage of development and continues until the operation is finally closed and the mine owner relinquishes the land affected by the operation. This is illustrated in Figure 4.

Brockman has initiated this closure planning process by submitting the PER documentation, which included a CCP and proposed Decommissioning and Rehabilitation Excerpt from the PER (Appendix C). This report is an update of that documentation, which incorporates the new data obtained during the continuing evolution of the Marillana Project.

From a closure perspective the development and completion of a mining project can be considered as a series of stages broadly outlined as follows:

- During the conception and design stages, high level closure objectives are set and broad strategies to meet these objectives developed
- During construction, methods of implementing the strategies are developed and the recovery of materials (e.g. topsoil) that will be required later in the closure process is commenced. This stage also sees temporary facilities constructed, such as plant and infrastructure, which will be required during operations but will be removed at closure
- During operations, large scale research is undertaken to develop cost-effective techniques to enable progressive rehabilitation of completed landforms and establish sustainable native vegetation on those landforms. Where practicable, progressive rehabilitation is practiced and off-site pollution minimised
- When productive operations cease the next stage of closure sees the de-construction of the temporary facilities, assessment of potential contamination, and remedial work to enable the mine site to be restored to an agreed post-mining land use. Those remaining landforms which have not been progressively rehabilitated will be shaped and rehabilitated using the techniques developed during the Project's operations phase
- When completion criteria (the agreed set of environmental indicators used to determine the success or otherwise of meeting agreed outcomes) have been achieved the site can be considered to be completed, as defined by the LPSDP publication referenced above. These criteria are inextricably linked to management and monitoring programmes used during operations

It is important that the post-mining land use and the expected design life for all final landforms and other rehabilitation initiatives taken during the closure processes are considered during preparation for tenement relinquishment. These two considerations can have a major impact on the actual implementation of the closure strategies, and have been discussed above in Section 8.2.

10.1 Summary of Project Closure Criteria

Preliminary closure criteria and interim rehabilitation targets have been summarised in the CCP (submitted to the State Government as part of the environmental approval process) and are shown in the table below:

Table 5: Marillana Project Closure Criteria as stated in the CCP

Aspect	Criteria	Interim Rehabilitation Target
Contamination	C1. There shall be no contamination of ground or surface water from inappropriate storage or handling of chemicals and hydrocarbons. C2. Known contaminated sites have been remediated to agreed levels as soon as possible and prior to site handover.	An ongoing life of mine surface monitoring program demonstrates that pollutant levels at potential contaminated sites are within regulatory requirements.
Decommissioning	C3. Project infrastructure that is not required for post-closure land use will be removed or disposed of appropriately.	Infrastructure has been removed and rehabilitation commenced to simulate the pre-disturbance state as closely as possible.
Final Landforms	C4. Above-ground waste storage will be minimised by utilising the pit for waste storage. C5. Final landforms will be developed such that they will remain structurally and chemically stable, safe to humans and fauna and self-sustaining. C6. Landforms conform to the requirements of agreed post-closure land use. C7. The pit will not adversely affect groundwater quality by ensuring that no permanent open water voids result from the project.	Safety and abandonment structures are in place and final landforms have been shaped to agreed design criteria.
Surface Water	C8. No change in the long term quantity or quality of surface water reaching the Weeli Wolli Creek as a direct result of operations at the Project site.	Monitoring program for surface water indicates no significant change in level and quality as compared to pre-disturbed state. Photographic evidence that diversions of surface water flow have been returned to a state consistent with the pre-disturbed state.
Groundwater	C9. The quality and quantity of groundwater has been maintained, so that existing and potential environmental values, including ecosystem maintenance, are protected.	The life of mine monitoring program for groundwater indicates no significant change in level and quality as compared to pre-disturbed state.
Native Vegetation and Topsoil	C10. Impacted areas will be returned to self-sustaining vegetation communities and fauna habitats that reflect pre-disturbed state. C11. Noxious weeds will be managed in line with mining best practice in the Pilbara. C12. Topsoil remains viable and has the capacity to support a safe, stable and functioning ecosystem that meets the requirements of the post-mining land use.	Deep ripping and/or moonscaping have been conducted in rehabilitation areas. Flora species have been identified for use in rehabilitation and seed collection, and reflect principles of vegetation succession. Permanent photographic record points and monitoring/analogue transect locations have been defined. Rehabilitation areas have been closed to traffic access and signposted.

Aspect	Criteria	Interim Rehabilitation Target
		Adequate topsoil/alternate subsoil material has been provisioned and stored in advance of mine closure.
Aesthetics and Heritage	C13. Ensure that aesthetic values and public experience of the landscape are considered, and measures are adopted to reduce the visual impacts on the landscape. C14. Maintain and protect any significant landscape, indigenous heritage and geo-heritage values.	GPS photographic monitoring locations are established and show progressive integration of rehabilitated areas with the natural environment.

In addition, the following completion criteria stated in the PER will apply:

Table 6: Additional Completion Criteria for Closure of the Marillana Iron Ore Project

Aspect	Criteria	Interim Rehabilitation Target
Subterranean Invertebrate Fauna	C15. Restore the Project area to a condition that supports subterranean fauna as soon as possible after infrastructure is no longer required.	Monitoring programme demonstrating the return of subterranean fauna species.
Terrestrial Fauna	C16. Restore the Project area to a condition that supports terrestrial fauna as soon as possible after infrastructure is no longer required.	Monitoring programme demonstrating the return of terrestrial fauna species.

On the basis that the land affected by the Project will have reverted back to its pre-mining land use, the following broad completion objectives will need to be demonstrably met for tenement relinquishment:

- The land will function in an ecologically sustainable way
- Groundwater and surface water quality will be suitable for the post-mining land use
- All mining landforms will be geomorphologically sustainable
- The pollution potential of the site will be reduced to a practicable minimum

Investigations conducted prior to, and during, mining will be used to establish measurements of the four essential objectives listed above. These values will be used to assess the attainment of the completion criteria listed in Table 5.

11.0 REHABILITATION AND CLOSURE STRATEGIES

11.1 Construction

The construction of the process plants, stockpile areas, railway line, and other infrastructure needed for the Project will require the disturbance of some 530 ha as shown in Table 7.

Table 7: Construction Disturbance

Disturbance	Area (ha)
Topsoil Stockpiles	138
CID stockpile	61
Process Plant and train loadout	120
Haul road and service corridor	56
Camp	20
Other	135
Total	**530**

Brockman has committed to undertake progressive rehabilitation throughout the life of the Project, as disturbed areas become available. Progressive rehabilitation has known benefits, including allowing rehabilitation trials to be undertaken prior to final decommissioning, decreasing the total area of disturbance existing at any one time, and allowing smoother cash flow over the life of the Project (Department of Environment and Resource Management, 1995).

Topsoil is an important resource for successful rehabilitation and maximising its recovery during development and construction is important to ensure that there is sufficient topsoil available for rehabilitation. The topsoil will be stripped from these development footprints to a maximum depth of 200 mm and stockpiled. The mining schedule means that little of the land disturbed by the Project will be available for final rehabilitation until Year 7 of the Project life. The initial topsoil recovered will not be used for at least seven years and will therefore be stockpiled in engineered stockpiles (10-20 m in height) to minimise the topsoil stockpile footprint. As the mine progresses, topsoil will be used directly in rehabilitation to rehabilitate disturbed areas, or stored for only a short period of time, to maximise the benefits of the microbial fraction. The long storage time of the initially stockpiled topsoil will lead to the loss of the biological fraction and additional soil amelioration, such as seeding and fertilisation, will be required to maximise the benefit of the topsoil during rehabilitation.

A temporary cover of the stockpile may be required to minimise losing this important resource to rain and wind erosion.

11.2 Mining Operations

The Project is located on a mining tenement that is constrained by the surrounding tenements and a major regional water course (Weeli Wolli Creek). The proposed mining schedule is currently estimated to be 29 years and accommodates these constraints, while allowing the maximum practicable amount of waste to be placed into worked-out open pits during the ore extraction. The total footprint of the open pit is approximately 1771 ha.

Mining will commence at the eastern end of the orebody and work progressively to the west. All waste material mined will be placed in temporary waste dumps located west of the active mine excavation. The footprint of the active mining area and the temporary waste dumps will be stripped of topsoil. This topsoil will be stored in selected areas ready to be used when rehabilitation work is possible. The mine will be developed to its full depth, creating a void for the mined waste and rejects to be placed when all ore has been extracted from that portion of the mine.

Figures 5 and 6 show the progression of mining from east to west.

In Year 1 the fines rejects will be placed in the FRS 1 facility, while the coarse rejects will be incorporated into the temporary waste dumps.

By Year 5 a large void will have been developed at the mine's eastern end, separated from the active mining area by a remnant wall of non-mineralised ground. Backfilling will commence with the placing of fines rejects into this mined out area.

By Year 10 the mining sequence will be well established, with rejects being placed in the mined out area at the eastern end of the mine, waste backfill east of the active mine operations and waste in temporary dumps on the ore body footprint to the west of the active mining.

Ore extraction from the open pit continues until Year 25 when a final void will exist at the western end of the open pit. This final void will be backfilled using the combined coarse rejects and waste reclaimed from the temporary waste dumps and a number of the original drainage lines will be re-established. This final backfilling and re-establishment will take an estimated two to three years.

The mine waste geochemistry (Graeme Campbell & Associates Pty Ltd, 2009) has been evaluated and indicates a very low risk of any acid metal drainage issues existing at closure and at this stage no special allowance has been made for selective placement of any waste.

The landforms at the end of ore extraction (Year 25) will comprise five temporary waste dumps, and the final mining void. In the three years following cessation of ore extraction up to three waste dumps will be backfilled into the remaining pit void and the drainage lines will be redeveloped.

The site specific rehabilitation techniques needed to establish local native species will be developed during research and trials conducted during the early stages of mining. It is expected that the technique will include the use of topsoil recovered from the stockpiles, ground preparation such as deep ripping and scarification of the top surface and the sowing of local native seeds. Some degree of soil amelioration through the addition of fertiliser and/or soil pH adjustment may also be required, while the strong seasonality in germination displayed by many native plants at this site may require more than one seeding program to obtain the sought-after diversity in vegetative cover.

Backfilling of the open pit could result in differential settlements of up to 1 m over the backfilled surface over a period of up to 15 years (refer to consolidation modelling, Golder 2010). To minimise this adversely affecting the re-constructed drainage, the mine waste not required for backfilling the open pit will be placed to form low ridges on the interfluves between the drainage lines. The settlement characteristics of the backfill will be monitored during operations and the data collected used to optimise waste management at the site.

The CCP assumes that an excess of mine waste over the available pit void will result in the requirement for an above-ground waste dump(s) to be left and rehabilitated on the open pit footprint. This structure(s) will be up to 20 m high and have a footprint of approximately 325 ha (combined). The closure design for this waste structure will take into account the maximum credible earthquake (the largest earthquake magnitude that could occur within a particular seismo-tectonic area under the current tectonic framework for the site).

In addition, the construction of sub-horizontal external berms on those structures will be avoided, as there is a growing body of evidence to suggest such sub-horizontal features promote the development of gullies. The most erosion resistant external slopes for most materials have a concave-convex profile. Information on the characteristics of the waste materials gathered from test work during operations will enable optimal landform configurations to be designed well ahead of closure. All proposed landforms will be assessed in the design stage using SIBERIA (or a similar erosion prediction model) so that the least erosion prone shape can be built with a minimum of rehandling.

McPhail and Rey (2008) have published a slope erosion evaluation for a "typical" 35 m high waste dump using the SIBERIA model. They estimate the terraced (berm and batter) slope to erode at the same rate as an angle of repose slope (approximately 38°) over a 100 year period, while a concave slope would reduce the erosion to around 80% of that. In the same study, terrace overtopping increases the erosion by up to 135% of that for an angle of repose slope. In all of these cases no run-off from the flat upper surface was included.

11.3 Coarse and Fine Rejects

Apart from flocculants and coagulants, the beneficiation process does not use chemicals and as a result all plant by-product streams are benign.

All coarse rejects will be incorporated into the mine waste stream and progressively backfilled into the open pit. The coarse rejects will be conveyed and stacked using the same equipment as used for placement of the mine waste, effectively creating a co-mingled waste product.

There is insufficient land for waste to be dumped outside the pit. Waste and coarse rejects will therefore be dumped onto the pit ahead of mining and backfilled into the mined out void behind the active mine face. At mine closure a portion of the waste and coarse rejects will remain on top of the backfill in separate waste dumps. The fine rejects will be placed into four FRS facilities over the course of the mine life, three of which are in-pit facilities, with one facility, FRS 1 constructed external to the open pit. FRS 1 will have a footprint of approximately 340 ha. It will be used to deposit the fines rejects for the first five years of operation, before space is available in the mined out portion of the open pit to allow the placement of the fines rejects in the pit. Thereafter, the fine rejects will be deposited into cells created in pit.

Geotechnical modelling (Golder, 2010) carried out on fine rejects for in-pit placement indicates that:

- The fine rejects will take about 14 years to achieve 90% of post-depositional settlement
- Vehicle access to most of the surface of the in-pit FRS will be practical about 18 months to two years after deposition ceases
- A closure cover comprising a layer of overburden waste overlain by subsoil/topsoil should be pushed out over most of the fine reject surface after two years
- The cover should be mounded to allow for final subsidence. The final consolidation will be estimated by calibrating the consolidation model against monitoring results obtained during operations

For cost estimating purposes, it is assumed a 1.5 mm thick cover of mine waste overburden (0.5 m compacted, 1.5 m loose) (DOITR, 2006) will be used to cap the whole upper surface prior to establishing vegetation; in addition to topsoil spreading, surface treatment, and seeding.

During mining operations considerable data will be collected on the physical and chemical characteristics of the fine rejects in the storage facility, enabling a more specific cover design to be developed and costed.

The eastern and northern faces of the FRS 1 will be rehabilitated in Year 7, and the upper surface will be rehabilitated in Year 26. The western and southern faces will be rehabilitated when the railway is decommissioned in Year 29 as the rail embankment constrains the slope angle that can be constructed.

FRS 2 will have an estimated footprint of 260 ha and will be used for storing fines rejects from Year 6 to Year 15. The facility in the western portion of the pit will require an embankment constructed using mine waste to a maximum height of 10 m to accommodate the fine reject production. The above ground embankments of FRS 2 will be constructed from mine waste to their full height in Year 12, when they will be rehabilitated.

FRS 2 is expected to be sufficiently consolidated for the upper surface to be capped and rehabilitated in Year 17, about two years after deposition has ceased. A store release cover will be constructed on the upper surface and the surrounding embankment will be shaped to minimise erosion prior to being vegetated with local native species.

FRS 3 (estimated footprint 175 ha) and FRS 4 (estimated footprint 145 ha) are fully contained within the open pit and deposition into those facilities will stop below the level of the pit rim. They will be capped with stockpiled mine waste to create a store release cap when the rejects are sufficiently consolidated, approximately two years after deposition ceases.

FRS1 will not be immediately capped but will remain open and used for overflow or emergency placement of rejects and excess water. FRS1 will be capped after mining stops in Year 25. It has been assumed that the closure surface for FRS 1 will maintain a dished profile that reflects the final fine rejects profile of the facility.

Runoff from incident rainfall on the facility will collect around the decant location where it will be allowed to infiltrate into the groundwater aquifer. Consideration will need to be given at closure to the final beach profile of the facility and the ability for it to contain runoff from the probable maximum precipitation (PMP) without overtopping.

Should the fine rejects beach at very shallow angles, it may be preferable to create a domed, or shedding, landform. Alternatively, the storage capacity on the surface of the facility might necessitate installation of a broad, well armoured spillway with shallow slopes. The lack of appropriate armouring materials at the site and the potential for slopes to erode over time means that preference should be given to design of a closure landform that will not require a spillway.

11.4 Contaminated Sites

Under the *Contaminated Sites Act 2003* a site is considered to be contaminated if it has a substance present at above-background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.

While the Project does not pose an acid mine drainage risk (Graeme Campbell and Associates Pty Ltd, 2009), other hazardous materials such as fuels, process reagents, lubricants, detergents, explosives, solvents and paints that can be detrimental to the environment will be used at the mine site. Potential contamination source areas would include workshops, the landfill facility, plant, and fuel storage facilities.

For the purposes of evaluating potential contamination consideration was given to the following:

- Contamination of soil, groundwater, and surface water sources within the Marillana region as a result of inappropriate storage or handling of chemicals and hydrocarbons
- Adverse impacts to troglofauna and/or stygofauna as a result of soil or groundwater contamination
- Adverse impacts to vegetation lining the Weeli Wolli Creek
- Adverse impacts to Fortescue Marshes resulting from surface or groundwater contamination

11.4.1 Objectives

Brockman have developed the following contaminated sites management objectives:

- Provide for the safe storage, disposal and treatment of residual chemical wastes and residues
- Ensure any contamination that occurs is investigated and remediated as soon as possible
- Any significant spills will be reported to the DEC and recorded through Brockman's incident reporting system

11.4.2 Completion Criteria

The PER identifies the following completion criteria relating to contaminated sites:

- C1. There shall be no contamination of ground or surface water from inappropriate storage or handling of chemicals and hydrocarbons
- C2. Known contaminated sites have been remediated to agreed levels as soon as possible and prior to site handover

This will be ensured through the following observations/undertakings:

- The extent and severity of any site contamination has been determined
- Contaminating infrastructure has been removed
- A timeframe for implementation of remediation strategies has been set
- Appropriate remediation methods are adopted and implemented

- Specific remediation criteria will be determined relative to each contamination situation. The specific criteria will be developed in consultation with the appropriate regulatory body

11.4.3 Management Actions

To reduce the risk of site contamination, Brockman will endeavour to:

- Ensure potential contaminants are stored and handled appropriately
- Audit areas where contamination is likely to occur on a regular basis
- Develop criteria to be met by remediation, and timeframe for completion of remediation activities
- Determine remediation methods in consultation with the DEC and other relevant regulatory bodies
- Implement remediation in compliance with relevant standards
- Undertake monitoring using appropriate/recognised methods to demonstrate reduction in any contamination to acceptable levels using an independent auditor
- Obtain regulatory sign-off that the remediation process has been effective and the site is no longer contaminated
- Retain appropriate records of all actions and results

11.5 Process Plant and other Infrastructure

The State government usually places a condition on its mining leases that requires the removal of all plant and equipment from the site at the completion of mining.

The cost of de-construction and removal of all plant from the site will depend on the how the process plant and infrastructure have been designed and constructed. For cost estimating purposes it can be assumed that about 30% of the on-site construction labour costs will be required to de-construct and remove all the built facilities from the site at closure. This cost estimate approach is based on practices adopted by other confidential companies. Better defined estimates can be generated, from demolition companies, when concrete, steel and earthwork quantities are known.

For cost estimating purposes, it has been assumed that any non-salvageable material will be deposited into the final mine void, prior to completion of backfilling operations. Non-salvageable material deposited in the void will be inert.

11.6 Decommissioning

A Decommissioning Plan will be prepared by Brockman prior to commencing any decommissioning activities. The Decommissioning Plan will examine the safety and environmental effects associated with decommissioning work in accordance with Western Australian Government procedures, addressing likely safety and environmental effects and describing the proposed management procedures.

Table 8 outlines the specific actions that will be carried out during the decommissioning phase. These actions are consistent with those adopted by other Pilbara operations and form the basis of the Marillana closure cost estimate for deconstruction aspects.

Table 8: Decommissioning Actions

Category	Actions
Workshop, Buildings, Process Plant, Accommodation buildings, etc.	All above ground structures to be demolished/dismantled and removed for re-use, recycling or disposal. All service pipes, electrical to be removed. Voids to be backfilled or otherwise made safe and access blocked. Steel will be sold as scrap and equipment sold (e.g. scrubbers, conveyor, etc), where possible.
Concrete Slabs	Remove all attached steelwork/equipment. Break up concrete and dispose in the final pit void.
Concrete Footings	Remove all attached steelwork/equipment. Break up concrete and dispose in the final pit void.
Above ground concrete plinths and structures	Remove all attached steelwork/equipment. Break up concrete and dispose in the final pit void.
Reclaim tunnels and vaults – corrugated steel pipe or pre-cast concrete (i.e. relatively thin)	Remove all internals (equipment, piping and electrical) and salvage where possible. Remove tunnel steel and concrete. Re-profile surface to natural contours.
Culverts	Remove all fill to reinstate natural drainage contours. Remove culverts.
Borefield and water supply lines	Permanently cap all bores no longer required. Remove all infrastructure (fencing, pipework, electrics, tanks, etc). Treat concrete as per appropriate category above. Remove all overland pipes.
Powerlines, communication towers, etc.	All infrastructure to be removed unless approved for further use and signed over to the custodian.
Ponds, reservoirs	Drain pond. Remove and dispose of any liners. Re-profile containment walls and breach wall at lowest point to prevent ponding of rainfall/runoff. Line drainage point with rock or other suitable material, where there is potential for erosion.
Storage Tanks (hydrocarbon, water tanks)	Drain tanks in safe manner. Tanks shall be appropriately decontaminated to allow safe dismantling or removal. Modular tanks shall be removed from site. Permanent tanks shall be dismantled.
Rail Loop	Remove rails, sleepers and signalling equipment for re-use. Remove ballast and dispose of off-site. Remove culverts. Rail formation (others than culvert areas) – re-profile to stable slope by spreading out to extent of existing service corridor.
Roads	Main Access Road – leave intact. Plant roads (bitumen) – remove bitumen to landfill, re-profile, rip and seed sub-grade. Plants, roads (gravel) – re-profile, rip and seed.
Hardstand areas	Bitumen sealed – remove bitumen to landfill, re-profile, rip and seed sub-grade. Gravel – re-profile, rip and seed.

11.6.1 Objectives

The objectives of decommissioning are to:

- Remove or dispose appropriately of Project infrastructure that will not be required for post-closure land uses
- Modify as required any infrastructure that will remain to ensure its long-term safety and stability
- Dispose of all waste material appropriately and in accordance to agreed outcomes

11.6.2 Completion Criteria

The CCP has identified the following completion criteria for decommissioning:

- C3. Project infrastructure that is not required for post-closure land use will be removed or disposed of appropriately

11.6.3 Management Actions

To ensure appropriate decommissioning of the infrastructure, Brockman will:

- Through consultation, identify what infrastructure is to remain and what is to be removed
- Ensure that any Project infrastructure that will not be used by a post-closure land user has been removed
- Decommission any ancillary Project infrastructure including water reticulation supplying potable and process waters, including any borefield as required
- Rehabilitate disturbed areas to suit post-closure land uses and to reflect pre-disturbance condition

11.7 Surface Water

The post-closure topography of the pit area will be formed by mine waste or fine reject backfill placement into the mine voids. Most pit areas will be backfilled to the existing surface level, but there will be some sections that will be above or below the pre-mining level.

From a surface water perspective, a key objective in the closure planning is to ensure the stability of the Hamersley Ranges drainage system over the long term. The channels will flow across the backfilled pit into the floodplain zone as shown in Figure 3. Consequently, minor flow events will be conveyed to Weeli Wolli Creek ensuring environmental flows are maintained while major flow events will flow across the more permeable floodplain zones and be attenuated. At closure the drainage for the mine area will, in order to minimise sedimentation, revert to a close approximation of the drainage pattern that existed before mining. The operation drainage system will be closely monitored and that data will be used in the final design of the closure drain system. This will involve the re-construction of drainage lines that have a similar alignment, longitudinal profile, cross section and stream bed constitution of the pre-mining drainage system. This will not be possible with the most westerly lines due to the FRS 1 construction across the creek lines. The re-constructed drainage pattern will be predominantly over the backfilled pits which will have relatively high permeabilities. It is assumed that the drainage lines will be lined with fines reject material under the stream beds. Further studies will be required to determine this.

The precautionary design standard for all drainage structures at mine completion is the Probable Maximum Flood, the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible at this site.

Potential impacts to surface water values relevant to closure include:

- Drainage stability and erosion of mine closure landforms
- Subsequent increase in sediment loads to Weeli Wolli Creek
- Permanent changes to the pattern of overland sheet flow and the subsequent changes to vegetation distribution

11.7.1 Objectives

Brockman aims to restore baseline flow regimes in areas affected by mining and closure works in order to:

- Maintain baseline surface water quality (chemically and physically)
- Ensure stability, into perpetuity, of permanent diversions, creek reconstructions and other constructed water management works left after mine closure

- Ensure the long-term prevention of elevated sedimentation to the surface water system
- Ensure stability of drainage from landforms created by mining
- Maintain the integrity, ecological functions and environmental values of wetlands and drainage systems interacting with the proposal
- Control and contain on-site any contaminated waters, to prevent entry into groundwater, natural drainage systems and surrounding vegetation, and remediate as necessary

11.7.2 Completion Criteria

- C8. No change in the long term quantity or quality of surface water reaching the Weeli Wolli Creek as a direct result of operations at the Marillana Project site

This will be ensured through the following observations/undertakings:

- Water use related infrastructure will be effectively decommissioned, as per agreed post land use intentions, and natural drainage patterns reinstated as far as possible dependent on site layout and water management scenarios
- Surface water drainage will be reinstated to mimic pre-mining drainage

11.7.3 Management Actions

Brockman will ensure the appropriate management of surface water resources during and post-mine closure. To do this, Brockman will:

- Construct a series of diversion drains to redirect water around or through the mine site. Once downstream of the mine site, flow would be diverted back to the original drainage course wherever possible
- Design diversion channels with sufficient capacity for a nominated rainfall event, while minimising earthworks and the channel footprint
- Ensure channels are the appropriate width and depth and have a bed gradient and side batters to minimise channel velocities, ensure a stable channel profile, and encourage sedimentation prior to discharge to Weeli Wolli Creek
- Ensure all waste rock stockpiles are bunded appropriately to contain internal surface water runoff for treatment and to divert external surface water
- Develop and implement a monitoring program for surface water level and quality
- Implement systems and practices to avoid pollution events during the operational life of the mine
- Immediately manage all pollution events to reduce impact on surface and groundwater
- Remove and/or control sources of pollution
- Rehabilitate all disturbed areas relevant to the Project to reduce erosion and facilitate integration into the natural drainage system
- Record all actions and results

11.8 Groundwater

At closure the bulk of dewatering bores within the pit footprint will have been removed progressively as part of the mining operations. The remaining water supply bores may be left for usage by the pastoralist or closed according to the relevant abandonment procedures.

Following cessation of dewatering, natural recharge and inflow processes will result in water levels recovering to pre-mining levels. All areas mined below water table will have been backfilled and there will be no long-term pit lake or void in the water table. Consequently, there will be no significant impacts on water quality or groundwater flow.

The numerical groundwater flow model was also utilised to predict the long-term impact on recovering water levels of the proposed in-pit fines rejects and waste rock disposal scheme (Aquaterra Pty Ltd, 2010)

The modelling indicates the following in regards to groundwater levels:

- Regionally (away from the direct mine path area), predicted water levels are not impacted by the in-pit waste rock and fine rejects scheme, and recovered water levels match pre-mining conditions
- Locally (at either end of the backfilled pits), long-term changes in groundwater levels are less than 3 m
- At the most upstream end of the mine path, predicted water levels are higher than the pre-mining case, as groundwater flow is reduced consistent with the placement of fines rejects and waste rock of lower hydraulic conductivity than the existing orebody aquifer
- At the downstream end of the mine path, due to the restriction of groundwater flow, predicted water levels are up to 3 m lower than pre-mining

The modelling also indicates the depressed groundwater levels recover to 80% of their pre-mining levels in the first 50 years, although full recovery to pre-development is predicted to take approximately 100 years.

However, after mining ceases, it is likely that the site will receive enhanced rainfall recharge to the mine path post-closure (as the backfilled waste areas will have enhanced permeability associated with bulking factors, etc). Groundwater throughflow in the area is low, and recovery relies upon recharge events. Above-average rainfall events will therefore condense the groundwater recovery period for the project.

11.8.1 Objectives

The closure objectives for groundwater are as follows:

- The quality and quantity of ground and surface waters is maintained, so that existing and potential environmental values, including ecosystem maintenance are protected
- Hydraulic continuity along the aquifer system will be reinstated post-closure

11.8.2 Completion Criteria

- C9. The quality and quantity of groundwater has been maintained, so that existing and potential environmental values, including ecosystem maintenance, are protected

This will be ensured through the following observations/undertakings:

- Contaminated waters have been controlled and contained on-site to prevent entry into groundwater and remediation has occurred
- Groundwater levels, quality and flow processes return to pre-mining conditions

11.8.3 Management Actions

To ensure the appropriate management of groundwater during and post-mine closure, Brockman will:

- Backfill the pit to above the pre-mining regional water level to prevent long term salinisation of groundwater
- Prevent groundwater pollution and contamination through appropriate waste management practices
- Plan the in-pit storage of waste rock and fines to minimise effects on the hydraulic continuity of the aquifer system (in the majority of areas below the mine path, a permeable aquifer unit remains untouched and intact, retaining pre-mining groundwater throughflow characteristics))

- Develop and implement a monitoring program for groundwater level and quality

11.9 Rehabilitation of Native Vegetation and Topsoil

Minimising or controlling the disturbance footprint of the Project is the most effective method to ensure that rehabilitation closure objectives are met.

Rehabilitation normally comprises the following:

- Developing designs for appropriate landforms for the mine site
- Creating landforms that will behave and evolve in a predictable manner, according to the design principles established
- Establishing appropriate sustainable ecosystems

11.9.1 Objectives

The closure objectives for rehabilitation are as follows:

- Minimise the loss of native vegetation and plant communities
- Protect threatened species and/or communities within the project area
- Reduce the likelihood of soil erosion and dust;
- Restore the area to natural system as soon as possible
- Ensure that rehabilitation is appropriately planned for and complies with approved guidelines

11.9.2 Completion Criteria

- C10. Impacted areas will be returned to self-sustaining vegetation communities and fauna habitats that reflect pre-disturbed state
- C11. Noxious weeds will be managed in line with mining best practice in the Pilbara
- C12. Topsoil remains viable and has the capacity to support a safe, stable and functioning ecosystem that meets the requirements of the post-mining land use

This will be ensured through the following undertaking:

- Rehabilitation has occurred progressively where possible and areas have been revegetated to meet the agreed post-mining land uses

11.9.3 Management Actions

Rehabilitation will be carried out progressively over the life of the Project. The rehabilitation techniques will be regularly reviewed, based on knowledge gained by trials, monitoring performance of existing rehabilitation in other parts of the Pilbara as well as site specific information on waste and topsoil characterisation and performance. It is expected that the rehabilitation techniques will evolve with time and their implementation should be regularly reviewed and updated. Rehabilitation monitoring will be carried out until revegetation meets the designated completion criteria and is signed off by the DMP. Further details are rehabilitation techniques are provided in the CCP (Appendix A).

Based on current information the actions to be taken to rehabilitate the land disturbed by mining are shown in Table 9.

Table 9: Disturbance and Required Rehabilitation Actions

Disturbance	Rehabilitation
Open pit – waste backfill	1. Backfill to nominated RL that blends with pre-mining landform. 2. Spread topsoil to approximately 200 mm thickness. 3. Ameliorate soil as required, deep rip and seed at same time as ripping.
Open pit – FRS 2, 3 and 4	1. Place rejects. 2. Allow to dry out so that vehicles can safely operate on the surface. 3. Place mine waste to depth of approximately 2 m. 4. Spread topsoil to approximately 200 mm thickness. 5. Ameliorate soil as required, deep rip and seed at same time as ripping.
FRS 1	1. Re-profile slopes to reduce erosion potential. 2. Cap with approximately 2 m of mine waste rock. 3. Spread topsoil to approximately 200 mm thickness. 4. Ameliorate soil as required, deep rip and seed at same time as ripping.
Above-ground waste dump	1. Shape upper surface to reduce potential to over top and erode slopes. 2. Profile slopes to reduce erosion potential. 3. Spread topsoil to approximately 200 mm thickness. 4. Ameliorate soil as required, deep rip and seed at same time as ripping.
Other disturbed land	1. Re-contour to return to natural relief or compatible landform consistent with surrounding relief. 2. Re-establish drainage line, if applicable. 3. If compacted deep rip to loosen soil. 4. Spread topsoil to approximately 200 mm thickness. 5. Ameliorate soil as required, deep rip and seed at same time as ripping.

11.10 Visual Amenity and Heritage

Due to the isolated nature of the Project location, it is not anticipated that there will be a significant impact to visual amenity for locals or tourists. However, there will be visible changes to the landscape, and Brockman are committed to reducing these visual impacts and maintaining, post-closure, the amenity and original uses of the area.

As there are neither known registered heritage sites, nor any identified ethnographic or archaeological sites within the Project footprint on the tenement, the impacts to heritage values as a result of the Project operations is anticipated to be negligible.

11.10.1 Objectives and Completion Criteria

- C13. Ensure that aesthetic values and public experience of the landscape are considered, and measures are adopted to reduce the visual impacts on the landscape
- C14. Maintain and protect any significant landscape, indigenous heritage and geo-heritage values

11.10.2 Management Actions

To ensure that amenity values of the area are maintained, Brockman will:

- Consult with relevant stakeholders throughout the life of the Project to determine appropriate end land use
- Shape waste dumps to mimic local landforms
- Re-instate streams where practicable
- Implement the Project CHMP throughout the life of the project

11.11 Fauna and Biodiversity

The recovery of fauna is linked to the following rehabilitation actions:

- Subterranean fauna – rehabilitation of pit subsurface and groundwater flows
- Terrestrial fauna – rehabilitation of surface landforms (including vegetation covers) and surface water flows

11.11.1 Objectives and Completion Criteria

- C15. Restore the Project area to a condition that supports subterranean fauna as soon as possible after infrastructure is no longer required
- C16. Restore the Project area to a condition that supports terrestrial fauna as soon as possible after infrastructure is no longer required

11.11.2 Management Actions

To meet these completion criteria, Brockman will:

- Rehabilitate Project areas as soon as practicable to pre-pre-disturbance conditions
- Undertake regular terrestrial and subterranean monitoring programmes following the cessation of mining activities to track fauna recovery

12.0 COSTS ESTIMATES

A closure costs estimate is essential to ensure the cost of closure is economically feasible, that adequate resources will be provided to assure conformance with the Mine Closure Plan, and that the Company and the community are not left with a liability (ANZMEC 2000). This costs estimate incorporates progressive rehabilitation activities, and includes provisions for ongoing site management post-closure but prior to relinquishment. Closure costs will be reviewed regularly and adjusted as necessary, throughout the life of the Project.

The closure costs have been estimated on the following basis:

- The costs are based on information available as at 31st May 2010
- All costs are in Australian Dollars
- Cost estimates are based on 2010 prices
- No allowance has been made for contingencies
- All topsoil stripping and stockpile costs are included as part of the operating costs
- Mining lease fees consist of tenement holding fees (DMP rental + Shire rates), and do not include required annual expenditure costs
- All progressive rehabilitation activities (e.g. research and trials) will be incorporated into operating costs
- Rehabilitation of FRS 2, 3 and 4 commences two years after final deposition into those facilities
- The capping of FRS 1 will occur after production ceases
- The western and southern wall of FRS 1 will be reshaped and rehabilitated after the removal of the rail facilities
- 10% of revegetated areas will require reseeding in the year following initial seeding

- Deconstruction and removal of all mining infrastructure from the tenement is estimated to cost approximately 30% of the on-site labour costs required to construct that infrastructure
- The Net Present Cost has been calculated at a discount rate of 8%
- One contaminated location will exist and require remediation at closure
- Mobilisation Mobilisation/demobilisation for rehabilitation efforts is 10% of the estimated cost of the work (excluding backfilling, where mobilisation and demobilisation are included in the cost estimate)
- No salvage value has been included in the cost estimate for two reasons:
  - most international financial reporting systems do not allow the reduction in closure costs through the inclusion of salvage values
  - closure is too far in the future for a reasonable salvage values to be estimated
- Rehabilitation for each disturbance area will be staged. Earthworks (i.e. stabilisation and shaping), rehabilitation and revegetation will occur within in the same year, whilst reseeding will occur the following year. Initial UPB reduction in the Unconditional Performance Bond (UPB) will be 30% of the original bond amount, then 20% the following year after reseeding works
- A 1.5% UPB annual service fee will be applied to the Projects closure costs
- Relinquishment will be allowed for five years after final on-site closure work is completed (refer to Figure 2a for a schedule)

Refer to Figure 2b below for a project closure timeline flow diagram.

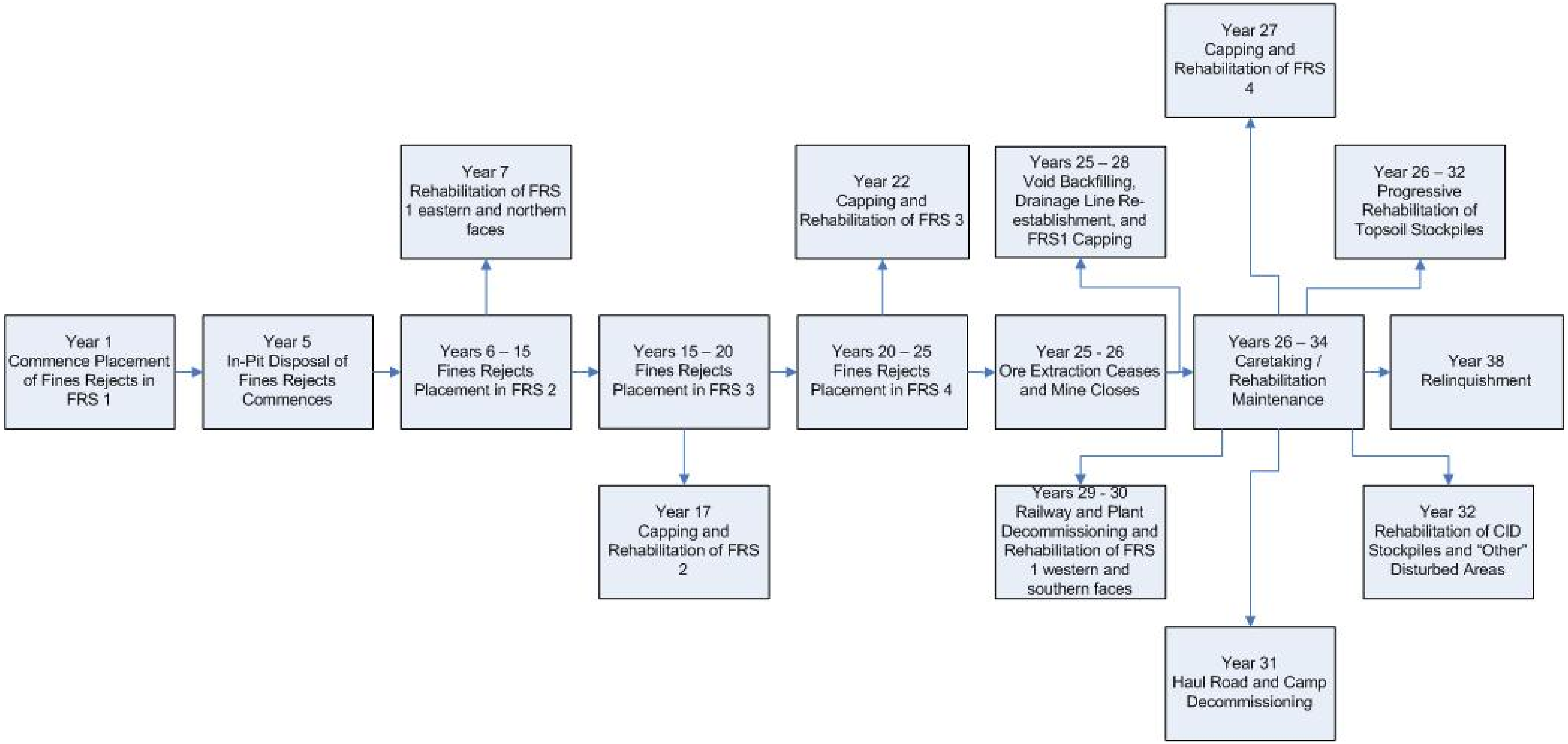

Figure 2b: Project Closure Timeline

The total area of potentially disturbed ground for the Project is 2641 ha as listed in Table 10 below and shown in Figure 7.

Table 10: Total Potential Land Disturbance

Disturbance	Area (ha)
Topsoil Stockpiles	138
CID stockpile	61
Process Plant and train loadout	120
Haul road and service corridor	56
Camp	20
Other	135
Waste rock dump	325
Backfilled pit	866
FRS 2,3 & 4	580
FRS 1	340
Total	**2641**

It is estimated that the cost for closure of the Project will be approximately $204,600,000. The Net Present Cost of the Project, calculated at a discount rate of 8%, is approximately $44,100,000.

The costs, schedule of rehabilitation, assumptions, and unit rates are summarised in Appendix D.

13.0 OTHER CLOSURE COSTS

All mobile equipment will be sold or otherwise transferred to third parties. The third party will be responsible for removing of the mobile equipment from the mine site at no cost to Brockman.

The water management facilities, including the extraction bores, infiltration systems and the associated pipe lines and power supply systems will be largely removed, with some bores remaining in commission as they will be required for post-rehabilitation monitoring. Ultimately all bores will be fully decommissioned unless specifically required by a future land occupier.

Post-closure monitoring of the tenement will be required for some time after Brockman has ceased production at the site, but before the authorities have released Brockman from its responsibility for the site and allowed the relinquishment of the mining lease. Monitoring will include:

- Post-rehabilitation vegetation monitoring (e.g. ecosystem function analysis) for at least five years after each rehabilitation/revegetation effort
- Groundwater monitoring using remote data loggers for five years after mining has ceased
- Several surface water monitoring missions following the reconstitution of drainage lines
- Landform erosion monitoring

Annual closure audits will be undertaken during the five years to anticipated site relinquishment.

The cost of a caretaker is included for Years 26 to 34 to manage the rehabilitation, monitoring efforts and site maintenance. Maintenance costs (e.g. roads, tracks, fencing, etc) are accounted for, costs decreasing from Year 33 until relinquishment (at the end of Year 38).

Mining Lease fees are included across the closure years at 2010/2011 levels.

13.1 Unconditional Performance Bonds

The Western Australian Government has a system of UPBs that apply to tenements granted under the *Mining Act 1978.*

The UPB are a contract between the Minister for Mines and a third party acceptable to the Minister, normally a bank or other financial institution, where the third party agrees to pay the Minister a sum of money, on demand, should the Company fail, for whatever reason, “fail to meet the rehabilitation requirements on their tenements”.

The UPB is calculated (Table 11) using standard rates that apply to four categories of disturbance (see Figure 8) and can be progressively adjusted as rehabilitation progresses.

Table 11: Total Potential Land Disturbance and Unconditional Performance Bond Calculation

Disturbance	Area (ha)	Calculated UPB (Rate/ha)	Amount ($)
Topsoil stockpiles	138	10,000	$1,380,000
CID stockpile	61	10,000	$610,000
Process plant and train loadout	120	10,000	$1,200,000
Haul road and service corridor	56	5,000	$280,000
Camp	20	5,000	$100,000
Other	135	55,000	$675,000
Waste rock dump	325	1010,000	$3,250,000
Backfilled pit	866866	5,000	$4,330,000
FRS 4	145	12,000	$1,740,000
FRS 3	175	12,000	$2,100,000
FRS 2	260	12,000	$3,120,000
FRS 1	340	12,000	$4,080,000
Total	**26412641**		**$22,865,000**

The published Government Policy states (DMP, 2008):

“Bonds will be retired when the rehabilitation has met all completion criteria and standards set out in approval documents, annual environmental reports and decommissioning plans. Bonds will not be retired until the Environmental Officer is satisfied that the rehabilitated area is safe, stable, erosion is comparable to the surrounding areas and that the biological system is sustainable under a range of seasonal conditions representative of that climate. In some circumstances it may take up to 10 years or more to fully retire a bond. The Director – Environment Division must formally approve all significant bond reductions and/or retirements.”

The amount of the UPB is adjusted roughly annually based on the progress in rehabilitation at the mine site as shown in Table 12.

Table 12: Unconditional Performance Bond Reductions and/or Retirement

Activity	Completion Criteria Met	Reduction Rate
Primary Earthworks - Reshaping - Drainage	Structure stable. Erosion controlled. Water run-off managed effectively	50% Total
Finishing Earthworks - Topsoil spread - Deep ripping	Appropriate topsoil cover. Adequate, contour ripping. Demonstrated stability and erosion control.	30% Total
Revegetation - Seeding - Planting	Vegetation established but not demonstrated to be self-sustaining. Weed control program commenced. Grazing control commenced.	20% Total
Relinquishment All actions complete	All criteria met	UPB Retired

For the purposes of this costs estimate it has been assumed that rehabilitation for each disturbance area will be staged, resulting in an initial UPB reduction of 30% (following Primary Earthworks, Finishing Earthworks, rehabilitation, and revegetation), followed by a 20% reduction the subsequent year (after reseeding). This will allow the retirement of the UPB. Financial institutions charge an annual service fee (1.5%) for providing the UPB and this has been included in the closure cost estimates.

14.0 MONITORING, REPORTING AND RECORDS

During operations a number of monitoring programs will have been implemented. At closure the majority of these will continue and will be crucial in recording the success or otherwise of meeting the completion criteria, as well as validating agreed criteria for relinquishment. Monitoring may address the following areas:

- Biological (flora and fauna)
- Surface and groundwater
- Remediation of contaminated sites
- Public safety
- Landform stability

The duration of post-mining monitoring programs will be developed in consultation with appropriate regulatory agencies.

Should monitoring indicate some closure completion criteria not being met, consultation with appropriate regulatory agencies will be conducted to develop of appropriate remedial actions.

Monitoring will be undertaken by Brockman until the agreed completion criteria have been met.

Reporting procedures will be established during operations will continue to ensure that results of all trials and actions including remediation works and monitoring of revegetation are properly recorded, referenced, and available for other personnel and for long-term reference.

The following records will be kept to enable assessment of Project completion:

- Geological records, including drilling and exploration data
- Plans and surveys of surface facilities

- Location, quantities and types of waste disposed in the area
- Results of rehabilitation as identified in monitoring
- Additional maintenance conducted post-closure
- Contamination reports
- Water quality reports
- Engineering reports regarding the stability of final landforms
- Other site specific surveys or studies
- The various iterations of the mine closure plan

These records will be made available to relevant authorities as required.

15.0 CLOSURE SCENARIOS

Closure may be initiated as a result of a number of scenarios that can be grouped under the headings of Planned Closure, Unplanned Closure and Temporary Closure (care and maintenance). The consideration of these scenarios within closure planning activities is a specific requirement of the Strategic Framework for Mine Closure (ANZMEC/MCA, 2000).

15.1 Planned Closure

Planned closure effectively follows the process model described shown in Figure 2b. That is, the preparation of a CCP during the planning phase of a project followed by regular reviews and updates of the Closure Plan during operations and the development of a Decommissioning Closure Plan prior to planned closure and the systematic implementation of this plan.

15.2 Unplanned Closure

In the event of sudden or unplanned closure, an accelerated closure process will be implemented. This involves the immediate preparation and implementation of a Decommissioning Closure Plan (based on the most current closure plan), taking into account the early cessation of activities at the site.

15.3 Temporary Closure

Temporary closures occur when mining activities cease or shut down temporarily, with the intention to recommence in the future. In this event, the site will be placed under care and maintenance, and a Decommissioning Closure Plan will be prepared and implemented, accounting for the potential for future operations. An environmental audit will be undertaken as soon as possible, to determine the status of all potential environmental risks during the expected care and maintenance period, and implement appropriate management strategies (DMP 2009).

15.4 Relinquishment

This closure plan assumes that relinquishment will be achieved at the end of Year 38. Relinquishment will occur only once the rehabilitation has met all completion criteria and standards set out in approval documents, annual environmental reports and decommissioning plans. This will need to be demonstrated through a series of closure audits during the last five years of rehabilitation to the satisfaction of the DMP. This will require demonstration that the:

> *"rehabilitated area is safe, stable, erosion is comparable to the surrounding areas and that the biological system is sustainable under a range of seasonal conditions representative of that climate" (DMP, 2008).*

16.0 RECOMMENDATIONS

The Mine Closure Plan should be reviewed and updated as part of the process of developing the final mine design before construction commences.

After construction is completed the "as built" drawings for the Project should be used to obtain a more accurate assessment of decommissioning costs by obtaining a quotation from a suitably qualified contractor.

During the mine operations it is recommended that regular review of the Mine Closure Plan be included as part of the normal mine planning process.

Continue to proactively engage with stakeholders and incorporate closure as a specific topic of discussion to clarify and agree on the closure vision, future land use and closure options.

In summary, this review should include the following:

- Finalisation of mine planning and design, based on detailed design information
- Identification of progressive rehabilitation opportunities to minimise closure liabilities
- Risk assessment update
- Revision of the closure outcomes and goals, based on detailed design information
- Undertake a legal review for the Marillana operation subject to approvals and commissioning once all operational licences, permits and approvals have been obtained to determine the implications on closure
- Continue to review and validate the closure objectives, targets and measures to ensure they continue to reflect statutory, corporate and community requirements
- Where applicable ensure the closure plan is aligned with relevant operational procedures, tools and measures
- Regularly review and update the decommissioning, rehabilitation and human resources inventories for the Project and regularly review and update the closure costs
- Conduct rehabilitation and revegetation research and trials during the early stages of mining to develop site specific rehabilitation techniques needed to establish local native species

17.0 LIMITATIONS

Your attention is drawn to the document – "Limitations", which is included in Appendix E of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks associated with the groundworks for this project. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

18.0 REFERENCES

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Report Signature Page

GOLDER ASSOCIATES PTY LTD

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Senior Environmental Scientist	Senior Consultant

JH/IC/lgs

A.B.N. 64 006 107 857

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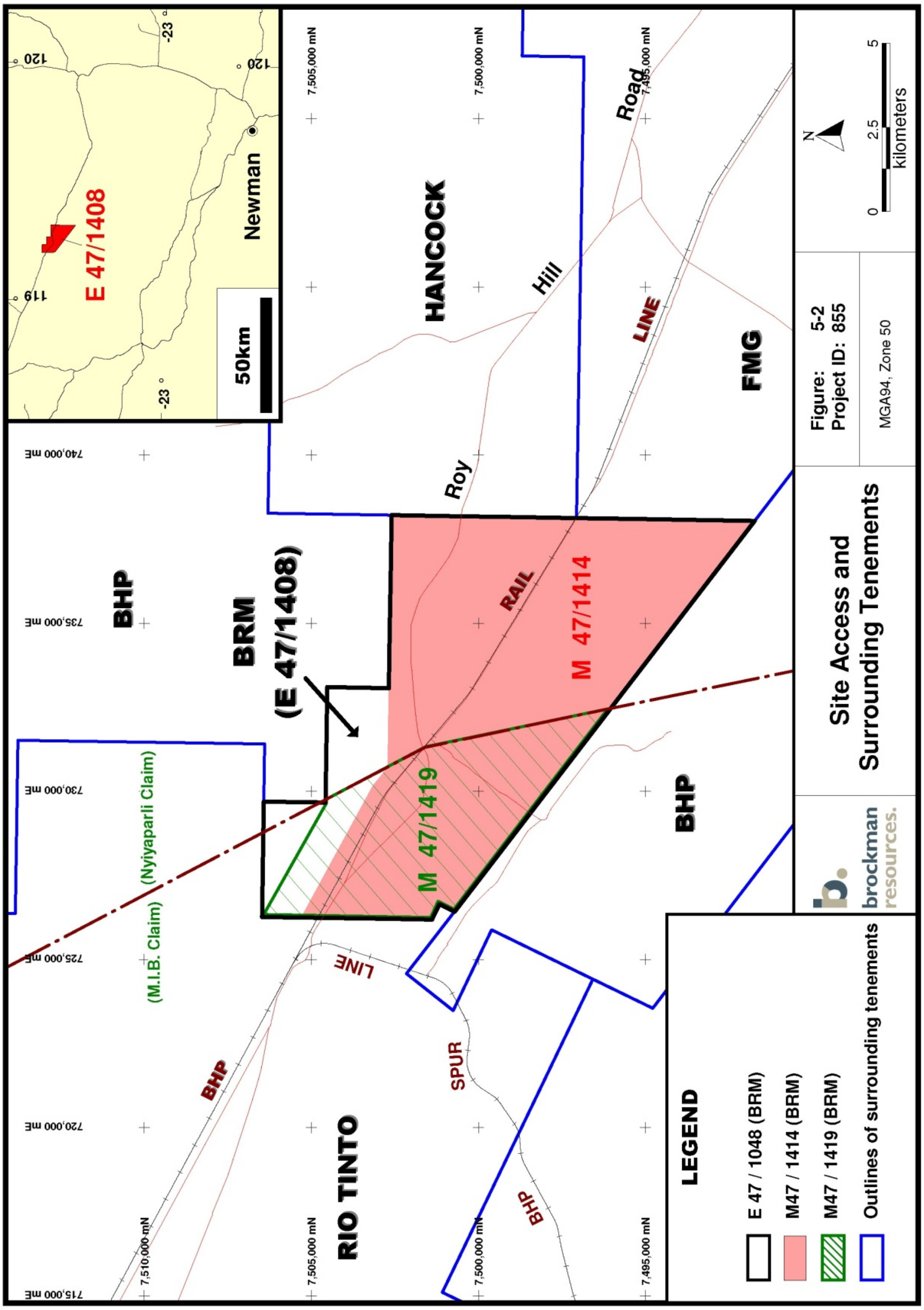

Source: Brockman Resources LTD – Marillana Iron Ore Project – Public Environmental Review

Golder Associates Level 2, 1 Havelock Street, West Perth WA 6005 Ph: +618 9213 7600 Fx: +618 9213 7611	CLIENT Brockman Resources Ltd		PROJECT Closure Plan	
	DRAWN JH	DATE 23/06/2010	TITLE **Site Access and Surrounding Tenements**	
	CHECKED HJ	DATE 07/07/2010		
	SCALE NTS	A4	PROJECT No 097641382	FIGURE No **Figure 1**

Location: M:\Jobs409\Mining\097641382_Brockman_Mining\ProjectDoc

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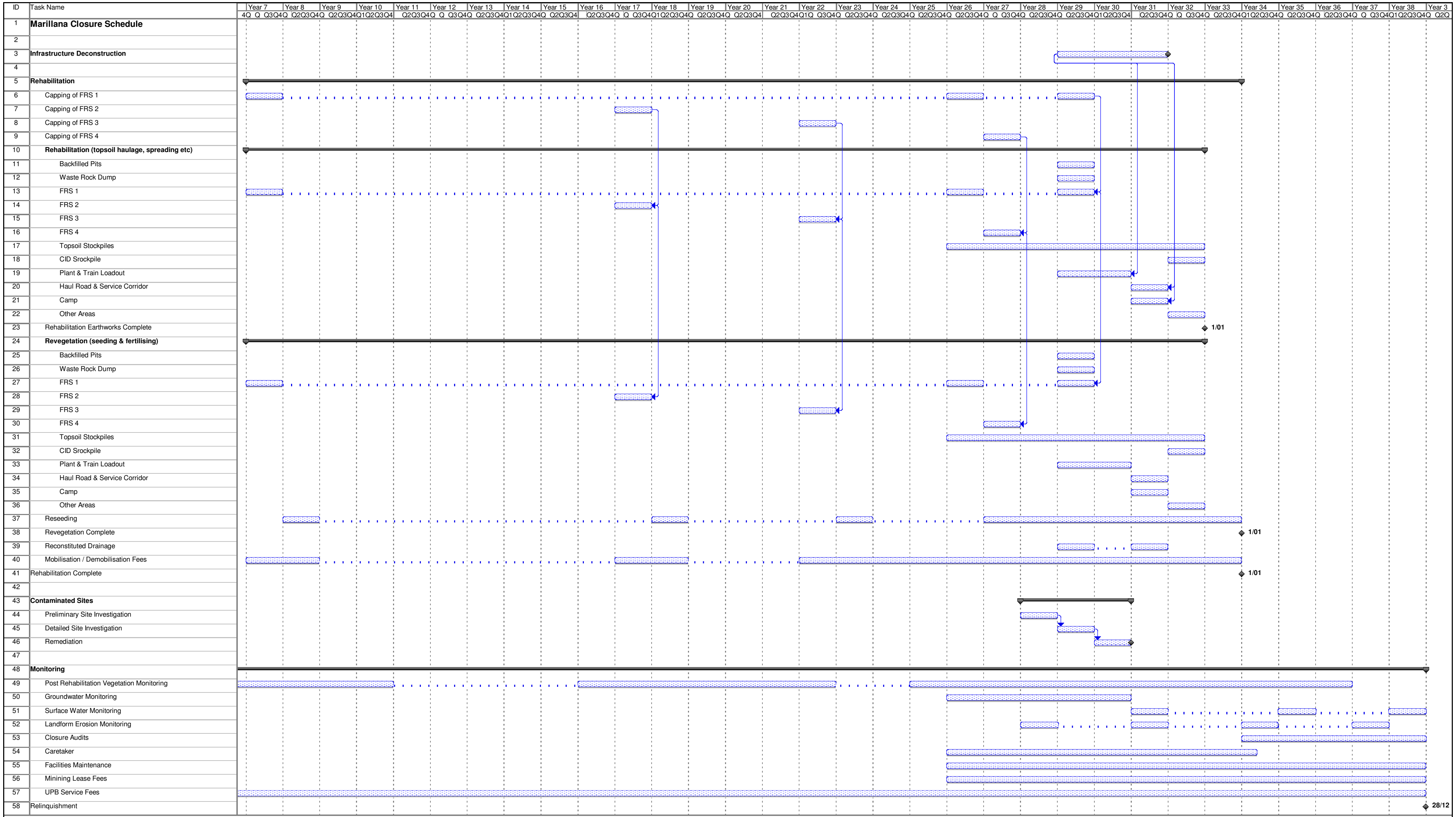
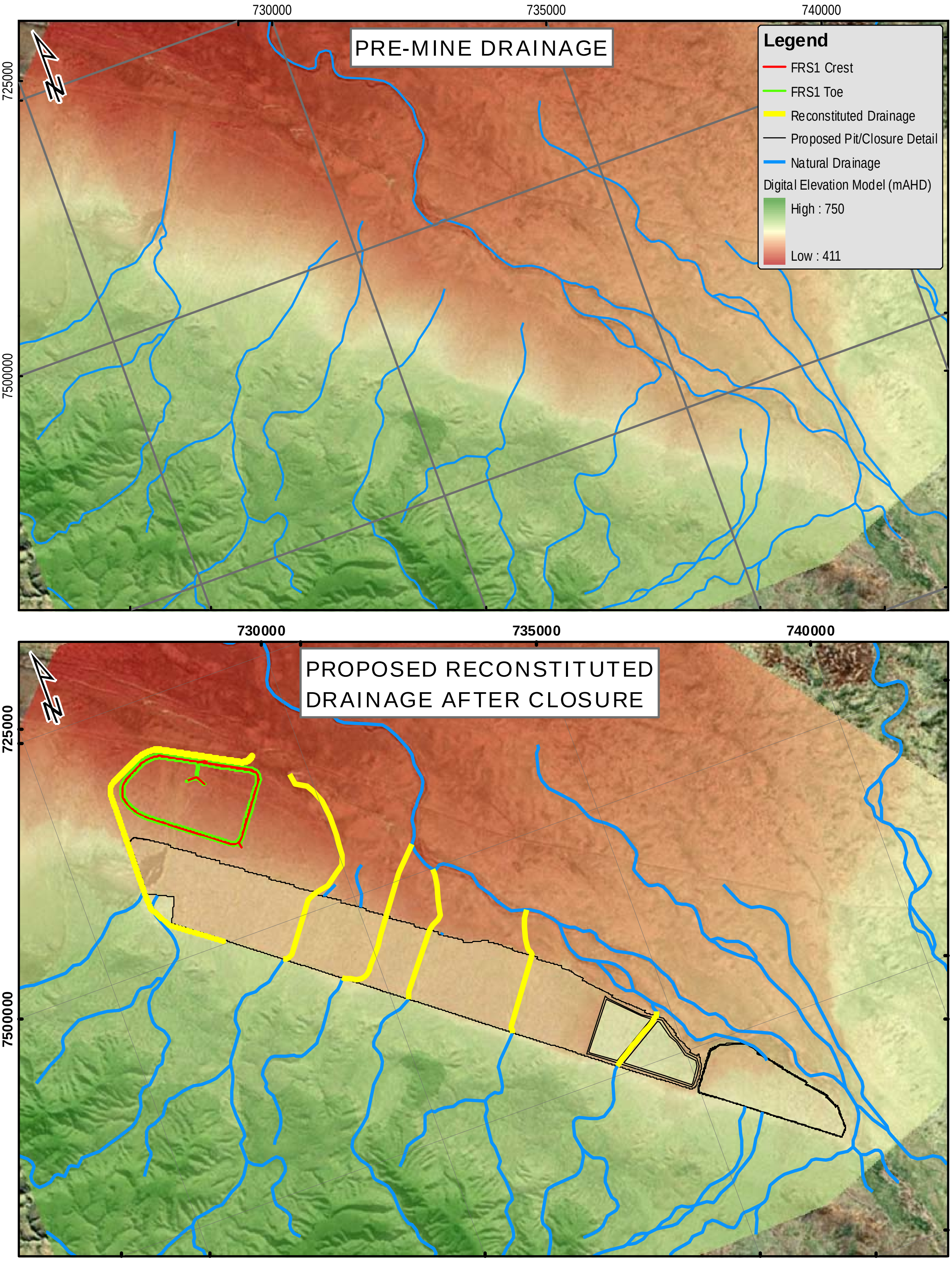


Figure 2a: Closure Schedule

(097641382_012_F0002_Rev0 - Closure Figure 2.mpp)



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PROJECT	097641382-012-R-REVA
DATE	24/06/2010
COMPILED	JOR
APPROVED	HJ

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Metres

A4 SCALE 1:100,000

Datum GDA94, Projection MGA Zone 50

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Marillana Iron Ore Project,
Costed Conceptual Closure Plan

PRE & POST MINE DRAINAGE

FIGURE 3

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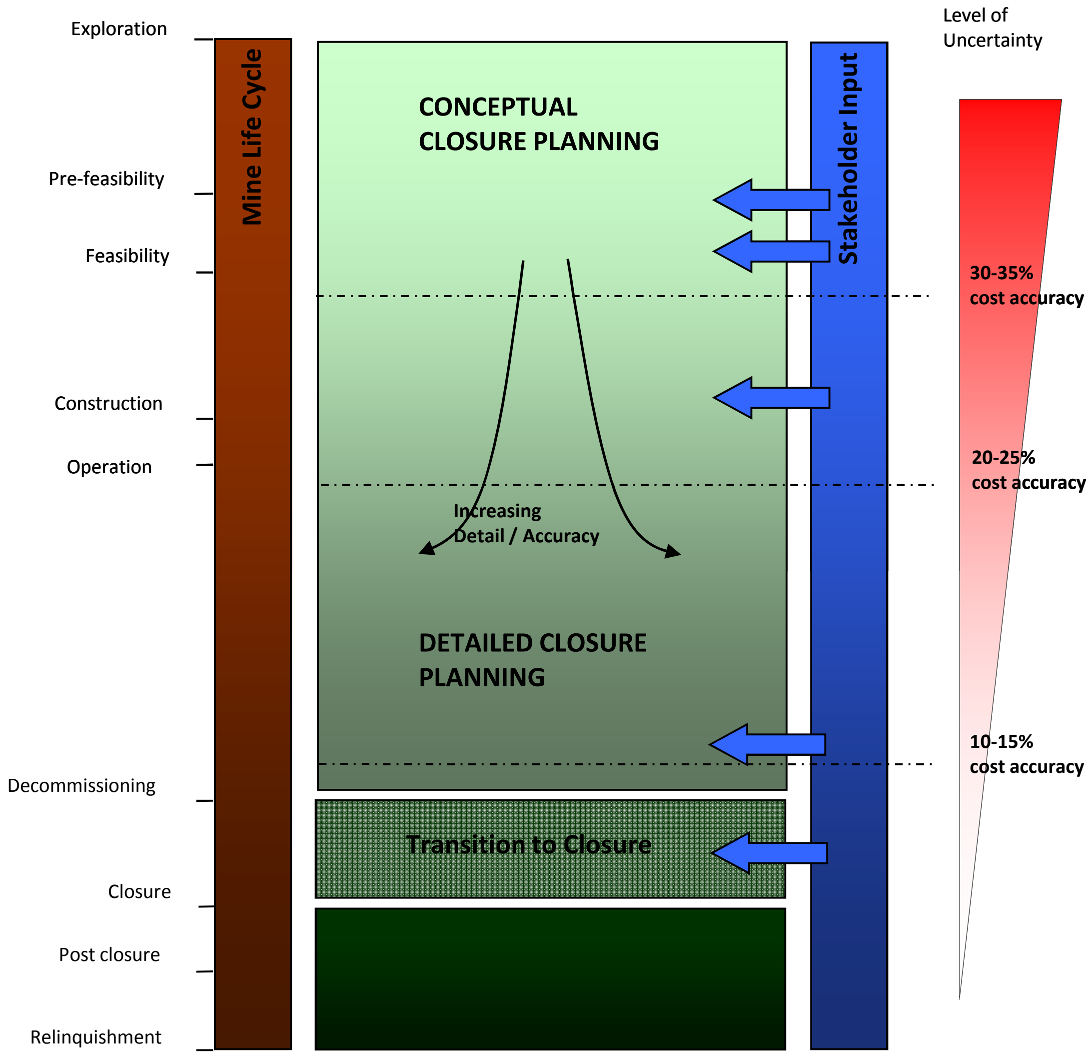

Adapted from Planning for Integrated Mine Closure: Toolkit, International Council on Mining & Metals, 2008.

Golder Associates	CLIENT Brockman Resources Ltd		PROJECT Closure Plan	
	DRAWN RJB	DATE 11-Jun-10	**Mine Closure Planning Development Process**	
	CHECK HJ	DATE 7-Jul-10		
	SCALE NTS	**A4**	PROJECT No. **097641382**	**FIGURE 4**

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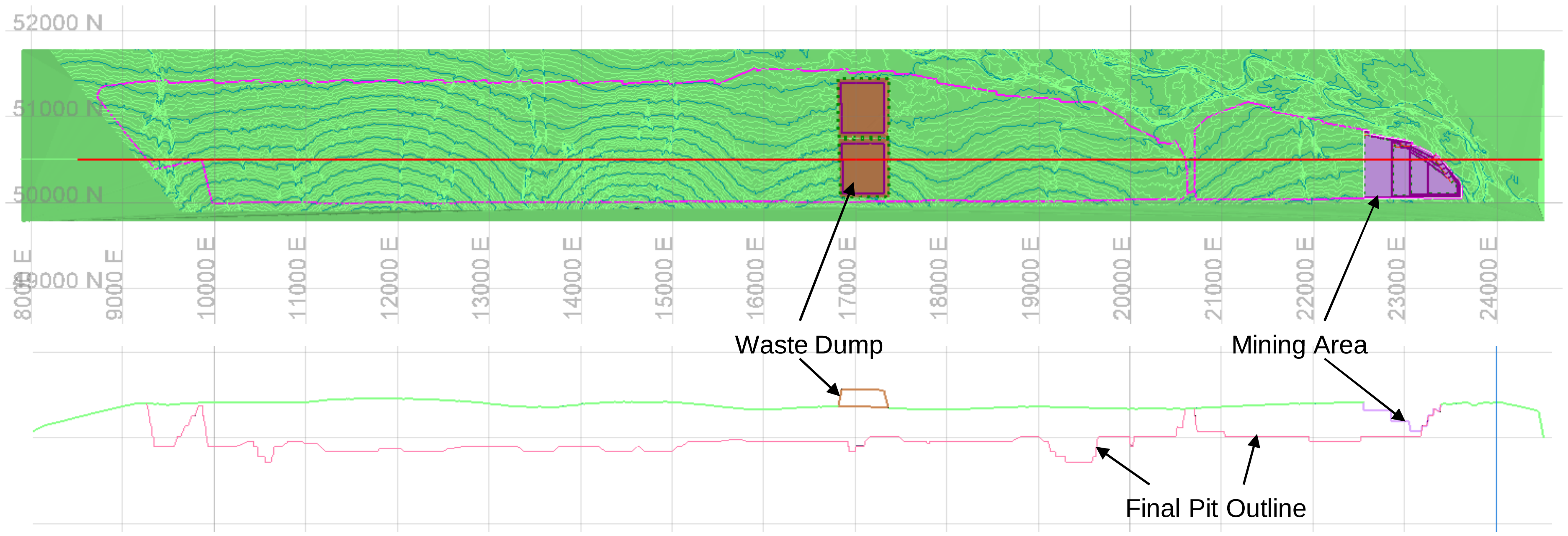
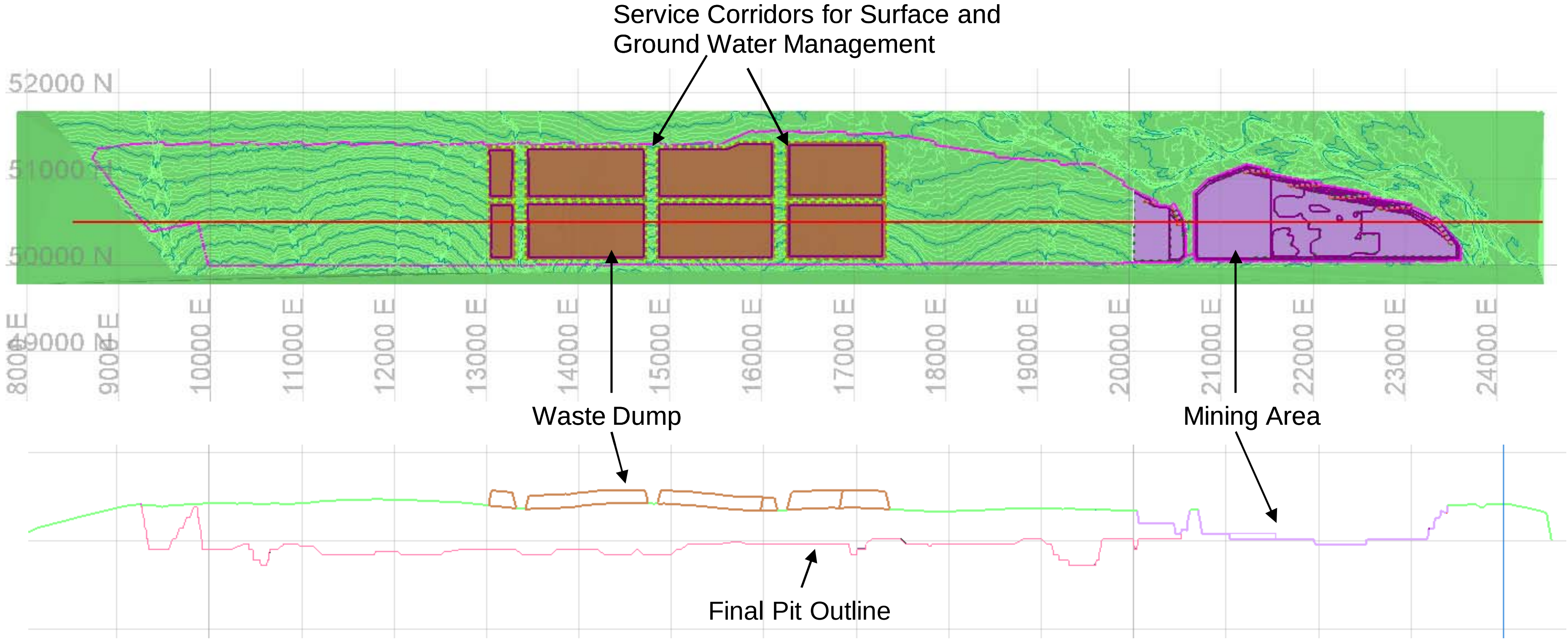


Year 1



Year 5

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	DRAWN RJB	DATE 11-Jun-10		**Progression of Mining (Year 1 and Year 5)**	
	CHECK HJ	DATE 7-Jul-10			
	SCALE NTS		A3	PROJECT No. **097641382**	**FIGURE 5**

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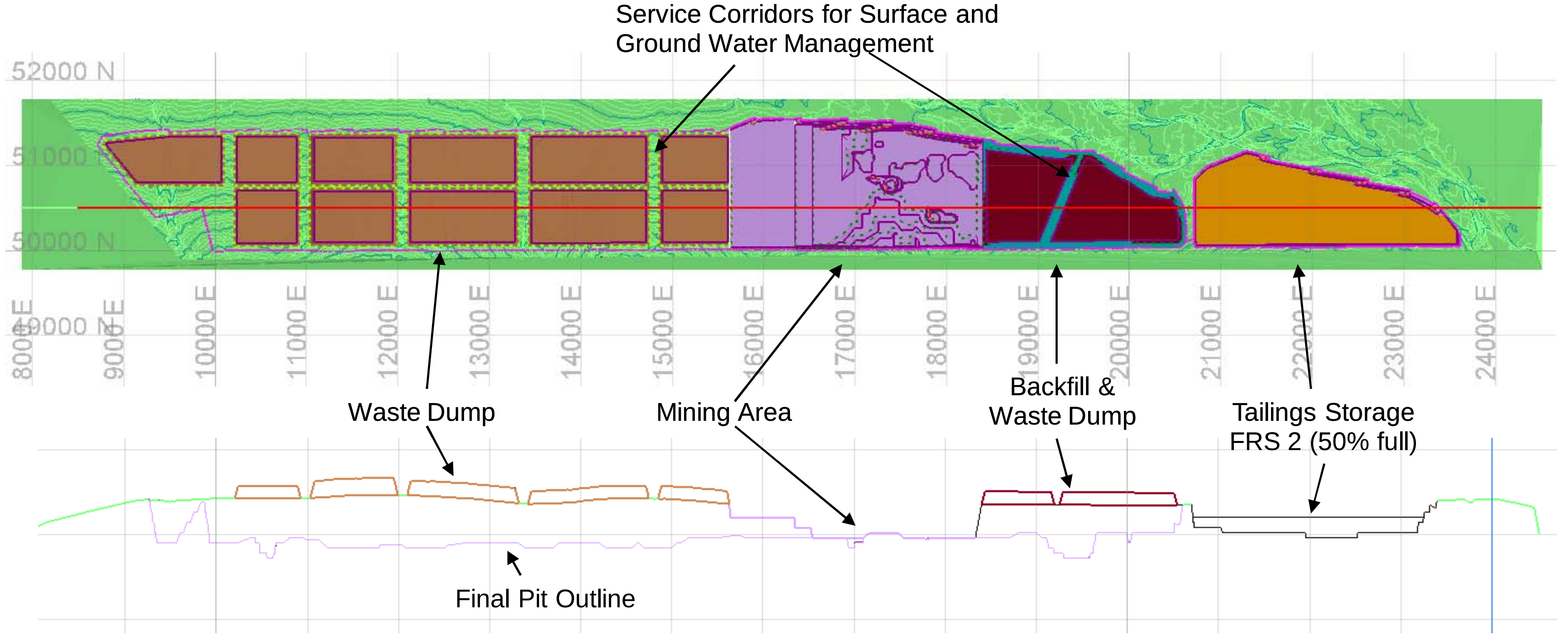
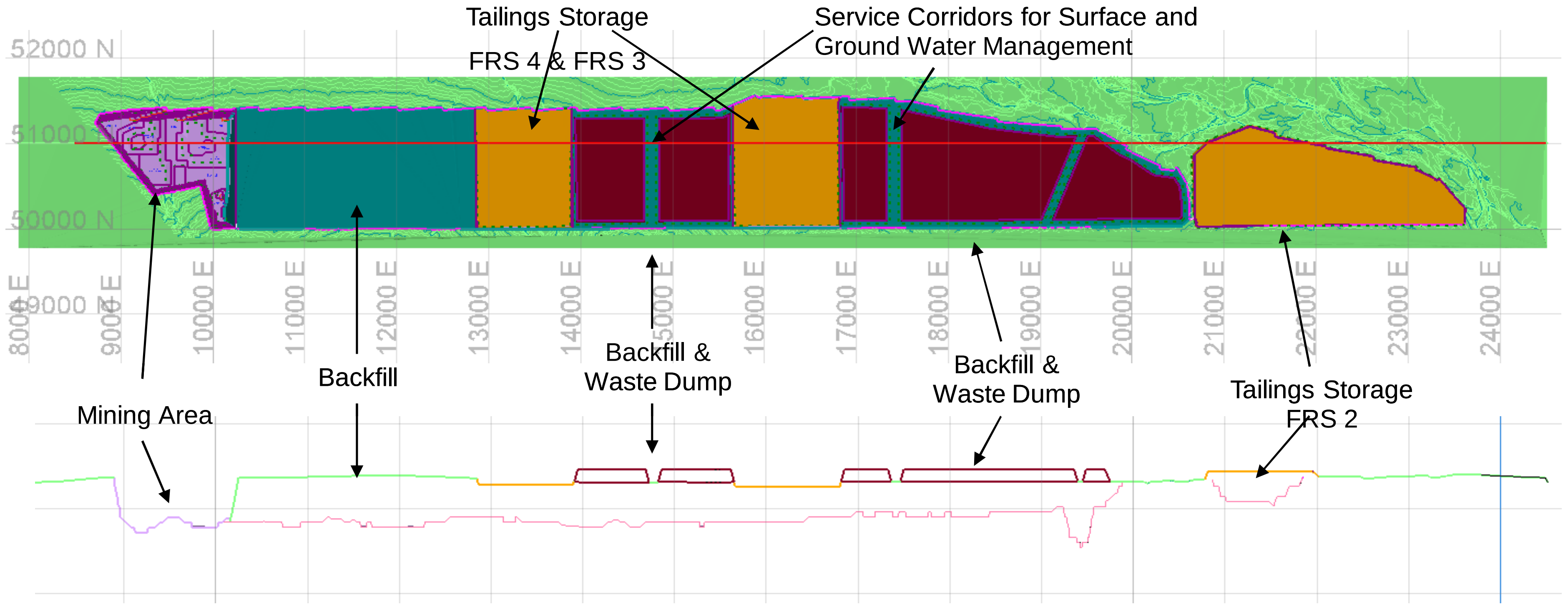


Year 10



Year 25

Golder Associates	CLIENT Brockman Resources Ltd		PROJECT Costed Closure Plan	
	DRAWN RJB	DATE 11-Jun-10	**Progression of Mining (Year 10 and Year 25)**	
	CHECK HJ	DATE 7-Jul-10		
	SCALE NTS	A3	PROJECT No. 097641382	FIGURE 6

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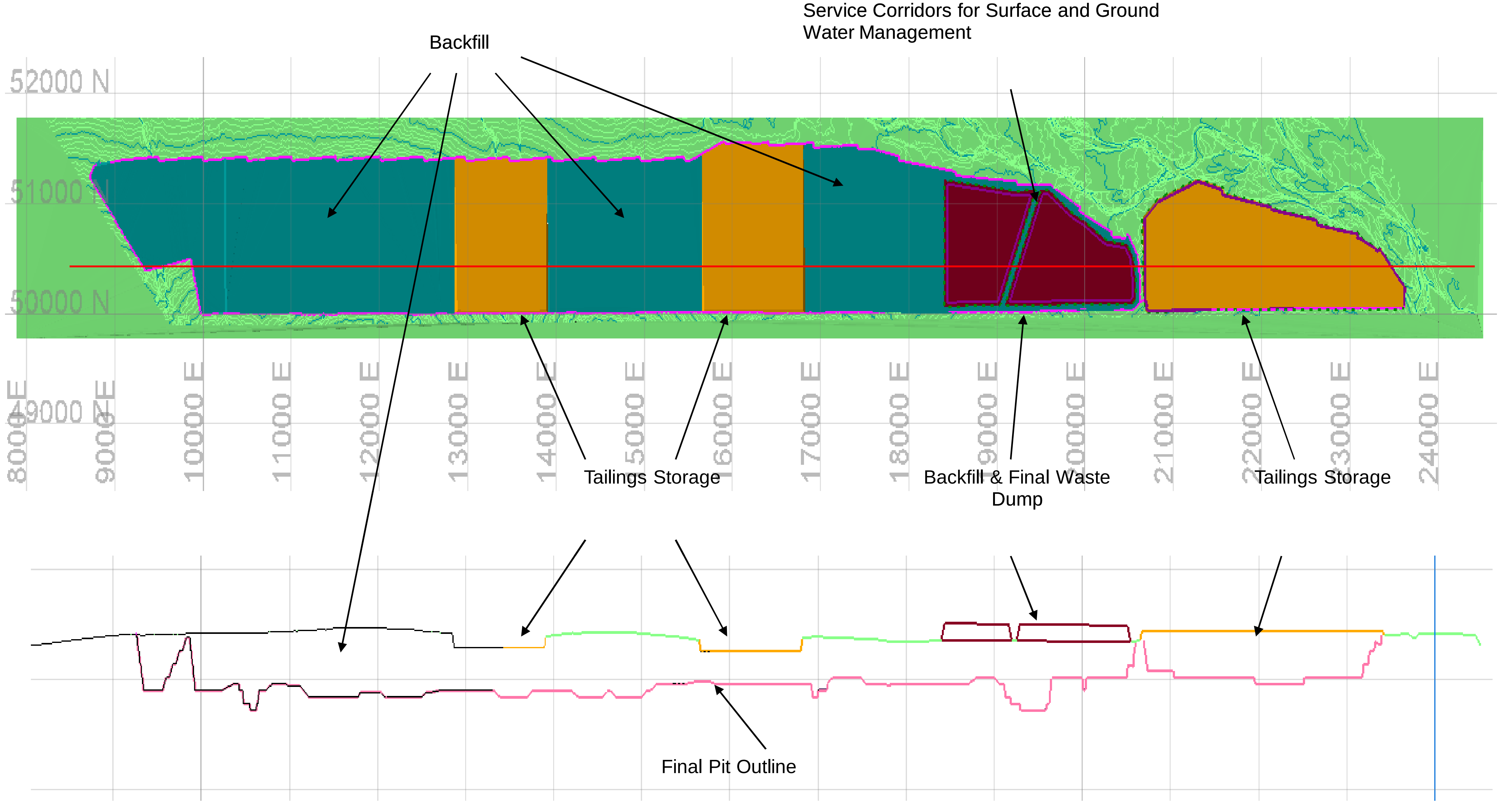
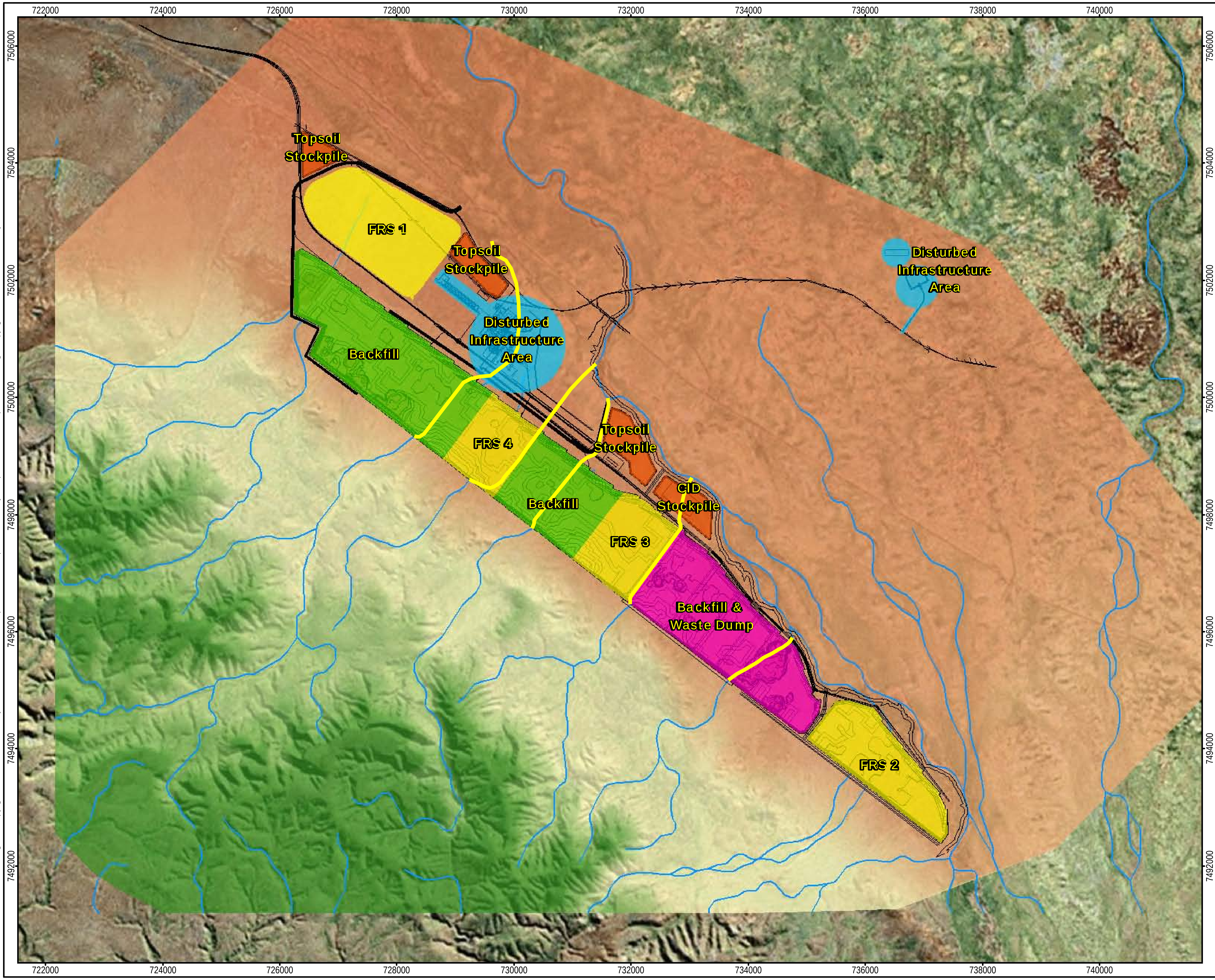


Golder Associates	CLIENT Brockman Resources Ltd			PROJECT Costed Closure Plan	
	DRAWN RJB	DATE 11-Jun-10		**Progression of Mining (Pit at Closure)**	
	CHECK HJ	DATE 7-Jul-10			
	SCALE NTS		A3	PROJECT No. **097641382**	**FIGURE 7**



Legend

- Reconstituted Drainage
- Site Layout
- Natural Drainage

Digital Elevation Model
Elevation (mAHD)

- High : 750m
- Low : 354m

Disturbed Area Footprints

- Backfill & Waste Dump
- Backfill
- Disturbed Infrastructure Area
- Fine Rejects Storage
- Stockpiles

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N

0 250 500 1,000 1,500 2,000
Metres

A3 SCALE 1:60,000

Datum GDA94, Projection MGA Zone 50

CLIENT	BROCKMAN RESOURCES PTY LTD
PROJECT	097641382-012-R-REV0
DATE	23/06/2010
COMPILED	JOR
APPROVED	HJ

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Marillana Iron Ore Project,
Costed Conceptual Closure Plan

DISTURBED AREA FOOTPRINT

FIGURE 8

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APPENDIX A

Conceptual Closure Plan

OCTOBER 2009

Providing sustainable environmental strategies, management and monitoring solutions to industry and government.

ecologia ENVIRONMENT

BROCKMAN RESOURCES LIMITED
CONCEPTUAL CLOSURE PLAN

BROCKMAN RESOURCES
MARILLANA IRON ORE PROJECT

CONCEPTUAL CLOSURE PLAN

brockman resources.

October 2009

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Document Status						
Rev No.	**Author**	**Reviewer/s**	**Date**	**Approved for Issue**		
				Name	**Distributed To**	**Date**
A	E. Congear	S.Gosney	12/08/08			
1	S.Gosney	R, Gabbitus	14/08/08			
1A	M.Barter	T.Souster	28/11/08			
1B	M.Barter	S.Gosney	03/12/08	S.Gosney	Brockman	04/12/08
2	M.Barter	T.Souster	31/07/09	M.Barter	B. Hynes	05/08/09
3	M.Barter	--	14/08/09	M.Barter	B. Hynes	25/08/09
4	M.Barter	G. Connell	11/09/09	G. Connell	Brockman	11/09/09
5	M.Barter	--	11/09/09	M. Barter	Brockman	13/10/09
6	M.Barter	--	27/10/09	M. Barter	Brockman	27/10/09

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Appendices

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EXECUTIVE SUMMARY

Brockman Iron Pty Ltd (Brockman) proposes the Marillana Iron Ore Project (the Project). The Project is located approximately 100 km northwest of Newman, in the Hamersley Iron Ore Province in the Pilbara region of Western Australia.

The Project will consist of conventional open pit mining operations, wet ore processing, stockpiling and the establishment and maintenance of an accommodation village and supporting infrastructure. The mine is anticipated to yield up to 19 Mtpa over 20 years. Ore will be transported by rail to Port Hedland, where it will be exported to world markets.

Brockman proposes to develop the Project which consists of a 700-750 Mt iron ore mine, processing facility and associated infrastructure within the Hamersley Iron province in the Pilbara region of Western Australia, approximately 100 km from the town of Newman.

Waste and fines rejects disposal will consist of two waste rock stockpiles (WRS), a fines rejects storage (FRS) facility and in-pit disposal of waste rock after year 2 and fines rejects after year seven of operation. The waste material has been assessed by Graeme Campbell and Associates to be Non-Acid Forming (NAF), therefore, the waste rock and fines are not expected to have significant potential for acid generation.

Final landforms will include the two WRS facilities, the FRS, a contoured pit filled to above the pre-mining water table to avoid the potential for pit lakes, flood protection levees and bunding, two run-of-mine (ROM) pads and possibly some diverted streams.

This *Conceptual Closure Plan* (CCP) forms part of the documentation that is to be submitted for environmental assessment with the Brockman Marillana Iron Ore Project Public Environmental Review.

Closure, either at the end of the mine life or running concurrently with mining activities, is a critical component of mine management and ensures there are no ongoing adverse environmental or other impacts. By developing closure strategies as part of the planning stages of the project, Brockman is demonstrating that areas impacted by the project will be left in a condition acceptable to regulators, post-mining land users and community stakeholders.

Planning for mine closure seeks to address the social, environmental, financial and safety aspects of mine closure. The aim is to prevent or minimise long-term impacts and to create a self-sustaining natural ecosystem or alternate land use based on an agreed set of objectives (ANZMEC, 2000). In undertaking mine closure activities at areas impacted by the project, Brockman will fulfil the following objectives:

- Ensure, as far as practicable, that rehabilitation achieves a long term, safe, stable and functioning landform which is consistent with the surrounding landscape and pre-existing environmental values.
- Conduct effective consultation to enable stakeholders, including regulatory agencies, non-government organisations and other interested parties, to have their interests considered during the mine closure process.
- Ensure that commitments made to stakeholders and regulators are fulfilled.
- Ensure that public safety is protected.

- Minimise negative impacts to the surrounding environment.
- Ensure legislative requirements are met.
- Re-establish landforms and vegetation communities to meet the agreed post-mining land use requirements.
- Achieve closure completion criteria, as confirmed by monitoring, to allow for effective and complete relinquishment of tenements.
- Fulfil all commitments in this CCP.
- Release Brockman Iron from further liability.

The CCP will be updated throughout the anticipated 20 year life of mine in order to consider changing stakeholder requirements and environmental impacts. A Final Closure Plan will be drafted two years prior to mine closure.

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of a *Conceptual Closure Plan* (CCP) is to identify the key objectives for mine closure to guide project development and design (ANZMEC, 2000).

This CCP outlines closure issues related to the infrastructure and activities incorporated with the mining, processing, and disposal of waste ore for Brockman's Marillana Iron Ore Project (the Project).

The aim of this CCP is to provide a strategic planning framework for the closure of the Project by:

- Identifying those aspects relating to decommissioning and closure which may impact on the environment, health and safety.
- Providing a basis for consultation with responsible authorities and identified stakeholders regarding the post-mining land uses of the project area and the development of agreed completion criteria.
- Developing management strategies to be implemented as part of the project's design, construction and operation to minimise impacts and site closure requirements.
- Identifying preliminary closure costs to establish adequate financial provisions.
- Providing details of the management strategies to be implemented by Brockman to the appropriate responsible authorities and the community to confirm completion criteria are met.

This closure plan will be reviewed and improved at least every five years over the life of the Project to consider changes in site conditions, operations, technology and community expectations.

1.2 PROJECT LOCATION

The Project is located within the Pilbara region of Western Australia approximately 100 km northwest of the township of Newman (Figure 1-1). The Project is located within E47/1408 and is subject to applications M47/1414 and M47/1419. All tenements are held by Brockman Iron Pty Ltd (Brockman) a wholly owned subsidiary of ASX listed company Brockman Resources Limited.

The tenement covers 95 km^2 of the Fortescue Valley and borders the Hamersley Range, where extensive areas of supergene iron ore mineralisation are developed within the dissected Brockman Iron Formation which caps the range.

The main access to the project site is via the Great Northern Highway and the unsealed Munjina – Roy Hill Road. Approximately 58 km along the Munjina – Roy Hill road the BHP Billiton rail line into the Yandi mine intersects the road. The northern boundary of the tenement is a further 1 km west of this rail line intersection.

The Project lies south of the Fortescue Marsh, and is intersected by distributaries of the Weeli Wolli creek delta.

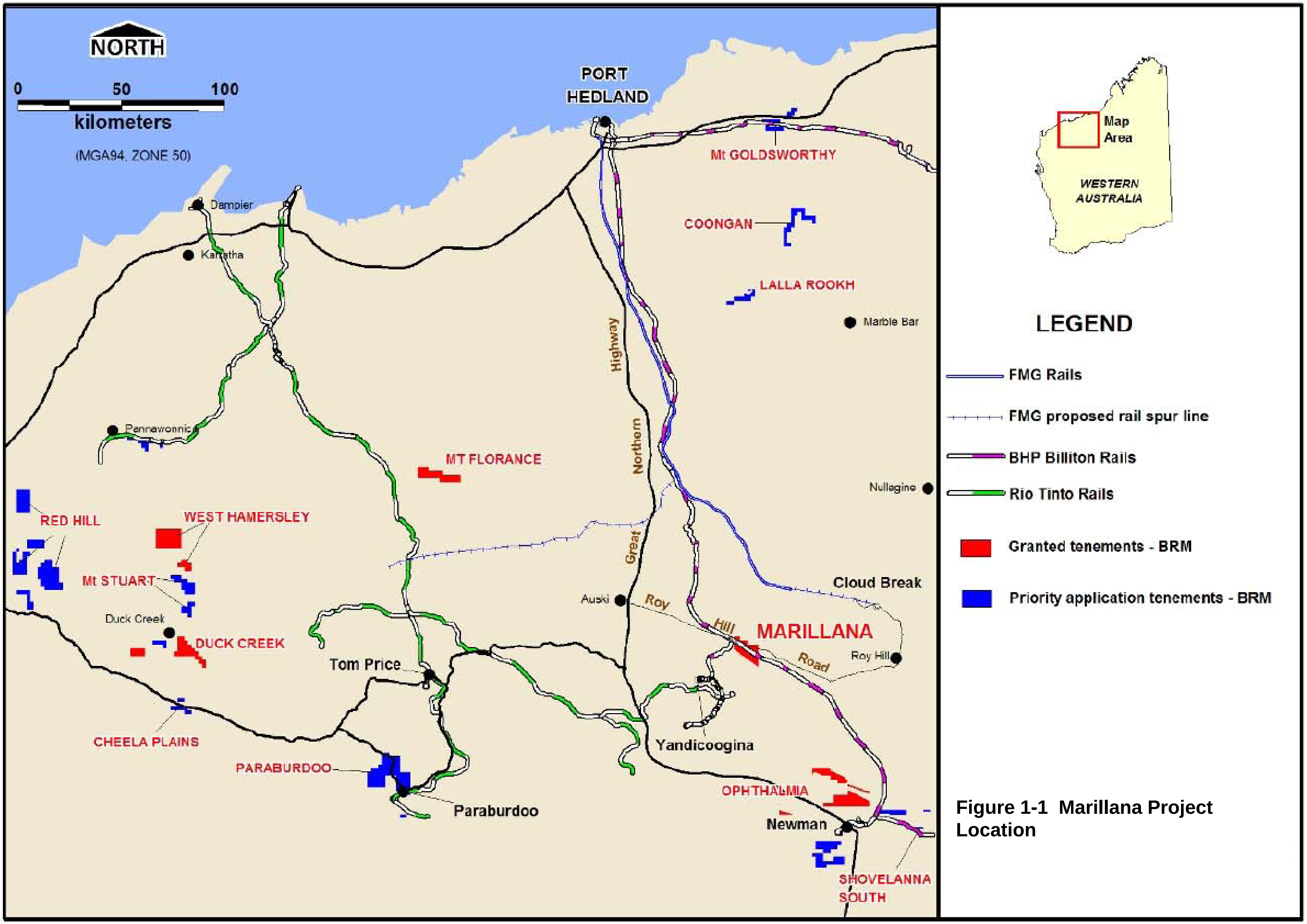

Figure 1-1 Marillana Project Location

1.3 PROJECT COMPONENTS

Brockman proposes to develop the Project which consists of a 700-750 Mt iron ore mine, processing facility and associated infrastructure. The Project will comprise:

- An open cut iron ore mine producing 17-19 Mt of ore per annum.
- Above ground overburden and fines rejects storage facilities.
- In-pit disposal of mine waste after year two of operation.
- In-pit disposal of fines rejects after year seven of operations.
- Crushing, screening and processing facilities.
- A train loading facility.
- An accommodation camp for 550 personnel.
- A bore field to supply potable water to the accommodation and offices.
- Offices, workshops, a laboratory and supporting infrastructure including an explosives facility, landfill, water treatment plant and bulk fuel storage.

The table below highlights the key aspects of the project.

Table 1-1 Key Aspects of the Marillana Iron Ore Project

Key Aspect	Description
Mining Operations	
Proposed commencement	2012
Project life span	20 years
Anticipated year of decommissioning	2032
Size of ore body	700-750 Mt
Ore type	Hematite Detrital and Channel Iron Deposit
Ore mining rate	37.5 Mtpa
Total mining rate	80-90 Mtpa
Total estimated production (refined ore)	17-19 Mtpa
Average Stripping ratio (overburden : ore)	1.4:1
Mine Pit	
Depth of pit	40-80 m Below surface
Depth of water table	20-38 m Below surface
Total pit area	1,655 ha
Overburden stockpiles	587 ha
Ore Stockpiles	13 ha
Topsoil stockpiles	78 ha
Processing Requirements	

Crushing (and Screening)	Yes
Beneficiation Process	Wet Gravity beneficiation
Product Characteristics	Hematite Detrital and Channel Iron Deposit
Processing area footprint (incl. stockyard and rail loop)	234 ha
Fines Rejects Storage	247 ha
Mine Site Infrastructure	
On-site camp	15 ha
Waste Water Treatment and landfill	15 ha
Power source	On site diesel-NG/LNG dual fuel generators
Anticipated Power Requirement	35 MW
Water source	Pit de-watering
Miscellaneous Infrastructure footprint	148 ha
Total estimated area of clearing	2,931 ha
Anticipated annual water requirement	
Processing	7,250 MLpa
Dust suppression	1,400 MLpa
Accommodation	60 MLpa

2.0 CLOSURE OBJECTIVES

Closure objectives outlined in the Australia and New Zealand Minerals and Energy Council (ANZMEC/MCA) Strategic Framework for Mine Closure (2000) include:

- To enable all stakeholders to have their interests considered during the mine closure process.
- To ensure the process of closure occurs in an orderly, cost effective and timely manner.
- To ensure the cost of closure is adequately represented in company accounts and that the community is not left with a liability.
- To ensure there is clear accountability and adequate resources for the implementation of the closure plan.
- To establish a set of indicators that will demonstrate the successful completion of the closure process.
- To reach a point where the company has met agreed completion criteria to the satisfaction of the responsible authorities.

Brockman are committed to fulfilling the above objectives, and in undertaking closure activities at the Marillana project site, Brockman will fulfil the following project specific objectives:

- Ensure, as far as practicable, that rehabilitation achieves a long term, safe, stable and functioning landform which is consistent with the surrounding landscape and pre-existing environmental values.
- Conduct effective consultation to enable stakeholders, including regulatory agencies, non-government organisations and other interested parties, to have their interests considered during the mine closure process.
- Ensure that commitments made to stakeholders and regulators are fulfilled.
- Ensure that public safety is protected.
- Minimise negative impacts to the surrounding environment.
- Ensure legislative requirements are met.
- Re-establish landforms and vegetation communities to meet the agreed post-mining land use requirements.
- Achieve closure completion criteria, as confirmed by monitoring, to allow for effective and complete relinquishment of tenements.
- Fulfil all commitments in this Closure Plan.
- Release Brockman Iron from further liability.

Project closure objectives will be achieved by:

- Establishing through survey and investigation a baseline of the environment prior to project disturbance.
- Allocating appropriate cost and resource provision requirements.
- Planning mining and associated activities to best fit with closure concepts.

- Consulting with stakeholders to determine post closure land use and completion criteria for the project areas.
- Undertaking environmental monitoring to ensure that rehabilitation techniques have been successful in achieving post closure land-use criteria.

3.0 LEGAL OBLIGATIONS

Mine closure is subject to both federal and state legislation and Brockman is required to meet legal obligations during design, operation and closure phases of the Project.

The Marillana Iron Ore Project is being assessed by the Department of Mines and Petroleum (DMP) under the *Mining Act 1978* and by the Environmental Protection Authority under the *Environmental Protection Act 1986* through a Public Environmental Review (PER). This CCP is consistent with the environmental objectives outlined in the Marillana Iron Ore Project PER document.

This plan aims to incorporate requirements under the *Mining Act 1978* and fulfil the conditions placed on Brockman's Marillana tenements.

Additional legislation that may be applicable to mine closure is included in Table 3-1.

Table 3-1 Legislation Applicable to Closure and Responsible Government Agencies

Legislation	Responsible Government Authority	Aspect
Commonwealth Legislation		
Environmental Protection & Biodiversity Conservation Act 1999	Department of Environment, Water, Heritage and the Arts	Rare flora and fauna,.
Native Title Act 1993	National Native Title Tribunal	Aboriginal rights
Protection of Moveable Cultural Heritage Act 1986	Protection of Moveable Cultural Heritage Act 1986	Protection of moveable cultural artefacts
National Greenhouse and Energy Reporting Act 2007	Department of Climate Change	Climate change
State Legislation		
Aboriginal Heritage Act 1972	Department of Indigenous Affairs	Archaeological and ethnographic heritage
Agricultural and Related Resources Protection Act 1976	Department of Agriculture, Western Australia	Weeds and feral pest animals
Bush Fires Act 1954	Bush Fires Board	Wild fire control
Conservation and Land Management Act 1984	Department of Environment and Conservation	Flora and fauna / habitat / weeds / pests / diseases
Contaminated Sites Act 2003	Department of Environment and Conservation	Management of pollution
Country Areas Water Supply Act 1947.	Department of Water	Water resources supply
Dangerous Goods Safety Act 2004	Department of Consumer and Employment Protection	Dangerous goods management
Environmental Protection Act 1986	Department of Environment and Conservation	Environmental impact assessment and management

Legislation	Responsible Government Authority	Aspect
Explosives and Dangerous Goods Act 1961	Department of Consumer and Employment Protection	Explosives and dangerous goods, transport and management
Health Act 1911	Department of Health	Human health management
Heritage of Western Australia Act 1990	Heritage Council of Western Australia	European heritage management
Local Government Act 1995	Shire of East Pilbara	Development approvals and management
Local Government (Miscellaneous Provisions) Act 1960	Shire of East Pilbara	Community issues / resources / facilities
Occupational Safety and Health Act 1984	Department of Consumer and Employment Protection	Occupational safety and health
Public Works Act 1902	Department of Housing and Works	Development approvals and management
Soil and Land Conservation Act 1945	Department of Agriculture	Protection of soil resources
Water and Rivers Commission Act 1985	Department of Water	Protection of surface and groundwater
Waterways Conservation Act, 1976	Department of Water	Protection of surface and groundwater
Wildlife Conservation Act 1950	Department of Environment and Conservation	Protection of indigenous wildlife
Rights in Water and Irrigation Act 1914	Department of Water	Access to and use of water resources

3.1 GUIDELINES AND CODES OF PRACTICE

The Guidelines and Codes of Practice outlined below have been used in the preparation of this document, and contain material relevant to this plan:

General/ Closure

ANZMEC/MCA (2000), *Strategic Framework for Mine Closure*. Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia. Canberra, ACT.

Chamber of Minerals and Energy of Western Australia Inc (1999) *Mine Closure Guidelines for Minerals Operations in Western Australia.*

Department of Industry and Resources, (2006). *Guidelines for Mining in Arid Environments.*

Department of Industry and Resources, (2006). G*uidelines for Mining Proposals in Western Australi*a.

Minerals Council of Australia (2000) *Code for Environmental Management.*

	Department of Tourism, Industry and Resources, (2006). *Mine Closure and Completion: Leading Practice Sustainable Development Program for the Mining Industry.*
	Ministerial Council of Minerals and Petroleum Resources, Minerals Council of Australia (2003). *Strategic Framework for Tailings Management*.
	EPA Guidance No. 33 (2008). *Environmental Guidance for Planning and Development.*
	Department of Mines and Energy, (1997). *Safety Bund Walls around Abandoned Open Pit Mines*.
Water	Water and Rivers Commission, (2000). *Mine Void Resource Issues in Western Australia*.
	Department of Water, (Draft, February 2009). *Pilbara Water in Mining Guideline*.
	National Health and Medical Research Council (2004). *Australian Drinking Water Guidelines*.
	ANZECC / ARMCANZ (2000). *Australian New Zealand Guidelines for Fresh and Marine Water Quality*.
	Water and Rivers Commission (2000). *Statewide Policy No. 5 Environmental Water Provisions for Western Australia*.
	EPA Position Statement No. 4. Environmental Protection of Wetlands.
Tailings and Waste	Department of Industry and Resources (2001). *Environmental Notes on Mining Waste Rock Dumps*.
	Department of Industry and Resources (1999) *Guidelines on the Safe Design and Operating Standards for Tailings Storage*.
	Department of Tourism, Industry and Resources (2007). *Tailings Management*.
	Water and Rivers Commission (2000). *Water Protection Guidelines No. 2- Mining and Mineral Processing- Tailings facilities*.
	Australian Standard 1940 – The Storage and Handling of Flammable and Combustible Liquids (AS 1940-1993)
Rehabilitation	Australian Mining Industry Council (1989), *Mine Rehabilitation Handbook.*
	Department of Tourism, Industry and Resources, (2006). *Mine Rehabilitation: Leading Practice Sustainable Development Program for the Mining Industry.*
	Environment Australia (1998). *Landform Design for Rehabilitation*.
Flora and Fauna	National Strategy for Ecologically Sustainable Development (1992) Commonwealth of Australia.
	EPA Position Statement No. 6: Towards Sustainability.

EPA Guidance Statement No. 55 Implementing Best Practice in proposals submitted to the EIA process.

EPA Position Statement No 3: Terrestrial Biological Surveys as an element of Biodiversity Protection.

EPA Position Statement No. 2 Environmental Protection of Native Vegetation in WA.

EPA Position Statement No. 9 Environmental Offsets.

EPA Guidance Statement No. 51. Terrestrial Flora and Vegetation Surveys Environmental Impact Assessment in WA.

EPA Guidance Statement No. 54. Consideration of Subterranean Fauna in Groundwater and Caves during EIA in WA.

EPA Guidance Statement No. 3. Separation Distances between Industrial and Sensitive Land Uses.

EPA Guidance Statement No. 56. Terrestrial Fauna Surveys for Environmental Impact Assessment in WA.

4.0 PRE AND POST MINING ENVIRONMENT

4.1 EXISTING ENVIRONMENT

The project area lies on the Fortescue valley floor to the northeast of the Hamersley Range. The area is flat lying and consists of mainly transported colluvium and alluvium deposits, with minor outcrops of canga and Archaean Wittenoom Dolomite. The combined thickness of the transported cover is up to 80 m and it hosts the targeted detrital deposits.

The Fortescue Marsh runs through a broad valley (The Fortescue Valley) probably formed by the preferential erosion of the Mt McRae, Mount Sylvia and Wittenoom Formations of the adjacent ranges. The Fortescue valley is bounded by the Chichester ranges to the North and the Hamersley ranges to the south.

The main aquifers in the area and those that are the primary concern to this project are the superficial Channel Iron Deposits (CID) and pisolites which are present in the Tertiary Detrital material, along with the underlying Paraburdoo Member Dolomite basement. Groundwater levels vary from 40 m below ground level (mbgl) along the slopes of the Hamersley Ranges, decreasing to 10-20 mbgl through the Marsh 20 km to the north of the Project.

The project area occupies a predominantly moderately to significantly disturbed landscape, with some pockets of minimally disturbed areas at the base of the Hamersley Ranges (*ecologia*, 2009). Pastoralism has been the dominant land use in the past and is likely to have caused some degradation to the land and vegetation, particularly surrounding the Weeli Wolli creek.

Investigations undertaken during 2007-2009 by *ecologia* Environment and Aquaterra indicate that the project area contains the following significant environmental aspects:

- Weeli Wolli creek flows from the SE to the NW of the project area, and eventually empties into the Fortescue Marsh, some 20 km to the north of the tenement. Several small creeks flow from the Hamersley Ranges into Weeli Wolli creek.
- One species of Priority 3 Flora (*Goodenia nuda*) was recorded in low densities (< 2% cover) at two locations on the site.
- A regionally significant dune community (Priority Ecological Community).
- Two DEC conservation significant vertebrate fauna species were recorded at numerous locations within the project area; the Australian Bustard (*Ardeotis australis*) and the Rainbow Bee-eater (*Merops ornatus*).
- Six species of subterranean invertebrate fauna (troglofauna) have been recorded from within the project area. It is likely that the site supports a community spread across the tenement, probably extending across the site from the base of the range to the southern extent of the Weeli Wolli creek, and northwards along the base of the Ranges.
- Three species of subterranean aquatic invertebrate fauna (stygofauna) have been recorded from the project area. The one species that could be fully identified is found throughout the broader Marillana - Weeli Wolli drainage channel.

- Groundwater is generally low in salinity (<2,000 mg/L TDS), with the watertable up to 40 mbgl and flowing in a north to north-westerly direction across the tenement.

4.2 POST MINING ENVIRONMENT

Final land use is expected to comprise of pastoralism with some restricted zones to ensure the future safety of people and wildlife.

The landscape will comprise rehabilitated waste and fines rejects stockpiles, with final slopes ensuring long-term stability, a pit that has been backfilled above the pre-mining water table and contoured to mimic the natural landforms. Surface drainage will be reinstated where possible or diverted to reduce the likelihood of ponding after heavy rains.

Brockman will undertake further community consultation to develop and define the end land use options for its operations and also undertake environmental, social and economic assessments to ensure the selected options are sustainable.

An overview of the conceptual options for closure and rehabilitation of the major mining features is provided in the following sections.

5.0 STAKEHOLDER CONSULTATION

ANZMEC (2000) highlights the importance of enabling all stakeholders to have their interests considered during the closure process.

Brockman has been in consultation with the key responsible authorities, non-government organisations (NGO's) as well as local communities (such as Nyiyaparli and Martu Idja Banjima) since the commencement of the feasibility studies.

Ongoing consultation with responsible authorities, the general public, private landowners, interested NGO's and other stakeholders will continue throughout the operation of the mine and the closure process. The closure process will not be viewed as complete until commitments made by Brockman to stakeholders concerning site closure have been met.

Stakeholders that have been identified as having an interest in the closure aspects of the Project have been identified in Table 5-1.

Table 5-1 Stakeholder consultation.

Stakeholder Group	Contact Name	Interest
Department of Environment and Conservation	Murray Baker, Nic Woolfrey	Site contamination, landform and surface water restoration.
Department of Environment and Conservation	Murray Baker, Brad Durrant	Subterranean fauna.
Department of Water	Gary Humphries, Darryl Abbott	Impacts on groundwater.
Department of Indigenous Affairs	Cesar Rodriguez	Impacts on indigenous heritage assets.
Department of Mines and Petroleum	Demelza Dravnieks	Conceptual and final closure plan.
Nyiyaparli	Rodney, Nichole	Land use and heritage values
Martu Idja Banjima	Rick Callaghan	Land use and heritage values
Shire of East Pilbara	Bill Hardy, Gabrielle Pieraccini	Decommissioning, waste management.
Marillana Station	Barry Grate, Lee Drayton	End land use
Environmental Protection Authority	Vanessa Angus, Ray Claudius	All closure issues.

The CCP will be reviewed based on input from stakeholders to ensure all parties are agreed on final land use, decommissioning and rehabilitation procedures.

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6.0 PLANNING

A key objective of ANZMEC (2000) is to ensure that the process of closure occurs in an orderly, timely and cost-effective manner.

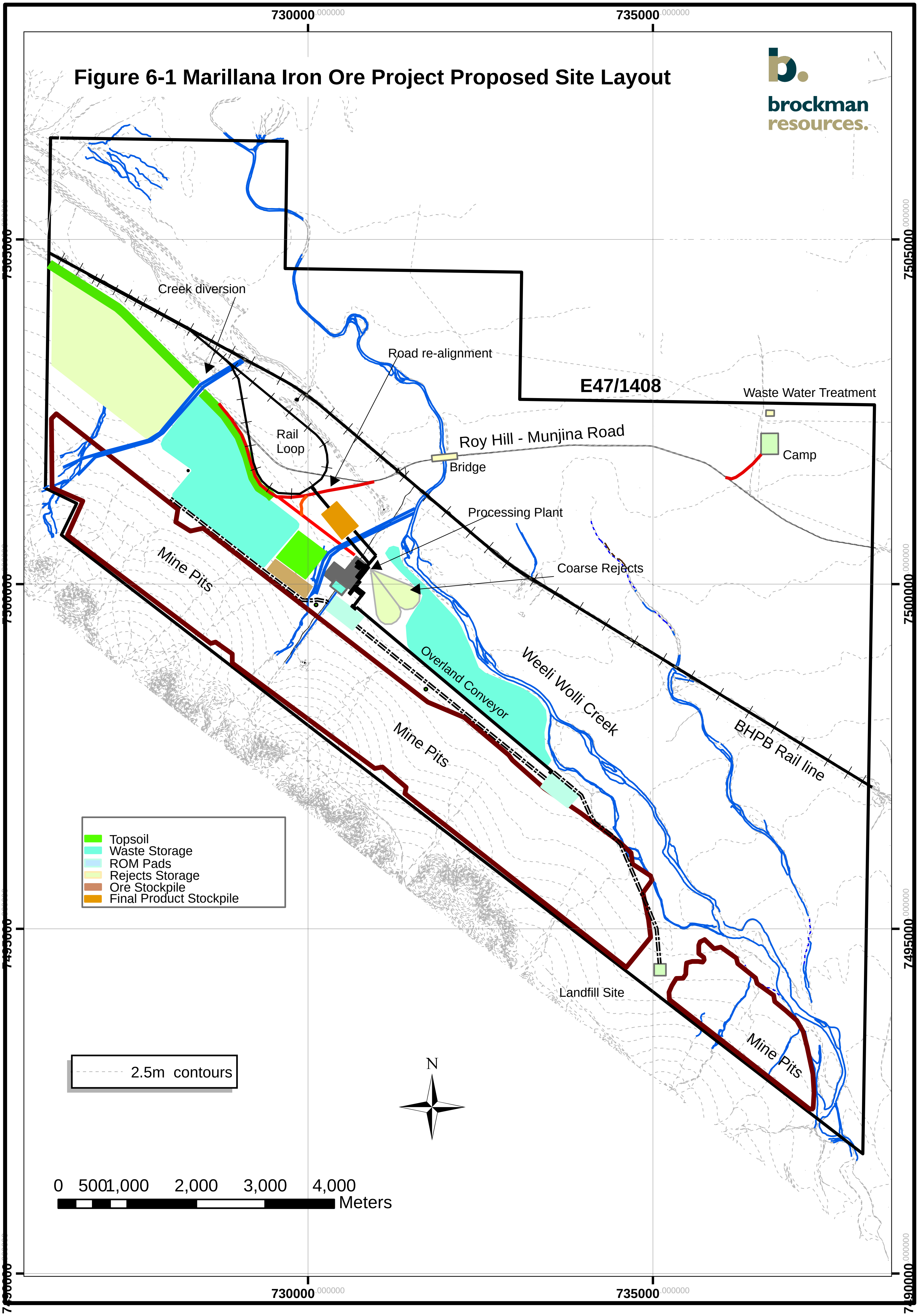
Mine closure should be integral to the life-of-mine plan, should reflect a risk-based approach and should be reviewed and updated as required. Brockman have ensured that mine closure strategies have been incorporated into each stage of the planning process, from planning and design, to construction, operations and decommissioning.

Brockman has undertaken extensive public consultation (Section 5) throughout the planning stage of the proposal concerning final landforms, and all Marillana work areas and associated construction will be in compliance with the appropriate legislation.

Mine infrastructure including haul roads, plants, power station, administration buildings, workshops, water supply, the FRS and overburden stockpiles have been planned to consider the following, which may influence the success of mine closure:

- Alignment with natural topographic landforms in the area.
- Use of pre disturbed areas to minimise the impact of clearing on native vegetation.
- Minimise impacts on groundwater levels and quality.
- Avoidance of threatened flora (i.e. *Goodenia nuda*).
- Consideration of natural drainage lines and flooding zones.
- Avoidance of indigenous heritage sites.

Figure 6-1 Marillana Iron Ore Project Proposed Site Layout



6.1 RISK ASSESSMENT

A comprehensive risk assessment was undertaken to inform all environmental management documents in April 2009. The methodology used is outlined in Appendix 1.

The assessment highlighted the following as having the potential to influence mine closure:

- waste landform (waste rock stockpiles, tailings storage facility) design and location;
- topsoil storage;
- impacts of mine infrastructure to surface water flows and water quality during flood events;
- impacts to groundwater from dewatering and disposal;
- vegetation disturbance and weed dispersal;
- handling and storage of hazardous materials and remediation of fuel and chemical spills;
- progressive rehabilitation with appropriate species; and
- financial provisioning for mine closure

Consequently preliminary controls have been developed (and described in Section 7) to manage the extent to which these factors may impact on closure objectives and completion criteria.

Brockman have developed and will use the following 'hierarchy of control' methodology in planning for project closure:

- elimination of risk;
- substitution with a lower risk;
- engineering to reduce the impact of the risk;
- administrative procedures and training; and
- remediation to mitigate impacts.

6.2 PROJECT CONDITION REPORTS

In order to appropriately determine closure objectives, survey and investigation work has been conducted including:

- flora and fauna surveys including stygofauna, troglofauna and short range endemics;
- hydrogeology assessments on the impact of groundwater extraction, surface water flows and water quality;
- geochemical and physical analysis of waste rock material; and
- heritage studies including archaeological and ethnographic heritage surveys.

The data gathered from these assessments has been used to inform this CCP.

6.3 SUMMARY OF PROJECT CLOSURE CRITERIA

Completion criteria are an agreed set of environmental indicators, which upon being met, will demonstrate that agreed outcomes have been achieved and hence the site may be deemed closed. These criteria are inextricably linked to management and monitoring programmes.

Brockman will consult with all stakeholders and interested parties throughout the life of the project to ensure the agreed completion criteria are and / or will be met, or alternatives agreed to as necessary.

The proposed completion criteria for the Project have been developed taking into consideration the following factors:

- public health and safety;
- regulatory requirements;
- Brockman's Environmental Policy;
- expectations of stakeholders;
- geotechnical stability and the suitability of final landforms;
- sustainability of revegetated areas and surrounding ecosystems;
- no unapproved disturbance of heritage areas; and
- post-closure land use objectives.

The preliminary closure criteria and interim rehabilitation targets are summarised in Table 6-1 below, and detailed aspects are contained in the remaining sections of this document.

Table 6-1 Marillana Iron Ore Project Closure Criteria.

Aspect	Criteria	Interim Rehabilitation Target
Contamination	C1. There shall be no contamination of ground or surface water from inappropriate storage or handling of chemicals and hydrocarbons. C2. Known contaminated sites have been remediated to agreed levels as soon as possible and prior to site handover.	An ongoing life of mine surface monitoring program demonstrates that pollutant levels at potential contaminated sites are within regulatory requirements.
Decommissioning	C3. Project infrastructure that is not required for post closure land use will be removed or disposed of appropriately.	Infrastructure has been removed and rehabilitation commenced to simulate the pre-disturbance state as closely as possible.
Final Landforms	C4. Above-ground waste storage will be minimised by utilising the pit for waste storage. C5. Final landforms will be developed such that they will remain structurally and chemically stable, safe to humans and fauna and self-sustaining. C6. Landforms conform to the	Safety and abandonment structures are in place and final landforms have been shaped to agreed design criteria.

Aspect	Criteria	Interim Rehabilitation Target
	requirements of agreed post-closure land use. C7. The pit will not adversely affect groundwater quality by ensuring that no permanent open water voids result from the project.	
Surface Water	C8. No change in the long term quantity or quality of surface water reaching the Weeli Wolli creek as a direct result of operations at the Marillana project site.	Monitoring program for surface water indicates no significant change in level and quality as compared to pre-disturbed state. Photographic evidence that diversions of surface water flow have been returned to a state consistent with the pre-disturbed state.
Groundwater	C9. The quality and quantity of groundwater has been maintained, so that existing and potential environmental values, including ecosystem maintenance, are protected.	The life of mine monitoring program for groundwater indicates no significant change in level and quality as compared to pre-disturbed state.
Native Vegetation and Topsoil	C10. Impacted areas will be returned to self-sustaining vegetation communities and fauna habitats that reflect pre-disturbed state. C11. Noxious weeds will be managed in line with mining best practice in the Pilbara. C12. Topsoil remains viable and has the capacity to support a safe, stable and functioning ecosystem that meets the requirements of the post-mining land use.	Deep ripping and/or moonscaping have been conducted in rehabilitation areas. Flora species have been identified for use in rehabilitation and seed collection, and reflect principles of vegetation succession. Permanent photographic record points and monitoring/analog transect locations have been defined. Rehabilitation areas have been closed to traffic access and signposted. Adequate topsoil / alternate subsoil material has been provisioned and stored in advance of mine closure.
Aesthetics and Heritage	C13. Ensure that aesthetic values and public experience of the landscape are considered, and measures are adopted to reduce the visual impacts on the landscape. C14. Maintain and protect any significant landscape, indigenous heritage and geo-heritage values.	GPS photographic monitoring locations are established and show progressive integration of rehabilitated areas with the natural environment.

6.4 COSTS AND RESOURCES

The ANZMEC (2000) objective for financial provision is to ensure the cost of closure is adequately represented in company accounts and that the community is not left with a liability. ANZMEC (2000) also states that clear accountability and adequate resources must be provided for the implementation of the closure plan.

Planning for closure commenced in the feasibility stage and will continue throughout the life of the mine.

Development of a final closure cost model will incorporate the following actions:

- Conduct technical review and analysis of risk and cost benefit.
- Quantify subjective factors and analyse aspects with uncertainty.
- Manage closure of the project as a self-funded operation and the project business plan includes costs, revenues, profit / loss and cash flows.
- Assess closure costs in terms of economic, technical, and social feasibility.
- Determine that closure does not incur long-term liabilities to Brockman or to the community.
- Comprehensively review costs on a regular pre-determined basis and taking inflation into account.
- Determine that closure financial provisioning remains flexible to cope with unexpected events, new technologies, operational change or change in community or regulator expectations.
- Determine that cost estimates include management of the project related social and environmental issues.
- Include associated monitoring and long-term site management costs.
- Determine that closure cost estimates don't rely on return from sale of assets and salvage value.
- Provision for adequate form and amount of surety and upon closure, determine that requirements for release of surety are met.
- Periodically review assurance levels re-adjusted as closure needs, environmental risks or economic factors dictate.

Brockman's preliminary cost estimates and closure schedule will be developed to a +/- 15% level of accuracy during its definitive study commencing in November 2009.

Brockman will establish a closure provision in accordance with the requirements of *Australian Accounting Standards Board 137 - Provisions, Contingent Liabilities and Contingent Assets*.

7.0 GENERAL REHABILITATION AND CLOSURE STRATEGIES

The rehabilitation and closure aspects considered for the Marillana Project include contamination, decommissioning, landform construction, surface and groundwater, rehabilitation, visual amenity and heritage.

7.1 CONTAMINATED SITES

Acid forming waste rock or fines rejects and hazardous materials such as fuels, process reagents, lubricants, detergents, explosives, solvents and paints can be detrimental to plant growth and may result in contamination of both surface and groundwater. If these materials are not properly managed, they may have the potential to cause atmospheric, soil or water contamination and could potentially pose ongoing risks to human health and the environment (DoIR, 2006).

Under the *Contaminated Sites Act 2003* a site is considered to be contaminated if it has a substance present at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.

There are no recognised contaminated sites within the project footprint.

Waste rock and fines rejects have been assessed as non-acid forming (NAF) and therefore pose negligible risk of site contamination or environmental degradation.

The potential exists for contamination to occur during the life of the Project due to the handling and storage of hydrocarbons and chemicals. This potential will be minimised by ensuring hazardous materials are stored in contained areas and any spills of these materials are cleaned up promptly and appropriately.

Potential contamination sources may include the landfill facility, workshops, plant and fuel storage facilities. Potential impacts identified in the environmental risk assessment for the proposal and relevant to closure include:

- Contamination of soil, groundwater and surface water sources within the Marillana region as a result of the inappropriate storage or handling of chemicals or hydrocarbons.
- Adverse impacts to troglofauna and/or stygofauna as a result of soil or groundwater contamination.
- Adverse impacts to the vegetation lining Weeli Wolli creek.
- Adverse impacts to Fortescue Marshes resulting from surface or groundwater contamination.

7.1.1 Objectives

The objectives for management of contaminated sites are to:

- Provide for the safe storage, disposal and treatment of residual chemical wastes and residues.
- Ensure any contamination that occurs is investigated and remediated as soon as possible.

- Any significant spills will be reported to the Department of Environment and Conservation (DEC) and recorded through Brockman's incident reporting system.

7.1.2 Completion Criteria

The following completion criteria for contaminated locations will be observed before or during closure:

- The extent and severity of site contamination has been determined.
- Contaminating infrastructure has been removed.
- A timeframe for implementation of remediation strategies has been set.
- Appropriate remediation methods are adopted and implemented.
- All known contaminated waters and soils have been remediated.
- Specific criteria will be determined relative to each contamination situation. The specific criteria will be developed in consultation with the appropriate regulatory body.

C1. There shall be no contamination of local ground or surface water from inappropriate storage or handling of chemicals and hydrocarbons on site.

C2. Known contaminated sites will be remediated to agreed levels as soon as possible and prior to site handover.

7.1.3 Management Actions

To reduce the risk of soil or water contamination and to ensure that the site is remediated to agreed standards, Brockman will:

- Audit areas where contamination is likely to occur on a regular basis.
- Develop criteria to be met by remediation and a timeframe for remediation activities.
- Determine appropriate remediation methods in consultation with the DEC together with other agencies as appropriate.
- Implement remediation in compliance with relevant standards.
- Undertake monitoring and/or testing using appropriate, recognised methods, to demonstrate reduction of any contamination to acceptable levels using an independent auditor.
- Obtain regulatory sign off that the remediation process has been effective and the site is no longer contaminated.
- Keep appropriate records of all actions and results.

7.2 DECOMMISSIONING

During the decommissioning phase of the Project, all infrastructure that cannot be used by another party will be removed or buried and the disturbed areas rehabilitated. Decommissioning will comprise the safe dismantling and removal of infrastructure, the appropriate disposal of waste materials and the return of impacted areas to a variety of vegetation types and fauna habitats that simulate the pre-disturbance state as closely as possible or other agreed post-mining land use.

This could include the removal of:

- crushing and screening plant, and processing buildings;
- fuel and bulk storage facilities and associated pipe work;
- workshops;
- dewatering equipment;
- power station;
- explosives magazine;
- offices and accommodation village; and
- support infrastructure such as water pipelines.

Where the removal of non-visible infrastructure, or features that have been incorporated into the natural landscape may cause more environmental damage than if left in situ, then their retention will be discussed with the relevant authorities.

7.2.1 Objectives

The objectives for decommissioning are to:

- Remove or dispose appropriately of project infrastructure that will not be required for post closure land uses.
- Modify, as required, any infrastructure that will remain to ensure its long term safety and stability.
- Dispose of all waste material appropriately and in accordance to agreed outcomes.

7.2.2 Completion Criteria

The following are the desired outcomes concerning Project decommissioning:

- Appropriate removal and/or modification of all required infrastructure.
- Stable long term structural integrity is achieved.
- Public and environmental health and safety is protected.
- Local ground and surface water characteristics are preserved.
- Successful rehabilitation occurs to support sustainable habitat for native fauna and flora.
- Consideration of post closure land uses is undertaken.

C3. Project infrastructure that is not required for post closure land use will be removed or disposed of appropriately.

7.2.3 Management Actions

To ensure appropriate decommissioning of Project infrastructure, Brockman will:

- Through consultation identify what infrastructure will remain and what will be removed.

- Ensure that any Project infrastructure that will not be used by a post closure land user will be removed.
- Decommission any ancillary Project infrastructure including water reticulation supplying potable and process waters including any bore field as required.
- Rehabilitate disturbed areas to suit post closure land uses and to reflect pre-disturbance condition.

7.3 DEVELOPMENT OF LANDFORMS

With the size and scale of operations, the project will have a significant impact on the surrounding areas. Changing the existing landform with the mining of the pit void and construction of the mine waste dump will be the most significant visual impact of the mining operation.

Potential impacts identified in the environmental risk assessment for the proposal and relevant to closure include:

- Erosion of fines rejects facilities outer walls exposing and mobilising fines rejects.
- Final landforms are not stable and do not resemble pre-mining landforms.
- Erosion of final landforms and sedimentation of surface or flood waters.

7.3.1 Objectives

The objectives for management of final landforms are to:

- Maintain and protect any significant landscape, indigenous heritage and geo-heritage values and maintain the integrity, ecological functions and environmental values of the soil, drainage lines and landforms.
- Meet post-mining land use requirements.

7.3.2 Completion Criteria

The following are the desired outcomes concerning the development of landforms:

- Landforms around the mine have been shaped and rehabilitated as per stakeholder consultation and condition requirements.
- The mine pit has been backfilled to at least 2 m above the pre-mining water table, and the above-ground fines rejects storage and overburden stockpiles are stable, safe and shaped to mimic local landforms.
- The potential for erosion has been countered where possible and natural drainage lines have been restored.
- All project infrastructure has been removed and rehabilitation of the site to final land use requirements has been completed.

C4. Above-ground waste storage will be minimised by utilising the pit for waste storage.

C5. Final landforms will be developed such that they will remain structurally and chemically stable, safe to humans and native fauna and self-sustaining.

C6. Landforms conform to the requirements of agreed post-closure land use.

C7. The pit will not adversely affect groundwater quality by ensuring that no permanent open water voids result from the project.

7.3.3 Management Actions

Brockman will undertake public consultation throughout the planning stage of the proposal concerning final landforms and all project work areas.

To ensure the development of safe and environmentally appropriate landforms and to minimise long-term visual impacts resulting from the project, Brockman will:

- Establish completion criteria, including landform design, for each landform.
- Implement rehabilitation methods to achieve the required landform.
- Revegetate the site to the required land-use objective.
- Sloped landforms will be covered with topsoil and then deep ripped to a minimum of 1 m on contour.
- Ensure rip lines are horizontal for the entire length.
- Monitor the site to determine that agreed outcomes are being achieved.
- Undertake remedial action as necessary to remedy any deviation from the required objective.
- Record all actions at the site.

A major cause of erosion on newly created landforms is the lack of adequate drainage control. Therefore design and construction of drainage control measures will take into account the predicted 1 in 100 ARI flood events.

To ensure final landforms are geotechnically stable, not prone to erosion and able to be successfully rehabilitated a concave slope profile has been designed. However, soil characteristics, rainfall, drainage and topography are all contributing factors that have to be taken into account in determining the optimal slope angle and slope length.

Reshaping of landforms aims to produce slopes with angles, lengths and shapes compatible with the surrounding landscape, suitable for the proposed land use and not prone to an unacceptable rate of erosion. On finalisation of the project, the following landforms will require earth works reshaping:

- waste rock dumps;
- fines rejects storage;
- mine pit and in-pit wastes;
- ROM pads;
- flood protection levees;
- borrow pits; and
- haul roads.

Specific closure strategies for key infrastructure is described in section 8.

7.4 SURFACE WATER

Surface water drainage lines flowing off the Hamersley Range will be affected by the development of infrastructure and waste dumps, which may in turn impact the nearby Weeli Wolli creek system. Some vegetation units occur on these drainage lines and are likely to be influenced by changes in surface water flow.

Permanent changes to the pattern of flows due to post closure landforms are likely to result in geomorphic changes to drainage lines around and downstream of the mine site. The degree of change will depend on how post closure flows are distributed compared to the natural distribution of flows. Brockman's aim is to ensure post closure flows are as close as possible to natural conditions.

Figure 7-1 illustrates the operational and post closure management of surface waters in relation to some of the mine infrastructure, in this case the waste rock dumps.

Potential impacts identified in the environmental risk assessment for the proposal and relevant to closure include:

- drainage stability and erosion of mine closure landforms; and
- permanent changes to the pattern of overland and sheet flow and the subsequent changes to vegetation distribution.

7.4.1 Objectives

The closure objectives for surface waters are:

- To restore baseline flow regimes in areas affected by mining and closure works.
- To maintain baseline surface water quality.
- To ensure stability of permanent diversions, creek reconstructions and other constructed water management works left after mine closure.
- To ensure stability of drainage from landforms created by mining.
- The integrity, ecological functions and environmental values of wetlands and drainage systems interacting with the proposal are maintained.
- Contaminated waters have been controlled and contained on site to prevent entry into groundwater, natural drainage systems and surrounding vegetation and remediation has been undertaken as necessary.

7.4.2 Completion Criteria

The following are the desired outcomes concerning surface water:

- Water use related infrastructure has been effectively decommissioned, as per agreed post land use intentions, and natural drainage patterns are reinstated as far as possible dependent on site layout and water management scenarios.
- Surface water drainage has been reinstated to mimic pre-mining drainage.

C8. No change in the long term quantity or quality of surface water reaching the Weeli Wolli creek as a direct result of operations at the Marillana project site.

7.4.3 Management Actions

To ensure the appropriate management of surface water during and post mine closure, Brockman will:

- Construct a series of diversion drains to redirect water around or through the mine site. Once downstream of the mine site, flow would be diverted back to the original drainage course wherever possible.
- Diversion channels will be designed with sufficient capacity for a nominated rainfall event, while minimising earthworks and the channel footprint.
- Channels will be the appropriate width and depth and have a bed gradient and side batters to minimise channel velocities and ensure a stable channel profile.
- Ensure all waste rock stockpiles are bunded appropriately to contain internal surface water runoff for treatment and to divert external surface water.
- Develop and implement a monitoring program for surface water level and quality.
- Implement systems and practices to avoid pollution events during the operational life of the mine.
- Immediately manage all pollution events to reduce impact on surface and ground water.
- Remove and or control sources of pollution.
- Rehabilitate all disturbed areas relevant to the project to reduce erosion and facilitate integration into the natural drainage system.
- Record all actions and results.

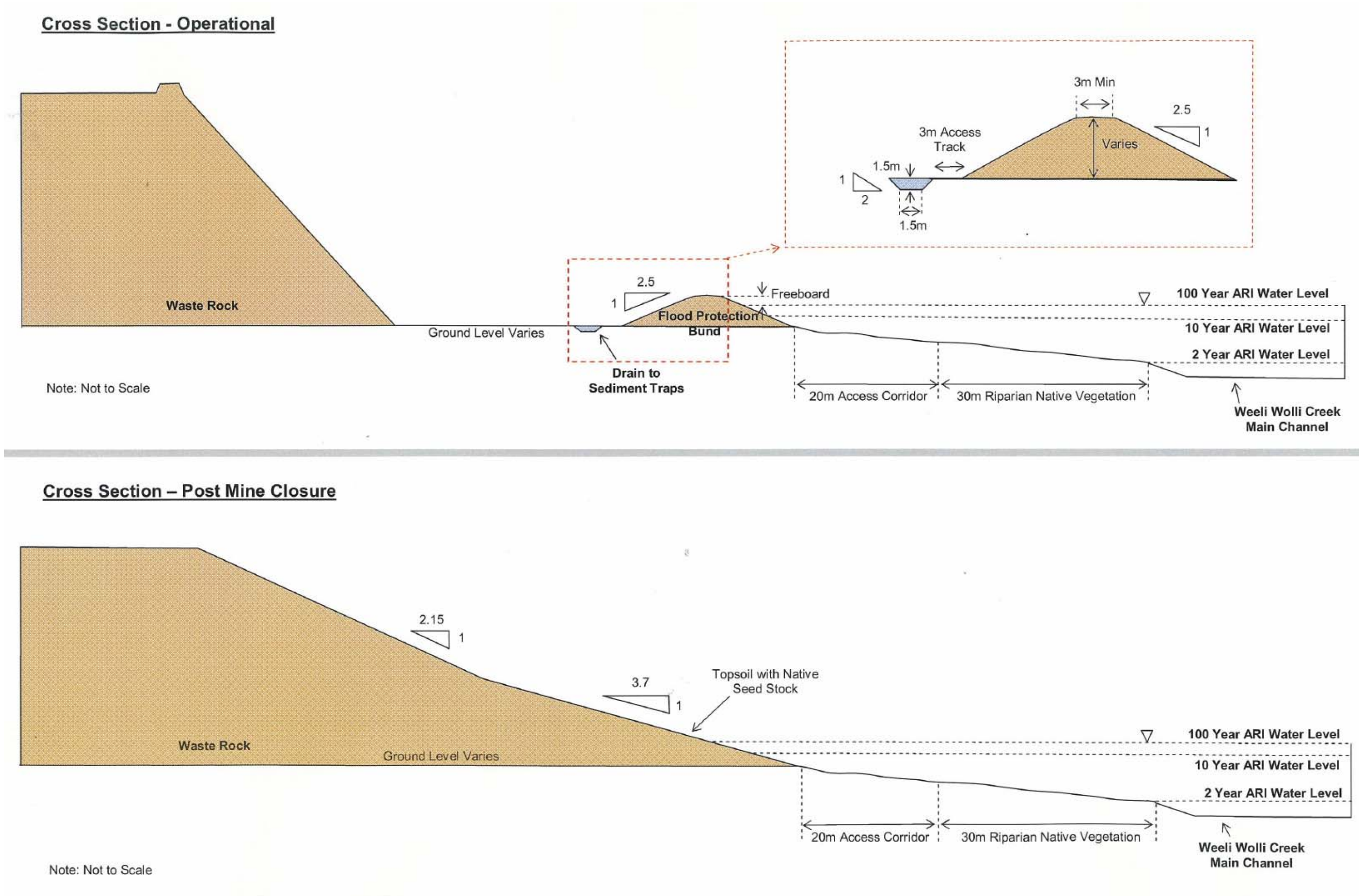


Figure 7-1 Cross Section of Waste Rock Disposal to Weeli Wolli Creek

7.5 GROUNDWATER

Potential impacts to groundwater arising from the proposal and relevant to closure include:

- Lasting disruption to the natural groundwater flow processes as a result of mining operations.
- Pollution from chemical and hydrocarbon materials and waste water streams from the operation.
- Increases in salinity caused by the concentration of salts by evaporation of water in mined-out pit voids.

Following cessation of dewatering, natural recharge and inflow processes will result in water levels recovering to pre-mining levels. All areas mined below the water table will be in-filled to at least two metres above original water table level (and in some cases up to 20 m). Overall water level changes are generally less than 2.5 m and are focused on the areas directly up and downstream of the backfill zone.

Consequently, there are unlikely to be any significant long-term impacts on water quality or groundwater flow as a result of this proposal. Numerical groundwater modelling has been undertaken to simulate the closure strategy and confirm the viability of the preferred closure option.

7.5.1 Objectives

The closure objectives for groundwater are:

- The quality and quantity of ground and surface waters is maintained, so that existing and potential environmental values, including ecosystem maintenance are protected.
- Hydraulic continuity along the aquifer system will be reinstated post closure.

7.5.2 Completion Criteria

The following are the desired outcomes concerning groundwater:

- Contaminated waters have been controlled and contained on site to prevent entry into groundwater and remediation has occurred.
- Groundwater levels, quality and flow processes return to pre-mining conditions.

C9. The quality and quantity of ground water will be maintained, so that existing and potential environmental values, including ecosystem maintenance are protected.

7.5.3 Management Actions

To ensure the appropriate management of groundwater during and post mine closure, Brockman will:

- Backfill the pit to above the pre-mining regional water level to prevent long term salinisation of groundwater.

- Prevent groundwater pollution and contamination through appropriate waste management practices, as outlined in the Project Environmental Management Plan (EMP) 5.12 and 5.13.
- Plan the in-pit storage of waste rock and fines to facilitate the restoration of hydraulic continuity along the aquifer system.
- Develop and implement a monitoring program for groundwater level and quality.

7.6 REHABILITATION OF NATIVE VEGETATION AND TOPSOIL

Minimising or controlling the disturbance footprint of the Project is the most effective method for ensuring that closure objectives with respect to a functioning ecosystem are met. Vegetation disturbance refers to the direct impact of clearing as well as indirect disturbance through the spread of weeds, fire, altered hydrology, soil or water contamination and dust.

Rehabilitation is the process used to repair the impacts of mining on the environment. The long-term objectives of rehabilitation can vary from simply converting an area to a safe and stable condition, to restoring the pre-mining conditions as closely as possible to support the future sustainability of the site (DoIR, 2006b).

Rehabilitation normally comprises the following:

- Developing designs for appropriate landforms for the mine site.
- Creating landforms that will behave and evolve in a predictable manner, according to the design principles established.
- Establishing appropriate sustainable ecosystems.

7.6.1 Objectives

The closure objectives for rehabilitation are:

- Minimise the loss of native vegetation and plant communities.
- Protect Priority flora (*Goodenia nuda*) within the project area.
- Ensure that rehabilitation achieves a safe, stable and functioning ecosystem that meets the requirements of the post-mining land use.
- Undertake progressive rehabilitation to minimize open areas as far as possible and reduce the likelihood of weed infestation.
- Weed outbreaks as a result of project activities have been assessed and controlled in a manner agreed with stakeholders and responsible authorities.
- Rehabilitation measures and methods utilised comply with agreed and approved rehabilitation management guidelines.
- Practices fulfil commitments made to stakeholders and regulators regarding closure outcomes.

7.6.2 Completion Criteria

The following are the desired outcomes concerning the rehabilitation of native vegetation:

- Brockman will comply with and ANZMEC-MCA Strategic Framework for Mine Closure (2000), to return the mine site to a viable, and wherever practicable, self-sustaining ecosystem that is adequately financed, implemented and monitored within all jurisdictions.
- Overburden stockpiles and disturbed sites have been constructed according to the approved design criteria.
- Rehabilitation has occurred progressively where possible and areas have been revegetated to meet the agreed post-mining land uses.

C10. Impacted areas will be returned to self-sustaining vegetation communities and fauna habitats that reflect pre-disturbed state.

C11. Noxious weeds will be managed in line with mining best practice in the Pilbara.

C12. Topsoil remains viable and has the capacity to support a safe, stable and functioning ecosystem that meets the requirements of the post-mining land use.

7.6.3 Management Actions

To ensure the project site is adequately rehabilitated during mine operation and post mine closure, Brockman will:

- Control clearing in accordance with the Project EMP.
- Rehabilitation will be carried out progressively over the life of the project.
- Rip on contours to relieve compaction, reduce erosion and improve water infiltration. Deep ripping will be undertaken where the soil or waste material is of low permeability. In areas where the soil or waste material is of high permeability scarifying on contours will be undertaken. On steep slopes this may require terracing or benching. All ripping, terracing or benching will be surveyed to ensure that they are on contours.
- Re-establish stable landforms with erosion control measures for long term stability will be undertaken.
- Where available, topsoil will be utilised to provide a foundation into which native vegetation will be planted and/or seeded. Topsoil or other suitable material will be applied at an appropriate depth, in the order of 100 mm where practicable, to achieve revegetation.
- Direct seeding and/or planting will be undertaken to encourage vegetation growth to stabilise surfaces and aid the integration of landforms into the surrounding landscape and ecosystems. Seeding and/or planting will be undertaken prior to the wet season (as soon as possible after earthworks) using seed and plants native to the project area.
- Local provenance seeds will be collected from the impacted Marillana project area prior to disturbance. Local provenance seeds will be stored separately and used in their respective local areas during rehabilitation.
- Rehabilitation monitoring will be carried out until revegetation meets the designated completion criteria and is signed off by the DMP. In response to monitoring results, infill planting and weed control will be implemented as necessary.

- A visual inspection of rehabilitated areas will be carried out following rain to ensure that any potential erosion issues are identified early and can be repaired before they become severe.
- Photographic monitoring will be undertaken. This will consist of establishing fixed photographic points (adequately marked with a long lasting item such as metal star picket) and taking photographs from each of these points.
- Quantitative assessment of the progress of revegetation will be undertaken. Replicate monitoring quadrats (20 m x 20 m) will be established and total plant species richness and plant cover index will be recorded.
- Reporting procedures will be established to ensure that results of all trials and actions are properly recorded, referenced, and available for other personnel and for long-term reference.

7.7 VISUAL AMENITY AND HERITAGE

As there are no known registered heritage sites nor any identified ethnographic or archaeological sites within the project footprint on the tenement, the impacts of the project on indigenous heritage are likely to be negligible. However there is the possibility that sites or values may yet be identified.

Due to the isolated nature of the project location and the use of the Munjina-Roy Hill Rd largely by mining traffic, it is not anticipated that the project will have a significant impact on visual amenity of locals or tourists.

However the mine will result in highly visible, permanent changes to the landscape, and Brockman are committed to reducing these visual impacts and maintaining post closure the amenity and original uses of the area.

7.7.1 Objectives

- Ensure that aesthetic values and public experience of the landscape are considered, and measures are adopted to reduce the visual impacts on the landscape.
- Protect as far as possible the heritage values of the area.

7.7.2 Completion Criteria

The following are the desired outcomes concerning aesthetics and indigenous heritage:

- Aboriginal heritage sites have not been disturbed without approval from the Department of Indigenous Affairs (DIA) and the areas traditional custodians.
- All sites have been signed off by stakeholders and responsible authorities.

C13. Ensure that aesthetic values and public experience of the landscape are considered, and measures are adopted to reduce the visual impacts on the landscape.

C14. Maintain and protect any significant landscape, indigenous heritage and geo-heritage values.

7.7.3 Management Actions

To ensure that amenity values of the area are maintained, Brockman will:

- Consult with relevant stakeholders throughout the life of the project to determine appropriate end land use.
- Shape stockpiles to mimic local landforms.
- Re-instate streams where practicable.
- Implement the project Cultural Heritage Management Plan throughout the life of the project.

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8.0 SPECIFIC CLOSURE STRATEGIES

Where specific closure strategies are required, closure objectives, strategies and completion criteria have been developed to deal with these aspects. These project components are listed in the following section and they will be decommissioned and rehabilitated in accordance with Section 7 of this document.

8.1 PIT CLOSURE

Open cut mining is proposed for the project. The proposed mine pit will have a footprint of approximately 1,655 ha, a strike length of 16 km and a depth of up to 70 m. The pit will intercept the groundwater table, which is approximately 30 mbgl at the western end of the orebody, and 20 mbgl at the eastern end of the orebody, and dewatering will be required. Dewatering rates are estimated to be approximately 2000 kL/d over the life of the Project.

The pit will be mined in a series of stages with progressive backfilling of waste rock occurring after year two and fines rejects occurring after year seven of operation. It is estimated that 110 million bank cubic metres (Mbcm) of waste and coarse rejects will be hauled to external waste dumps and 528 Mbcm of coarse rejects and waste into the pit. 52 million loose cubic meters (Mlcm) of fines rejects will be stored in the surface FRS, and 88.3 Mlcm of fines rejects will be backfilled into the pit, contoured and rehabilitated.

Waste will be hauled from external waste storages on closure to fill the final void to between 2 and 20 m above the pre-existing water table. Figure 8-1 shows the conceptual backfill schedule.

Geotechnical investigations will be undertaken to determine the optimum final landform of the mine pit walls, to ensure stability and aesthetic suitability of the final landform and diverted drainage lines re-instated as far as possible.

In order to minimise inadvertent public access to abandoned open pits:

- An abandonment bund wall will be constructed around the perimeter of open pit voids greater than 5 m in depth.
- The bund wall will be constructed outside the area designated as being susceptible to wall collapse.
- The location and design of the abandonment bund will be in accordance with “Safety Bund Walls around Abandoned Open Pit Mines” (DoIR, 1997).

The movement of mine waste will be programmed such that the final pit shapes, both above and below the pit rim will be achieved as part of the mining process. Double handling of waste will be avoided as much as possible. Where required, additional earthworks will be undertaken on those areas of the pit walls that are safely accessible to improve long term structural stability and facilitate revegetation. On completion of material placement topsoil will be spread and the surface ripped along the contour (parallel to the slope) and seeded with seeds of local provenance.

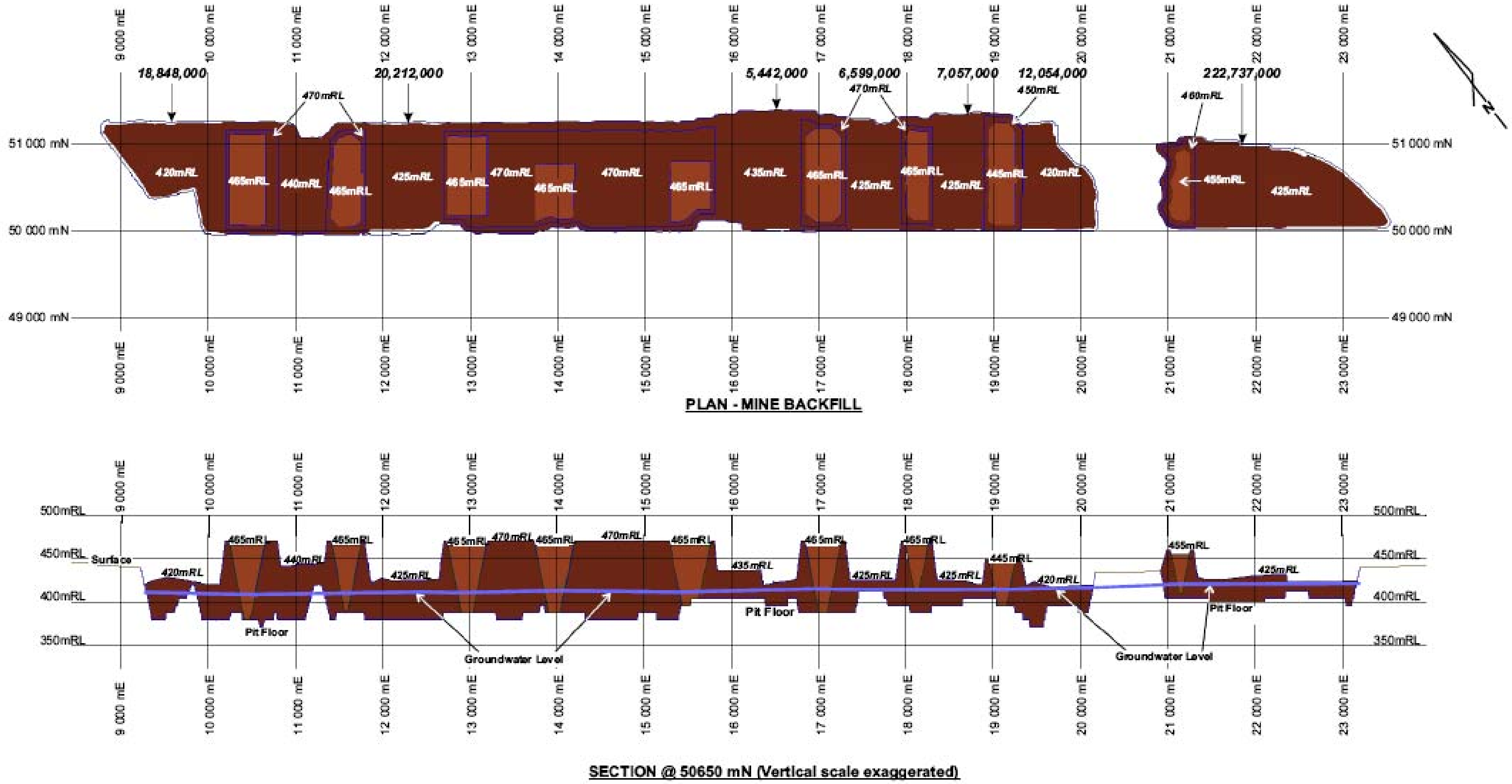

Figure 8-1 Concept Design for Backfill

8.2 FINES REJECTS STORAGE

The fines rejects storage (FRS) design concept comprises both above ground storage and in-pit storage of fines rejects (tailings). For the first seven years of production fines rejects will be stored in an above ground FRS, an integrated waste landform that will be constructed within a mine waste dump. After year seven fines rejects will be stored in-pit along with coarse rejects waste.

The operational design of the above-ground FRS has been aimed at:

- Optimising the removal of surface water for return to the processing plant.
- Maximising tailings density and storage capacity by undertaking cyclic deposition for the above ground storages.
- Minimising land disturbance and potential seepage.

The above-ground FRS has concave design slopes ranging from 1:2.15 to 1:3.7 which have been developed as a result of research into erosion of such facilities in order to maximise stability (Figure 8-2).

The in-pit FRS (IFRS) facilities have been designed to store fines rejects, with storage cells constructed within the mine waste placed within the pit (Figure 8-1). Coarse rejects will also be incorporated into the mine waste and fines rejects stream and stored within the pit from years 7 to 20.

The conceptual design of the above ground section of these facilities has a 40 m wide crest, 5 m above the final surface of the rejects. Once fine rejects deposition has been completed and little further settlement is expected, the top surface of the storages will capped with a layer of mine waste rock (0.5 m nominal thickness) in order to minimise dust generation from the dried fine rejects surface and provide support for topsoil for re-vegetation of the top surface.

Topsoil removed from the FRS area during the construction of the facilities will be redeployed on the final surfaces of the above-ground FRS to assist with rehabilitation, where appropriate. The downstream slopes of the final embankments will be covered with topsoil, contour ripped, seeded with native species and fertilised as appropriate.

At final closure, the decant structures will be sealed by:

- backfilling of the slotted concrete pipe annulus with dried fine rejects
- removal of the slotted concrete pipes and filter rock to the level of the surrounding fine rejects, and
- capping of the central area of the FRS using clayey mine waste.

A spillway will be required for decommissioning the above ground storages to control the release of excess water on the facility surface resulting from large rainfall events. The design of the spillway will be prepared during the final rehabilitation planning stage.

The IFRS will be rehabilitated to store rainfall from most precipitation events within the cover systems for subsequent release by a combination of evaporation and evapotranspiration. Surface water controls will remain in place post closure to ensure significant erosion of fines materials does not occur.

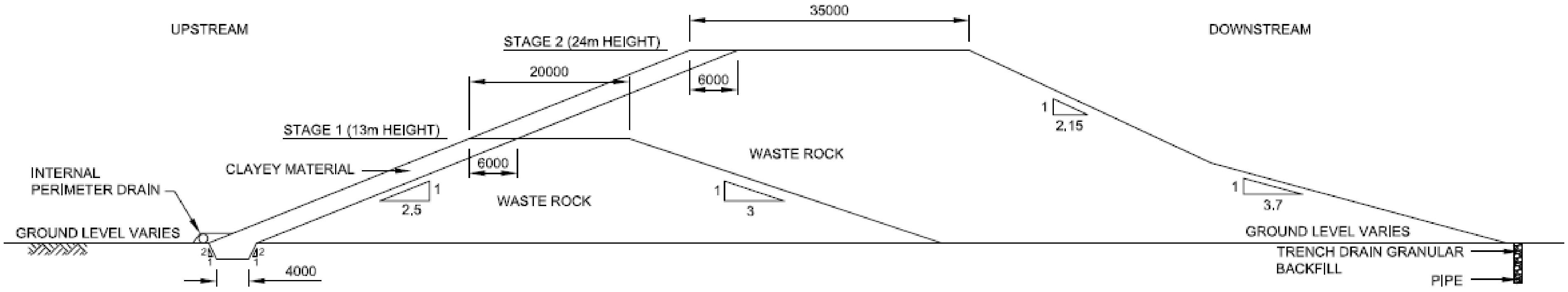

Figure 8-2 Cross Section of the Proposed Above Ground FRS and Waste Dump Design

8.3 WASTE ROCK STOCKPILES

Stockpiles will be designed to minimise erosion, mimic local landforms where practicable and ensure that no single part of the stockpile has to discharge excess amounts of storm water.

Specifically, waste rock dumps will be designed, constructed and operated to:

- retain water, minimise runoff, and enhance the establishment of self-sustaining native vegetation;
- incorporate a rounded footprint to conform to surrounding natural landforms;
- consider, the physical nature of material and landform stability, chemical nature of waste materials, associated pollution prevention, integration into surrounding landscape and revegetation issues;
- incorporate windrows will be used along the crest of slopes to prevent erosion of the slopes. Toe windrows will be used to contain eroded material if needed; and
- reduce the potential for erosion and incorporate protective bunding and diversion drains.

The ex-pit waste dump will have concave slopes as per Figure 8-2 and will be built to these final shapes as part of the materials placement. Dumps that will be relocated prior to mine closure may be constructed with slope angles of 37º while dumps that will be left in place after mine closure will have a maximum slope of 20º.

8.4 LANDFILL

A minor landfill will be established to manage the disposal of putrescible and inert wastes. The landfill has been located in an area that poses minimal impact on surface and ground water, and to reduce the potential for pollution (Figure 6-1).

The main issues associated with the closure of the landfill site area are:

- ground or surface water contamination due to the release of leachate from the site; and
- stability of the landfill area as subsidence occurs.

While in operation the following will be undertaken to ensure the landfill site impacts are managed:

- Only inert, general and putrescible waste will be disposed of in the landfill. All hazardous material will be disposed of according to government guidelines.
- The landfill has been sited and designed to prevent surface water from draining into the landfill. Diversion drainage structures will be used to divert stormwater flows away from the landfill area.
- Surface water and groundwater monitoring will be undertaken if deemed to be necessary to determine any impacts to water quality. If changes in water quality are identified the DEC will be notified and an action plan developed.
- Adequate separation distance will be maintained between the base of the landfill and the water table.

- To facilitate consolidation of the landfill to minimise subsidence, waste material will be compacted in layers not exceeding 500 mm thickness. Waste will be covered by a depth of soil no less than 230 mm and compacted. Not only will this facilitate consolidation of the waste material but ensure other impacts such as fire, pests and odour are minimised.

All infrastructure associated with landfill site will be removed. Once the infrastructure is removed a contaminated site assessment will be undertaken as per section 7.1. If soil or water contamination is identified a remediation plan will be developed and agreed with the DEC.

Disturbed areas will be contoured to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated as per Section 7.6.

8.5 WATER SUPPLY INFRASTRUCTURE

Consideration of available water resources and their sustainability has been incorporated into project planning. Water from pit dewatering will be directed in the first instance for re-use in the process plant and for dust suppression, however potable water will need to be extracted via two bores to service general office requirements and the accommodation. It is anticipated that potable water use will total 60ML/pa.

The location of water supply infrastructure is yet to be confirmed, but is likely to include:

- pumps & gen-sets;
- delivery pipelines;
- turkeys-nest(s);
- storage tanks;
- distribution pipelines; and
- the borefield.

This infrastructure will be removed or decommissioned to the satisfaction of regulatory authorities and to reduce potential impacts on native flora and fauna post mine closure.

8.6 SEWAGE INFRASTRUCTURE

The waste water infrastructure to be used during the life of the project for routine maintenance and storage and during line inspections will be decommissioned at closure. The sewage tanks will be pumped out and removed or broken up and buried *insitu*. The sewage treatment plant will be removed from site.

All monitoring required by statutory authorities will be continued with annual reviews on the need to maintain or cease the monitoring programs.

8.7 FUEL AND EXPLOSIVES FACILITIES

A small amount of standard mining explosives and accessories will be required for limited blasting in the pit. These will be contained in licensed facilities and managed according to requirements of the *Dangerous Goods Safety Act 2004.*

Magazines will be contained to ensure there is no contamination of ground or surface water due to storage of explosives, and all infrastructure associated with explosives storage will be removed at the completion of mining.

Hydrocarbons will be required for mobile plant operation and maintenance and as such fuel storage, and lubricant storage facilities will be located on site. .

To prevent contamination of soils and water from the storage of fuel, hydrocarbons and chemicals, fuel and bulk storage facilities will be fully contained. Facilities will be designed and maintained to be compliant with all aspects of *AS 1940 - The Storage and Handling of Flammable and Combustible Liquids*. Monitoring bores will be established surrounding the hydrocarbon storage to ensure no significant impacts to groundwater.

All infrastructure and materials associated with fuel and bulk storage facilities will be effectively demobilised in liaison with the appropriate stakeholders.

A contaminated sites assessment will be conducted and all required remediation undertaken on completion of mining.

8.8 POWER SUPPLY INFRASTRUCTURE

The power supply to the project will be via mixed fuel (diesel-natural gas) powered generators.

The following generation and transmission related structures on the project will require decommissioning:

- generators and associated plant;
- substations; and
- overhead transmission lines.

At the conclusion of mining, all power generating and supply infrastructure will be decommissioned and removed from site unless otherwise agreed.

General surface treatment, soil remediation and rehabilitation works will then be implemented as described in Section 7.1 and 7.6.

8.9 BORROW PITS, ROADS AND TRACKS

At the completion of mining at Marillana, access roads that have not been rehabilitated as part of the progressive rehabilitation programmes will be rehabilitated (including removal of portions of road embankment where necessary) to blend in with surrounding topography. Where necessary road surfaces will be reshaped and ripped where necessary to allow free drainage and minimise interference with natural surface flows.

Dependent on landholder and government requirements, the access route may be left as an access route to the Marillana area, or rehabilitated.

Borrow pits are progressively rehabilitated during the operational life of the mine, or following closure of the pit. Sides of the borrow pits will be battered to a slope equal to or less than 20°. Where required, culvert diversion drains and upslope windrows will be used to divert surface flow from entering pits and contributing to waterlogging or erosion.

Borrow pits will then be ripped and spread with topsoil as per section 7.6.

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9.0 MONITORING, REPORTING AND RECORDS

The implementation of a monitoring programme is crucial in recording the success or otherwise of the completion criteria, as well as validating agreed criteria for relinquishment. Monitoring may address the following areas:

- biological (flora and fauna);
- surface and groundwater;
- remediation of contaminated sites and acid rock drainage issues;
- public safety; and
- landform stability.

Post-closure monitoring programs will be developed in consultation with appropriate regulatory agencies, and will aim to inform the development of agreed actions if it is determined through monitoring that closure completion criteria not being met. Monitoring will be undertaken by Brockman until the agreed completion criteria have been met.

Reporting procedures will be established to ensure that results of all trials and actions including remediation works and monitoring of revegetation are properly recorded, referenced, and available for other personnel and for long-term reference.

The following records will be kept to enable assessment of closure completion and rehabilitation:

- geological records, including drilling and exploration data;
- plans and surveys of surface facilities;
- location, quantities and types of waste disposed in the area;
- results of rehabilitation as identified in monitoring;
- additional maintenance conducted post-closure;
- contamination reports;
- water quality reports;
- engineering reports regarding the stability of final landforms;
- other site specific surveys or studies; and
- this CCP.

These records will be made available to relevant authorities as required.

10.0 CONTINGENCY PLANNING

In the event of a temporary suspension of mine operations, the *Mines Safety and Inspection Regulations 1995* will be utilised to guide development of a suspension plan. The Department of Mines and Petroleum (DMP) will be notified of the nature of the suspension and measures in place that will limit impact to the environment and ensure health and safety requirements are met.

The suspension plan will not consist of a full rehabilitation and closure strategy but will incorporate interim measures. In the event that a decision to decommission operations is made during a suspension period, closure strategies outlined in this CCP will be implemented in full in consultation with the relevant authorities.

As a minimum the suspension plan would include:

- Maintenance of drainage structures to limit erosion events and sedimentation of surface water.
- Removal of chemicals, hydrocarbons and other hazardous substances. This includes assessment of containment facilities and bunds to ensure contamination is not possible.
- Provision of maintenance staff / caretakers to monitor mine conditions.
- Ensure adequate on-site facilities for any staff remaining at the operations.
- Revision of reporting procedures and consultation with regulators regarding mine suspension.
- Removal of domestic and industrial waste products, and waste facilities.
- Provision of adequate signage, safety measures and security to ensure no un-authorized access to the mine site.

10.1 WALKAWAY

In the situation of sudden (unplanned) closure, a decommissioning plan will be immediately prepared and implemented with input from the CCP, taking into account the site’s non-operational status. Where provision accounts are inadequate to fund the full closure requirements, funds will be provided from other company sources. Figure 10-1 illustrates a provisional sudden closure strategy.

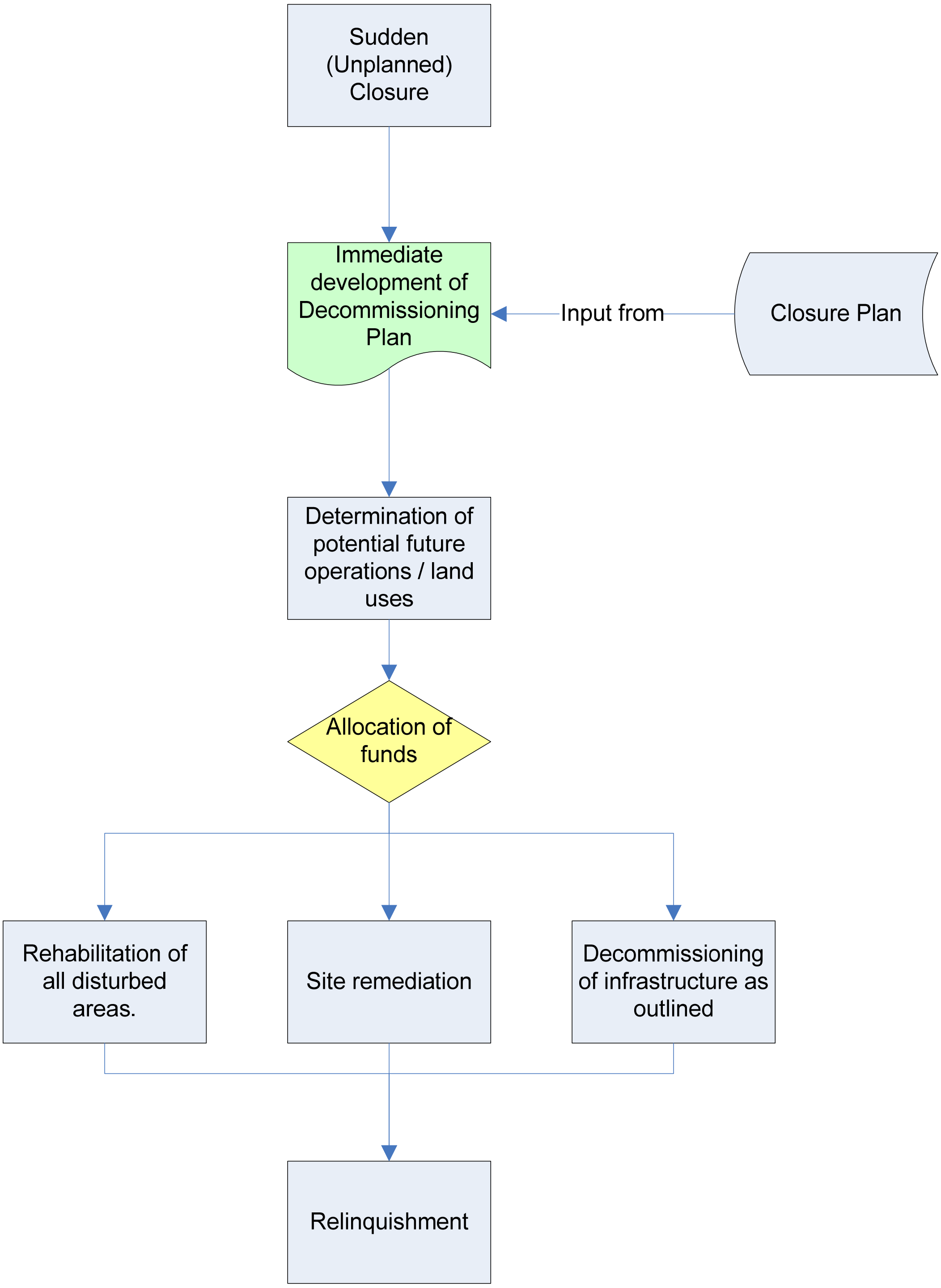

Figure 10-1 Sudden Closure Strategy

10.2 TEMPORARY CLOSURE

Mining activity may cease and shut down on a temporary basis, with the assumption that the operation will recommence in the near future. A decommissioning plan will be immediately prepared and implemented with input from the CCP, taking into account the potential for future operations. The CCP will be reviewed, as it may be required to be implemented if circumstances remain adverse to reopening the operation.

Rehabilitation will be undertaken on all disturbed areas, where possible and economically practicable, and site remediation works will be undertaken to prevent potential off-site contamination. The site will be placed under care and maintenance until such time as the operation recommences or it is closed indefinitely. Figure 10-2 illustrates a provisional temporary closure strategy.

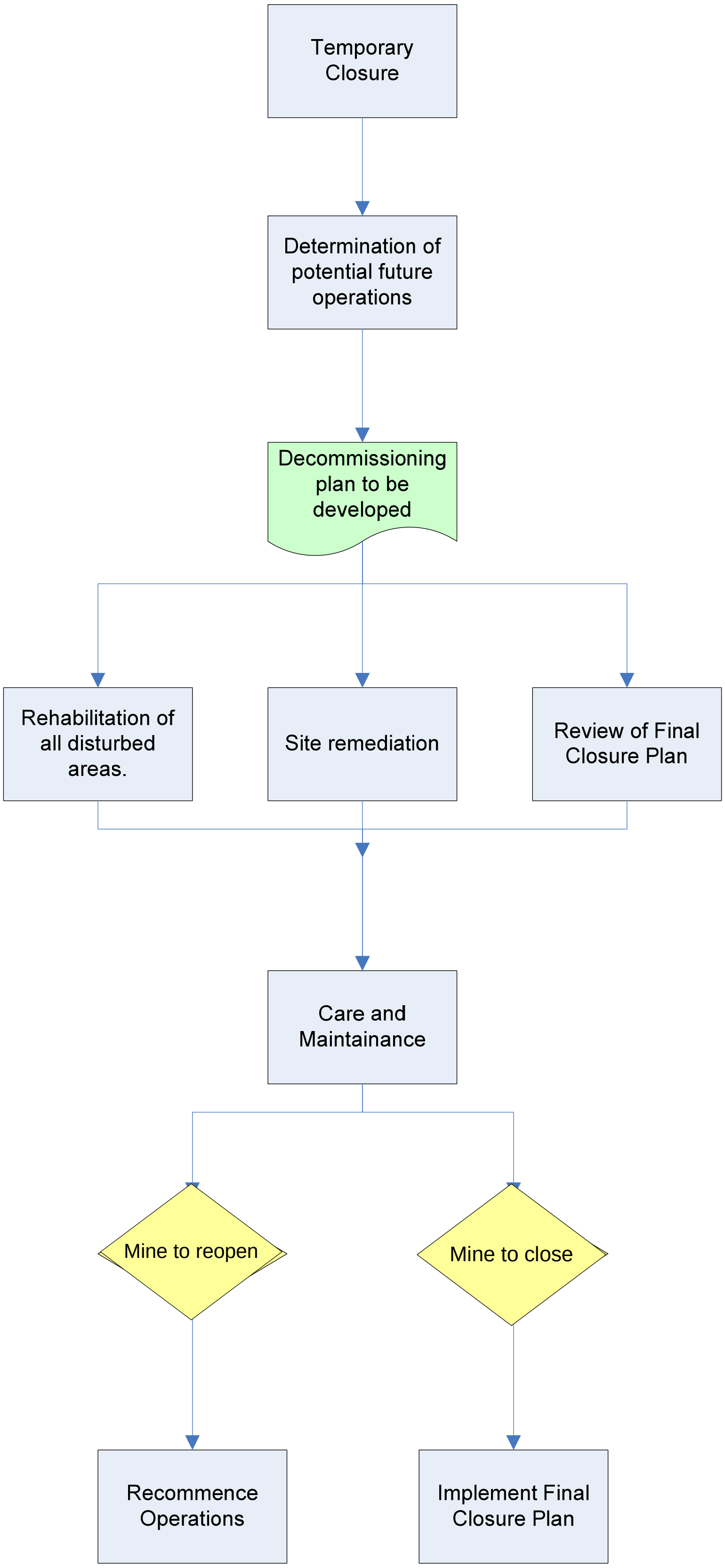

Figure 10-2 Temporary Closure Strategy

10.3 RELINQUISHMENT

The unconditional performance bond(s) lodged with the DMP will be retired when the rehabilitation has met all completion criteria and standards set out in approval documents, annual environmental reports and decommissioning plans. Once the rehabilitated area is safe, stable, erosion is comparable to the surrounding areas and the biological system is sustainable under a range of seasonal conditions representative of that climate (DMP, 2008), the management and maintenance of the site will rest with the subsequent owners or the State.

11.0 REVIEW AND REVISION

The CCP will be reviewed throughout the life of the project and revised into a full Closure Plan at least two years prior to the planned closure of the Marillana Project.

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APPENDIX 1
RISK ASSESSMENT METHODOLOGY

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Consequence Ranking

Level		Consequence (*example*)
1	Insignificant	No lasting effect. Low level impacts on biological or physical environment. Limited damage to minimal area of low significance.
		Individual mortality (i.e. roadkill).
2	Minor	Minor effects on biological or physical environment. Minor short-medium term damage to small area of limited significance.
		Removal of a small proportion of habitat for a short period of time.
3	Moderate	Moderate effects on biological or physical environment but not affecting ecosystem function. Moderate short-medium term widespread impacts.
		Removal of a large proportion of habitat that will be rehabilitated as suitable habitat in the future.
4	Major	Serious environmental effects with some impairment on ecosystem function. Relatively widespread medium-long term impacts.
		Removal of habitat to the threshold required to maintain a viable population.
5	Catastrophic	Very serious environmental effects with impairment of ecosystem function. Long term, widespread effects on significant environment
		Excessive removal of habitat beyond the threshold required to maintain a viable population.

Likelihood Ranking

Level		Likelihood
5	Almost certain	The incident is expected to occur most of the time (*i.e.* every time).
4	Likely	The incident will probably occur in most circumstances (*i.e.* quarterly).
3	Moderate	The incident should occur at some time (*i.e.* once every few years)
2	Unlikely	The incident could occur at some time during the life of the project.
1	Rare	The incident may occur only in exceptional circumstances and may never happen.

Risk Matrix

		Consequences				
		1	2	3	4	5
Likelihood		Insignificant	Minor	Moderate	Major	Catastrophic
5	Almost certain	5	10	15	20	25
4	Likely	4	8	12	16	20
3	Moderate	3	6	9	12	15
2	Unlikely	2	4	6	8	10
1	Rare	1	2	3	4	5

Impact Definitions

(red)	High impact	Senior management involvement, planning and significant DEC / EPA input will be required.
(orange)	Moderate impact	Senior management attention required and the DEC / EPA must be consulted with.
(green)	Low impact	Manage by routine procedures.

Other Definitions

Definitions	
Activity	*broad mine site activity, operation*
Aspect	*interaction with the environment, contributing factor, cause*
Event	*risk event, result of the aspect*
Impact	*outcome of the risk occurring*
Management	*operational control to mitigate impact*
Residual Risk	*level of risk assigned to an activity after management controls are taken into account*

Providing sustainable environmental strategies,
management and monitoring solutions
to industry and government.

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ENVIRONMENT

APPENDIX B

Existing Environment Excerpt from Brockman Resources Ltd, Marillana Iron Ore Project, Public Environmental Review

6.0 EXISTING ENVIRONMENT

6.1 CLIMATE

The Project is situated in the Pilbara region of Western Australia and experiences an arid-tropical climate with two distinct seasons; a hot summer from October to April and a mild winter from May to September. Annual evaporation exceeds rainfall by as much as 500 mm per year. Seasonally low but unreliable rainfall, together with high temperatures and high diurnal temperature variations are also characteristic climatic features of the region. This region has in the past experienced no rainfall in any month of the year, which is typical of a desert climate (Beard, 1975).

Within the Pilbara, the temperature range is large and maxima are high. Summer temperatures may reach as high as 46°C at Newman, with a mean maximum of 31.3°C. Light frosts occasionally occur during July and August. The climate experienced throughout the year is usually very dry since high temperature and humidity seldom occur simultaneously.

Rainfall in the Pilbara is highly unpredictable and recordings are highest at stations around the Hamersley Ranges, which lie at altitudes of up to 900 m (Beard, 1975). From January to March, rain results from moist tropical storms penetrating from the north, producing sporadic and drenching thunderstorms. Tropical cyclones moving south from northern Australian waters also bring sporadic heavy rains.

From May to June extensive cold fronts move easterly across the state and occasionally reach the Pilbara. These fronts produce only light winter rains that are ineffective for plant growth other than herbs and grasses. Larger perennial species require the intense and prolonged storms of summer.

Surface water can be found in some pools and springs in the Pilbara all year round, although watercourses only flow briefly due to the short wet season. Meteorological data has been recorded at the Bureau of Meteorology (BOM) weather station at Newman (23°22'S, 119°44'E). This BOM weather station is located approximately 100 km to the south-west of the Project area, providing an indication of climatic conditions experienced within the study area.

The calculated average annual rainfall is 310.3 mm, occurring over 45 rain days. It loosely follows the typical Pilbara bimodal distribution pattern, with a peak between December and March and a smaller peak in May and June. Most of the rainfall occurs in the summer period, with over 55% of total annual precipitation occurring between December and March.

Mean annual maximum and minimum temperatures for Newman are 31.3°C and 17.3°C respectively. Mean monthly maxima range from 38.8°C during January to 22.2°C in July, while mean monthly minima range from 25.3°C in January to 8.0°C in July (Figure 6-1).

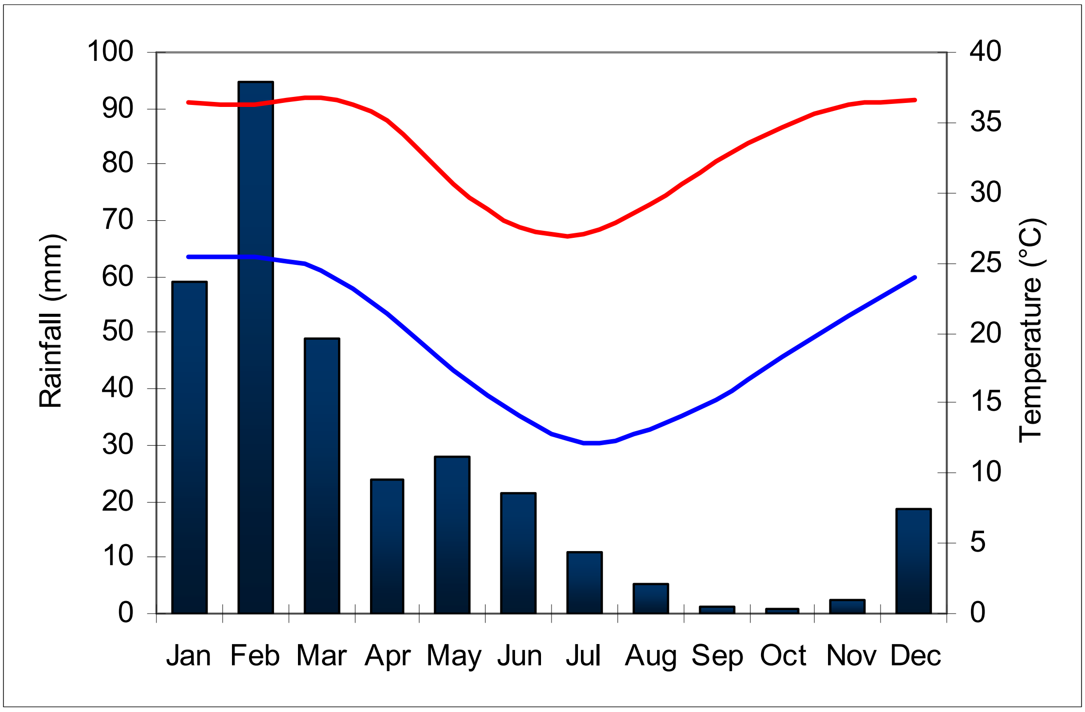


Figure 6-1 Summary of Climatic Data for 2008 (Bureau of Meteorology)

6.2 BIO REGIONS

The Interim Biogeographic Regionalisation for Australia (IBRA) represents a landscape-based approach to classifying the land surface of Australia, in which bioregions (broad scale regionalisation) are formally recognised and mapped. Biogeographic regions are defined on the basis of climate, geology, landforms, vegetation and fauna.

Western Australia encompasses 26 IBRA bioregions and 53 subregions, each affected by a range of different threatening processes and with varying levels of sensitivity to impact (DEC, 2002). The EPA utilises IBRA regions and subregions as the largest unit for EIA decision-making in relation to the conservation of biodiversity (EPA 2002).

The Project area lies in the Pilbara biogeographic region of the IBRA. With an area of 179, 287 km^2, the Pilbara bioregion is in the largest area class. Other bioregions vary from 2,372 to 423,751 km^2, most being between 14,000 and 200,000 km^2 in size. The size of the Pilbara bioregion is fairly typical of bioregions situated in remote arid and semi-arid areas.

Dominant limiting factors and constraints for the Pilbara bioregion listed by Thackway and Cresswell (1995) include extinction of critical weight range (CWR) mammals, wildfire, feral animals (in particular the cat and fox), weeds, and grazing or pastoral activities. The reservation status of the bioregion is 1-5%, which is relatively low (some bioregions have a greater than 10% reservation status).

The Pilbara bioregion has been separated into four sub-regions; the Hamersley, Fortescue Plains, Chichester and Roebourne sub-regions. The Project area is located within the Fortescue Plains sub-region (PIL2), with a small section crossing the border of the Hamersley sub-region (PIL3) (Figure 6-2).

Figure 6-2 Location of the Project Area within Pilbara IBRA Sub-Regions

The Fortescue Plains subregion is characterised by alluvial plains, hard pan wash plains and sandplains (with stony plains, floodplains and some salt lakes) on alluvial deposits over sedimentary rocks of the Hamersley Basin (Kendrick 2001). The soils associated with these habitat types include; red deep sands, red loamy earths and red-brown non-cracking clays with some red shallow loams and hard cracking clays. These soils support mulga shrublands and spinifex grasslands (with some tussock grasslands and halophytic shrublands (van Vreeswyk *et al.* 2004).

The areas of the Project area that extend into the hills and dissected plateaus of the Hamersley Ranges have stony soils with red shallow loams, some red-brown non-cracking clays and red-loamy earths. These soils support spinifex grasslands with Snappy gum (*Eucalyptus leucophloia*) and Kanji (*Acacia inaequilatera*) (Beard 1975).

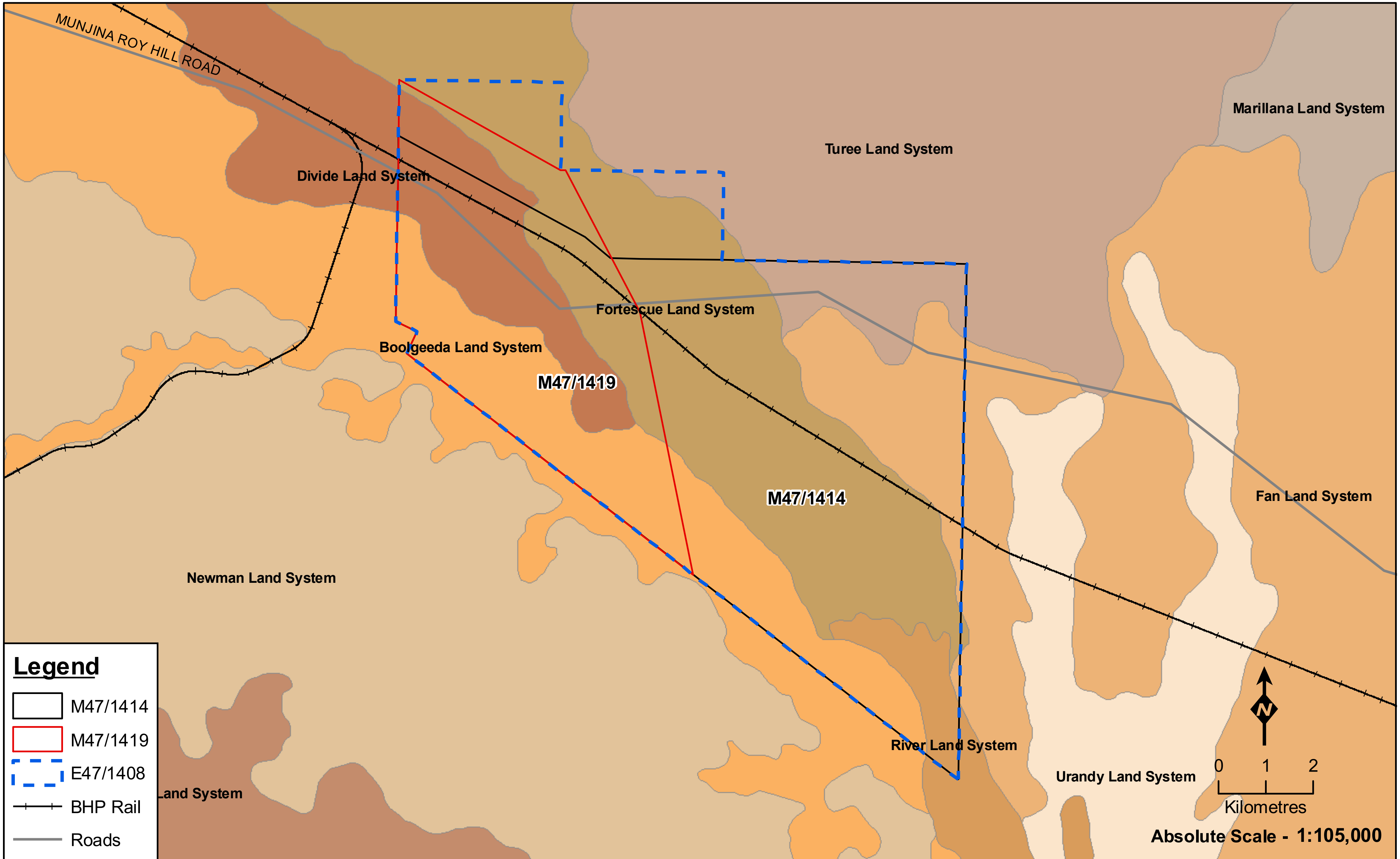
6.3 LAND SYSTEMS

The Project area spans six land systems (Figure 6-3) as described by Van Vreeswyk *et al*. (2004).

Table 6-1 shows the total area of each land system in the Project area (exploration and mining leases), within the actual Project footprint and in the Pilbara region in total.

Table 6-1 Land Systems of the Marillana Project Area (from van Vreeswyk *et al.* 2004).

LAND SYSTEM	HABITAT	PROJECT AREA (km^2)	PROJECT FOOTPRINT (km^2)	TOTAL AREA IN PILBARA (km^2)
Fortescue	Alluvial plains and floodplains supporting patchy grassy woodlands, shrublands and tussock grasslands	41.91	2.88	504
Turee	Stony alluvial plains with gilgaied and non-gilgaied surfaces supporting tussock grasslands and grassy shrublands of mulga and snakewood.	6.76	0.09	581
Fan	Wash plains and gilgai plains supporting groved mulga shrublands and minor tussock grasslands	10.46	0	1,482
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands	20.56	17.12	7,748
Divide	Sandplains and occasional dunes supporting shrubby hard spinifex grasslands	12.18	5.31	5,293
River	Active floodplains and major rivers supporting grassy *Eucalyptus* spp. woodlands, tussock grasslands and soft spinifex grasslands	3.44	0.44	4,088



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brockman resources.

Marillana Land Systems

Figure: 6-3
Project ID: 936

Drawn: SG
Date: 07/04/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: M065

A4

6.4 GEOLOGY AND SOILS

Geologically, the Project is located within the Hamersley Province on the southern Pilbara Craton of Western Australia.

The Hamersley Group is an approximately 2,500 m thick sequence of banded iron formation (BIF), shale, dolomite, mafic volcanics and dolerite sills, and is Archaean to Paleoproterozoic in age. A notable feature of this group is the presence of five major BIF units that are laterally continuous throughout the province with no apparent facies change. Two of these BIF units, the Marra Mamba Iron Formation and the Brockman Iron Formation host all of the major iron ore deposits in the Pilbara, and are the source for most detrital iron deposits.

The Project area lies on the Fortescue valley floor to the northeast of the Hamersley Range. The area is flat lying and consists of mainly transported colluvium and alluvium deposits, with minor outcrops of Canga and Archaean Wittenoom Dolomite. The combined thickness of the transported cover is up to 80 m, and it hosts the targeted detrital deposits.

Transported cover can be divided into four subdivisions, including: colluvium (and alluvium), hematite detritals, pisoliths and cemented pisoliths. The colluvium and alluvium are interbedded and varies in thickness from 10 m to 57 m in the areas drilled. Below the colluvium/alluvium are hematite detrital accumulations, interbedded with lenses of pisolite rich material. In places, the base of the profile is a cemented goethitic pisolite, interpreted to represent a buried and partially re-cemented CID.

The sequence is typical of the detrital sequences in the region.

The Project lies within a large region of soils that have been classified by Bettenay *et al.* (1967) as dominated by:

- red earth;
- hard-setting loamy soils;
- loamy soils with pedalogic organisation;
- dissected pediments; and
- outwash plains.

The three soil types that are most applicable to the Project area are the red earth plains of the Fortescue valley, the surface cover of which consists of stony gravels, the dissected pediments forming low stony hills and the outwash plains; both of which support a surface cover of gravel and the hard setting loamy soils with red clay subsoils forming dissected stony pediments, hills and mesas. As a consequence of the sparse vegetation cover and the erosive force of heavy summer cyclonic rains, much of the soil on the hill slopes tends to be transported down to the valleys and plains.

6.5 SURFACE HYDROLOGY

The Hamersley Ranges are located immediately to the south of the Project area. The ranges extend from an elevation of 440 m in the Project area to include peaks of up to 775 m within the catchments which drain through the Project area.

Outside of the Project area catchments, the Hamersley Ranges contain Western Australia's highest peak Mt Meharry reaching 1253 m. The Hamersley Ranges catchments which impact the Project site have a moderately dense network of streams which generally have very steep upper catchments and bed slopes ranging from 3% to 19%. Drainage from these areas occurs via incised, topographically controlled channels.

The catchments typically level out to a wide, flatter plain with bed slopes of 1% to 2% before forming a delta upon leaving the ranges and draining through the Project area. Slopes through the Project area range from 0.2% to 1%. The flow occurs within numerous small and shallow distributary channels which often become indistinct. In major events, runoff through the Project area would occur as wide, shallow slow moving sheet flow (Aquaterra, 2009b).

Weeli Wolli Creek is a major Pilbara drainage system and flows diagonally across the tenement from the south-east to the north-west. In addition there are numerous smaller streams that flow down the Hamersley escarpment and form deltas when they reach the flatter country at the base of the escarpment. They then flow in the form of sheet/overland flow until they reach Weeli Wolli Creek (Aquaterra, 2009b).

Weeli Wolli Creek is recharged mainly from Weeli Wolli Springs, located approximately 40 km upstream of the mine site, and Yandicoogina and Marillana Creeks which discharge into Weeli Wolli Creek at approximately 25 km upstream of the mine site. Upon exiting the ranges, Weeli Wolli Creek has formed an extensive delta with numerous flow paths in major events. The split of flow between the channels will vary with the intensity of the event. For example, during low flow events, flow will be confined exclusively to the main Weeli Wolli Creek channel, however during large events, the flow within the main channel would only represent a small proportion of the total flow. From this delta, the Weeli Wolli Creek channels extend northwards into the Fortescue Marsh, which is an extensive intermittent wetland located on the floor of the Fortescue River valley.

The main creek channel flows in a north westerly direction through the Project area. The channel is typically trapezoidal in shape with steep banks and a flat wide channel. The typical creek width is 50 m with banks typically 1.5 to 2 m high. In places the width between creek banks extends to as much as 200 m. This width typically includes a main channel of around 50 m and islands which typically support eucalypts. Bed slopes through the Project area are typically low at around 0.1%. With the exception of the in-stream islands, and occasional isolated eucalypts, there is little in-stream vegetation. Eucalypts are common on the bank of the creek channel, typically occurring within 20-30 m of the creek bank.

Waterloo gauging station is located approximately 8 km downstream of the confluence of Yandicoogina Creek and Weeli Wolli Creek. A record of streamflow data between 1984 and 2008 shows that on average, Weeli Wolli Creek can be expected to flow a mean of 24 days/year and a median of 7 days/year (DoW, 2009). The duration of a 1 in 2 year flow event is about 7 days, while a 1 in 10 year flow event is approximately 18 days in duration.

The proposed development is located in the Fortescue Marsh catchment. The marsh area is in the physiographic unit known as the Fortescue Valley, and occupies a trough between the Chichester and Hamersley Plateaux (Beard, 1975).

The Goodiadarrie Hills, located on the valley floor just west from the marsh rail crossing, effectively cuts the Fortescue River into two separate river systems. West from the Goodiadarrie Hills, the Lower Fortescue River Catchment drains in a general north-westerly direction to the coast, whereas east of the hills the Fortescue Marsh receives drainage from the Upper Fortescue River Catchment. Several large creek systems discharge to the Fortescue Marsh with a total catchment area of approximately 31,000 km^2. These systems include the Fortescue River, Weeli Wolli

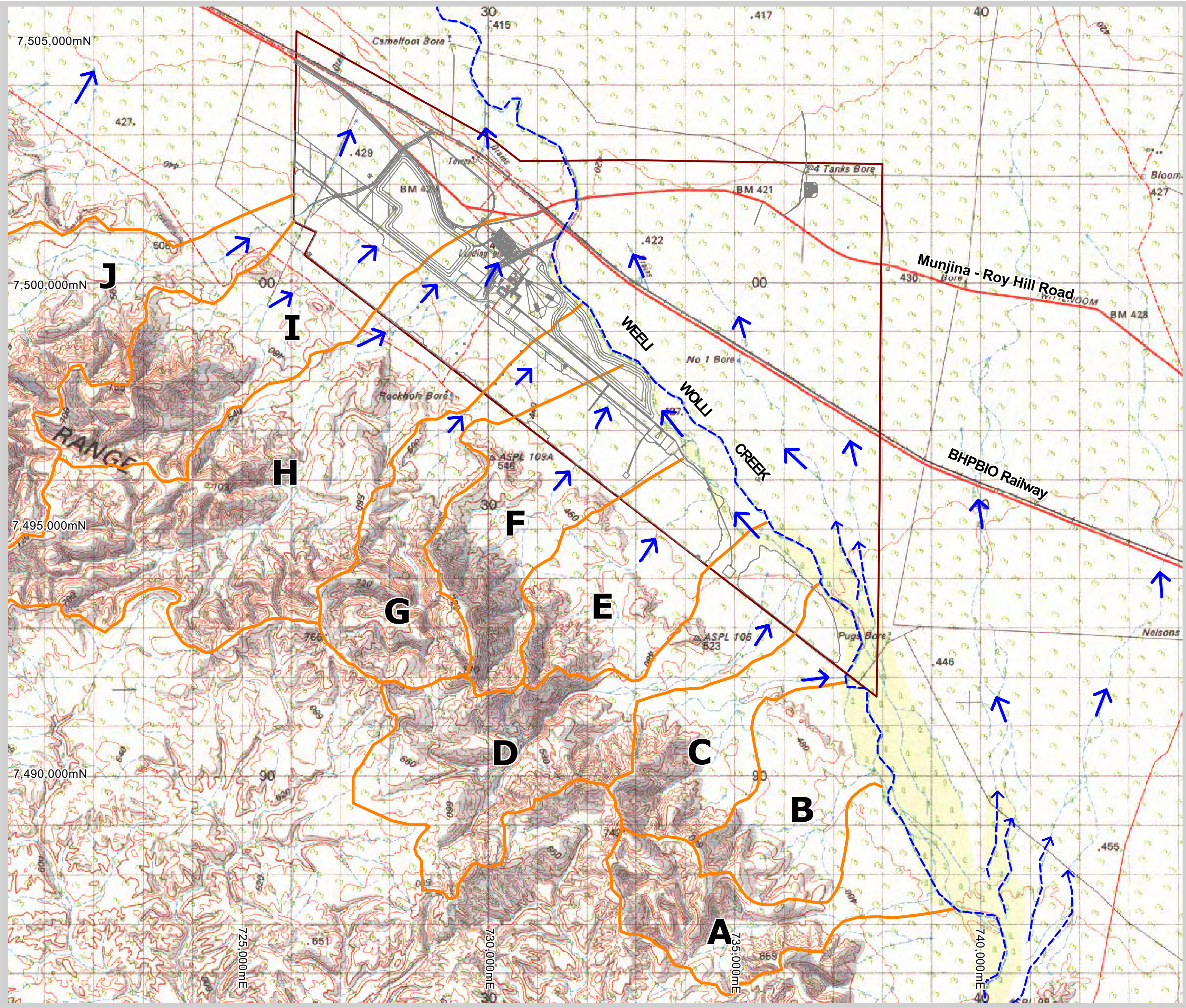
Creek, Marillana Creek, Caramulla Creek, Jigalong Creek, Kondy Creek and Kulkinbah Creek. The alluvial outwash fan from the Weeli Wolli Creek and other smaller creek systems abutting the Goodiadarrie Hills is believed to be partially responsible for this obstruction to the Fortescue River and forming the Fortescue Marsh. The DoW considers the upper portion of the Fortescue River which drains to the Marsh as a closed system.

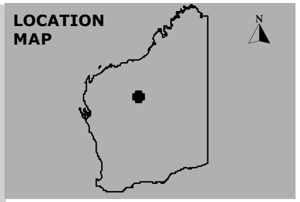
The Fortescue Marsh itself is an extensive intermittent wetland acting as a flood storage and occupying an area around 100 km long by typically 10 km wide, located on the floor of the Fortescue Valley. The marsh has an elevation around 400 m AHD. To the north, the Chichester Plateau rises to over 500 m AHD, whereas to the south the Hamersley Ranges rises to over 1000 m AHD. Following significant rainfall events, runoff from the creeks drains to the marsh. For the smaller runoff events, isolated pools form on the marsh opposite the main drainage inlets, whereas for the larger events the whole marsh area has the potential to flood.

Published topographical mapping indicates that the lower bed levels in the Fortescue Marsh predominantly lie between 400 m and 405 m AHD. Data provided by the DoW states that the flood level in the marsh would need to be marginally higher than 413m AHD to overspill westwards past the Goodiadarrie Hills. No published flood level data are available for the marsh. Anecdotal evidence suggests that over the last 50 years, following major cyclonic events, flood levels of approx 410 m AHD have occurred.

Surface water runoff to the marsh is of low salinity and turbidity, though the runoff turbidity typically increases significantly during peak periods of flooding (WRC, 2000). Following a major flood event (that flooded the whole marsh area), anecdotal data indicates that the water could pond up to 10 m in depth in the lowest elevation marsh areas. Water stored in the marsh slowly dissipates through the processes of seepage and evaporation. During the evaporation process, the water salinity increases and as the flooded areas recede, traces of surface salt can be seen. During the seepage process, the increasingly more saline water is believed to seep into the valley floor alluvial deposits.

Figure 6-4 shows the natural (pre-development) surface water drainage across the Project area.





LEGEND

- Weeli Wolli Creek and Distributaries
- Existing Flow Paths
- Hamersley Ranges Catchments
- Brockman Mining Lease Boundary
- Proposed Mine Infrastructure

SCALE

1 0 1 2 3
Kilometers
Scale: 1:75,000

aquaterra

Figure 6-4
Pre Development Surface Water Drainage

AUTHOR:	LC	REPORT NO:	044a
DRAWN:	LC	REVISION:	a
DATE:	13/08/2009	SCALE:	1:75,000 at A3
JOB NO:	832H/H5	PROJECTION:	GDA94 Z50

Location: F:\Jobs\832H\SWMP\044a Figure 5.1

6.6 HYDROGEOLOGY

Regional hydrogeology

The Weeli Wolli Creek catchment area is 4,769 km^2, and this upstream catchment includes three major mining areas: Hope Downs, Area C, and Marillana Creek. The Weeli Wolli Creek system has a combination of groundwater and surface water flow, which represents the upstream recharge. During high rainfall events, there is significant surface water flow into the Project area; some of this run-off reaches the Fortescue Marsh, while some infiltrates in the groundwater system.

The most extensive aquifer in the area is associated with an alluvial sequence that extends northeast from the lower slopes of the Hamersley Ranges across to the Fortescue Marsh. The alluvial deposits consist of clays, silts, sands, gravels and calcretes, and extend to depths of 100 m. Over most of the area, low permeability clays with occasional sand and gravel lenses dominate the alluvial sequence. In these areas, the permeability is typically low (0.1 to 1 m/d).

Closer to the base of the Ranges, a CID and detrital sequence lies within a palaeo-valley. The CID is up to 40 m thick, is typically goethitic, and is pisolitic in parts. The CID is typically highly porous and vuggy with significant secondary porosity from joints and solution cavities. It is assumed that the palaeochannel continues downstream beyond the Project area (perhaps aligning to the north towards the Fortescue Marsh west of the Project area), while upstream, it is anticipated that the palaeochannel aligns with the modern drainage line of Weeli Wolli Creek where it extends up into the Hamersley Ranges.

Groundwater levels across the Project area have been measured from existing regional water bores, along with recently installed stygofauna monitoring holes and piezometers. The data shows that groundwater levels on tenement vary from approximately 424 mRL, where Weeli Wolli Creek exits the Hamersley Ranges to the east of the Project area; down to 410 mRL several kilometres into the valley towards the Fortescue Marsh, and also west along strike of the orebody near the base of the Hamersley Ranges. Groundwater levels tend to be a subdued reflection of topography.

Contours of the groundwater levels shows that the water table generally has a low gradient to the north (towards the centre of the valley); while locally within the palaeochannel, the flow is in a north-westerly direction along the base of the Hamersley Ranges, likely an artefact of preferential groundwater flow through the more permeable palaeochannel.

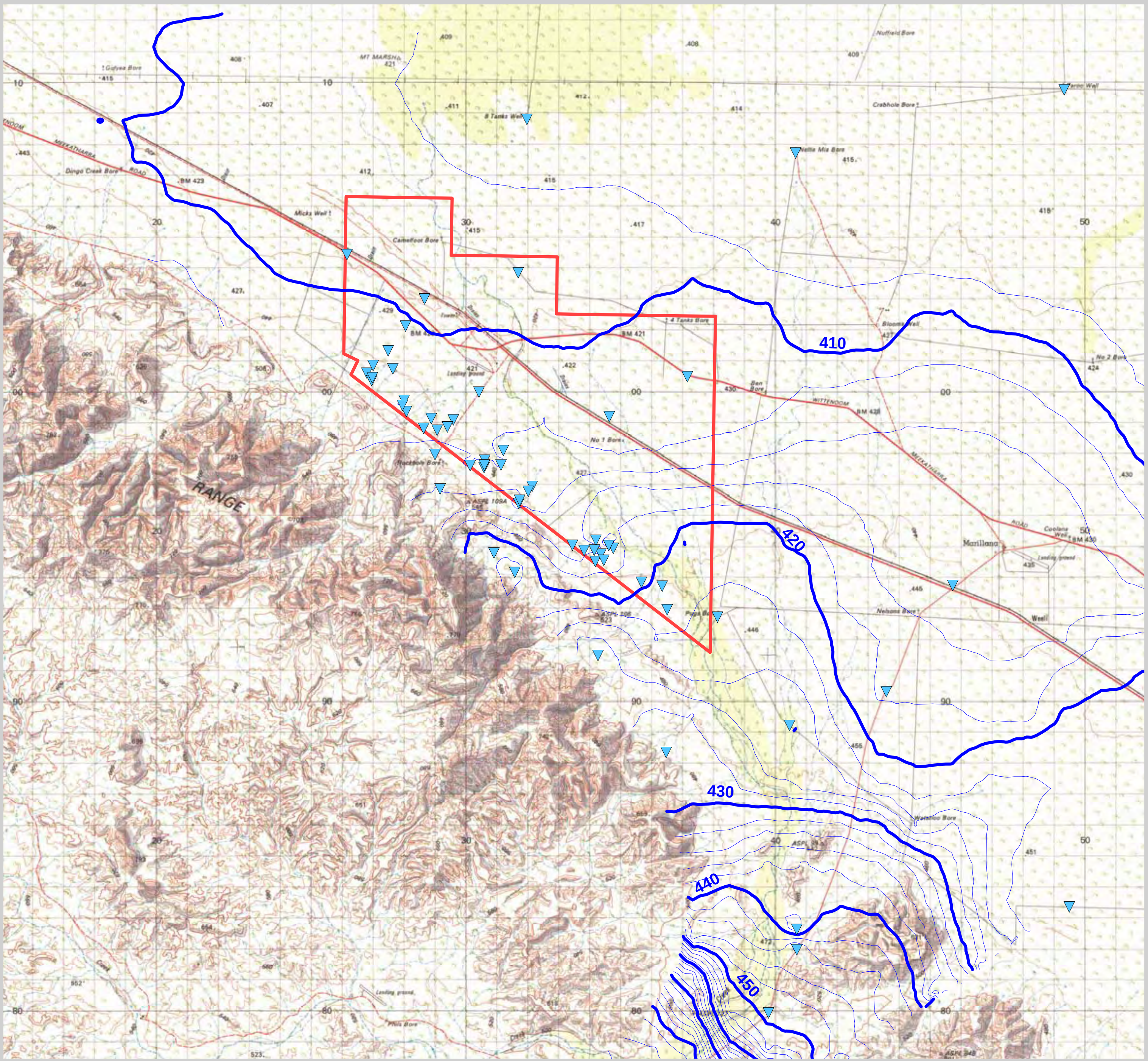
Significant rainfall events can potentially induce a groundwater level increase of several metres, and it is likely that sizeable background seasonal fluctuations occur in the region, and are likely to be accentuated in the vicinity of Weeli Wolli Creek, which sustains numerous channel flow events every year.

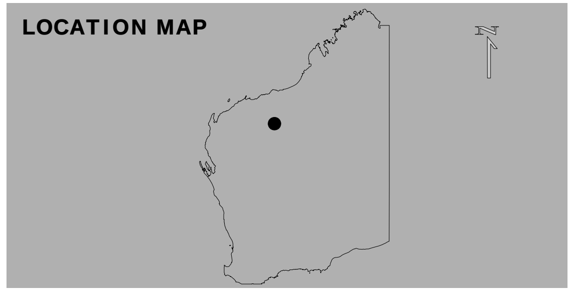
Table 6-2 and Figure 6-5 summarises the hydrogeology of the Project area.

Table 6-2 Summary of Local Hydrogeology

AGE	LITHOLOGY	DESCRIPTION	GROUNDWATER POTENTIAL
Quaternary	Transported overburden	Poorly consolidated silty sandy colluvial gravel, with angular to sub-rounded clasts of BIF, cherts and shales, and occasional clay bands.	Generally of low permeability, but will be a source of storage where located below the water table, due to its hydraulic connection with the underlying THD.
TD3	Tertiary Hematite Detritals	Transported mineralised detrital unit, comprising of poorly consolidated hematite-rich BIF clasts, angular to sub-rounded, with varying pisolith and clay content.	This unit is generally of moderate permeability where present below water table. The Potable bore drilled in 2008 is constructed in this aquifer, and testing results suggested a transmissivity of 110m^2/d, and a hydraulic conductivity of 7m/d.
TD3	Tertiary Pisolite Gravel	Similar to the Tertiary Hematite detritals, but with the well-rounded pisolith component increasingly dominant. This formation has variable clay content and is poorly to very poorly consolidated.	During recent drilling, much air was lost to the formation, suggesting that where the clay content is low, that this formation has high permeability and is high-yielding.
TD3	Calcrete	Unit is buff/pink/white in colour, with calcareous and siliceous zones. It is generally 10-20m thick, although reached ~50m thickness is some areas.	It is thought to be of moderate permeability, although this is likely to vary to the degree that the calcrete has been reworked and weathered.
TD2	Channel Iron Deposit	Cemented pisolite gravel which has developed vuggy porosity. There is variable clay content, and the unit is poorly to moderately consolidated. CID forms from palaeo creek beds.	With its high permeability it forms a preferred pathway for groundwater flow. As both the Hematite Detritals and Pisolite Gravel that surround CID are permeable, the discontinuous nature of the CID is not expected to significantly affect the continuity of groundwater flow through the system.
TD1	Basal Conglomerate	Below the CID at several locations an unmineralised transported chert-dominated detrital material was encountered. The extent of this basal conglomerate is unknown, but it is suspected	This unit is of low permeability, while being is hydraulic connection with the overlying ore zone.

AGE	LITHOLOGY	DESCRIPTION	GROUNDWATER POTENTIAL
		to be limited to the bounds of the palaeochannel.	
Proterozoic	Hamersley Group	The Wittenoom Formation is made up of three members, two of which are likely to be present beneath the Project tenement. These are the Bee Gorge Member (calcareous shale and dolomite) and Paraburdoo Member (dolomite).	Permeability of this unit was low where encountered in recent drilling. There is no evidence of this unit being in hydraulic connection with the overlying Tertiary units.





LEGEND

Brockman Mining Lease Boundary

Groundwater Level Contours

Water Level Measuring Point

0 2 4 km

aquaterra

FIGURE 6-5

REGIONAL GROUNDWATER LEVEL CONTOUR MAP

AUTHOR:	DJ	REPORT NO:	145
DRAWN:	MS	REVISION:	...
DATE:	08/09/09	PROJECTION:	MGA94 Z50
JOB NO:	832G	SCALE:	1:185,000

Location: F:\Jobs\832G\MapInfo\145a_Figure2.1.wor

Fortescue Marsh system

Current hydrogeological data indicates that water levels in the alluvium on the plain are below the bed of the Fortescue Marsh, thus suggesting that the marshes are a predominantly surface water feature as opposed to a groundwater discharge area. During flood events salts deposited during previous drying episodes are redissolved, and the freshwater entering the marshes becomes moderately saline.

Following a flood event, a portion of the ponded surface water infiltrates causing water levels to rise beneath the marsh, ultimately to ground level (the marsh bed). Continual evaporation removes ponded surface water, after which the groundwater table in the marsh bed sediments will decline to its former position under the combined processes of direct evaporation and radial groundwater flow. Under this concept, any change in groundwater level beneath the marsh will have no impact on the occurrence of surface water ponding, or on the rate of seepage from the marsh bed into the water table.

It is conceivable however, that where the groundwater level is lowered significantly, an increased amount of water would be required to fully saturate the profile, which would reduce the duration of surface water ponding. However as discussed above, the proposal will have an insignificant impact on the groundwater levels beneath the Marsh, so impacts to surface hydrology as a result of drawdown will be negligible.

The alluvium and orebody aquifers on the flanks of the valley are recharged with fresh water during rainfall events. Given there is a hydraulic gradient towards the marshes, this water will drain towards it. As a result of recharge from the ponding on the marshes, groundwater both below and close to the marshes is saline, whilst that further away and up gradient is fresh (Appendix E).

Groundwater quality

Water quality distributions are distinct in the alluvial and basement sequences. The basement has 20,000 mg/L TDS below the mine area, increasing to an estimated 150,000 mg/L TDS beneath the southern margin of the Fortescue Marsh. Within the alluvial sequence, water is fresh <1,000 mg/L TDS near the base of the Hamersley Ranges, increasing to an estimated 7,000 mg/L TDS near the southern margin of the Fortescue Marsh.

Data regarding the salinity of groundwater within the area was gathered from the DoW's AQWABASE system, along with hydrogeological drilling programmes completed by Aquaterra in 2008 and 2009. There are two distinct aquifers which show different salinity profiles. Within the shallow alluvial aquifer, groundwater is freshest (<1,000 mg/L TDS) close to the Hamersley Ranges, as this is the recharge zone for the alluvial aquifer, where groundwater flows in from the Weeli Wolli groundwater system. The salinity of the groundwater in the alluvial aquifer increases to approximately 6,000 mg/L TDS over a distance of 15 km northwards in the valley. Due to a lack of time series water quality data, it is not clear whether there is a fluctuation in water quality related to seasonal variations. The salt distribution is likely related to the Fortescue Marsh surface water body recharging relatively fresh water immediately following an inundation event, and becoming progressively more saline as evapo-concentration takes place.

Within the Wittenoom Formation dominated basement, groundwater is approximately 20,000 mg/L TDS in the basement beneath the orebody. The groundwater salinity increases rapidly within the basement further north into the valley, with a salinity of 75,000 mg/L TDS 10 km into the valley. This is attributed to the longer residence times of groundwater within the basement aquifer; the limited affects of freshwater recharge to the system; and the limited mixing between the shallow and deep aquifers, which means salt content concentrates over longer time periods without dilution.

Water samples taken from within the Project area suggest that a large proportion of recharge enters the groundwater system further up-gradient, rather than locally, or that mixing of local recharge with mature waters is taking place. Waters within the basement and the orebody were found to differ in salinity which indicates that there is little to no connectivity between the alluvial and basement aquifer systems within the Project area.

6.7 VEGETATION AND FLORA

6.7.1 Previous Work

The Pilbara is a region of considerable environmental significance, lying on the southern limits of the Northern Botanical Province (Burbidge, 1959; Beard, 1979). The region includes species from the north-west, a region of high species endemism, and the arid interior, as well as numerous species which are either endemic to the Pilbara or have restricted geographic distributions (Beard, 1975).

The Project area lies in the Pilbara Biogeographic Region as classified by IBRA, with over approximately 95% of the area in the Fortescue plains sub-region and the remainder in the Hamersley sub-region.

The vegetation of the Fortescue Plains sub-region is described by Kendrick (2001a) as salt marshes fringing the salt lakes, *Acacia aneura* (mulga) and tussock grasses on the alluvial plains, short grass communities on the alluvial plains and *Eucalyptus camaldulensis* (River Gum) woodlands fringing the drainage lines.

The vegetation of the Hamersley sub-region is described by Kendrick (2001b) as a mountainous area of sedimentary ranges dissected by gorges with *Acacia aneura* (mulga) low woodlands, over tussock grasses on the valley floors and *Eucalyptus leucophloia* (Snappy Gum) over *Triodia brizoides* on skeletal soils of the ranges.

Beard (1975) classifies the Project area as falling within the Fortescue Botanical region of the Pilbara. Beard described these communities as;

1. *Acacia aneura* (mulga) in groved patterns with an understorey of *Triodia pungens* (spinifex);
2. *Eucalyptus gamophylla* shrub steppe, over *Triodia basedowii* (spinifex) hummock grassland; and,
3. *Eucalyptus brevifolia* (Snappy Gum) sparse low trees, over *Triodia wiseana* open hummock grassland.

Beard's classification characterises the Project area as *Acacia aneura* (mulga) in the majority of the north eastern half and the south west of the tenement is located within the area classified as *Eucalyptus gamophylla* shrub steppe, over *Triodia basedowii* (spinifex) hummock grassland.

6.7.2 Recent Surveys

ecologia undertook a two phase flora and vegetation assessment during July and September 2008 (Appendix M).

The survey methods used were developed to meet the Environmental Protection Authority's Guidance Statement 51 (Terrestrial Flora and Vegetation Surveys for

Environmental Impact Assessment in Western Australia; EPA, 2004) and Position Statement Number 3 (Terrestrial Biological Surveys as an element of Biodiversity Protection; EPA, 2002). The field survey involved systematic flora sampling in quadrats measuring approximately 50 m x 50 m = 2 500 m^2 (or an equivalent area for land forms that are linear i.e. creeklines). This is the accepted size for surveys conducted in the Pilbara. Figure 6-6 shows the locations of the quadrats across the Project area.

The vegetation of the Project area has been separated by *ecologia* into eight main units (listed below) with twelve sub-units;

1. *Eucalyptus victrix* and *Acacia citrinoviridis* low woodland (with two sub-units);
2. *Acacia tumida* and *Grevillea wickhamii* tall shrubland;
3. *Acacia aneura* low woodland, over *Acacia synchronicia* tall shrubland, over **Cenchrus spp*. tussock grassland;
4. *Acacia aneura* low open forest (with two sub-units);
5. *Acacia citrinoviridis*, *Corymbia hamersleyana*, *Acacia aneura* and *Acacia pruinocarpa* open woodland, over *Acacia spp*. tall shrubland, over **Cenchrus spp*. closed tussock grassland (with three sub-units);
6. *Acacia dictyophleba* tall shrubland, over *Triodia schinzii* open hummock grassland;
7. *Acacia spp*. medium to high open shrubland, over *Triodia basedowii* and *Triodia schinzii* hummock grassland;
8. *Corymbia hamersleyana* isolated low trees, over *Eucalyptus gamophylla* mallee woodland, over *Acacia spp*. and *Grevillea wickhamii* tall shrubland, over *Triodia basedowii* hummock grassland (with five sub-units).

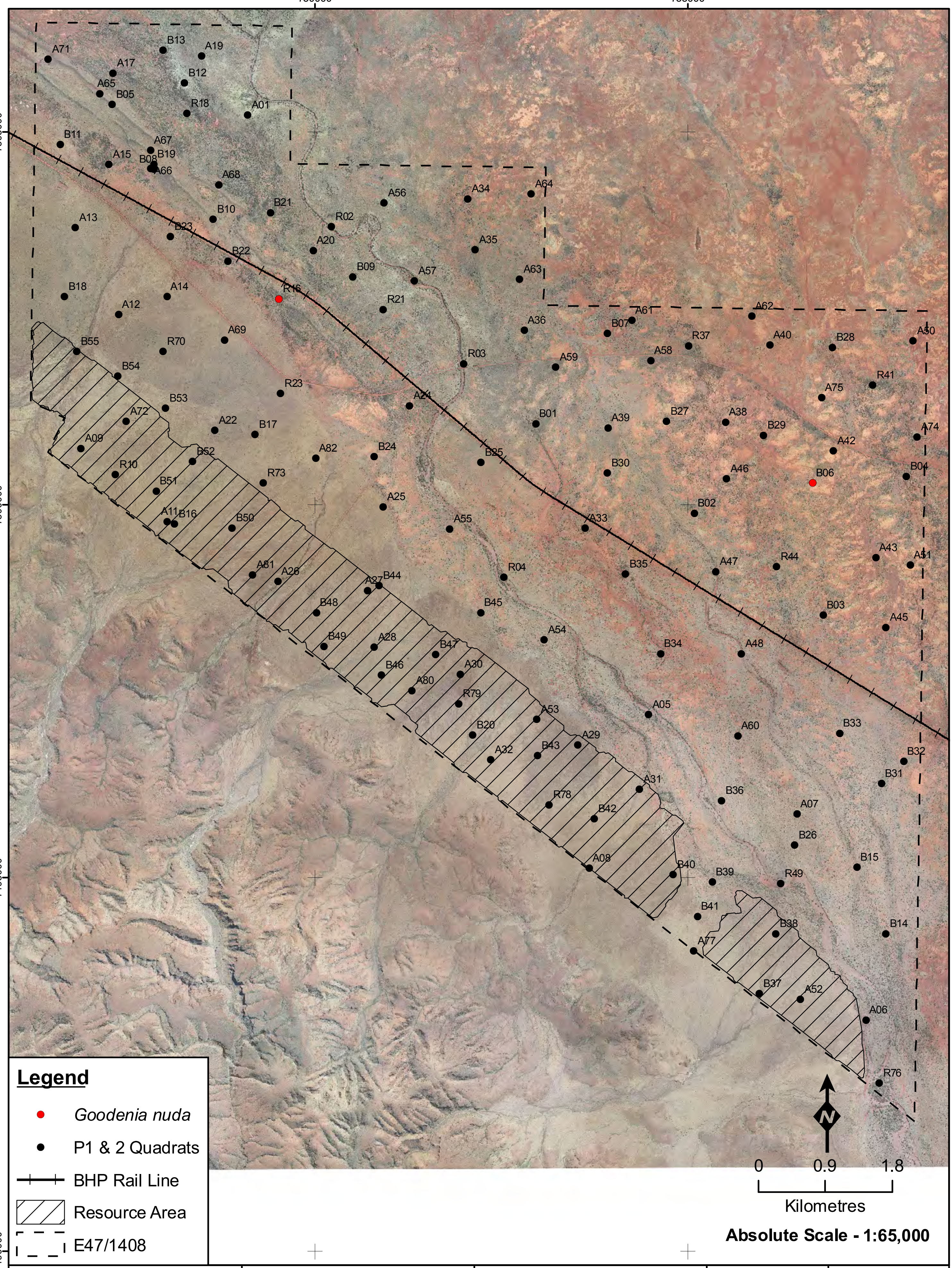
The sub-units are not visible on the aerial photographs and consequently the vegetation has been mapped into the eight main units described above (Figure 6-7).

No flora species or threatened ecological communities of national or state significance were recorded during this vegetation and flora survey.

One State-listed PEC occurs within the Project area, the Priority 3 'Vegetation of sand dunes of the Hamersley Range and Fortescue Valley'. The Fortescue Valley Sand Dune PEC occurs in the Divide Land System (Van Vreeswyk et al. 2004). The dunes are considered to be regionally rare, small, fragile and susceptible to threatening processes (Biota 2004b).

The vegetation associated with colluvial fans of the survey area (Unit 8a) are considered to be of local conservation significance. All other vegetation types in the area are not considered to be regionally or locally significant.

Two sub-units of potentially phreatophytic vegetation were recorded within the survey area. These have been mapped as vegetation Unit 1 in Figure 6-7.



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Flora Quadrats Surveyed in the Project Area and Locations of *Goodenia nuda*

Figure: 6-6
Project ID: 1140

Drawn: SG
Date: 16/10/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: S035

A4

6.7.3 Vegetation Condition Assessment

Vegetation condition of the Project area was noted in the field using the levels indicated in Table 6-3. Factors considered when determining these levels are the presence of weeds, tracks, litter, grazing and any other ground disturbances.

Table 6-3 Marillana Vegetation Condition Assessment

VEGETATION CONDITION	LEVEL	% OF SURVEY AREA
Pristine	No disturbance	0
Excellent	Minimal disturbance	11
Good	Moderate disturbance	44
Poor	Significant disturbance	45
Degraded	Very high disturbance	0

The creek banks, floodplains and flat clay-pan areas at Marillana are in a poor condition (*ecologia,* 2008a). These areas are characterised by high levels of cattle grazing and significant weed populations. The introduced taxa; **Cenchrus ciliaris* and **Cenchrus setiger* are the dominant tussock grasses within the Project area due to introduction by pastoralists as fodder. The dominance of these introduced grasses is likely to be decreasing the diversity of native grasses and species in the lower shrub and herb stratum (*ecologia,* 2008a).

The rocky foot slope located along the southern perimeter of the Project area is dominated by spinifex. Because of this cattle grazing pressure is low and there is minimal weed establishment, with the exception of tracks which have been populated by **Cenchrus ciliaris*. These areas have significantly better vegetation condition (*ecologia,* 2008a).

6.7.4 Significant Flora

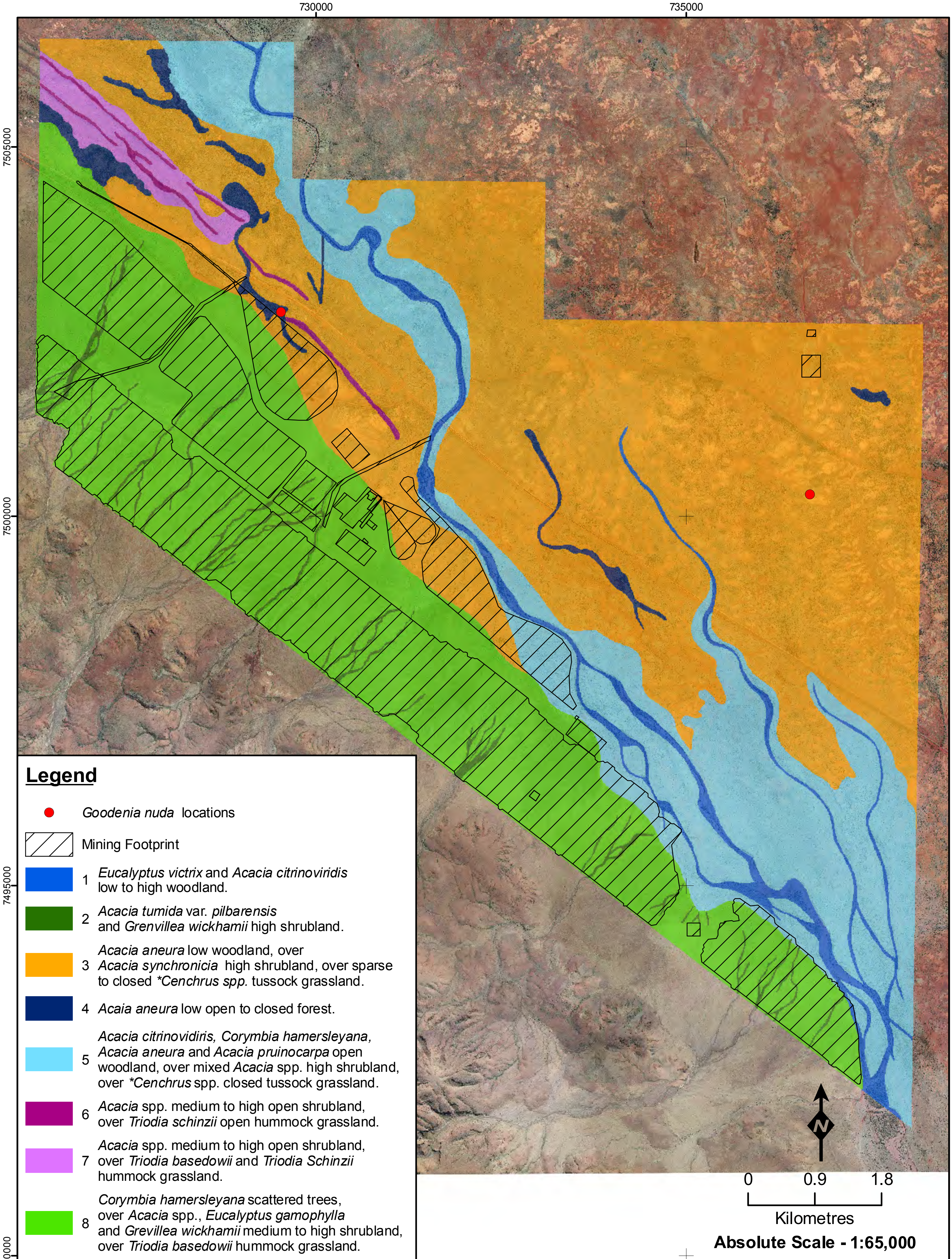
Three hundred and two taxa were recorded during the survey and this total includes subspecies, varieties, forms and affinities. Of this combined total, 224 taxa from 38 families and 100 genera were recorded during the first phase of the survey and 244 from 39 families and 104 genera during the second phase.

Ten of the 302 taxa were introduced species and one was a priority flora species. Sixteen taxa collected during the survey could not be confirmed to species level.

No Declared Rare Flora taxa were recorded during the survey, however one Priority Flora taxon; *Goodenia nuda* (P 3) was recorded once in low numbers (< 2% cover) on the banks of the Weeli Wolli Creek. The location is provided and shown in Figure 6-6.

Goodenia nuda is an erect non woody herb growing to 50 cm high. The leaves and stems are a pale green to grey-green colour, sometimes with a frosted look from a powdery coating and are between 4 - 10 cm in length and 0.5 - 1 cm in width. The flowering section can be up to 25 cm long, with the yellow flowers less than 2 cm long, occurring between April and August.

The preferred habitat of *G. nuda* is in dry river beds and at the edge of floodplains on stony hard pans and cracking clays. There are currently 12 records on FloraBase of *G. nuda* from areas including Newman, Roy Hill and Weeli Wolli Creek (FloraBase, 2008).



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Marillana Vegetation Map

Figure: 6-7
Project ID: 1140
Drawn: SG
Date: 16/10/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: S036

A4

6.7.5 Introduced Species

No Priority or Declared weed species were recorded during the 2008 surveys.

Ninety species of naturalized alien flora are currently known to occur in the Pilbara region (FloraBase, March 30, 2009). Ten general or environmental weeds were recorded at the Marillana survey area: **Aerva javanica, *Argemone ochroleuca* subsp*. ochroleuca, *Cenchrus ciliaris, *Cenchrus setiger, *Chloris virgata, *Datura leichhardtii, *Malvastrum americanum, *Portulaca oleracea, *Setaria verticillata* and **Vachellia farnesiana.*

**Argemone ochroleuca subsp. ochroleuca* and **Datura leichhardtii* are listed as declared weeds in other districts in Western Australia but not in the Marillana area.

The frequency of occurrence and densities of populations are provided in Table 6-4.

Table 6-4 Weeds Recorded at the Marillana Survey Area

WEED SPECIES	NUMBER OF TIMES RECORDED PHASE 1	NUMBER OF PLANTS OR COVER (%) PHASE 1	NUMBER OF TIMES RECORDED PHASE 2	NUMBER OF PLANTS OR COVER (%) PHASE 2
**Aerva javanica*	**5**	< 10 plants - < 2%	**1**	< 10 plants
**Argemone ochroleuca subsp. ochroleuca*	Not recorded		**1**	< 10 plants
**Cenchrus ciliaris*	**66**	< 10 plants - > 70%	**63**	< 10 plants - > 70%
**Cenchrus setiger*	**35**	< 10 plants - > 70%	**29**	< 10 plants - 70%
**Chloris virgata*	**1**	2 – 10%	**1**	< 2%
**Datura leichhardtii*	**2**	< 10 plants	**1**	< 2%
**Malvastrum americanum*	**10**	< 10 plants - 70%	**19**	< 10 plants - 70%
**Portulaca oleracea*	**15**	< 10 plants - < 2%	**3**	< 10 plants - < 2%
**Setaria verticillata*	**1**	< 2%	**1**	< 10 plants
**Vachellia farnesiana*	**15**	< 10 plants - < 2%	**12**	< 10 plants – 30%

**Cenchrus ciliaris* and **Cenchrus setiger* are the dominant tussock grasses at the Marillana survey area. Extensive populations were recorded covering a large proportion of the tenement.

6.8 VERTEBRATE FAUNA

ecologia undertook a two phase vertebrate fauna survey from 25th April to 7th May 2008 and from 30th August to 10th September 2008 using a variety of sampling techniques, including systematic (trapping) and opportunistic sampling (Figure 6-8, Appendix N). The survey methods adopted by *ecologia* were aligned with the Environmental Protection Authority's Guidance Statement No. 56 (EPA 2004) and Position Statement No. 3 (EPA 2002).

Five main fauna habitat types were identified in the Project area during site selection, and these were chosen for systematic sampling; (1) sandy spinifex grassland (Site 1), (2) stony spinifex plains (Site 2), (3) creekline (Site 3), (4) longitudinal sand dune (Site 4) and (5) mulga woodland (Site 5 and Site 6). Open plain habitat makes up the majority of the Project area south-west of the Weeli Wolli Creek, covering much of the Hamersley Range alluvium deposits. The open plains fall on two different land systems, the Divide and the Boolgeeda land system, providing two similar but sufficiently distinct fauna habitat types: sandy spinifex grassland and stony spinifex plains.

Twenty-three species of mammal, 82 species of bird, and 43 species of reptile were recorded within the survey area.

Two conservation significant species were recorded at numerous locations within the survey area; the Australian Bustard (*Ardeotis australis*, DEC Priority 4) and the Rainbow Bee-eater (*Merops ornatus*, EPBC Act Migratory). A further six conservation significant species are considered likely to occur in the Marillana Project area based on previous nearby records (from state and national databases and other surveys conducted in the vicinity) and the habitat types available within the Project area.

All conservation significant species that occur or are likely to occur in the Project area are described below in order of significance.

Night Parrot (*Pezoporus occidentalis*) – *EPBC Act* Endangered, *WC Act* Schedule 1

The Night Parrot is a medium-sized, nocturnal parrot that spends much of its time on the ground. Historical evidence indicates that Night Parrots were distributed over much of semi-arid and arid Australia.

Two fauna habitat types present in the Project area, sandy spinifex grassland and longitudinal sand dune, have the potential to support Night Parrots, as they both have a thick, long unburnt cover of spinifex hummocks. Furthermore, there are several active bores present within and immediately adjacent to the Project area, providing the drinking water potentially required by the species.

The probability of Night Parrots occurring in the Project area is difficult to estimate, as the species is unlikely to be recorded even in areas where it may be common. If the Night Parrot occurs in the Project area, the sandy spinifex grassland and longitudinal sand dune habitats, which also occur in surrounding areas, have the greatest potential to support this species.

The EPBC threatened fauna database indicated that the nearest record of the Night Parrot occurs at Mulga Downs (approx. 90 km north-west of the Project area) but there is a more recent record from Minga Well, approx. 35 km north-east of the Project area (Davis and Metcalf 2008). It is difficult to assess any potential regional impact to this species due to the paucity of data regarding population size and distribution. However correspondence with Stephen Van Leeuwin has indicated that suitable Night Parrot habitat is unlikely to exist within the Project area, as this species is thought to inhabit the samphire and lignum community and fringing hummock grassland of the Marsh proper. Therefore impacts to this species is likely to be negligible.

Pilbara Olive Python (*Liasis olivaceus barroni*) – *EPBC Act* Vulnerable, *WC Act* Schedule 1

The Pilbara subspecies of the Olive Python only occurs in the ranges of the Pilbara region of Western Australia. It is a dull olive-brown or pale fawn python that can grow to 2.5 m. In the Pilbara it inhabits watercourses and areas of permanent water in rocky gorges and gullies (Garnett and Crowley 2000). This subspecies is an adept swimmer, regularly hunting in water, with which it is often associated. It feeds on a variety of vertebrates including rock wallabies, fruit bats and birds.

The species prefers to inhabit the gorges and escarpments more typically found in the nearby Hamersley Range, but may be attracted to the Weeli Wolli Creek for hunting, or as a conduit to dispersal, when water is present. For most of the year the species is unlikely to be affected by mining activities in the Project area, but individuals may enter the area when the creek is in flood.

Pilbara Olive Pythons are widespread in the Pilbara and the impact to the regional population is expected to be negligible.

Rainbow Bee-eater (*Merops ornatus*) – *EPBC Act*, Migratory

The Rainbow Bee-eater is a strikingly colourful bird that lives almost anywhere suitable for hawking insects - principally bees, flies, dragonflies and grasshoppers. They are scarce to common throughout much of Western Australia, except for the arid interior, preferring lightly wooded, preferably sandy, country near water (Johnstone and Storr 1998). Rainbow Bee-eaters can occur as a resident, breeding visitor, postnuptial nomad, passage migrant or winter visitor and are common in the Pilbara.

Rainbow Bee-eaters were recorded at Sites 3, 4, 5, and 6, however, survey records of this species were concentrated around the Weeli Wolli Creek system, and also the longitudinal sand dune in the north-west of the Project area. Individuals were also recorded opportunistically throughout the Project area. The most likely place for this species to breed within the Project area, if it does, would be at Weeli Wolli Creek, where ideal sandy embankments occur.

Fork-tailed Swift (*Apus pacificus*) – *EPBC Act* Migratory

The Fork-tailed Swift is a small insectivorous species with an almost entirely aerial lifestyle. This species is distributed from central Siberia and throughout Asia, breeding in north-east and mid-east Asia, and wintering in Australia and south New Guinea. It is a relatively common trans-equatorial migrant from October to April throughout mainland Australia (Simpson and Day 2004). In Western Australia the species begins to arrive in the Pilbara in November (Simpson and Day 2004). In Western Australia, the Fork-tailed Swift is considered uncommon to moderately common near the north-west, west and south-east coasts, common in the Kimberley and rare or scarce elsewhere (Johnstone and Storr 1998).

Fork-tailed Swifts are likely to occasionally overfly the Project area, since they are highly nomadic and associated with storm fronts that sweep through the Pilbara. However, they are almost entirely aerial and will not utilise habitat within the Project area.

Peregrine Falcon (*Falco peregrinus*) – *WC Act* Schedule 4

This nomadic or sedentary falcon is widespread in many parts of Australia and some of its continental islands, but absent from most deserts and the Nullarbor Plain. It most commonly occurs near cliffs along coasts, rivers and ranges and around wooded watercourses and lakes. Peregrines feed almost entirely on birds, especially parrots and pigeons.

Peregrines primarily nest on ledges in cliffs, granite outcrops and in quarries, but may also nest in tree hollows around wetlands. Eggs are predominantly laid in September (Johnstone and Storr 1998). The species is considered to be moderately common in the Stirling Range, uncommon in the Kimberley, Hamersley and Darling Ranges, and rare or scarce elsewhere (Johnstone and Storr 1998).

Although this species may occasionally hunt within the Project area, particularly around the Weeli Wolli Creek area, there is no suitable breeding habitat within it due to the absence of any rocky ridges. No impacts to the regional population of Peregrine Falcon are likely.

Northern Short-tailed Mouse (*Leggadina lakedownensis*) – DEC Priority 4

Northern Short-tailed Mouse is distributed across northern Australia. The species has been recorded from diverse habitats ranging from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, acacia shrublands, tropical eucalyptus and melaleuca woodlands and stony ranges.

This species was recorded in the Chichester Range to the north during recent *ecologia* surveys (*ecologia* 2008), where they were recorded from cracking clay soils. It has a medium potential to occur within the Project area but was not recorded during *ecologia*'s survey.

Australian Bustard (*Ardeotis australis*) – DEC Priority 4

Australian Bustards are nomadic, ranging over very large areas, and their abundance varies locally and seasonally from scarce to common, depending on rainfall and food availability. Breeding occurs when conditions are favourable. In northern Australia, this is generally late in the wet season or early in the dry (January to March).

Although the population size is still substantial, there has been a large historical decline in abundance, particularly south of the tropics, but also across northern Australia (Blakers *et al.* 1984).

Australian Bustards were directly and indirectly recorded at Site 2 and Site 5 and also by four opportunistic sightings within the Project area. This species appears to be relatively common in the Project area. With the exception of Site 2 all observations were made north of the existing rail line.

Even though the Australian Bustard was recorded within the Project area, it is a nomadic species which is relatively common in the Pilbara. Suitable habitat is widespread and common in surrounding areas.

Grey Falcon (*Falco hypoleucos*) – DEC Priority 4

Grey Falcons are a rare, nomadic raptor species, sparsely distributed across much of arid and semi-arid Australia. In Western Australia, the current distribution is now thought to be restricted to north of 26°S (Johnstone and Storr 2004). Because the species is scarce, and occurs over a large area, sightings are very uncommon.

Grey Falcons prey primarily on birds, although reptiles and mammals are also taken (Johnstone and Storr 1998). Two to three eggs are laid in winter in the nests of other birds of prey and ravens, typically in tall eucalypt trees near water (Johnstone and Storr 1998).

The Grey Falcon is widespread but scarce in the Pilbara. There are a few records of this species in proximity to the Project area (*ecologia* 2008c; *ecologia* 2009), and suitable hunting and breeding habitat (at Weeli Wolli Creek) does exist. Although the species has potential to inhabit or breed within the Project area, this conspicuous species was not recorded during the surveys. It is therefore thought to be absent and the risk to the regional population minimal.

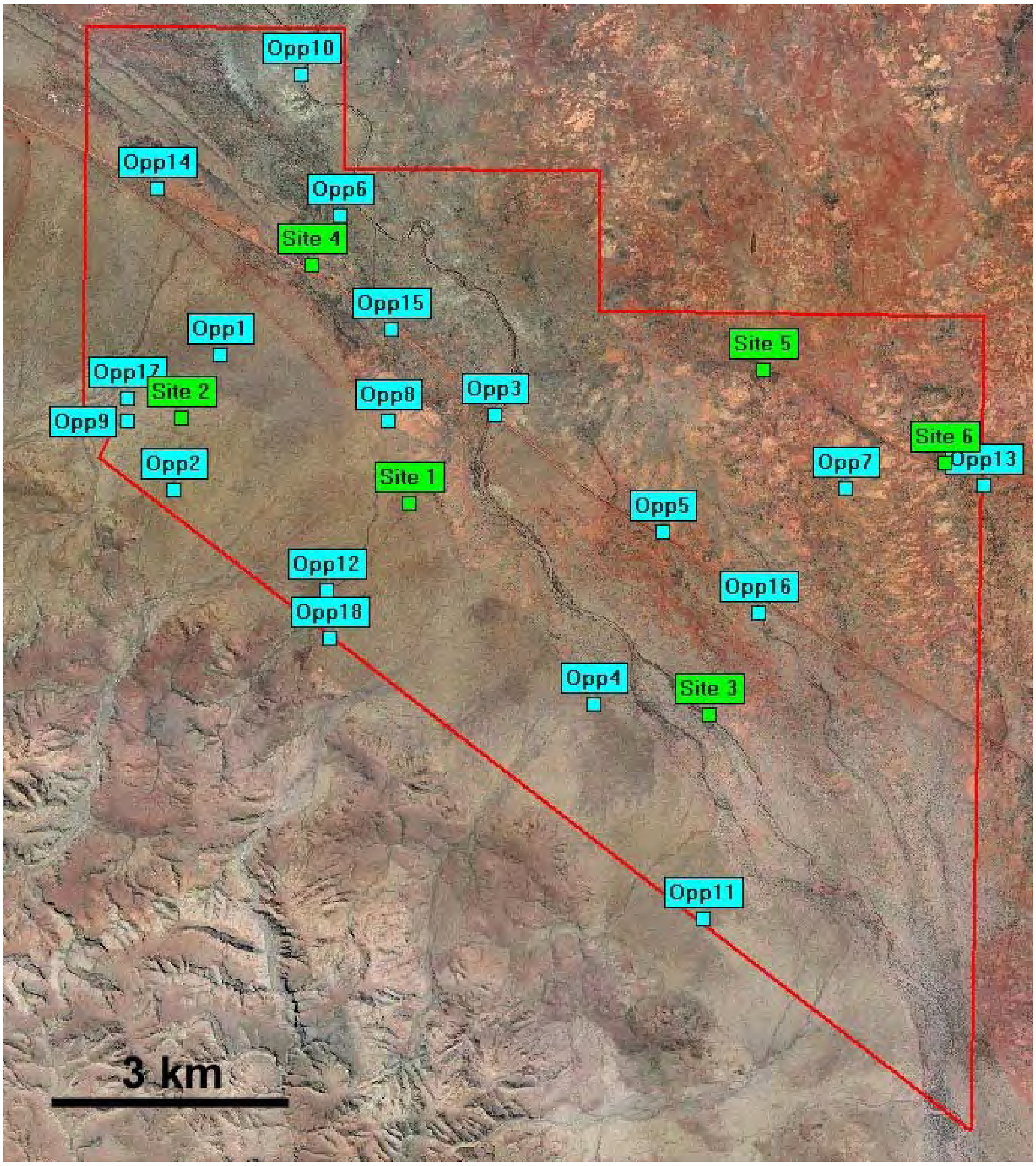


Figure 6-8 Location of Fauna Sites within the Project Area

6.8.1 Ecologically Important Habitats within the Project Area

Longitudinal Sand Dunes

The longitudinal sand dunes running north-west to south-east though the middle of the western half of the Project area represents a unique land form within the Project area. Sand dunes are an occasional feature present in the divide land system, a common land system in the south-east Pilbara with a total area of 5,293 km^2. The overall fauna assemblage at Site 4 in this habitat had affinities with Site 1 and Site 2. However, a small number of species were recorded mostly or only at the longitudinal sand dune site such as the skink Burton's legless lizard, the gecko *Strophurus wellingtonae*, and the Spinifex Slender Blue-tongue.

Weeli Wolli Creek

The Weeli Wolli Creek is likely to perform an important ecological role in the Project area, with creeks in arid zones forming refuges and habitat corridors. The majority of bats recorded in the fauna survey were recorded from this habitat which is not surprising given the preference of bats for tree lines which provide invertebrate prey as well as shelter (Ekman and De Jong 1996; Verboom and Spoelstra 1999). The Weeli Wolli Spring, represents the most northerly record of the Chocolate Bat (*Chalinolobus morio*) and the Ghost Bat (*Macroderma gigas*; DEC Priority 4) has been recorded foraging above pools downstream of the spring (Van Leeuwen, 2009).

When holding water, this creekline would attract large numbers of bird species, with over 60 species of bird previously recorded along the Weeli Wolli Creek (Van Leeuwen, 2009). As has been noted previously, this creek system was where Rainbow Bee-eaters (*EPBC Act* Migratory) were most frequently recorded and represents the most likely location this species would breed within the Project area.

6.9 SUBTERRANEAN INVERTEBRATE FAUNA

6.9.1 Stygofauna

Stygofauna are groundwater dwelling fauna known to be present in a variety of subterranean strata including porous karst and calcrete limestones, fissured rock and coarse gravels (Mamonier et al., 1993). They are typically adapted for, and restricted to, the subterranean environment, with features such as lack of pigmentation, elongated appendages, filiform body shape (worm like) and reduced or absent eyes.

Numerous stygofauna studies have taken place in the Pilbara (Figure 6-9) with over 150 published records of stygofauna existing within the Fortescue Basin (Eberhard et al., 2005). Stygofauna found in the Pilbara region tend to colonise most groundwater environments, whether karst conduit or the benthic and interstitial zones of springs and spring-brooks (Eberhard et al., 2005).

The main aquifer sequence within the Project area is the ore body itself, representing a palaeo-channel of the ancestral Weeli Wolli Creek (Coffey, 2009). More broadly, the aquifer comprises channel iron deposits overlain by an uncemented pisolite gravel, hematite and BIF detritals. In places, calcrete is developed below and adjacent to the detrital zone. Underlying the detrital ore body are low permeability strata including BIF, Shale and Dolomite.

In the vicinity of the Project area, the Weeli Wolli palaeo-drainage area is likely to be restricted Weeli Wolli Creek and its alluvial outwash fans associated with the Hamersley Range front. The detrital sequences along the base of the ranges are bounded to the north by distal clayey-alluvial deposits that form the flood plain of the Fortescue Valley. These alluvial deposits are generally of low permeability and thus likely to represent the northern limit of the stygofauna habitat (Coffey, 2009). To the south of the tenement the aquifer is likely to follow the Weeli Wolli Creek and Marillana Creek palaeo-channels into the Hamersley Range.

Two phases of sampling were conducted by *ecologia* in February and May 2009 within the Project area, each comprising 44 samples (88 samples in total), thus satisfying the requirements of EPA Guidance Statement 54a. In addition, a single phase of sampling was undertaken (July 2009) in six nearby bores off-tenement (Appendix O).

Four stygobitic species were collected during the survey. One of the species, the amphipod *Pilbarus millsi*, was found both inside and outside the tenement (Figure 6-10). Two of the species (unidentified copepod and oligochaete) were found only within the tenement and represented by singletons. The fourth species, the isopod *Pygolabis weeliwolli*, was found only outside the tenement. The amphipod and the isopod were the focus of recent publications (Finston et al., 2007; Finston et al., 2009) within which it was indicated that these species were present in the Weeli Wolli Creek and Marillana Creek palaeo-drainage channel. Although the other two organisms could not be identified to species level they are expected to occur outside the tenement because their body size is significantly smaller than the size of the amphipod and the isopod. They are therefore expected to be subject to the same or lesser dispersal limitations.

<u>Order Amphipoda (amphipods)</u>

Pilbarus millsi was found in sample wells MRC0804, MRC0567, MRC050, MRC0577 (Figure 6-9) as well as from the outside tenement survey in Pug Bore, Coolana Bore, MAPB01 Bore and Waitawhile Bore (Figure 6-10).

Until recently, *Pi. millsi* was thought to have a widespread distribution throughout the Pilbara region (Finston et al. 2007). Using molecular evidence (COI gene sequences), Finston et al. (2007) revealed significant divergences between populations within the Pilbara which were consistent with different species. Of these cryptic species populations, Finston et al. (2007) found the Marillana Creek and Weeli Wolli Creek populations to comprise a “Fortescue lineage” associated with the Weeli Wolli and Marillana Creeks.

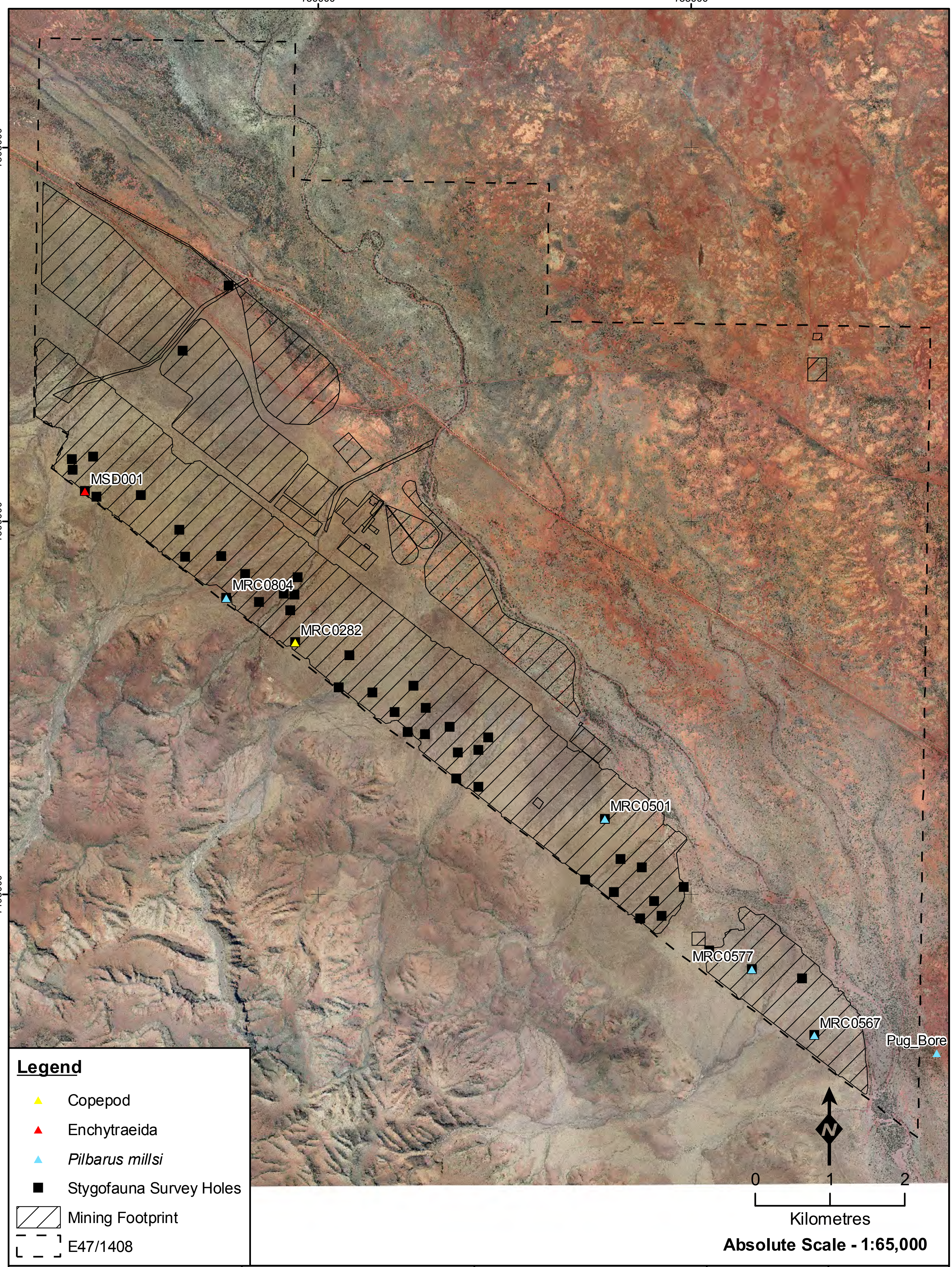
<u>Subclass Copepoda (copepods)</u>

A single copepod specimen was collected from bore MRC0282 on tenement (Figure 6-9). The specimen was badly damaged, making even ordinal level identification impossible. The species could not be sequenced owing to previously having been cleared with lactic acid during slide preparation (D. Tang, UWA, pers. comm.).

<u>Order Oligochaeta (segmented worms)</u>

A single enchytraeid oligochaete specimen was collected from bore MSD001 (Figure 6-9). This specimen was a sub-adult and thus could not be identified to species (M. Scanlon, Bennelongia, pers. comm.).

The two largest species detected during this survey, *Pi. millsi* and *Py. weeliwolli*, have distribution ranges extending well outside of the proposed area of development. Their large size and wide distribution pattern suggests an extensive stygobitic habitat comprising relatively large pore spaces. Therefore, it seems likely that the much smaller enchytraeid oligochaete and copepod species will follow similar distribution patterns as their adults and larvae would be capable of dispersing through the aquifer to the same (or larger) degree as *Pi. millsi* and *Py. weeliwolli*.



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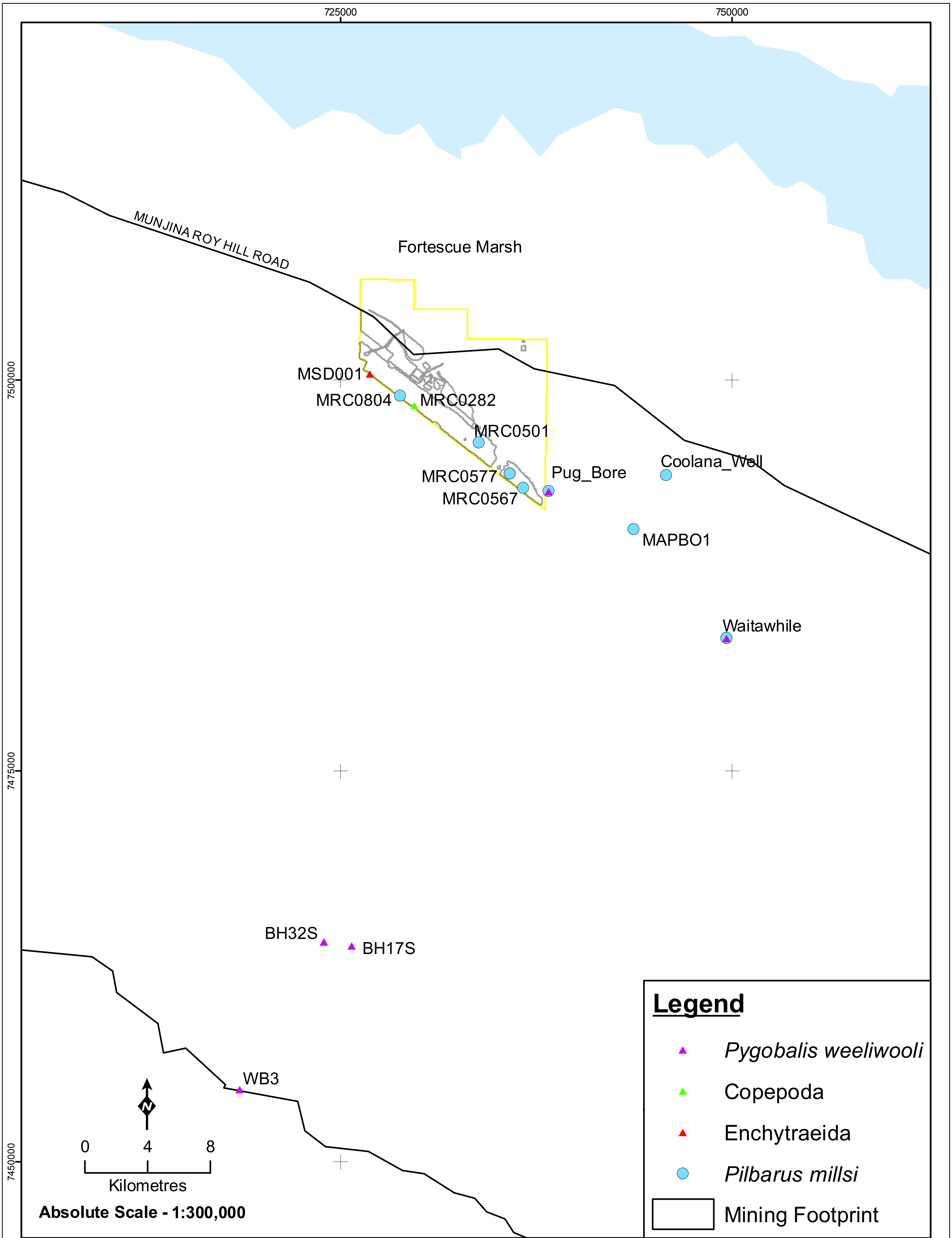
Stygofauna survey sites and records

Figure: 6-9
Project ID: 1140
Drawn: SG
Date: 16/10/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
Unique Map ID: S037
A4



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Stygofauna survey sites and records outside of tenement

Figure: 6-10
Project ID: 1140
Drawn: SG
Date: 23/09/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: S019

A4

6.9.2 Troglofauna

Troglofauna are communities of terrestrial subterranean animals that inhabit air chambers in underground caves or small, humid voids. A species is considered truly troglobitic if it displays morphological characters resulting from specialized evolution within subterranean habitats (Howarth, 1983): absence of body pigment, attenuation of appendages, loss or reduction of eyes, loss and or reduction of wings and or reduced metabolic rate.

Troglobites are obligate inhabitants of subterranean habitats and are incapable of surviving on the surface for long periods. Such dispersal limitations result in extremely small and localized species ranges and thus high levels of endemism (EPA, 2003), which is characteristic of subterranean fauna worldwide (Strayer, 1994).

The presence of troglofauna in Western Australia is still poorly understood and documented (Eberhard, 2001). To date, troglofauna have been recorded from karstic limestone systems at Cape Range, Barrow Island and in the Kimberley (Biota, 2005; Harvey, 1988), pisolitic mesa formations in the Pilbara (Biota, 2006) and in the cave systems of Yanchep (EPA, 2005), Margaret River (Eberhard, 2006) and across the Nullarbor (Moore, 1995).

A three phase troglofauna survey was undertaken within the proposed pit area on M47/1414. Phase 1 (61 samples) was conducted between 29 May - 14 July 2008, Phase 2 (61 samples) between 14 July - 15 September 2008 and Phase 3 (30 samples) between 13 August – 14 October 2008 (Appendix P). Trapping in 61 bores was undertaken over two back-to-back phases (122 survey samples) and, in conjunction with the additional 30 samples, provided a total of 154 samples; thus satisfying the requirement of the EPA Guidance Statement 54a. Five definitive troglobites were discovered during these surveys.

Subsequent to Phase 3, additional survey phases were undertaken within new survey bores drilled outside of the proposed pit area. Phase 4 (45 bores) was conducted between 16 February - 15 April 2009, Phase 5 (44 bores) between 15 April 2009 -26 May 2009 and Phase 6 (39 bores) between 26 May - 10 July 2009. This survey comprised 128 samples and produced one additional troglobitic species and two troglobitic species that were previously sampled during the first three phases.

The capture rate of troglobites is lower than expected from these surveys. This may be due to the strata supporting the troglobitic community, in which there are no survey precedents in Western Australia. Not-withstanding these low capture rates, species accumulation curves (see Appendix P) do suggest that the majority of the expected species were detected (estimation predicted up to seven species), so it is anticipated that the sample of the community collected is representative and the survey was comprehensive (*ecologia*, 2009d).

The six phases of sampling produced a total of six definitive troglobites and one tentative troglobite. These are outlined below and listed in Table 6-5. The locations of the Troglofauna across the Project area can be found in Figure 6-11.

Table 6-5 Summary of Definitive and Tentative Troglobites Found at Marillana

ORDER	FAMILY	MORPHOSPECIES	PHASE	SPECIMENS	HOLE ID
Definitive Troglobites					
Schizomida	Hubbardiidae	*Draculoides* 'marillana'	1 2	2	MRC219 MRC212
Pseudoscorpiones	Olpiidae	Olpiid 'marillana'	2	1	MRC175
Isopod	Armadillidae	Armadillid 'marillana'	2 5	2	MRC367 Trog24
Hemiptera	Reduvidae (Emesinae)	Emesine 'marillana'	2	1	MRC112
Polyxenida	Polyxenidae	Polyxenid 'marillana'	2 5 6	7	MRC247 MRC084 Trog41a Trog04
Coleoptera	Undetermined	Coleoptera 'marillana2'	5	6	Trog41a
Tentative Troglobite					
Coleoptera	Undetermined	Coleoptera 'marillana1'	2	5	MRC247, MRC213

Order Schizomida (schizomids)

Schizomids are small arachnids that superficially resemble spiders (Harvey, 1992). They are found in moist environments in tropical and subtropical regions of the world. Their reliance on high humidity environments and their absence in the terrestrial short range endemic survey indicate that this is not an accidental species from the surface.

Two specimens of schizomid were detected from survey boreholes MRC219 and MRC212.

Order Pseudoscorpiones (pseudoscorpions)

Pseudoscorpions are predatory arachnids that capture and subdue their invertebrate prey using pincer-like anterior appendages (Brusca and Brusca, 2003). Numerous troglobitic psedoscorpion species are known (Harvey, 1991).

A single undescribed species of olpiid (family Olpiidae) pseudoscorpion was recorded from borehole MRC175. The family Olpiidae is very diverse and contains numerous undescribed species (Mark S. Harvey, WAM, pers. com.). The specimen collected was sub-adult and thus specific identification was impossible, however the species is a definitive troglobite.

Order Hemiptera (Sucking Bugs)

Emesine bugs are characterised by extremely long and thin legs and possess mantis-like raptorial front legs (Gross et al. 2000). They occur worldwide and all known species are predatory, using their raptorial front legs to capture and secure prey items (Gross et al. 2000). Emesines are known from cave habitats; however, taxonomic knowledge of the Western Australian species is poor. Approximately 44 named species are known from Australia (Gross et al. 2000).

One specimen of an undescribed emesine bug species was collected from sample bore MRC112. The specimen was white and possessed eyes that lacked pigment while epigean species possess well developed compound eyes and body pigmentation. This species is clearly a definitive troglobite.

Order Isopoda (Slaters)

An undescribed slater (suborder Oniscoidea) was detected.Terrestrial isopods are a diverse order of the subphylum Crustacea with more than 4000 species known (Brusca and Brusca 2003). Isopods are known from nearly all environment types, including subterranean habitats (Brusca and Brusca 2003). The suborder Oniscoidea contains all terrestrial species, members of which are generally omnivorous or herbivorous (Brusca and Brusca 2003).

Two specimens of a new species of oniscoid isopods (slaters) were detected from holes MRC367 and Trog24. The species is pale and blind and is a definitive troglobite (S. Judd, ECU, pers. com.).

Order Polyxenida (pincushion millipedes)

Polyxenids are very small, caterpillar-like millipedes, usually less than 5mm in length. They possess numerous setae over the dorsal surfaces; giving them a bristly or pincushion-like appearance. Polyxenids are herbivorous or omnivorous and may occur in very large aggregations (Koch 1985).

Seven specimens of ployxenid millipede were found during the survey from sample bores MRC084, MRC247, Trog41a and Trog04. The specific identity of this species is presently unknown as the general taxonomy of Australian polyxenid millipedes is poorly known. Polyxenids typically have well pigmented bodies and well developed eyes and the pale and blind features of the species collected during this survey indicate that it is a definitive troglobite.

Order Coleoptera (beetles)

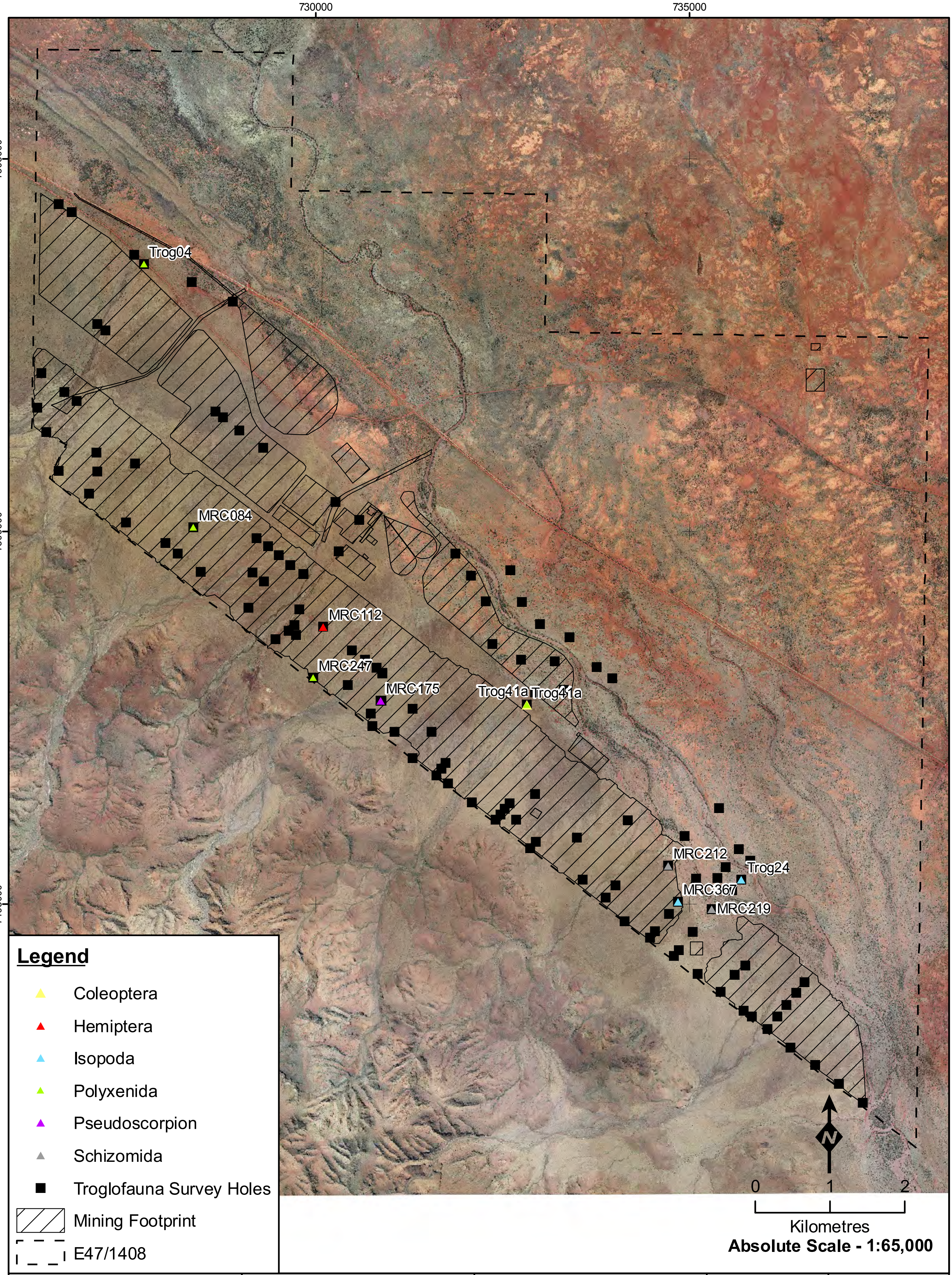
Two different types of beetles were collected during this survey and for the purpose of this report were assigned the morphospecies names Coleoptera 'marillana1' and Coleoptera 'marillana2'.

Coleoptera 'marillana1'

Several specimens of an unknown beetle species were detected from sample bores MRC247 and MRC213. The specimens possess much reduced eyes spots and lacks pigmentation; however they are also extremely tiny leading to the conclusion that they may be an element of the soil fauna. For this reason this species is only tentatively considered to be a troglobite.

Coleoptera 'marillana2'

Six specimens of this species were detected from sample bore Trog41a. The larger size of this species and its complete lack of eyes and pigmentation lead to the conclusion that this is more likely to be a definitive troglobite species.



ecologia ENVIRONMENT

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Troglofauna survey sites and records

Figure: 6-11
Project ID: 1140

Drawn: SG
Date: 16/10/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: S038

A4

6.10 SHORT-RANGE ENDEMICS

A four phased short-range endemic survey was undertaken by *ecologia* within the Project area over approximately three months, July-October 2008 (Appendix R). The primary objectives of this survey were to fulfil the requirements outlined in the EPA's Guidance Statement 56 (EPA 2004) and Position Statement No. 3 (EPA 2002), thus providing an inventory of short-range endemic (SRE) fauna species occurring in the survey area, incorporating recent published and unpublished records.

Thirty sites were selected in and around the proposed development. Site selection aimed to target as wide a range of habitats as possible, focussing on areas where SRE species were most likely to occur. Each site was represented by five wet pitfall traps and approximately 60 hours of targeted foraging (Figure 6-12, Table 6-6).

Table 6-6 Summary of SRE Survey Effort

METHODOLOGY	NUMBER OF TRAPS PER SITE / FORAGING TIME (HRS) PER SITE	NUMBER OF SITES	TOTAL TRAPPING EVENTS / FORAGING HOURS
Pitfall Traps (*ca* 90 nights)	5	30	*ca* 13,500 events
Foraging	2.5 person hrs	14	70 person hours
Burrow Pitfall Trapping	n/a	20	20 traps

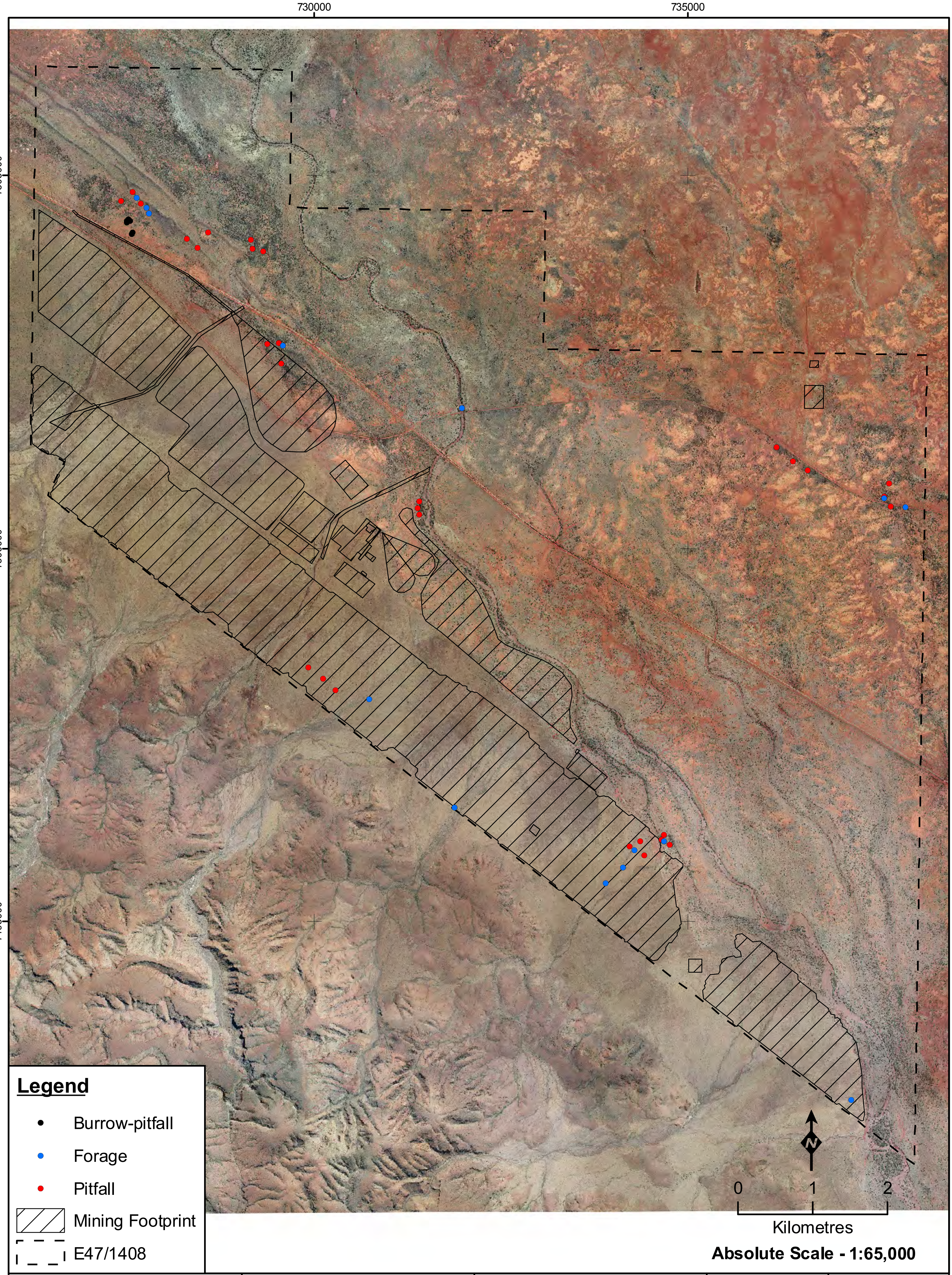
Short-range endemic organisms are characterised by having highly restricted natural distributions of 10,000 km² (100 km x 100 km) or less. Habitats conducive to supporting short-range endemics are typically isolated patches of landscape with abiotic properties (ambient moisture, sun exposure or temperature profiles) differing from the surrounding land forms (Harvey, 2002)

These landforms are frequently remnants of historically wetter periods that became isolated during the last 30 million years as much of the Australian landscape became drier. Speciation within the invertebrate populations is mediated by the amount of genetic cross over that occurred (emigration and immigration of individuals) between populations. Isolation over sufficiently long periods of time produces species that are restricted to the habitat in which they have evolved (Harvey, 2002).

ecologia's survey revealed six invertebrate groups known to contain SRE species. These were: pseudoscorpions, scorpions, trapdoor spiders, isopods, centipedes and snails. Closer inspection of these groups revealed three taxa that may potentially be considered as SRE, being two undescribed species of *Beierolpium* pseudoscorpions (family Olpiidae) and a species of geophilomorph centipede.

In all three cases, the taxonomic knowledge of the respective group is very poor and a clear determination of SRE status will only be known after significant revisions of the groups are undertaken at a regional level (pers. com. V.W. Framenau and M.S. Harvey, WAM).

However the lack of typical SRE island habitats within the Project area supports the absence of classically recognised terrestrial SRE invertebrates from these surveys. .



ecologia ENVIRONMENT

brockman resources.

SRE Sampling Sites (Foraging, Wet pitfall and Burrow Pitfall)

Figure: 6-12
Project ID: 1140

Drawn: SG
Date: 16/10/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: S039

A4

6.11 CULTURAL HERITAGE

6.11.1 Indigenous

There are no established Aboriginal communities in the vicinity however the Project area is subject to native title claims from the Martu Idja Banyjima (MIB) people and the Nyiyaparli people. A native title agreement is in place between Brockman and the MIB People, dated October 2008 and another between Brockman and the Nyiyaparli people dated November 2009.

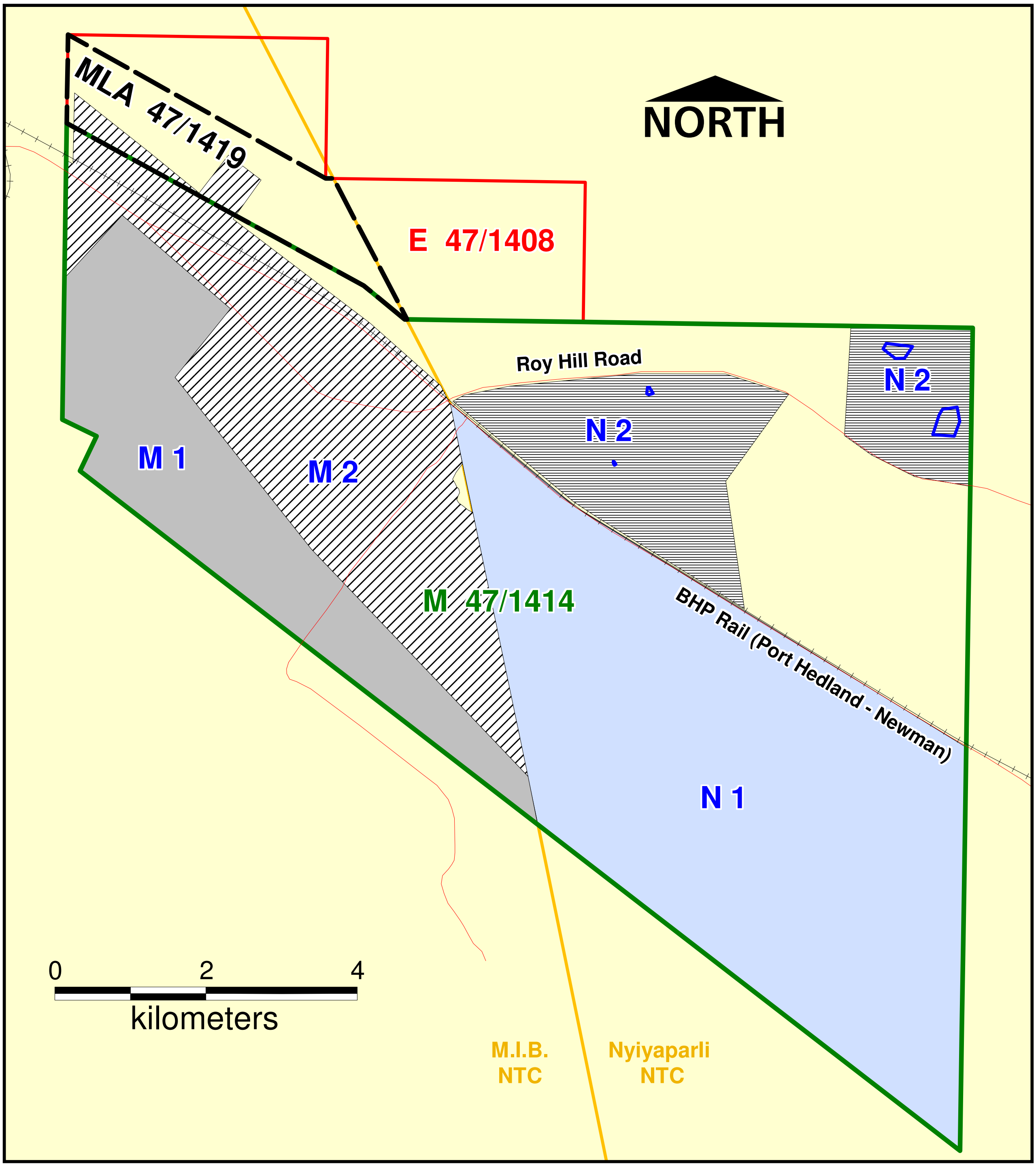
A search of the Department of Indigenous Affairs (DIA) sites register revealed that there were no Aboriginal archaeological or ethnographic sites registered within the Project area. An Aboriginal site is a defined place – i.e., a specific area of land and/or water to which special heritage significance applies, and therefore attracts the protection of the *Aboriginal Heritage Act 1972*, and potentially also the protection of the *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984*.

Heritage surveys have been completed by Australian Cultural Heritage Management (ACHM) in consultation with and involving the participation of MIB elders over the entire Project footprint within the MIB claim area (the majority of the resource area) and further surveys have been conducted covering all remaining proposed resource and infrastructure areas within the Nyiyaparli claim area (see Figure 6-13). The ground clearance surveys were carried out by archaeologists, with hand held GPS units, flanked by Traditional Owner (TO) representatives spaced at increments ranging from 20 to 50 m depending on ground surface visibility. Transects of the survey areas were then walked and any culturally significant sites or materials were recorded. Ethnographic surveys were also carried out in consultation with Traditional Elders.

In the Nyiyaparli claim area the archaeological survey and assessment resulted in the identification of four archaeological sites (stone artefact scatters), a modified tree, and a number of isolated finds (AAA, 2009). A common feature of all these areas was the generally large size of the stone artefacts and nodules, as well as the diversity of raw material types present. This implies that the area is close to raw material sources, and it is presumed that the prominent ridges to the south and north of the Project area contain plentiful supplies of high quality raw materials for stone knapping.

No archaeological or ethnographic sites have been identified within the Project footprint and none of the sites identified within the broader Project area (Figure 6-13) are in areas proposed to be developed by Brockman.

Ongoing consultation between Brockman and the Nyiyaparli and MIB people regarding Native Title will ensure that any impacts to land utilisation are managed in a way that recognises their customs and traditions.



LEGEND

HERITAGE SURVEY AREAS

M1 MIB heritage survey area , completed in April 2007

M2 MIB heritage survey area, completed in Aug 2009

N1 Nyiyaparli heritage survey area, completed in Dec 2007

N2 Nyiyaparli heritage survey area, completed in Aug 2009

Area of artefact scatters identified (4 in total)

Brockman Resources Ltd

PROJECT: **Marillana**

BRM Tenement &
Heritage Survey Areas

Figure: **6-13**
Project ID: **855**

6.11.2 European

A search of the Australian Heritage Database showed that no non-indigenous heritage sites are listed as occurring in the areas surrounding the Project area.

The tenement is located 100 km north north-west from the township of Newman, within the Marillana pastoral station. The neighbouring area is predominated by pastoral and mining activities (predominantly exploration) and its supporting infrastructure.

The nearby town of Newman has developed as a result of mineral exploitation, and requires ongoing resource Projects to provide revenue to the community. The development of the Project will provide financial and social benefits for the area through employment and flow-on effects to the non-mining sector.

The impacts of mining activities to surrounding communities and landholders will be minimal due primarily to the remote location of the Project area, some 60 km from any area of habitation, and the nature of the existing land use.

The Karijini National Park is located 100 km to the west and is the primary tourism attraction in the area. Access to the Park is encouraged from Tom Price off the Paraburdoo Tom Price Road.

APPENDIX C

Decommissioning and Rehabilitation Excerpt from Brockman Resources Ltd, Marillana Iron Ore Project, Public Environmental Review

7.7 MINE DECOMMISSIONING AND REHABILITATION

The development of a mining operation and its associated infrastructure involves the permanent alteration of existing landforms, disturbance to vegetation and fauna habitats, hydrological impacts and some level of contamination (DTIR, 2006).

While appropriate management of these issues during operation will minimise many of these impacts, residual impacts are inevitable and it is important that the closure and decommissioning of the mine site considers these with regard to the following priorities: public safety, sources of ongoing contamination, future land use, ecological compatibility, community expectations and aesthetics (DTIR, 2006).

7.7.1 Management Objectives

The objectives for decommissioning and rehabilitation are to:

- Ensure that rehabilitation achieves a long term safe, stable and functioning landform which is consistent with the surrounding landscape and other environmental values.
- Fulfil commitments made to stakeholders and regulators regarding closure outcomes.

7.7.2 Applicable Standards and Guidelines

Applicable standards and guidelines for decommissioning and rehabilitation include:

- AMEC - AMEC Mine closure Guidelines (AMEC, 2000).
- Strategic Framework for Mine Closure (ANZMECC, 2000).
- Mine Closure Guideline for Minerals Operations in WA. (DoIR, 2000).
- Mine Void Water Issues in WA (WRC, 2003).
- Guidance Statement No 6: Rehabilitation of Terrestrial Ecosystems (EPA, 2006).
- Mine Closure and Completion (DITR, 2006).
- Mine Rehabilitation (DITR, 2006)
- Planning for Integrated Mine Closure: Toolkit (ICMM).

7.7.3 Potential Impacts

Poorly closed and derelict mine sites provide a legacy for the local community (DITR, 2006). If appropriate mine closure and completion are not undertaken, a site may continue to be hazardous and a source of environmental pollution for many years (DITR, 2006) and cannot be utilised for other purposes. By failing to return a mine site to something resembling its pre-mining condition by rehabilitating native vegetation, surface waters and removing hazardous wastes, a site may also harbour weeds and feral animals and promote their spread to neighbouring properties.

Aspects of the Project that will require decommissioning and rehabilitation include:

- plant and processing infrastructure;
- offices, workshops and the accommodation village;
- water supply and sewage infrastructure;
- power supply infrastructure;
- fuel and bulk storage facilities;
- landfill and contaminated sites;
- borrow pits, roads and tracks;

- surface water diversions;
- waste dumps and other man-made landforms; and
- the mine pits.

Impacts to surface and groundwater as a result of mine closure are discussed in Sections 7.5.3 and 7.4.3 respectively.

7.7.4 Management

A mine backfill plan (Appendix L) has been developed to guide the progressive backfilling and rehabilitation of the mine pit to reduce the depth of the void and minimise surface interactions with groundwater.

Planning for mine closure commenced as part of exploration activity and PFS. Baseline data is being collected in accordance with ANZMEC /MCA (2000) standards to identify potential risks to successful mine closure.

Brockman has prepared a Conceptual Closure Plan (Appendix T) based on ANZMEC/MCA (2000) and DITR (2006) for submission to regulatory bodies as an appendix to the PER. Closure considerations include assessment and remediation of contaminated sites, ongoing placement of waste materials to improve the form of existing waste dump areas, and the rehabilitation of all Project disturbed areas.

The land will be returned to pastoral use after mining activities have ceased. Every effort will be made by Brockman to ensure that the impact areas are rehabilitated and returned, as near as possible to pre mining conditions.

Decommissioning

During the decommissioning phase of the Project all infrastructure that cannot be used by another party will be removed or buried and the disturbed areas rehabilitated. Decommissioning will comprise the safe dismantling and removal of infrastructure, the appropriate disposal of waste materials and the return of impacted areas to a variety of vegetation types and fauna habitats that simulate the predisturbance state as closely as possible or other agreed post-mining land use.

Where the removal of non-visible infrastructure, or features that have been incorporated into the natural landscape may cause more environmental damage than if left in situ, then their retention will be discussed with the relevant authorities. For further information on particular aspects of decommissioning refer to the Conceptual Closure Plan (Appendix T).

Rehabilitation

Rehabilitation will occur progressively as disturbed areas are no longer required for mining activities. Rehabilitation activities will include:

- Developing designs for appropriate landforms for the mine site.
- Creating landforms that will behave and evolve in a predictable manner, according to the design principles established.
- Establishing appropriate sustainable ecosystems.

A detailed rehabilitation programme will be developed within the first two years of mining activities which will include development of completion criteria to determine when rehabilitation can be considered self-sustaining. Soil characterisation assessments will also be conducted to ascertain the suitability of the topsoil for rehabilitation purposes.

Topsoil will be stripped and placed directly onto areas requiring rehabilitation to a depth of 100 mm where possible. Where this is not possible it will be stockpiled separately and away from water courses. Erosion control techniques will be employed to guard against loss of topsoil.

Prior to revegetation, ripping on contours will take place to relieve compaction, reduce erosion and improve water infiltration. In areas where the soil or waste material is of very high permeability scarifying on contours will be undertaken. On steep slopes this may require terracing or benching. All ripping, terracing or benching will be surveyed to ensure that they occur on contours.

Local provenance seed stock will be gathered pre-clearance, to provide an effective provenance seed-set for use during rehabilitation practices.

Following rehabilitation, the area will be monitored for weed invasion and native seedling success.

Activities with respect to the closure and rehabilitation of waste and fines storage will in general include:

- providing erosion protection to prevent sedimentation of the Weeli Wolli Creek;
- providing a safe and stabilised surface; and
- designing for minimal post-closure maintenance.

Landforms (two waste rock dumps and the FRS) will be constructed to reduce the requirement for double handling and will be reshaped prior to rehabilitation in order to produce appropriate slopes and a shape that is compatible with the surrounding landscape.

Topsoil removed from the FRS area during the construction of the facilities will be redeployed on the final surfaces of the FRS to assist with rehabilitation. The downstream slopes of the final embankments will be covered with topsoil, contour ripped, seeded with native species and fertilised as appropriate.

Once fine rejects deposition has been completed and little further settlement is expected, the top surface of the storages will be capped with a layer of mine waste rock (0.5 m nominal thickness) in order to minimise dust generation from the dried fine rejects surface and provide support for topsoil/growth medium for re-vegetation of the top surface.

The upper surface of the FRS will assume the form of a truncated prism with a depressed cone. On decommissioning, the FRS will remain a permanent feature of the landscape but be completely enclosed in a mine waste rock dump forming the integrated waste landform.

The main objectives of the IFRS cover will be to:

- provide a robust long-term cover that will stabilise the surface of the IFRS;
- retain/store all rainfall from most precipitation events within the cover system for subsequent release by a combination of evaporation and evapotranspiration; and
- control the flow of any excess surface water across the IFRS such that significant erosion does not occur.

At final closure, the decant structures will be sealed by:

- backfilling of the slotted concrete pipe annulus with dried fine rejects;
- removal of the slotted concrete pipes and filter rock to the level of the surrounding fine rejects, and
- capping of the central area of the FRS using clayey mine waste.

A spillway will be required for decommissioning the above ground storages to control the release of excess water resulting from large rainfall events on the facility surface. The design of the spillway will be prepared during the rehabilitation planning stage.

The IFRS will be rehabilitated to store rainfall from most precipitation events within the cover systems for subsequent release by a combination of evaporation and evapotranspiration. Surface water controls will remain in place post closure to ensure significant erosion of fines materials does not occur. The finished surface will be covered with mine waste and will take the form of the natural landscape.

Fines reject storage and waste dump rehabilitation requirements are further outlined in the Conceptual Closure Plan (Appendix T).

Surface Water Re-instatement

Post-closure, a series of diversion drains will be constructed to redirect water around or through the mine site. Once downstream of the minesite, flow will be diverted back to the original drainage course wherever possible. These post-closure diversion drains will include sections re-established over the backfilled pits. As the backfilled pits may have high permeabilities, to enable the drains to convey water across the pit, the drains will be lined with fines reject materials under the base of the channels. The channels will be combined with a flood plain zone. Consequently, minor events will be conveyed to Weeli Wolli Creek ensuring environmental flows are maintained while major flow events will be attenuated.

Groundwater Re-instatement

Results from the groundwater modelling undertaken by Aquaterra suggest that long term changes in groundwater level are less than 3 m on a local scale and unaffected regionally. At the most upstream end of the mine path, predicted water levels are higher than the natural case, as groundwater flow is reduced consistent with the placement of tailings and waste rock of lower hydraulic conductivity than the existing orebody aquifer. At the downstream end of the mine path, due to the restriction in groundwater flow, predicted water levels are up to 3 m lower. Further downstream, between the mine path and Fortescue Marsh, predicted water levels are not significantly impacted by the proposed in pit waste rock and tailings scheme. Groundwater modelling indicates that groundwater will recover to 80% of pre-mining levels within 50 years, although it will take up to 120 years for the groundwater system to return to pre-mining levels. However, actual recovery times will also be influenced by the periodicity of inundation events, with higher than average rainfall accelerating the recovery.

Submission of Mine Closure Documents

Mine closure plan documents will be continually updated thought the life of the mine as new technology and methodologies become available. The status of Project closure will be discussed with relevant agencies at least three years prior to the scheduled closure, and a finalised closure plan will be submitted to the DMP at least two years prior to final mine closure.

7.7.5 Expected Outcome

Rehabilitation of portions of the FRS, waste dumps and other impacted areas will commence as early as possible. Mine site infrastructure will be removed at the end of mining and waste dumps, FRS and pit rehabilitation completed to support selfsustaining ecosystems with minimal post-mining maintenance.

7.7.6 Management Commitments

C9. Twenty-four months prior to mine closure, a Mine Closure Plan will be finalised in consultation with the DEC and DMP. The plan will define appropriate closure criteria necessary for the establishment of safe landforms and self sustaining ecosystems, and set out procedures for monitoring in order to meet compliance with the closure criteria.

C10. A rehabilitation programme will be developed within the first two years of mining in liaison with the DEC.

C11. Rehabilitation will occur progressively as disturbed areas are no longer required for mining activities.

C12. Soil characterisation assessments will be conducted to determine the suitability of topsoil for supporting rehabilitation.

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APPENDIX D

Costs, Schedule of Rehabilitation, Assumptions, and Unit Rates

Disturbance Type and Rehabilitation Activitiy	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Infrastructure Deconstruction																					
All Infrastructure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Rehabilitation																					
Capping of FRS1	$0	$0	$4,460,800	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Capping of FRS2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$17,056,000	$0	$0	$0	$0	$0	$0	$0	$0
Capping of FRS3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$11,480,000	$0	$0	$0
Capping of FRS4	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Rehabilitation (topsoil haulage, spreading, ripping)																					
- Backfilled Pit	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Waste Rock Dump	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS1	$0	$0	$448,800	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,716,000	$0	$0	$0	$0	$0	$0	$0	$0
- FRS3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,155,000	$0	$0	$0
- FRS4	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Topsoil stockpiles	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- CID stockpile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Plant & Train Loadout	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Haul Road & Service Corridor	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Camp	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Other Areas	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Revegetation (seeding and fertilising)																					
- Backfilled Pit	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Waste Rock Dump	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS1	$0	$0	$125,800	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$481,000	$0	$0	$0	$0	$0	$0	$0	$0
- FRS3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS4	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Topsoil stockpiles	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- CID stockpile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0		
- Plant & Train Loadout	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0		
- Haul Road & Service Corridor	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0		
- Camp	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0		
- Other Areas	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0		
Reseeding Revegetated Areas	$0	$0	$0	$12,580	$0	$0	$0	$0	$0	$0	$0	$0	$0	$48,100	$0	$0	$0	$0	$32,375	$0	$0
Reconstituted Drainage	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Mobilisation / Demobilisation	$0	$0	$57,460	$1,258	$0	$0	$0	$0	$0	$0	$0	$0	$219,700	$4,810	$0	$0	$0	$115,500	$3,238	$0	$0
Subtotal	$0	$0	$5,092,860	$13,838	$0	$0	$0	$0	$0	$0	$0	$0	$19,472,700	$52,910	$0	$0	$0	$12,750,500	$35,613	$0	$0
Contaminated Sites																					
Phase 1 Investigation																		$0	$0		
Phase 2 Investigation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0		
Remediation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				$0	$0		
Subtotal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Monitoring & Maintenance																					
Post Rehabilitation Vegetation Monitoring	$0	$30,000	$30,000	$30,000	$30,000	$30,000	$0	$0	$0	$0	$0	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$0	$0	$90,000
Groundwater Monitoring	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
Surface Water Monitoring	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
Landform Erosion Monitoring	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
Closure Audits	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
Caretaker	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
Facilities Maintenance	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
Minining Lease Fees	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		
UPB Service Fee	$342,975	$342,975	$342,975	$342,975	$342,975	$342,975	$342,975	$342,975	$342,975	$342,975	$342,975	$342,975	$310,215	$262,695	$256,575	$256,575	$256,575	$234,525	$231,375	$231,375	$231,375
Subtotal	$342,975	$372,975	$372,975	$372,975	$372,975	$372,975	$342,975	$342,975	$342,975	$342,975	$342,975	$372,975	$340,215	$292,695	$286,575	$286,575	$286,575	$264,525	$231,375	$231,375	$321,375
YEARLY TOTAL	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**	**Year 21**	**Year 22**	**Year 23**	**Year 24**	**Year 25**
	$342,975	**$372,975**	**$5,465,835**	**$386,813**	**$372,975**	**$372,975**	**$342,975**	**$342,975**	**$342,975**	**$342,975**	**$342,975**	**$372,975**	**$19,812,915**	**$345,605**	**$286,575**	**$286,575**	**$286,575**	**$13,015,025**	**$266,988**	**$231,375**	**$321,375**
DISCOUNTED YEARLY TOTAL (8%)	**$342,975**	**$345,347**	**$4,686,073**	**$307,065**	**$274,148**	**$253,841**	**$216,132**	**$200,123**	**$185,299**	**$171,573**	**$158,864**	**$159,963**	**$7,867,981**	**$127,078**	**$97,568**	**$90,340**	**$83,649**	**$3,517,557**	**$66,813**	**$53,612**	**$68,950**

Disturbance Type and Rehabilitation Activitiy	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39
Infrastructure Deconstruction														
All Infrastructure	$0	$0	$0	$33,500,000	$33,500,000	$33,500,000	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal	$0	$0	$0	$33,500,000	$33,500,000	$33,500,000	$0	$0	$0	$0	$0	$0	$0	$0
Rehabilitation														
Capping of FRS1	$14,497,600	$0	$0	$3,345,600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Capping of FRS2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Capping of FRS3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Capping of FRS4	$0	$9,512,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Rehabilitation (topsoil haulage, spreading, ripping)														
- Backfilled Pit	$0	$0	$0	$5,715,600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Waste Rock Dump	$0	$0	$0	$2,145,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS1	$1,458,600	$0	$0	$336,600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS4	$0	$957,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Topsoil stockpiles	$264,000	$66,000	$66,000	$132,000	$132,000	$66,000	$184,800	$0	$0	$0	$0	$0	$0	$0
- CID stockpile	$0	$0	$0	$0	$0	$0	$402,600	$0	$0	$0	$0	$0	$0	$0
- Plant & Train Loadout	$0	$0	$0	$396,000	$396,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Haul Road & Service Corridor	$0	$0	$0	$0	$0	$369,600	$0	$0	$0	$0	$0	$0	$0	$0
- Camp	$0	$0	$0	$0	$0	$132,000	$0	$0	$0	$0	$0	$0	$0	$0
- Other Areas	$0	$0	$0	$0	$0	$0	$891,000	$0	$0	$0	$0	$0	$0	$0
Revegetation (seeding and fertilising)														
- Backfilled Pit	$0	$0	$0	$1,602,100	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Waste Rock Dump	$0	$0	$0	$601,250	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS1	$408,850	$0	$0	$94,350	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- FRS4	$0	$268,250	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Topsoil stockpiles	$264,000	$66,000	$66,000	$132,000	$132,000	$66,000	$184,800	$0	$0	$0	$0	$0	$0	$0
- CID stockpile	$0	$0	$0	$0	$0	$0	$112,850	$0	$0	$0	$0	$0	$0	$0
- Plant & Train Loadout	$0	$0	$0	$111,000	$111,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
- Haul Road & Service Corridor	$0	$0	$0	$0	$0	$103,600	$0	$0	$0	$0	$0	$0	$0	$0
- Camp	$0	$0	$0	$0	$0	$37,000	$0	$0	$0	$0	$0	$0	$0	$0
- Other Areas	$0	$0	$0	$0	$0	$0	$249,750	$0	$0	$0	$0	$0	$0	$0
Reseeding Revegetated Areas	$0	$48,285	$28,675	$1,850	$244,570	$14,800	$15,910	$41,440	$0	$0	$0	$0	$0	$0
Reconstituted Drainage	$0	$0	$0	$130,680	$0	$130,680	$0	$0	$0	$0	$0	$0	$0	$0
Mobilisation / Demobilisation	$239,545	$140,554	$16,068	$1,139,843	$101,557	$91,968	$204,171	$4,144	$0	$0	$0	$0	$0	$0
Subtotal	$17,132,595	$11,058,089	$176,743	$15,883,873	$1,117,127	$1,011,648	$2,245,881	$45,584	$0	$0	$0	$0	$0	$0
Contaminated Sites														
Phase 1 Investigation	$0	$0	$20,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 2 Investigation	$0	$0	$0	$570,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Remediation	$0	$0	$0	$0	$1,000,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal	$0	$0	$20,000	$570,000	$1,000,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Monitoring & Maintenance														
Post Rehabilitation Vegetation Monitoring	$150,000	$150,000	$180,000	$300,000	$360,000	$390,000	$420,000	$390,000	$240,000	$180,000	$90,000	$0	$0	$0
Groundwater Monitoring	$10,000	$10,000	$10,000	$10,000	$10,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Water Monitoring	$0	$0	$0	$0	$0	$20,000	$0	$0	$0	$20,000	$0	$0	$20,000	$0
Landform Erosion Monitoring	$0	$0	$50,000	$0	$0	$50,000	$0	$0	$50,000	$0	$0	$50,000	$0	$0
Closure Audits	$0	$0	$0	$0	$0	$0	$0	$0	$20,000	$20,000	$20,000	$20,000	$100,000	$0
Caretaker	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$50,000	$0	$0	$0	$0	$0
Facilities Maintenance	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$75,000	$60,000	$45,000	$30,000	$15,000	$0
Minining Lease Fees	$188,308	$188,308	$188,308	$188,308	$188,308	$188,308	$188,308	$188,308	$188,308	$188,308	$188,308	$188,308	$188,308	$0
UPB Service Fee	$231,375	$213,105	$210,495	$130,905	$119,535	$106,935	$86,655	$70,523	$68,595	$68,595	$68,595	$68,595	$68,595	$0
Subtotal	$829,683	$811,413	$888,803	$879,213	$927,843	$1,005,243	$944,963	$898,831	$691,903	$536,903	$411,903	$356,903	$391,903	$0
YEARLY TOTAL	**Year 26**	**Year 27**	**Year 28**	**Year 29**	**Year 30**	**Year 31**	**Year 32**	**Year 33**	**Year 34**	**Year 35**	**Year 36**	**Year 37**	**Year 38**	**Year 39**
	$17,962,278	**$11,869,502**	**$1,085,546**	**$50,833,086**	**$36,544,970**	**$35,516,891**	**$3,190,844**	**$944,415**	**$691,903**	**$536,903**	**$411,903**	**$356,903**	**$391,903**	**$0**
													Total	**$204,592,451**
DISCOUNTED YEARLY TOTAL (8%)	**$3,568,310**	**$2,183,282**	**$184,885**	**$8,016,344**	**$5,336,220**	**$4,801,946**	**$399,452**	**$109,471**	**$74,260**	**$53,356**	**$37,902**	**$30,408**	**$30,917**	**$0**
													NPC Total	**$44,101,702**

SCHEDULE OF REHABILITATION

Disturbance Type and Rehabilitation Activitiy	Unit	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39
Infrastructure Deconstruction																																
...	N.o.	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
Rehabilitation																																
Capping of FRS1	t	2720000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8840000	0	0	2040000	0	0	0	0	0	0	0	0	0	0
Capping of FRS2	t	0	0	0	0	0	0	0	0	0	0	10400000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capping of FRS3	t	0	0	0	0	0	0	0	0	0	0	0	0				7000000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capping of FRS4	t	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5800000	0	0	0	0	0	0	0	0	0	0	0	0
Rehabilitation (topsoil haulage, spreading, ripping)																																
- Backfilled Pit	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	866	0	0	0	0	0	0	0	0	0	0
- Waste Rock Dump	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	325	0	0	0	0	0	0	0	0	0	0
- FRS1	ha	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	221	0	0	51	0	0	0	0	0	0	0	0	0	0
- FRS2	ha	0	0	0	0	0	0	0	0	0	0	260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- FRS3	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- FRS4	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	145	0	0	0	0	0	0	0	0	0	0	0	0
- Topsoil stockpiles	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	10	10	20	20	10	28	0	0	0	0	0	0	0
- CID stockpile	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61	0	0	0	0	0	0	0
- Plant & Train Loadout	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	60	0	0	0	0	0	0	0	0	0
- Haul Road & Service Corridor	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	0	0	0	0	0	0	0	0
- Camp	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
- Other Areas	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135	0	0	0	0	0	0	0
Revegetation (seeding and fertilising)																																
- Backfilled Pit	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	866	0	0	0	0	0	0	0	0	0	0
- Waste Rock Dump	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	325	0	0	0	0	0	0	0	0	0	0
- FRS1	ha	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	221	0	0	51	0	0	0	0	0	0	0	0	0	0
- FRS2	ha	0	0	0	0	0	0	0	0	0	0	260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- FRS3	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- FRS4	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	145	0	0	0	0	0	0	0	0	0	0	0	0
- Topsoil stockpiles	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	10	10	20	20	10	28	0	0	0	0	0	0	0
- CID stockpile	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61	0	0	0	0	0	0	0
- Plant & Train Loadout	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	60	0	0	0	0	0	0	0	0	0
- Haul Road & Service Corridor	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	0	0	0	0	0	0	0	0
- Camp	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
- Other Areas	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135	0	0	0	0	0	0	0
Reseeding	ha	0	6.8	0	0	0	0	0	0	0	0	0	26	0	0	0	0	17.5	0	26.1	15.5	1	132.2	8	8.6	22.4	0	0	0	0	0	0
Reconstituted Drainage	m^3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0
Mobilisation / Demobilisation	N/A																															
Contaminated Sites																																
Preliminary Site Investigation	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Detailed Site Investigation	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Remediation	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Monitoring																																
Post Rehabilitation Vegetation Monitoring	N.o.	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	3	5	6	10	12	13	14	13	8	6	3	0	0	0
Groundwater Monitoring	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
Surface Water Monitoring	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0
Landform Erosion Monitoring	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0
Closure Audits	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
Caretaker	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0.5	0	0	0	0	0
Facilities Maintenance	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0.5	0.4	0.3	0.2	0.1	0	0
Minining Lease Fees	N.o.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0
UPB Service Fee	N.o.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

Detailed Cost Assumptions	Unit Rate	Comments
Infrastructure Deconstruction		
All Infrastructure	$33,500,000 yr for 3 yrs	Assume cost of deconstruction is 30% of the labour cost for construction. Cost will be spread over three years. Construction cost provided by Ausenco.
Rehabilitation		
Rehabilitation / Revegetation		
- Capping of FRS'	$1.64 t	Cost derived from the area of each FRS, a capping depth of 2 m, an assumed density of 1.5 m and a unit cost of $1.64/t of rock for backfilling (from final year of backfilling in mining schedule). It is assumed FRS1 is left open during operations as an emergency pond, but no deposition occurs for the final 14 years of mining. 20% of the facility (680,000m2) will be closed in Year 7 (northern and eastern embankments), a further 65% of the facility (2,210,000 m^2) will be closed in Year 26 (top), whilst the final 15% (510,000 m^2) (southern and western embankments) will be closed following the cessation of rail activities. Assume that capping of in-pit backfill areas occurs during mining operations.
- Topsoil	$6,600 ha	Topsoil loading, haulage, spreading and ripping costs have been determined from the mining schedule costs, with an average haulage of 5 km at $0.66/m^3$. Areas to rehab are those of the FRS pits (FRS1 340 ha, FRS2 260 ha, FRS3 175 ha & FRS4 145 ha), backfilled pit (866 ha), waste rock dump (325 ha), topsoil stockpiles (138), CID stockpile (61 ha), plant and train loadout (120 ha), haul road and service ocrridor (56 ha), camp (20 ha) and other areas (135 ha). It is assumed that the settling rates will be such as to allow the rehab of the in-pit FRS cells two years after final deposition. Therefore, rehab for FRS' 2 and 3 will be undertaken during operations. Infrastructure areas are based on information provided by Ausenco (emailed 17 June 2010). All other areas based on Golder tailings and mining design.
-Seeding & Fertilising	$1,850 ha	From Rallyreveg - comprises of a seed supply of $110/kg, seeding rate of 10 kg/ha, mechanical seeding (D9) at $450/ha, fertiliser supply at $1/kg and fertiliser rate of 300 kg/ha.
Reeseeding	10 %	Assume that 10% of seeded areas require reseeding the following year.
Reconstituted Drainage	$0.66 m^3 66,000 m^3	Unit rate is an estimate, based on the topsoil earth moving cost in the mining schedule. Assume drainage lines are 1,100 m long, 30 m wide and 2 m deep.

Mobilisation / Demobilisation	10 %	Assume mobilisation / demobilisation costs 10% of works. This cost for the backfilling work is excluded as it has already been accounted for in the backfilling estimate.
Contaminated Sites		
Preliminary Site Investigation	$20,000 event	Based on internal Golder costing.
Detailed Site Investigation	$570,000 event	Based on internal Golder costing. Assumes there are five areas of potential environmental concern (3 refuelling areas, one fuel storage area and an area associated with the beneficiation process). Assumes that some additional groundwater wells will be required to supplement the ones to be installed for TSF monitoring. Cost breakdown: Fees = $120,000, Analysis = $200,000 & Drill Rig/Backhoe and Well Installation = $250,000.
Remediation	$1,000,000 event	Nominal sum, assumes good on-site spill management practices.
Monitoring		
Post Rehabilitation Vegetation Monitoring	$30,000 year	For 5 years after each rehab event. Based on discussions with and estimated costings by Outback Ecology surrounding Ecosystem Function Analysis.
Groundwater Monitoring	$10,000 year	Based on discussions with Aquaterra. Assume 5 years of monitoring, via remote data loggers, after cessation of operations (Year 26).
Surface Water Monitoring	$20,000 year	Assume surface water drainage designed for walkaway, thus only 3 surface water monitoring event throughout the closure period.
Landform Erosion Monitoring	$50,000 event	Every three years after cessation of operations (Year 26).
Closure Audits (year 34-37)	$20,000 year	
Closure Audit (year 38)	$100,000 year	
Caretaker	$100,000 year	100% from Year 26 to Yeat 32, 50% at Year 33, no caretaker thereafter.
Facilities Maintenance	$150,000 year	To maintain roads, fences, tracks etc. 100% from Year 26 to Year 32, 50% at Year 33, then reductions of 10% thereafter.
Tenement Holding Costs (M47/1414)	$188,308 year	Based on 2010 costs, includes DMP annual rental and Shire rates. Assume constant throughout closure period (i.e. from Year 26 onwards).
UPB Service Fee	1.5% year	1.5% annual service fee. It is assumed that bond rehabilitation and revegetation will occur in the same year, therefore the bond reduction will be 30% of original bond, then a 20% reduction the following year after reseeding works. We are assuming that Brockman will not be able to relinquish the site until 5 years after the last rehab work, which is the last reseeding effort.
Net Present Cost Discount Rate	8% year	

APPENDIX E

Limitations

LIMITATIONS

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