
4.2.1.6 Waste Rock Dump –Monitoring

Arafura has committed to monitoring of:

- Extraction volumes from groundwater extraction bores using flow meters. (C. 9.3.2a);
- Standing water levels (SWL) of production bores, monthly for the duration of the operation. (C. 9.3.2b); and
- Ground water levels and quality, post-mining twelve months after mine closure. If deemed necessary, further monitoring of groundwater would be conducted. (C. 9.3.2d)

Arafura considered that the limited studies of groundwater levels already undertaken provided sufficient information to determine that the potential quantity of ground water from the project is low, with negligible risk to the downstream environment. On this basis, Arafura rejected requests for baseline monitoring.

Arafura stated that water monitoring bores would be installed during operations, to allow post mining monitoring to occur, in fulfilment of commitment (C. 9.3.2d) to monitor ground water levels and quality, post-mining for twelve months, or longer if necessary. Arafura stated that the monitoring bores would also provide further site specific data to inform prediction of the possible extent of the final pit lake.

Arafura gave no indication of proposed monitoring bore locations which is important in indicating the bore's relevance to ground water quality of the pit, the WRD or nearby waterways. Arafura deferred submission of details of post closure monitoring, routine management and contingency plans for rehabilitation until drafting of the Mining Management Plan (MMP). The statement was made that should post-closure monitoring to identify levels of acidification in the pit and deterioration of groundwater that is of concern, and management measures would be drafted and implemented, at that stage.

On the Mt Porter site, no direct groundwater samples were taken for analysis, but spring discharges from the Pit Gully Spring and watercourse samples from Pandanus Gully and Rainforest Gully were taken. Only the Pit Gully Spring represents direct groundwater discharge, and is in the sub-catchment of the mine. As the source of this spring is predicted to be disrupted by the open pit, the site cannot be used for comparison of groundwater impacts pre and post mining. In effect, no baseline groundwater exists for the Mt Porter site on which to base groundwater quality closure criteria. This fails to satisfy the most basic requirements of a valid monitoring program. Low sample counts (replicates) have further increased statistical uncertainty. Baseline monitoring is required to establish the impact of the operation in the context of its geographical location. This data is very valuable when closure criteria are being negotiated as baseline data may show the effect of mineralisation in the area on water quality.

No monitoring is proposed of the WRD cover system performance nor of the WRD seepage from the toe of the dump. Without an effective monitoring system in place, it would not be possible to determine if the performance specifications of the cover design have been achieved.

Significant uncertainty exists as to whether groundwater quality monitoring (commitment 9.3.2d) would be located to examine WRD seepage to groundwater, or contaminant transport dynamics. If monitoring systems are located too far away, or in hydraulically inappropriate locations, a developing contaminant plume may go undetected for so long that it would be too late for mitigation of the source to be effective in preventing the impact. Recovery from this situation would likely be very costly and require a long period of active management.'

Impact monitoring is important in providing an early warning system of site contamination, and if it exists, to what extent. It triggers early intervention and measures the effectiveness of controls. TeamNT (2004, pge.82) states that as a rule of thumb:

‘one year of groundwater contamination can translate to ten years of pump and treat to recover and treat the plume’.

In general, the earlier the warning, the lower the cost of remedial measures that may be required, and the greater the range of options that may be available. Effective monitoring programs save time and money by properly identifying issues requiring management attention.

Conclusions

- **The EPA Program notes the commitments made by Arafura to undertake monitoring;**
- **Adequate gathering of baseline information is required to support an effective monitoring program; and**
- **Details regarding the monitoring programs were not provided to understand their intent and to judge their effectiveness.**

4.2.1.7 Waste Rock Dump – Alternatives

Arafura examined a number of options for waste rock disposal. Backfilling of all waste to the pit was not considered practical because:

- Land disturbance would be required for each option. Backfilling would not prevent disturbance;
- PAF material if placed back in the pit would be in a location where it could not be practically encapsulated with NAF material where infiltration of water and oxygen could be reliably prevented;
- PAF material would be subject to oxidation for the period while in a temporary stockpile. Construction measures used to minimise oxidation would not be implemented as these would make material rehandling on completion of mining more difficult;
- If acid generation could not be reliably prevented from occurring after backfilling of the pit, a higher risk existed of contamination of local aquifers; and
- Risk exists of resource sterilisation.

The alternative of returning the significantly ‘Potentially Acid Forming’ (PAF) material to the pit was examined by Arafura. Discussion indicated that at the current stage of project development, returning PAF material to the pit was considered a high risk strategy. Factors in the determination included the apparent limited volume of groundwater in the area, the lack of conclusive groundwater data or modelling, high evaporation rates and the need for maintenance of at least one metre cover of water permanently over all PAF material to prevent acid generation. Placement of PAF material in an out of pit waste dump where it can be appropriately encapsulated was considered a lower risk option.

Arafura considered reliable prediction of the final depth of the pit lake and the level of seasonal fluctuation to be difficult. Complex geology of the site and lack of groundwater data appear to contribute to this difficulty. The risk created by an unreliable prediction of final pit depth is the potential for acid generation caused by periods of insufficient water covering high PAF waste returned to the pit. Acid generation compromises pit water quality, and may pollute connected aquifers and any connected watercourses fed by springs from those aquifers.

In the NT, experience has shown that pit lake stratification could not be relied upon as a mechanism to limit oxygen to deeper pit lake layers, as inversion events have been recorded. Full immersion slows oxidation, but doesn’t stop it, due to water’s oxygen content.

The above uncertainties with pit water depths in relation to the option of returning PAF material to the pit are set against the uncertainty of being able to obtain sufficiently low porosity ratings from the oxide material intended for use in the PAF cell liner.

Examination has not been made as to whether backfilling of the pit with just PAF and/or all waste material represents a greater or lesser environmental risk. As the proposal currently stands, it represents a risk of producing relatively low levels of AMD affected seepage to surface waters, and potentially to underlying aquifers. Once stronger evidence is obtained regarding final pit water depths, and connectivity of underlying aquifers, examination of the alternative of returning either just PAF or all rock waste to the pit should be made.

The cost of returning PAF material to the open pit was not considered by Arafura to be uneconomical, as only 2% of the waste is characterised as PAF. The estimated cost of \$30,000 for the rehandling of waste (approximately 48,000 tonnes) was not considered significant enough to make encapsulating PAF material in the waste landform preferred option.

NLC recommended that all waste material removed should be returned to the pit prior to closure. This was considered by NLC to preclude future problems of acid mine drainage from an eroding waste rock stockpile and prevent ingress of native fauna, stock and vehicles into the pit void. Long-term maintenance contingencies would be avoided, and future costs minimized to the Government and the taxpayer. NLC recommended that the security bond obtained from the proponent cover the cost of back-filling the pit.

Arafura has stated that backfilling of pits would sterilise economic resources and is typically not undertaken until known economic resources have been exhausted. Arafura indicated that consideration of returning material to the pit would not be made until resource evaluation and extraction was complete.

Conclusion

There is potential to further examine alternatives to the proposed waste rock dump.

4.2.2 Mitigation of Contaminated Seepage

Arafura has indicated an intention to design sediment ponds to capture suspended sediment eroded from the WRD landform, until a vegetation cover has established. This indicates an intention to operate the sediment ponds for up to a few seasons. Acid rock drainage can take that long to begin, and be ongoing for many decades or centuries. No indication has been given that the ponds are designed to mitigate any potential for acid mine drainage. Arafura's original proposal indicated plans to install wetland filters to capture sediment and remediate acidic seepage water. The wetlands proposal was subsequently dropped due to realisation that insufficient water would exist for wetland species to survive through the Dry season. No alternative has been proposed to remediate any acidic seepage, although sediment ponds may potentially address these issues in the MMP.

Arafura argues that Acid and Metalliferous Drainage (AMD) would not occur due to adequate front line preventative measures. If AMD occurs, leading to acidic seepage from the toe of the WRD, Arafura has no described contingency proposal in place to mitigate this. Upon prompting, a verbal commitment has been offered to the EPA Program to address any such issues if and when they arise. This '*wait and see, then plan, then act*' contingency planning approach is likely to introduce unnecessary and avoidable delays, contaminant release, environmental harm, unforeseen mistakes and costs to the situation. It is highly unlikely to represent best practice in any industry.

The potential for AMD and sedimentation from the WRD represent the principal potential impacts of the project. The act of withholding submission of design details until the MMP

creates significant uncertainty whether environmental impacts can and would be managed, especially to current best-practice standards.

Conclusion:

There is a need to develop mitigation structures and strategies to rehabilitate low level AMD from the WRD.

4.3 Sedimentation Basins

Sediment basins represent an essential line of defence in preventing contamination of surface waters by seepage and stormwater runoff from the WRD. Detail of designs, or standards designed to, for sediment basins affect the level of water quality improvement achievable, and the maximum size rainfall events in which that improvement is likely to occur.

Arafura has stated that sediment basins would be constructed to contain runoff from all operational areas where sediment is identified as a potential surface water contaminant. Commitment is provided that any surface run-off requiring discharge to the environment would be directed to detention basins to remove sediment prior to discharge (C. 9.4.2a). Given that all mining activities are scheduled to be undertaken in the Dry season, sediment basins would only be required to manage runoff from decommissioned areas until these surfaces have been stabilised with vegetation over time. Sediment basins would be designed in accordance with Water Quality Protection Guideline No 6. *Mining and Mineral Processing: Minesite Stormwater* (2000) produced by the WA Department of Environment, Water and Rivers Commission, and the Department of Industry and Resources.

In respect to specific points contained within the WA guideline No.6, the following responses are provided:

- o *Zero water would be discharged and reused where it is cost effective...Water should only be discharged off-site to surface watercourses or groundwater where there are no other feasible methods of disposal.*

Arafura has undertaken in the further information submission that minimum sediment basin design standard is to retain water in up to a 1 in 20 year event. Discharge would occur if rainfall events of greater intensity occurred.

- o *Site drainage should aim to separate natural runoff from water generated by mining and processing operations to minimise the amount of water that needs to be treated or retained...The project site can be considered as a number of individual 'catchments'. Each catchment would have design criteria that reflect the level of risk... Suggested: Separation of acidic water from other minewater and treating it separately.*

To fulfil this undertaking, Arafura's sediment pond designs should separate the WRD seepage from stormwater runoff resulting from the surface of the WRD and catchment above. WRD seepage should be treated in accordance with its different risk set (AMD rather than sediment). No indication has been suggested by Arafura that this level of complexity would be incorporated, although a potential for multiple ponds was flagged in discussions.

- o *Consequences of potential failure of the containment system should be assessed using risk analysis methods.*

The PER did not present this information.

- o *Acid-generating potential must be determined in the planning phase and addressed in the operational phase. Professional advice should be sought to ...develop and implement site-specific methods to manage any acid mine water. The method adopted should render the contaminated material inactive in order to minimise environmental impact.*

As discussed in section 4.2.1.3 the information provided was limited in respect to determining acid generating potential. The PER did not discuss in detail management measures, except for a potential to add lime to the PAF cell if advised to do so. Once the WRD is constructed, opportunity for this measure is lost. AMD is likely to develop progressively after mining has ceased, and the WRD is sealed. Arafura indicated in discussions that it would address issues such as this if and when they arose, rather than prepare contingency plans up-front, and made a verbal commitment to take contingency action if required.

- *Site management planning should also include rehabilitation of the mining pit to avoid acidification from sulphidic material left exposed in the walls.*

Arafura has expressed plans not to rehabilitate the pit nor avoid acid development from the pit walls.

- *Where the threat of acidic mine water exists, a monitoring program should be established to ...facilitate the early detection of any acid mine drainage and ongoing effectiveness of any acid drainage management program.*

Monitoring programs for WRD seepage have not been proposed or described and sediment ponds do not address contaminant transport of dissolved minerals or acids, unless operating as evaporation ponds.

Conclusion

- **The use of the WA Guideline No.6 is accepted, however Arafura will need to ensure design characteristics are incorporated into the proposal to meet the objectives of the Guideline.**
- **The PER failed to provide information regarding management or monitoring of Acid and Metalliferous Drainage.**

4.4 Roads

Arafura has stated that the access road from the mine site (see Figure 3 - Site Layout, pge.12) to the Francis Creek road is already constructed as a track for car access, and is approximately 3 metres wide. This track would need to be widened (and a portion diverted around the Aboriginal rock art site) to accommodate haul truck transport of the ore to the Union Reef Mill. Depending on whether Arafura want it as two lanes or one, it would need to be widened to 5m (for 1 lane) or 8-10m (for 2 lanes). If one lane, trucks, in radio contact with each other, would need to go through this section of road in single file. The length of road is about 2.5km from mine site to Francis Creek Road. Land clearing for the road represents an area of between 1.2 and 2.5 hectares.

The chemical nature and grading of any waste rock used for roading requires careful attention otherwise the road itself could be a source of contamination of surface and groundwater in the area. Similarly the design of stormwater treatment structures in the road would be required to minimise the potential for any contaminated water to reach the aquatic ecosystem from road verges. In the small streams at the head of the Mt Porter catchment, there would most likely be limited opportunities to dilute any metallic toxicants or other potential threats to water quality.

Although the PER states that oxide rock would be used for road construction, subsequent information indicates that quantities required would be small. Arafura communicated that the widening would be constructed by a grader widening the existing track. Some fill may be needed to bury pipelines in creek beds that cross the road but this would only be a few truckloads of material – measured in the hundreds of cubic metres rather than the thousands. This quantity is insignificant compared to the quantity of material available. Details of the

extent of earthworks and deposition of oxide rock on the Frances Creek road have not yet been supplied.

Conclusion

The chemical nature and grading of any waste rock used for road or stormwater treatment structures in the road is required to minimise the potential for any contaminated water to reach the aquatic ecosystem from road verges.

4.5 Water

4.5.1 Surface Water

An estimate of 500 kL per day of water will be required for site use; water requirements for the proposed operations are limited to dust control, equipment washdown and personal use. Temporary earthen dams to store water for site use will be constructed. Water will be pumped to these dams from the open pit sump and unnamed bore (used as make-up water if there is insufficient quantity from the open pit dewatering).

The PER states that it is not expected there will be an offsite water discharge from the mine site under normal operating circumstances. The quantities of water produced from pit dewatering are not expected to exceed daily use. As described in section 4.3, sedimentation ponds are being designed for a 1:20 rainfall event.

Pit inflow water is expected to increase in the final stages of the pit excavation, when the pit is below the standing water level of the unnamed bore. Quantities significantly in excess of the estimated 500 kL per day required for site use will require discharge. The duration of the final stage of the pit excavation below this level is very short and will only be approximately four to six weeks of the eight month project duration. The total volume of surplus water requiring discharge will be approximately 20000 kL.

The PER provided no description of the discharge regime proposed for the 20000 kL of water likely to be discharged. The PER failed to provide a water management plan outlining a discharge regime developed to protect the water quality and flow to local streams.

During the Wet season relatively large volumes of water flow through the creeks and drainage gullies. Flow ceases in the mid Dry season with water remaining in a few pools that act as refuge for freshwater fish, reptiles, amphibians and macro-invertebrates. Water in some of these pools is maintained well into the Dry season by groundwater seepages or small springs. Any discharge of water from the site would have to be carefully managed to ensure that evaporation and concentration effects occurring during the cease to flow period do not cause elevated levels of toxicants in these pools or groundwater seepages.

Conclusion

- **A water discharge from the site may require a waste discharge licence under the Water Act.**
- **Before mining operations commence, Arafura needs to prepare, understand and be committed to the implementation of a water management plan. This plan needs to be supported by a full water balance to demonstrate real understanding of water flows, usage, storage and discharge occurring on the site.**

While the PER provided results of water quality sampling these results were based on five samples from five separate sites and no documentation was provided as to the location of the monitoring sites. The management of surface water on the mine site needs to be informed by

established local water quality objectives for the local watercourses. These cannot be developed based upon the information provided in the PER.

Conclusion

Further water quality sampling is required to further describe water quality particularly during events such as stream flow and low flow. This will allow water quality objectives to be developed for the local streams downstream of the proposed activity.

4.5.2 Groundwater

Arafura states that the WRD overlies a perched disconnected aquifer, inferring that any contaminated seepage reaching underlying groundwater aquifers would not travel downstream to affect downstream riparian ecosystems or water users. Once the pit is constructed to its 115m depth, likelihood exists that any groundwater aquifers underlying the WRD would express into the pit, containing contaminants, rather than expressing as local springs and streams.

Arafura did not undertake groundwater modelling for the project, despite repeated requests from the NT government and similar recommendation from SKM, the consultancy responsible for writing the hydrological report (App.4 PER). Due to the lack of modelling, understanding of existing groundwater patterns is based on a single airlift test, and a single data point (from a comparison of standing water heights between two bore holes [PER s.7.5.2]). Understanding of regional groundwater patterns has provided a context for the assumptions relating to the Mt Porter site, but given the complex geology of the site, the regional context also has limited value. SKM made a similar point (PER App.4. s2).

Not knowing underlying groundwater dynamics creates the risk that WRD seepage or contaminated pit water may cause downstream impacts on aquatic and riparian ecosystems, due to unforeseen aquifer connections and contaminant transport opportunities.

Arafura have committed to:

- Flow meters being fitted to groundwater extraction bores to enable monitoring of extraction volumes (Commitment 9.3.2a);
- Monthly monitoring of standing water levels (SWL) of production bores for the duration of the operation (Commitment 9.3.2b); and
- Post-mining monitoring of ground water levels and quality twelve months after mine closure. If deemed necessary, further monitoring of groundwater would be conducted (Commitment 9.3.2d).

Further information (Item 18) from Arafura after the Supplement stated that additional monitoring bores would be constructed during mining operations, when machinery is available, to implement Commitment 9.3.2d for groundwater post-mining monitoring. Submission of details of locations and depths of the monitoring bores was deferred to the MMP, despite an EPA Program request for this information.

The PER and commitments above (C.9.3.2 a,b&d), don't propose bores to monitor groundwater changes as the pit is dug. As mining progresses, further useful groundwater information could potentially become available if appropriate monitoring bores were to be put in place. Understanding gained from local groundwater changes resulting from digging the pit could provide further evidence of the degree of connectivity / disconnection of underlying aquifers between local seeps and the pit /WRD area, for example to Pandanus waterhole and Rainforest Gully. Such an arrangement could inform the refinement of closure plans for pit waters and potential WRD seepage. Monitoring bore sites should be chosen to maximise insight into potential environmental impacts and contaminant transfer pathways.

Conclusion

- Arafura has not presented an adequate proposed monitoring regime to demonstrate an understanding of expected impacts to local and regional groundwater systems.
- Any proposed discharge or extraction of water needs to be considered in light of the potential to detrimentally impact on declared beneficial uses of the Mary River catchment.

4.6 Flora and Fauna

4.6.1 Flora

Approximately 27 hectares of land would be disturbed for the open pit, infrastructure and access road associated with mining operations, with 22 hectares being rehabilitated at the conclusion of mining (eight months after clearing occurred).

Site infrastructure has been located to avoid significant vegetation features, such as the riparian rainforest. Vegetation communities to be disturbed are common and widespread in the region. No species or communities of conservation significance would be significantly affected. Species listed under the Australian *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, are discussed in section 4.12.2 and 4.12.3.

All permanent land clearing should be carried out in accordance with principles described in the *NT Land Clearing Guidelines* [DIPE (2002, 2006)].

4.6.2 Fauna

Although habitat disturbances may result in localised population reduction in the Mt Porter project area, most species are common and widespread throughout their range and their status is unlikely to be affected.

The project is unlikely to impact on the preferred habitat of species of conservation significance, such as the Gouldian Finch, which prefers woodlands of *Eucalyptus tintinans* and Sorghum grasses.

One species of current conservation significance was identified during the original Mt Porter survey. The White-striped or Arnhem Sheath-tail bat (*Taphozous kapalgensis*) listed as near threatened under the *Territory Parks and Wildlife Conservation Act* (2000). Local habitat loss is unlikely to affect the status of *T. kapalgensis*, as it is a plains dwelling species. Although Ghost Bats (*Macroderma gigas*) were found during the survey of nearby Francis Ck, they were not found at Mt Porter and no roosting habitat is known to occur on the site. However, mining operations need to minimise the impact on these and other species by conserving habitat where possible (especially rocky ridges and slopes).

The Orange Horseshoe-bat, (*Taphozous kapalgensis*) identified in the 2005 survey, was at that time EPBC Act and TPWC listed. Since then the NT form of the species has been removed from the lists (the Pilbara form remains listed). The Orange Horseshoe-bat has highly specialised roost requirements. The lack of local roosting habitat indicates there would be no significant impact on populations other than temporary loss of small areas of foraging habitat.

The PER (s.7.8.2.3) stated that the Short-Eared Rock Wallaby (*Petrogale brachyotis*) had been observed on the Mt Porter site. The species is of some concern in the region as its distribution appears to be contracting northward, although nationally it is not listed as being of conservation significance. Arafura commented further in the Supplement that the open pit

and waste landform are located on the flank of Mt Porter, while the rocky ridges and granite hills preferred by *P.brachyotis* would not be disturbed by the project.

4.6.3 Aquatic and Riparian ecosystems

Deterioration in surface water quantity and quality may have negative impacts on aquatic flora and fauna downstream of the operation. Comments identified the following issues and impacts of the project on aquatic flora, fauna and habitat:

- Diversion of surface water flows during mining and rehabilitation resulting in increased sediment loads to downstream aquatic environments;
- Potential for acidification of downstream aquatic environments due to exposure of sulphide waste rock material to rainfall;
- Direct loss of ephemeral riparian habitat in the flow-path of the Pit Gully spring, in the footprint of the WRD and sediment basins; and
- Pit water quality, which although a new water-body, is expected to undergo deteriorating water quality.

The proposal describes measures with the potential to reduce impacts upon aquatic and riparian ecosystems through:

- Retention of sediment loads in sediment basins;
- Controlled handling of hydrocarbons;
- Clay capping of significantly PAF material and contouring the WRD to shed water;
- Avoidance of rainforest riparian habitat by operations; and
- Revegetation and rehabilitation of disturbed surfaces.

Uncertainties due to lack of presentation of up-front data and analysis veil the proposal's potential impacts upon aquatic and riparian ecosystems. The issues identified in comments (above) have the potential to detrimentally affect aquatic flora and fauna downstream of the project. The final degree of impact upon aquatic and riparian ecosystems would depend on the final outcomes of Arafura's project designs and are yet to be presented to Government to their full extent. Various details may still be subject to negotiation during approval processes. As presented, the project has the potential to discharge lower but ongoing contaminants into groundwater aquifers and waterways of the Mt Porter site. The capacity of the waterways to absorb the levels of contaminants has not been established. No ecosystem condition has been established. Arafura has committed to undertake monitoring of aquatic environments, to be detailed in the MMP. Monitoring is likely to examine water quality and biota during mining, and post mining water quality to AUSRIVAS standard, or equivalent (Commitment S19).

Conclusion

No species of conservation significance are known to be present in the waterways of the Mt Porter site. The potential for impacts to occur upon ecosystems of Kakadu National Park appears to represent a low risk.

Further discussion of this issue occurs at section 4.12.1.

4.7 Transport

Regular transport of personnel would occur between the Mt Porter mine and Pine Creek township, 23km away. Workers would generally reside in a workers camp in Pine Creek and

commute to the mine site on a daily basis. Existing roads from Pine Creek provide general access to the mine site.

Arafura intends to transport ore from the mine to the Union Reef processing plant for treatment. Union Reef is located approximately 10 km south-southwest of Mt Porter. The transport route is shown in (see Figure 3 - Site Layout, pge.12).

Comments raised concerns with regard to:

- Potential road safety issues with the interaction of mine traffic with other local traffic, and of heavy traffic movements with tourist traffic using roads in the area;
- Fauna road deaths and injuries; and
- Impacts of ore dust on environmental or human health.

NT Police commented that the Mt Wells road would have heavy usage for the period of Arafura's operation with iron ore operations also being undertaken by Territory Iron nearby. Safety issues have been raised. Arafura responded by committing to ensuring the Northern Territory Police are consulted regularly to effectively manage road safety and improvement issues (Commitment S7). Appropriate signage is proposed.

Arafura has committed to reducing daily commuting trips of the workforce (approximately 40 people) by examining the viability of using a commuter bus.

The EPA Program requested management measures to minimise harm to fauna by road operations. Arafura committed to developing a Wildlife Rescue Procedure to operate in conjunction with land-clearing operations and where vehicle movements occur (C.9.6.2g). This is to be submitted with the MMP. Undertaking was also made to restrict speeds on haulage routes and mine roads to minimise fauna deaths on roads (Commitment 9.6.2e).

Potential for ore dust from trucks to impact upon on human or environmental health has been addressed by Arafura proposing to cover any ore to be transported off-site (Commitment S12). Dust suppression measures which draw on pit and / or production bore water are proposed to control dust on the mine site.

4.8 Cultural Heritage

Comments on the proposal raised the following issues:

- Identification and protection of Aboriginal sacred sites;
- Contamination of local foods by mine site wastes;
- Development of a reference collection of select Aboriginal cultural artefacts recovered from the areas; and
- Preservation of artefacts and values relating to the mining history of the area.

Heritage Conservation Services (HCS) of NRETA commented on the PER that Arafura had addressed archaeological heritage concerns by adopting the following guidelines:

- That all archaeological sites be disturbed as little as possible,
- That a 50 metre exclusion zone be provided for the protection of the most highly significant archaeological sites (MP03, MP07, MP34, MP48 & MP49);
- Further archaeological study of sites MP06, MP42 and MP50 be undertaken prior to any disturbance, including the systematic collection of all artefacts within the proposed disturbance area; and

-
- Any sites deemed of low archaeological significance are only subject to disturbance following permission being sought from the Minister for Natural Resources, Environment and Heritage.

Arafura has committed to providing a general site induction to staff, to include information on the importance of the cultural environment and the protection of artefacts and archaeological sites. (commitment 9.9.2b). Location of the mine access road was shifted to avoid dust impacts upon site MP49 (commitment 9.9.2e).

Arafura's consultation with Jawoyn Association, Aboriginal Areas Protection Authority (AAPA), and the Northern Lands Council, as well as with local Jawoyn and Wagiman communities at Pine Creek, failed to identify any local traditional owners to identify any sacred sites. On that basis Arafura planned no further search for sacred sites. The Aboriginal Areas Protection Authority accepted this stance

NLC comments raised the issue of potential for contamination of local traditional foods by mine site wastes. Arafura's response was an examination of existing bioaccumulation guidelines. Arafura found that no single concentration of metals in water can be definitively applied as trigger levels or guideline values to prevent possible bioaccumulation in organisms. In order to establish the likely risk from metal contamination by transport of material from the project site, Arafura focussed on monitoring of water quality against general *ANZECC (2000)* guidelines, to detect if values are found significantly outside the range normally accepted. Commitments to monitor any discharge water reflect this approach.

The Museum and Art Gallery of the Northern Territory (MAGNT) commented that it may be beneficial to have a reference collection of select artefacts recovered from the areas that would be disturbed to enhance knowledge and protect by placing into care some of this cultural heritage.

Arafura stated in response that application to remove affected sites would be made under provisions of the Heritage Conservation Act 2000. Consultation with local Aboriginal representatives would occur in this process and their wishes would be sought on the option of establishing any artefacts removed in a reference collection.

MAGNT commented further that it is possible the Indigenous custodians approach to stone technology and heritage protection may differ to the way archaeologists and heritage managers relate to such studies and regimes. MAGNT was concerned that the Indigenous representatives may not be aware of the scientific importance of the stone artefacts from this area, particularly the leilira blades that should be studied and the information disseminated. Belief was expressed that a resolution from the Indigenous representatives not to make a select collection of significant stone artefacts, in particular the leilira blades, from the sites that would be impacted upon by the project, would put at risk the Territory community's chance to enhance the archaeological collections and related records held in trust by the NTG because this opportunity would pass.

Conclusion

Further discussions are required between MAGNT, Arafura, NLC, AAPA and local traditional owner representatives, to seek agreement on what is appropriate criteria for deciding when to make a collection of aboriginal archaeological artefacts.

Comments from NRETA questioned the lack of discussion within the PER of historic values such as mining history of the area or artefacts that might exist from this history. Arafura stated that the area around Mt. Porter has been explored since the early 1980s. While the greater region has a history of mining dating back to the 1800s, the Mt Porter project area does not contain any area or artefact of historical significance. A search of the Australian Heritage Database had not registered any sites within the Mt Porter area.

4.9 Socio-Economic Environment

Comments on the proposal raised the following issues:

- Increased pressure on Pine Creek accommodation and medical services; and
- Lack of a formal public consultation and complaints process.

Both the EPA Program and the Department of Health and Community Services (DHCS) raised concerns regarding an apparent lack of a formal consultation and complaints process. DHCS concern related to the potential for registering complaints about dust emissions and noise.

Arafura undertook to liaise with the Pine Creek Community Government on company matters affecting the local community and provide a register for complaints related to the Mt Porter Gold Project (Commitment S21). Commitment already existed to establish a complaints procedure by which the public can lodge complaints about the operation or impact of the mine (Commitment 9.10.2g).

DHCS had asked whether consultation had occurred with the local health centre. Arafura stated that it hadn't, but committed to consult with a range of service organisations in Pine Creek prior to commencement of operations. In the PER Arafura had committed to establish liaison between onsite Emergency Response and First Aid personnel and providers of equivalent services in Pine Creek, Katherine and Darwin (Commitment 9.10.2f).

4.10 Biting Insects

Comments on the proposal raised the following issues:

- Design of temporary earthen dams, and of the open pit lake should discourage mosquito breeding; and
- Stocking the open pit lake with hardy native fish to discourage mosquito breeding.

In relation to the earthen dams, Arafura stated that the dams were temporary structures that would be removed at the completion of the short duration of mining, and vegetation was unlikely to develop. Arafura commented that the water could be treated with larvicides (should mosquitoes be identified) as it would not be a source of potable water on site.

With regard to the pit lake, Arafura stated that the sides of the open pit would be steep enough (>45°) to limit the establishment of semi-aquatic vegetation. The addition of hardy fish to the lake would require further research on the effects of introducing a biological control into the ecosystem. As such, Arafura would not commit to this option; but may investigate the idea.

Conclusion:

Arafura should consult with the NRETA Biodiversity Conservation section or the MAGNT fish curator, with regard to the appropriateness of introducing native hardy fish to the pit lake, to discourage mosquito breeding.

4.11 Cumulative Impacts

Gold Mining in the Pine Creek region has become increasingly economically and practically feasible. In a buoyant world minerals market, the Union Reef Gold Processing plant (GBS Gold) resumed operations in 2006 after a 3 year closure. Mining has been given new impetus at several satellite gold ore bodies in the Pine Creek area at (GBS Gold owned) Union Reefs, Fountain Head, Maud Creek, North Point, Princess Louise, Burnside - Mt Bonnie /Iron Blow

/Brocks Creek, and Cosmo Deeps. Arafura Resources (Mt Porter) and Tennant Ck Gold (Spring Hill) would also utilise the Union Reef plant.

The NLC commented on the lack of analysis of cumulative impacts on the environment in general, and the Mary River in particular, from previous mining activities and from other planned developments.

Gold mining has been carried out in the Pine Creek area since the 1870s, although apparently not at the Mt Porter site (Supp. s5.2). The Pine Creek Township has thus had a long relationship with mining. Closing of the Union Reef Processing plant meant a significant loss of population and economic input to the town. The re-opening of the plant and the large number of new and re-instated mining operation in the area would be a major reinvigoration for Pine Creek township.

Union Reef gold processing plant / mine and Mt Porter, ~ 10km apart, are both within the Nellie Ck catchment (270 km²), but on separate tributaries. 4km NE of Mt Porter, Territory Iron is developing an open-cut iron ore mine at Frances Creek, also within the upper Mary River Catchment, but in the separate Frances Ck / Maude Ck sub-catchments, which drain in parallel to the Mary River, 20-30km away. The Mary River catchment covers an area of 8,000 km², draining north-west into the ocean at Van Diemen Gulf, 155 km north of Mt Porter.

Groundwater connections between the current mines, as well as to contaminated sites from local historic mine sites have not been determined in the assessment. Limited information is known about the occurrence of groundwater at the Mt Porter site with no detailed groundwater investigations having been conducted to date (PER s7.5.3).

Conclusion

Although the NLC comments are considered valid in principle, the EPA Program considers that in the absence of wider data, appropriate management of discharged water and seepage from the mine to within appropriate water quality thresholds has the potential to prevent exaggeration of cumulative water quality impacts on the catchment due to the mine (refer section 4.2).

Cumulative impacts in terms of visual amenities of the Pine Creek area cannot be denied. A pit lake 115m deep, surrounded by bunding (and fencing) is rarely considered a satisfactory exchange for that of the pre-existing undisturbed site. The legacy loss of visual amenity is permanent. Rehabilitation of a large proportion of the site reduces this impact by degree only. Given Pine Creek's mining history, mine pits, rock piles and environmental degradation may be considered by some as consistent with the character of the area. The developing 'character' is clear evidence of cumulative impacts of mining on the area.

4.12 Environmental Protection and Biodiversity Conservation Act Triggers

The Mt Porter Project has been deemed a controlled action under the Australian *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. The controlling actions are:

- World Heritage (Sections 12 and 15A);
- Listed threatened species and communities (Sections 18 and 18A);
- Listed migratory species (Sections 20 and 20A);

Comments on the proposal raised the following issues:

- Monitoring for all listed species known to the area;
- Need for Wet season bird surveys pre and post mining; and

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- Rehabilitation species selection for habitat of listed species.

The Australian Department of the Environment and Water Resources (DEW - formerly the Department of Environment and Heritage) requested monitoring for all listed species known to the area, as well as Wet season bird surveys pre and post mining, to facilitate examination of the impacts of the project on species of listed national environmental significance (NES).

Arafura felt adequate fauna surveying had already been conducted, and stated no further surveys would be undertaken.

Arafura reasoned that this was not a reasonable request, on the basis that:

- The project has a short duration which makes it difficult to establish a monitoring program for 87 identified species and additional species that may occur in the area;
- The project area does not contain the range of habitat to support all species listed as potentially occurring;
- Although disturbances from mining would reduce localised fauna populations in the impacted parts of the Mt Porter project area, most species are common and widespread throughout their range and their status is unlikely to be affected. The short duration of the project is also likely to mean impacts on some species and areas is short term in nature; and
- The fauna survey conducted by Low Ecological only identified two species classified as Near Threatened under the TPWC Act 2000. These were the Orange Horseshoe Bat and Arnhem Sheath-tailed Bat. The Partridge Pigeon was sited nearby and is considered Vulnerable under the EPBC Act.

Arafura had already undertaken in the PER to:

- Educate all employees and contractors to recognise species of conservation significance, particularly the Gouldian Finch, and require them to report any sightings to the Environmental Manager (Commitment 9.6.2b);
- Report sightings of species of conservation significance to the Northern Territory Parks and Wildlife Commission (Commitment 9.6.2c); and
- Develop a monitoring program and management Plan specifically for the Gouldian Finch. As part of the site induction all staff would be educated in identifying Gouldian Finches and procedures to be followed if Gouldian Finches are observed (Commitment 9.6.2d).

NRETA's Biodiversity Conservation section and DEW indicated acceptance of Arafura's responses with regard to biodiversity issues.

Arafura failed to address requests from DEW and the EPA Program to consider the habitat requirements of species of conservation significance when selecting of species for rehabilitation

Conclusion

The choice of flora species for seed collection should be weighted to support local flora and fauna species of conservation significance and to optimise the habitat value of rehabilitated vegetation communities.

4.12.1 World Heritage

The Mt Porter project area lies approximately 20 kilometres from the boundary of the Kakadu National Park World Heritage Area. This is sufficiently far enough away that the project would have no visual, dust or noise impacts upon the World Heritage values of the park.

The proposed Mt Porter Gold Project lies in the upper catchments of Nellie Creek to the south and Watts Creek to the north. Nellie Creek drains east over 35 kilometres to the Mary River. The Mary River flows along the western edge of Kakadu National Park for about 46 kilometres before flowing away from the park to the north-west. There is limited potential for surface water runoff to impact on Mary River water quality and subsequently Kakadu National Park.

Any discharges of water associated with the Mt Porter mining operation would be either from the pit or from runoff / seepage from the WRD. It is anticipated that most dewatering would be used by the mining operation for dust suppression. If any discharge is required under the current proposal it is likely to be of limited quantity, towards the end of the Dry season, and would be unlikely to reach the Mary River before evaporation or infiltrating into the watercourse bed.

In the case that program delays led to the proposal overrunning into the next Dry season, discharge would then be required for pit dewatering at a time of flowing waterways. All discharges would require licencing under the NT *Water Act*. The waste discharge licence would require suitable water quality standards be met for protection of downstream ecosystems and beneficial uses. Adverse impacts on the Mary River or Kakadu World Heritage Areas are thus unlikely. Further discussion of this issue occurred at section 4.6.3.

4.12.2 Listed Threatened Species

Seven fauna species listed as threatened under the *EPBC Act 1999* have been identified as potentially occurring in the project area. No threatened flora species or Threatened Ecological Communities have been identified in the project area or nearby areas. The fauna species identified were:

- Bare-rumped Sheath-tail Bat (*Saccolaimus saccolaimus nudicunius*)
- White-striped Sheath-tail Bat (*Taphozous kapalgensis*)
- Orange Horseshoe Bat (*Rhinonictus aurantius*)
- Northern Quoll (*Dasyurus hallucatus*)
- Freshwater Sawfish (*Pristis microdon*)
- Gouldian Finch (*Erythrura gouldiae*)
- Red Goshawk (*Erythrotriorchis radiatus*)
- Partridge Pigeon (Eastern) (*Geophaps smithii smithii*)
- Masked Owl (northern) (*Tyto novaehollandiae kimberli*)

Two species of conservation significance were identified during the original Mt Porter survey. These were Orange Horseshoe-bat (*Rhinonictus aurantius*) and White-striped or Arnhem Sheath-tail bat (*Taphozous kapalgensis*). However, as a result of changes to legislation only the Arnhem Sheath-tail bat (*Taphozous kapalgensis*) is listed as near threatened under the *Territory Parks and Wildlife Conservation Act (2000)* (*TPWC Act (2000)*) (Updated Threatened species list, NRETA Website, November 2006). Local habitat loss is unlikely to affect the status of *T. kapalgensis*, as it is a plains dwelling species.

4.12.3 Listed Migratory Species

A number of species listed as migratory under the *EPBC Act 1999* have been identified as potentially occurring in the Mt Porter project area. These include:

Migratory Wetland Birds

- White or Great Egret (*Ardea alba*)
- Cattle Egret (*Ardea ibis*)
- Magpie Goose (*Anseranas semipalmate*)
- Painted Snipe (*Rostratula benghalensis* s. lat.)
- Oriental Plover (*Charadrius veredus*)
- Oriental Pratincole (*Glareola maldivarum*)
- Little Curlew (*Numenius minutus*)

Migratory Terrestrial Birds

- Fork-tailed Swift (*Apus pacificus*)
- Melville Cicadabird (*Coracina tenuirostris melvillensis*)
- Gouldian Finch (*Erythrura gouldiae*)
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
- Rainbow Bee-eater (*Merops ornatus*)
- Rufous Fantail (*Rhipidura rufifrons*)
- White-browed Robin (*Poecilodryas superciliosa cerviniventris*)

Migratory Reptile

- Saltwater or Estuarine Crocodile (*Crocodylus porosus*)

None of the species listed were recorded in the Mt Porter fauna surveys. As for the listed threatened species, most of habitats disturbed do not represent preferred habitat for these species. Additionally, these species are highly mobile and would be able to relocate to nearby areas of similar habitat.

4.13 Rehabilitation and Closure

When queried regarding details of rehabilitation plans, closure plans, monitoring plans and contingency plans, Arafura has repeatedly deferred submission of such information until the MMP, along the lines of:

‘If the project is approved, submission of Rehabilitation Plan is required under the *Mining Management Act* and Arafura would prepare and submit the plan for consideration at that time’.

The EPA Program considers (in consensus with DPIFM and NLC) that this approach avoids wider examination, discussion and refinement of key elements of the proposal which are each crucial in minimising ongoing environmental impacts of the proposal.

Issues raised in relation to rehabilitation and closure, included:

- Whether sufficient time exists for revegetation to establish before the onset of the Wet season rainfall;

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- Whether to return none, some or all of the waste rock to the pit;
 - Revegetation details;
 - Deep ripping of the waste rock stockpile slopes;
 - Mitigation of degrading pit water quality;
 - Post mining management of sediment basins; and
 - Post closure monitoring and maintenance schedules.

Understanding of how these potential impacts are to be minimised and managed into the future upon mine closure is central to understanding of the proposal and the evaluation of its acceptability.

As this is a short term project DPIFM has commented that the MMP would need to provide higher levels of detail about the rehabilitation and closure than would normally be accepted for longer term projects.

DEW and the EPA Program queried various elements of the revegetation proposal, as presented. Concern was raised that supplementary seeding or planting *may* only occur in the second season if regrowth from the topsoil's seed bank proved inadequate. The EPA Program argued that high risk existed for the loss of the thin layer of precious topsoil over the course of the first Wet season, unless vegetation was established quickly. DEW and the EPA Program suggested use of only locally collected native seed, with weighting to support local flora and fauna species of conservation significance.

Arafura stated in response that rehabilitation was proposed to commence prior to the Wet season following completion of mining. Reshaping and ripping would be followed by direct seeding of coloniser species (such as *Acacias* and native grasses) that would establish quickly, stabilising the surface in the short-term and aid the establishment of other species.

Arafura undertook to contact the Katherine branch of Greening Australia for information and assistance with native grass seed collection. Weather data and local forecasts would inform decisions on planting times. Species selection would be based on previous local flora surveys identifying dominant species for each land unit. The mix of provenance species would consider diversity, habitat and function, but would be subject to seed availability and further research to be included in the Rehabilitation Plan, which is proposed to be presented in the MMP.

Arafura clarified that deep ripping of the waste rock stockpile slopes would only occur, on the outer steeply sloped edges of the stockpile, and not into the 100mm topsoil cover. The adequacy of the thickness of the topsoil layer is discussed in section 4.2.1.2.

The EPA Program queried the proposal for mitigation measures against long term degradation of pit water quality. Arafura stated that long term degradation of pit water quality is anticipated, but would not be mitigated unless the quality of the pit water poses a serious threat to the surrounding environment, aquifer and/or public health. Arafura has committed to undertake monitoring of pit water quality and groundwater, post mining to assess levels of water quality deterioration.

Arafura considers that despite deteriorating water quality of the pit water, fauna / flora would not be impacted due to likely stratification of the pit water, with fresher water near the surface and progressively more contaminated water at depth. Comment from DPIFM and the EPA Program indicated that stratification of pit lakes was not reliable in the Northern Territory.

DPIFM and DEW queried the medium term management of sediment basins (post mining), as these were likely to accumulate contaminants, fill and erode. Arafura committed to ensuring that sediment in the basins is removed at the completion of mining and in the post-mining phase as required (Commitment S24). Requests for details of basin designs, management and monitoring plans were deferred by Arafura until the MMP.

4.14 Public Involvement and Consultation

Arafura initiated a stakeholder consultation process for the project before it submitted the Notice of Intent in July 2003. Arafura prepared a consultation strategy to facilitate effective communication with regulators, local and wider community and other stakeholders. This allowed issues raised during the consultation process to be taken into consideration in the project's design, development, operation and closure.

Significant stakeholders were identified through discussions with NRETA, DPI, DPIFM and the NLC. Arafura has continued to consult stakeholders on a regular basis. Consultation has included public presentations, government presentations and discussions and/or correspondence with pastoral leaseholders, environmental groups, community groups, local members of parliament, government departments, members of local Aboriginal communities and Native Title claimants.

In December 2004 a Deed for the proposed grant of mining lease 23839 was signed by Arafura and the Northern Land Council on behalf of the Wagiman, Warai and Jawoyn Groups. The Deed accords understanding and respect for the interests of the Native Title Party and their members in the Mining Area according to Aboriginal tradition; minimises the deleterious impact upon the Native Title Party and their members; minimises the deleterious impact upon the environment; and contributes to the social and economic well-being of the Native Title Party.

No direct comments were submitted by the community to the PER document. However, Arafura has provided commitment to:

- Liaise with the Pine Creek Community Government on company matters affecting the local community and provide a register for complaints related to the Mt Porter Project; and
- Liaise with the Pine Creek Police, Fire Brigade and Medical Centre on Emergency Response Plans for the Mt Porter Project and in assistance to the community.

4.15 Project Timing

The Department of Planning and Infrastructure (DPI) made comment on the PER that there was little scope for delays in relation to obtaining all necessary approvals or unsuitable weather conditions.

In the Supplement, Arafura recognised the tight timeframe to obtain approvals and commence work. It stated it would continue to work closely with various Northern Territory government departments to ensure approvals are obtained in a timely manner. If project extensions into the Wet season are required, Arafura stated it would discuss this with relevant regulatory authorities and ensure appropriate management and mitigation measure are implemented (Commitment S1).

A late start to the project might either push the proposal over two years, requiring pit dewatering early next year, or a delay to the start of the project until next year.

Conclusion

Any change to the proposal as presented in the PER (including an extension to the mine life) may be subject to further assessment in accordance with Clause 14A of the *Environmental Assessment Administrative Procedures* (1984).

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Appendix 1

Summary of Arafura's Commitments for the Mt Porter Project

Commitment Number	Commitment and Key Performance Indicators Where Applicable
Landform and Soils (PER Section 9.1)	
9.1.2.1a	An internal Land Clearance Procedure will be implemented for all ground disturbance activities, to track the cumulative clearing undertaken for the project.
9.1.2.1b	Access to all areas outside the immediate mine area and off formed roads and tracks will be prohibited.
9.1.2.1c	Vehicles and mobile equipment will be parked only in designated parking areas. Vegetated areas will not be used for parking areas.
9.1.2.2a	Stripping topsoil to a depth of about 100 millimetres where practicable and placing directly onto rehabilitation areas or stockpiles.
9.1.2.2b	Placing stockpiled topsoil in windrows less than two metres high to minimise loss of seed viability and soil biota.
9.1.2.2c	Rehabilitation of the waste landform and site infrastructure areas will be undertaken at the conclusion of mining. All rehabilitation will be performed in accordance with contemporary accepted industry best practice and conducted in accordance with an approved MMP.
9.1.2.2d	Stripping and stockpiling topsoil (where required) in dry and preferably still wind conditions, to minimise dust generation and assist rapid revegetation.
9.1.2.3a	Controlling slope gradients to minimise erosion and soil loss.
9.1.2.3b	Installing diversion bunds and drains as necessary to control local surface water runoff to minimise overland flow and consequential erosion.
9.1.2.3c	Ripping rehabilitation areas on the contour to remove compaction, improve soil structure and improve infiltration capacity.
9.1.2.3d	Routinely inspecting rehabilitated and disturbed surfaces for erosion, particularly after significant rainfall. Implementing appropriate remediation measures if soil erosion is observed during routine inspections.
Waste Rock Management (PER Section 9.2)	
9.2.2a	Ensuring all PAF material is encapsulated in the waste landform.
9.2.2b	Arafura will conduct further testing of PAF material as it is encountered during mining to ensure its geochemical properties are understood and management measures described in this PER will be effective in preventing acid generation over time.
9.2.2c	Contouring the waste rock stockpile so that it blends with the surrounding topography so that the final design is aesthetically pleasing.
9.2.2d	Contouring the waste rock stockpile top surface at gentle gradients to direct drainage off the dump and discourage infiltration over the PAF cell.
9.2.2e	Building diversion drains wherever stockpile construction obstructs significant water courses.
9.2.2f	Deep ripping the waste rock stockpile slopes on the contour to assist water absorption and minimise erosion.
9.2.2g	Spreading topsoil on the waste rock stockpile once shaping is complete to

Commitment Number	Commitment and Key Performance Indicators Where Applicable
	facilitate revegetation.
9.2.2h	Routinely inspecting the rehabilitated waste rock stockpile for erosion, particularly after significant rainfall. Implementing appropriate remediation measures if soil erosion is observed during routine inspections.
Groundwater Management (PER Section 9.3)	
9.3.2a	Flow meters will be fitted to groundwater extraction bores to enable monitoring of extraction volumes.
9.3.2b	Monthly monitoring of standing water levels (SWL) of production bores for the duration of the operation.
9.3.2c	Septic systems will be located in areas where there is sufficient depth to the natural watertable to allow the system to operate effectively and minimise risk of polluting the groundwater.
9.3.2d	Post-mining monitoring of ground water levels and quality twelve months after mine closure. If deemed necessary, further monitoring of groundwater will be conducted.
Surface Water Management (PER Section 9.4)	
9.4.2a	Any surface run-off requiring discharge to the environment will be directed to detention basins to remove sediment prior to discharge.
9.4.2b	Contouring the waste rock stockpile top surface at gentle gradients to direct drainage off the dump and discourage infiltration over the PAF cell.
9.4.2c	Building diversion drains where stockpile construction obstructs water courses.
9.4.2d	Shallow detention basins will be established on Pit Gully and East Gully downstream of the waste rock stockpile to remediate runoff from the waste rock stockpile.
9.4.2e	Culverts and/or floodways will be installed as required where roads cross watercourses and drains. Water diversion structures will be armoured, where necessary, to reduce the velocity and erosion potential, of surface flows.
9.4.2f	Hydrocarbon storage will be in accordance with Australian Standard <i>AS1940 Storage and Handling of Flammable and Combustible Liquids</i> .
9.4.3a	No water discharge to the environment will occur without an approved Waste Discharge Licence. Discharges will meet approved water quality criteria.
9.4.3b	Any dewatering discharge will be monitored and treated if necessary to meet agreed release criteria as specified in the MMP and waste discharge licence before release to the environment.
9.4.4a	Water management measures for infrastructure completed before the end of April will be designed to cope with major rainfall events of up to 500millimetres.
9.4.4b	Water management measures for landforms and infrastructure remaining at the end of October will be designed to manage Wet season rainfall events.
9.4.4c	Water management measures for temporary disturbances and infrastructure to be removed by October will be designed to manage Dry season rainfall events of up to 100 millimetres.
9.4.5a	A water monitoring program will be implemented under the Environmental Management Plan.
9.4.5b	The water monitoring program will include regular sampling of water unaffected by and water downstream of mining activities within the lease.

Commitment Number	Commitment and Key Performance Indicators Where Applicable
	Monitoring results will be reviewed against past monitoring and ANZECC guidelines to detect any deterioration in water quality and allow action to be taken.
9.4.5c	The water monitoring program will include analysis of water potentially to be discharged to the environment prior to any such discharge.
9.4.5d	Quantity of water discharge will be monitored and recorded.
9.4.5e	Dewatering and dust suppression water quality will be monitored regularly during operations. As operations will be occurring in the Dry season it is likely there will be little opportunity to monitor stormwater and natural streamflow during operations, but procedures will be developed to allow opportunistic monitoring of any runoff events that occur. Post-mining monitoring of surface water quality down stream from the project area will be undertaken for at least 12 months after mine closure. If deemed necessary, further monitoring of surface water will be conducted.
Vegetation and Flora Management (PER Section 9.5)	
9.5.2.1a	Developing a Land Clearing Management Procedure as part of the EMP.
9.5.2.1b	Minimising the impact of clearing by restricting vegetation clearing to the minimum necessary for operations.
9.5.2.1c	Clearly delineating the perimeter boundary of all areas approved for clearing before clearing works begin.
9.5.2.2a	Preparing a Weed Management Plan as part of the EMP. The plan will include, but will not be limited to, issues of vehicle and personal hygiene in regards to weeds, identification of weed species (including noxious weeds) and control and eradication measures.
9.5.2.2b	Requiring all earthmoving equipment introduced to the project area to have been cleaned to remove soil and plant seeds prior to entry.
9.5.2.2c	Confining company vehicles to travelling on purpose-built roads to minimise potential vehicle-borne spread of weed species.
Fauna Management (PER Section 9.6)	
9.6.2a	Requiring employees and contractors to attend an induction program that will include a component on environmental management. In particular, the induction will clearly explain employee and contractors' roles and responsibilities to restrict impacts on fauna and habitat.
9.6.2b	Educating all employees and contractors to recognise species of conservation significance, particularly the Gouldian Finch, and requiring them to report any sightings to the Environmental Manager.
9.6.2c	Reporting sightings of species of conservation significance to the Northern Territory Parks and Wildlife Commission.
9.6.2d	A monitoring program and Management Plan will be developed specifically for the Gouldian Finch. As part of the site induction all staff will be educated in identifying Gouldian Finches and procedures to be followed if Gouldian Finches are observed.
9.6.2e	Restricting speeds on haulage routes and mine roads to minimise fauna death on roads.
9.6.2f	Cleared vegetation will be stockpiled and respread in the rehabilitation program to provide fauna habitats.

Commitment Number	Commitment and Key Performance Indicators Where Applicable
9.6.2g	Developing a Wildlife Rescue Procedure to operate in conjunction with land-clearing operations and where vehicle movements occur.
9.6.2h	Participating in feral animal control programs on Mary River West stations, if requested by owners.
9.6.2i	Arafura will undertake Cane Toad trapping programs during the life of the Mt Porter Project.
9.6.2j	Banning domestic animals and firearms on site.
9.6.2k	Waste management procedures will be implemented to minimise attraction of feral animals to the project area.
9.6.2l	Drill holes will be capped and appropriately rehabilitated to remove potential hazard to the local wildlife.
Atmospheric Pollution and Noise Management (PER Section 9.7)	
9.7.3a	Emission control equipment is installed on all combustion engines.
9.7.3b	Diesel combustion engines in stationary and mobile equipment and diesel-powered electric generators will be operated and maintained to minimise emissions of combustion gases.
9.7.3c	Water trucks will be used to control fugitive dust within the pit and on internal roads to minimise dust emissions.
9.7.3d	Movement of mobile equipment and vehicles will be limited to formalised tracks and roads where dust control methods can be used.
9.7.3e	Equipment operators will remain in enclosed, air-conditioned cabins to minimise exposure to dust emissions.
9.7.3f	Areas will be rehabilitated at the conclusion of operations to prevent dust generation.
9.7.3g	Joining the Federal Government's Greenhouse Challenge Plus program and monitoring greenhouse emissions and efficiency.
9.7.3h	Energy efficiency will be a major consideration in the selection and design of equipment and plant.
9.7.3i	Encouraging all employees to be energy efficient in their day to day activities and educating them on this.
9.7.3j	Reducing the noise from equipment by installing soundproofing and/or noise abatement devices, where practicable, around/on primary sources of noise such as power generators and water pumps.
9.7.3k	Maintaining, to the extent practicable, the natural acoustic barriers (for example trees and ridges) between noise sources and neighbouring communities.
9.7.3l	Hearing protection equipment will be made available and utilised in onsite areas where engineering controls are deemed inappropriate or ineffective.
Waste and Hazardous Materials Management (PER Section 9.8)	
9.8.2a	Material Safety Data Sheets will be available and accessible at all work places where hazardous materials are used.
9.8.2b	Design of on ground hydrocarbon storage tanks and secondary containment will be in accordance with AS1940 -2004 Storage and Handling of Flammable and Combustible Liquids.

Commitment Number	Commitment and Key Performance Indicators Where Applicable
9.8.2c	All mobile equipment and light vehicle servicing activities including wash down will be done on impermeable surfaces.
9.8.2d	The heavy vehicle workshop will contain a purpose-built wash down facility incorporating an appropriate sediment and oil/grease removal system.
9.8.2e	An Emergency Response Procedure will be developed to ensure appropriate response can be made to minimise the environmental impact caused by incidents involving hazardous materials or wastes.
9.8.2f	The mobile refuelling truck will carry spill containment and cleanup material at all times and the driver will be trained in the use of these materials.
9.8.2g	A register of all hazardous materials imported to the site or generated as a result of site activities will be maintained. This will document the hazardous material name, location, approximate volume, storage method and where applicable, disposal method for the substance and containers.
9.8.2h	Bringing hazardous materials to the site in bulk packaging wherever possible. This practice will minimise the number of containers and reduce risk of spillage.
9.8.2i	Hazardous waste generated by the operation will be transported offsite to licensed waste disposal facilities. This is likely to include waste oil, grease and heavy equipment oil and fuel filters.
9.8.2j	All hazardous wastes will be temporarily stored in designated containers and contents properly labelled at all times.
9.8.2k	Domestic waste from the offices and workshops will be properly handled, transported to, and disposed of in the onsite landfill.
9.8.2l	Reusable pressurised containers and vessels will be returned to suppliers. Pressurised containers and vessels that are not reusable will be punctured using suitable equipment and disposed of in the onsite landfill.
9.8.2m	Arafura staff and contractors will be trained in proper handling and disposal of waste material.
9.8.2n	Explosives magazine will be constructed and operated in accordance with regulatory requirements.
9.8.2o	A licence to Store Dangerous Goods will be obtained for the storage of diesel fuel on site.
9.8.2p	Septic systems will be located in suitable areas where there is sufficient depth to groundwater to allow the system to operate effectively.
9.8.2q	Prior to their installation, plans for the septic systems will be approved by the relevant government agency.
Cultural Environment Management (PER Section 9.9)	
9.9.2a	The location coordinates of sites of archaeological significance will be stored in a suitable database by Arafura and shall be made accessible to project design, construction and operations personnel.
9.9.2b	All employees and contractors will be required to participate in a general site induction before starting work. The induction will include: • Information on the importance of the cultural environment and protecting artefacts and archaeological sites. • Information on the correct procedure if items of potential Aboriginal or heritage significance (including bones) are discovered during quarrying

Commitment Number	Commitment and Key Performance Indicators Where Applicable
	or other mining activities.
9.9.2c	The Northern Land Council and NRETA will be contacted immediately if items of potential Aboriginal significance are discovered.
9.9.2d	A 50 metre exclusion zone shall be provided around sites of high archaeological significance (sites MP03, MP07, MP34, MP48 and MP49 (excluding the area currently disturbed by the access track).
9.9.2e	The access track from Frances Creek Road to the mine site will be relocated to avoid generation of dust from the road impacting MP49.
9.9.2f	Arafura will operate with a preference to employ people from the local community where suitable.
Socio-Economic Environment Management (PER Section 9.10)	
9.10.2a	On final decommissioning plant and infrastructure will be dismantled, made safe and unless requested otherwise by project stakeholders, removed from the site.
9.10.2b	Compensation agreements will be reached with landowners for loss of use of land used by Arafura for mining or associated infrastructure.
9.10.2c	Employment opportunities will be advertised locally and preference will be given to local candidates.
9.10.2d	Provision of goods and services will be advertised locally and preference will be given to local businesses.
9.10.2e	First aid facilities will be established onsite for the duration of the project. These facilities will be manned by appropriately qualified employees.
9.10.2f	A liaison will be established between onsite Emergency Response and First Aid personnel and providers of equivalent services in Pine Creek, Katherine and Darwin.
9.10.2g	Arafura will establish a complaints procedure by which the public can lodge complaints about the operation or impact of the mine.
Transport Management (PER Section 9.11)	
9.11.2a	Erecting warning signs at the junction of Frances Creek Road and Mt Wells Road to advise the public they are entering private property and must comply with all directions issued by Arafura. Discouraging casual access.
9.11.2b	Signs on Mt Wells Road, giving warning of road trains entering, leaving and travelling along the haul road.
9.11.2c	Road maintenance to be carried out to DPI standards. This will include regular grading of the Frances Creek and Mt Wells roads and additional maintenance on stream crossings on the Mt Wells Road between Pine Creek and the mine as necessary to improve all-weather access.
9.11.2d	If deemed necessary, a commuter bus will be provided to minimize traffic between Pine Creek and Mt Porter.
9.11.2e	Road train drivers will use radio communications to coordinate safe passing. Only one to two road trains will operate at any time.
9.11.2f	Licensed road going vehicles will be used for haulage and standard axle loadings will be complied with.
9.11.2g	Sufficient freeboard will be left at the top of all trailers when loading to ensure ore product can not spill.
Visual Amenity Management (PER Section 9.12)	

Commitment Number	Commitment and Key Performance Indicators Where Applicable
9.12.2a	The impact of clearing will be minimised by restricting clearing of vegetation to the minimum necessary for operations.
9.12.2b	Access to the project site will be limited to employees and authorised visitors. All project access will be well signposted to control traffic movement in and out of the project area.
9.12.2c	The waste rock stockpile will be contoured so it ties in with the surrounding topography.
Biting Insects Management (PER Section 9.13)	
9.12.2a	During the site specific induction advising all employees of the potential for seasonal problems relating to biting insects including their potential pest, nuisance and disease carrying potential. All employees will be made aware of the diseases mosquitoes may carry.
9.12.2b	During site specific inductions, all staff will be advised on personal protection measures to protect themselves from mosquitoes and other biting insects.
9.12.2c	If mosquito breeding reaches significant levels, Arafura will liaise with the MEB to determine appropriate larvicides to use to control the problem.
Rehabilitation and Closure Management (PER Section 11)	
11.1a	As part of obtaining all permits necessary to start mining, Arafura will submit a security bond to DPIFM in case of any unplanned failure of the project. The size of this security bond will be reviewed in conjunction with DPIFM to ensure it remains consistent with level of disturbance caused by the project at any specific time.
11.1b	Monitoring will be conducted after completion of rehabilitation to establish the effectiveness of rehabilitation over time. Monitoring will consider physical stability, erosion, minimisation, vegetation establishment (species diversity, density, cover) and weed presence.

Commitments presented in the Supplement to the PER

Commitment Number	Commitment
S1	If project extensions into the Wet season are required, Arafura will discuss this with relevant regulatory authorities and ensure appropriate management and mitigation measure are implemented.
S2	Arafura will ensure appropriate technical resources are in place to implement environmental measures described in the PER and supplement.
S3	Arafura will communicate with local fire management authorities to ensure appropriate fire management measures are implemented.
S4	At the conclusion of operations, the septic tank will be pumped out and the concrete tanks broken up and buried.
S5	On site effluent disposal systems shall comply with the setback distances for watercourses specified in Table 6 of the <i>Code of Practice for Small On-site Sewerage and Sullage Treatment Systems and the Disposal or Reuse of Sewerage Effluent</i> .

Commitment Number	Commitment
S6	Given the short duration of the project, potable water will be imported in bulk from Pine Creek and stored in a dedicated water tank.
S7	Arafura will ensure that the Northern Territory Police are consulted regularly to effectively manage issues associated with road safety and improvements.
S8	Daily commuting of the workforce (approximately 40 people) will contribute to traffic volumes. Arafura will examine the viability of using a commuter bus to reduce traffic volumes.
S9	An application to the Department of Health and Community Services will be made to construct the on site effluent disposal system.
S10	Environmentally hazardous chemicals including fuel, oil or other hydrocarbons will be stored within bunded compounds designed to Australian Standards 1940-2004.
S11	Mobile equipment, light vehicle servicing and vehicle wash down activities will take place on a hardstand surface draining into a sedimentation basin and oil-water separator. The hardstand will be constructed from either compacted clay waste on site or a constructed concrete floor.
S12	Ore transported off site will be covered.
S13	Testing of water influx rates and permeability of the clay material will be conducted and presented as part of the MMP.
S14	The cap of the PAF cell will be a minimum of three metres thick and domed to prevent any water infiltration into the capped cell. Location of the PAF cell will be surveyed and information presented to DPIFM as part of MMP documentation.
S15	If water discharge occurs from the pit, monitoring will be undertaken weekly.
S16	To provide a preferred subsurface drainage pathway for any minor quantities of water from the spring in Pit Gully, a general purpose subsoil drainage pipeline will be located in the creek bed prior to deposition of waste material.
S17	Arafura will undertake to carry out biological monitoring on Nellie Creek downstream of operations.
S18	Measures will also be implemented to prevent the introduction of additional weed species. Arafura will participate in regional weed management activities with Station owners and the local Landcare group.
S19	Monitoring of aquatic environments will be undertaken. This will be detailed in the MMP and is likely to include water quality and biological monitoring during mining as well as post mining water quality monitoring.
S20	The realignment of the access track will examine the possibility of avoiding swampy meadow and heritage site MP49.
S21	Arafura will liaise with the Pine Creek Community Government on company matters affecting the local community and provide a register for complaints related to the Mt Porter Gold Project.
S22	Employees will be made aware of potential mosquito problems that may arise during operations as part of the project induction process.
S23	Arafura will operate in compliance with ' <i>Guidelines for preventing mosquito breeding sites associated with mining sites</i> '.
S24	Arafura will ensure that sediment in the basins is removed at the completion of mining and in the post-mining phase as required