3. Response to Comments

Aboriginal Cultural Heritage (A)

A1 AAPA Certificates

In response to comments from Aboriginal Areas Protection Authority (AAPA), most of which focus on Authority Certificates, Compass:

- Acknowledges that the phrase 'sites of significance to Aboriginal people' (Executive Summary, Section 7.12) should read 'Aboriginal sacred sites', and that the heading 'Archaeology and Heritage' could read 'Heritage, Archaeology and Protection of Aboriginal Sacred Sites'.
- Has applied for Authority Certificates for the project and associated infrastructure[1] (Appendix 10), and has added the required commitment and performance indicator to the summary of commitments (see Appendix 11).
- Acknowledges that the *Northern Territory Aboriginal Sacred Sites Protection Authority Act* should be included in Section 2.1.3.

A2 Cultural Heritage Management Plan

Compass will ensure that AAPA's comments concerning the *Northern Territory Sacred Sites Act* will be reflected in the project's Cultural Heritage Management Plan, which will also require fulfilment of all conditions of Authority Certificates as a specific implementation measure.

Compass agrees to further develop this plan in consultation with the NLC (as has always been Compass's intention).

A3 Heritage/Archaeology

Section 9.8.8 of the PER describes the implementation strategies and measures that Compass will adopt in relation to heritage and archaeological matters, as based on the specialist's report (Appendix 6 of the PER).

A4/A5 Indigenous Values/Traditional Owners

As stated in Section 6.5.2 of the PER, Compass's intention is that involvement of indigenous people will be a particular focus of the project's ongoing consultation

[1] Excluding the powerline, for which permitting and related issues will be the responsibility of the Power and Water Cooperation (PAWC) (see the response to Issue K5).

program. In particular, this will focus on matters such as further development of the Cultural Heritage Management Plan and identifying and protecting indigenous environmental values and land uses.

Acid Mine Drainage/Acid Rock Drainage (B)

B1 ARD Characterisation

The geochemical characterisation presented in Section 4.9 of the PER is based on relevant data from geochemical testwork undertaken in 1997 and 2002, plus that from analysis of 16 near-surface drill core samples in August 2005.

Additional testwork undertaken in late 2005 included characterisation of another 14 samples, and a summary of all data from 2005 is shown in Appendix 12 (Table 1). The results of the additional testwork (which are summarised in Table 3.1) support specific aspects of the classification described in the PER, as follows:

- Carbonates with total sulfur up to 0.5% will be NAF (see results for samples 29315, 29316, 29317 and 29318).
- Well-oxidised shale with low (<0.5%) sulfur levels is likely to be NAF (see results for samples 29310, 29311, 29313 and 29314).
- Shale with substantially elevated total sulfur (e.g., 2.9% to 10.8%) is likely to be PAF (see results for samples 29735, 29736, 29737, 29738 and 29739).

Table 3.1 Additional geochemical data from November/December 2005

EGi Code	Rock Type	Depth (from/to) (m)	Total S (%)	ARD Category
29310	Ferruginous oxidised footwall shale	1.0 to 6.0	<0.01	NAF
29311	Footwall shale	1.0 to 6.0	<0.01	NAF
29312	Near ore horizon	1.0 to 6.0	<0.01	NAF
29313	Hanging wall shale	1.0 to 5.0	0.14	NAF
29314	Hanging wall shale	1.0 to 6.0	0.02	NAF
29315	Outcropping magnesite/dolomite	--	<0.01	NAF
29316	Outcropping magnesite/dolomite	--	<0.01	NAF
29317	Weathered ferruginous dol/mag	2.0 to 6.0	<0.01	NAF
29318	Weathered ferruginous dol/mag	2.0 to 6.0	<0.01	NAF
29735	Black shale	16.0 to 17.0	2.9	PAF
29736	Black shale	21.0 to 22.0	8.6	PAF
29737	Black shale	26.0 to 27.0	10.8	PAF
29738	Mudstone	31.0 to 36.0	9.6	PAF
29739	Shale and schist	46.0 to 51.0	7.4	PAF

In addition to this static testwork, five leach columns have been established to further examine the acid-forming potential of waste rock from the Browns Oxide deposit. The five columns contain a range of material types (see Appendix 12, Table 2):

- High sulfur black shale.
- Low to medium sulfur black shale.
- Weathered (barren) black shale.
- Weathered ferruginous dolomite/magnesite.
- Sulfidic dolomite/magnesite.

Data from these columns, which have now been established by Environmental Geochemistry International Pty Ltd (EGi)[1], will provide information about the kinetics of acid formation and will allow further refinement of material classification in terms of acid-forming potential.

The mine plan is and mining schedule will be verified in April 2005 (following receipt of the most recent drilling and assay information), at which time the available data from the column leach tests will be reviewed and taken into account. This process, i.e., addressing the latest information concerning the acid-forming potential of waste rock, will be repeated whenever the mine plan is revised. Should the relative tonnages of NAF and PAF material alter from those described herein (see Issue B3) with deleterious outcomes, Compass will inform the NT authorities and, in conjunction with those authorities, determine an appropriate course of action. This is reflected in the updated Table of Commitments (Appendix 11).

Monitoring of PAF/NAF material during mining will involve visual classification of rock type combined with routine sulfur analyses.

B2 ARD Impacts

Impacts associated with ARD focus on downstream water quality effects, mine closure and rehabilitation, and monitoring. These are addressed elsewhere within this chapter in terms of the specific individual issues.

B3 ARD Management

Additional information concerning the mine plan and the design of the tailing storage facility (TSF) has become available since completion of the PER, and this is attached as Appendix 12. As described in that appendix, the revised design for the TSF provides for all PAF waste rock to be encapsulated in a specific, designated area within the structure (Figure 3.1). The TSF will comprise a zoned soil and rockfill embankment, with the low permeability soil zone being located on the upstream face (Figure 3.2).

The rockfill to be used in the external embankment will be derived from NAF waste material, with PAF waste being separated from the tailings by an internal dividing bund that will be constructed with compacted layers of PAF waste (see Figure 3.2). The design does not require the bund to be of low permeability and, in the final design,

[1] EGi undertook the initial testwork reported in the PER (Appendix 9).

provision will be made to pump excess water that accumulates in the PAF area back into the tailings side of the bund. The general PAF waste that will be placed behind the bund will be similar to the actual bund material, the main differences being that there will be no particle size limitation and no need for it to be placed in thin layers and compacted.

This change in design of the TSF and the PAF waste rock encapsulation requires revised waste movement, as shown in Table 3.2, where this has been achieved by relocating the mine ramp. Mine planning has also been revised (Tables 3.3 and 3.4) to ensure both an even supply of ore to the processing plant and the availability of the requisite waste materials required for TSF construction, with the revised pit being 800 m long and 250 m wide.

Table 3.2 Revised summary of pit waste utilisation

Embankment Stage	Mine Year	Pit Waste Production (m^3)*		
		NAF (Zones 3 and 4)	PAF (Zone 2 and Internal Dump)	Total
1	-1	222,000	38,000	260,000
2	1	499,000	52,000	551,000
3	2	614,000	132,000	746,000
4	3	351,000	165,000	516,000
	4	0	277,000	277,000
	Total	1,686,000	664,000	2,350,000

*For material placed in embankment at assumed density of 2.0 t/m^3.

Table 3.3 Revised total waste rock production

ARD Category and Type	Total Waste Rock Production (t)	Waste Rock Type as % of all Waste Rock
NAF1	2,057,000	38.7
NAF2	1,843,000	34.7
NAF3	82,000	1.5
PAF4	402,000	7.6
PAF5	126,000	2.4
PAF6	800,000	15.1
All NAF	**3,982,000**	**74.9**
All PAF	**1,328,000**	**25.1**
All waste	5,310,000	100.0

Note: NAF/PAF waste rock definitions are as described in Table 4.9 of the PER.

Table 3.4 Revised waste rock NAF and PAF breakdown*

ARD Category and Type	Waste Rock Production Schedule (t)				Waste Rock Types as % of all Waste Rock			
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
NAF1	799,000	566,000	228,000	464,000	49.3	37.9	22.1	39.9
NAF2	639,000	650,000	465,000	89,000	39.4	43.6	45.1	7.6
NAF3	4,000	12,000	9,000	57,000	0.2	0.8	0.9	4.9

Table 3.4 Revised waste rock NAF and PAF breakdown* (cont'd)

ARD Category and Type	Waste Rock Production Schedule (t)				Waste Rock Types as % of all Waste Rock			
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
PAF4	130,000	56,000	126,000	90,000	8.0	3.8	12.2	7.7
PAF5	0	0	10,000	116,000	0.0	0.0	1.0	10.0
PAF6	50,000	208,000	194,000	348,000	3.1	13.9	18.8	29.9
All NAF	1,442,000	1,228,000	702,000	610,000	**88.9**	**82.3**	**68.0**	**52.4**
All PAF	180,000	264,000	330,000	554,000	**11.1**	**17.7**	**32.0**	**47.6**
All waste	1,622,000	1,492,000	1,032,000	1,164,000	100.0	100.0	100.0	100.0

Note: NAF/PAF waste rock definitions are as described in Table 4.9 of the PER.
*Includes some rounding error.

Closure of the TSF is discussed in the response to Issue E16.

B4 Under-estimation of AMD

As indicated above (Issue B1), additional characterisation testwork has been undertaken since completion of the PER and will continue. Section 8.3.4 of the PER states that management of PAF wastes will be an ongoing and will continue, high-priority focus during project development and implementation, and this remains the case.

Given the planned rate of rise of the tailing in the TSF, no single surface will be exposed for any significant time during filling, hence onset of acid conditions is not expected to occur during operations. Regular sampling and testing will be undertaken to confirm the geochemistry of the tailing, and will be a requirement of the TSF Operations and Maintenance Manual. The proposed mining sequence will result in approximately 3 to 3.5 m of NAF secondary copper[1] tailing being deposited as the top tailings layer, and this will further minimise the likelihood of acid generation occurring. Further description of the preliminary final cover design is provided in the response to Issue E16 and Appendix 13.

Air Quality (C)

C1 Air Quality Impacts from Dust

Compass will adopt an approach to dust control that is best practice for mines in Australia, with specific measures being outlined in Sections 7.3.3 and 9.8.5 of the PER. These measures are designed to ensure that relevant dust assessment criteria for $PM_{2.5}$, PM_{10} and TSP (generally based on NSW Department of Environment and Conservation and National Environment Protection Measures for Ambient Air Quality) are met.

[1] Formerly referred to as supergene tailing.

Air quality monitoring for staff and contractors will be performed as part of the project's Occupational Health and Safety System. Ambient air quality monitoring will occur in response to public complaint.

C2 Air Quality Impacts from Processing

Crushing and transporting of ore during processing will occur and has the potential to generate dust with consequent adverse impacts on air quality. Dust from haul roads will be minimised by use of a water truck for dust suppression. Compass will operate water sprays in the crusher and conveying system (including transfer points), thereby minimising dust generation (see Section 9.8.5 of the PER). Annual dust generation during mining and processing is estimated at 260 t/a and will therefore comply with ambient air quality goals (see Section 7.3.4 of the PER).

The processing plant will be powered by electricity drawn from the Northern Territory grid (see Section 4.12.1 of the PER). Therefore, no particulate or gaseous emissions from power generation will occur at site.

Project emissions from those components of the process beyond the comminution circuit are expected to be too small and too widely dispersed to impact on air quality at the nearest off-site residences.

C3 Health Impacts from Lead-bearing Dust

The measures described above and in the PER for dust control (taking into account dust control during mining and vehicle movements [see Section 9.8.5 of the PER]) will also serve to minimise any health risk associated with any lead-bearing dust and similar materials.

C4 Health Impacts from Radon

Radiological doses to the workforce and the public from inhalation of radon have been calculated by ANSTO (see Appendix 7 of the PER) based on a conservative range of exposure scenarios to various workgroups and the public.

The estimated dose to indicative workgroups and the public from inhalation of radon and the estimated total dose is shown in Section 7.13.4 of the PER and indicates that doses will be well below the allowable exposure limit (1mSv/a).

C5 Air Quality Impacts from Radionuclides

As for radon, radiological doses to the workforce and the public from inhalation of long-lived radionuclides via dust have been calculated by ANSTO based on a conservative range of exposure scenarios to various workgroups and the public.

The maximum potential radiological dose to workers and members of the general public via inhalation of dust will be less than the annual dose limit of 1 mSv/a for an adult (see the PER - Section 7.13.4 and Appendix 7).

General good practice in dust control and waste management will limit the already negligible amount of radionuclides associated with fugitive dust.

Radiological monitoring is discussed in Section 9.9.4 of the PER and addressed in further detail in the response to Issue N2 herein.

Editorial (D)

D1 Editorial

Compass notes that a small number of editorial suggestions were made in some submissions.

Engineering Design/Project Description (E)

E1 Lack of Detail on Process Water Dam

The process water dam will be a small (1 ha area) engineered dam designed to retain water; further engineering information will become available during detailed design. This dam will be designed and constructed by competent personnel, does not pose any particular problems from an engineering perspective, and will be consistent with the many similar dams constructed throughout the Northern Territory and Australia.

E2 TSF Seepage

Additional information concerning seepage from the TSF has become available since completion of the PER, and this is attached as Appendix 13.

'Mature storage' seepage through the base of the TSF is likely to be of the order of 50 m^3/day. Mounding beneath the storage facility is expected to be a local response only, and seepage from the active storage will be captured by the drawdown cone resulting from the pit. More detailed assessment of seepage from the TSF and the overall groundwater response to the pit will be carried out using the results from monitoring during production, with final closure protocols determined during this period.

As discussed in Appendix 13, the critical factor for seepage quality post-closure is the air/oxygen diffusion rate through the cap, not the rate of seepage. The primary design criteria for the TSF cap will be to ensure that there is sufficient depth of water available in the 'store and release' layer to protect the clay layer from drying out. Closure of the TSF is addressed in more detail in the response to Issue E16.

Groundwater monitoring will be undertaken as described in response to Issue O6.

E3 Water Treatment

This issue is addressed in response to Issue S27.

E4 Borrow Areas

As described in Section 4.5.1 of the PER, the main requirement for external borrow material will be the first stage of the TSF construction. This material will be sourced from within the project footprint or, if this is not possible, from within the footprint of a possible future pit associated with development of the sulfide deposit.

There are no indications that borrow material will be required from beyond these areas.

E5 Site Infrastructure

A mess will not be provided on site. Appropriate amenities (a 'crib room') will be provided for the eating meals brought to site and, if necessary, appropriate approvals will be obtained.

E6 Effluent Re-use

Compass will undertake the required discussions with The Department of Health and Community Services (DHCS) regarding reuse of effluent and final design of the system.

E7 Final Design

The approach that underpins environmental impact assessment in general, and the PER in particular, is that the project is sufficiently well defined to be assessed by stakeholders in terms of key factors, conceptual responses by the proponent and notional impacts. The PER is not intended to describe detailed engineering aspects of the project, nor does it provide detailed management measures.

E8 Inconsistency

With regards to inconsistencies between Section 4.9.1 and Section 4.6.3, a detailed pit design and schedule will be conducted after the completion of the resource modelling, with this likely to occur in April 2005. However, a mine design and schedule has been developed that meets the ore production requirements and generates the required NAF (and PAF) waste material utilised for the construction of the TSF (see Table 3.2). This production schedule brings forward the mining of some of the waste material to enable the TSF to be built in stages ahead of tailing storage needs.

E9 Metallurgical Process

As proposed by Compass, ore will be crushed and ground in a conventional comminution circuit ahead of acid leaching (Figure 3.3). The oxide ore dissolves readily in sulfuric acid, especially when assisted by heating. Solid-liquid separation is achieved using conventional thickeners to produce a pregnant solution that feeds the copper solvent extraction circuit. Significantly, however, a conventional counter-current decantation circuit is replaced by a resin-in-pulp circuit. This best practice hybrid circuit maximises metal recoveries, improves the process water balance and ensures that heavy metals in the tailing stream are minimised. It also minimises capital cost, operating cost and plant footprint. Copper recovered in the solvent extraction circuit is electrowon as LME (London Metal Exchange) grade A cathode copper for direct sale into the copper

market. Cobalt and nickel are precipitated from the solvent extraction raffinate as a conventional mixed sulphide precipitate, filtered and bagged in bulka bags for sale. Tailings from the process will be delivered to the TSF from which water will be recovered for reuse.

The process described above consists of a combination of well-proved metallurgical components, i.e., comminution, acid leaching, solid-liquid separation, resin-in-pulp and solvent extraction/electrowinning. Sufficient testwork has been undertaken by Compass during project development since 1997 (albeit with a focus on the sulfide deposit) to provide a high level of confidence that the process will successfully recover the target metals.

E10 Mining Schedule

Mining operations may be constrained during the wet season, with the mining contractor being expected to either work on upper benches of the pit or alternatively temporarily suspend operations. A decision between these options will be made after discussion with the selected contractor and an appropriate mining schedule will be used.

E11 Pit Wall Failure

Given the relatively shallow nature of the pit and the conservative approach taken to pit slope angles, the risk of a catastrophic pit wall failure is considered to be low. Regular wall inspections will be made, and external geotechnical advice sought when needed. Failure monitoring and warning devices will be installed if required.

E12 Process Water Dam Design

See the response to Issue E1.

E13 Project Layout/Footprint

The project layout reflects the existing leases held by Compass and minimises additional disturbance to the area. Final design will ensure that environmental and safety considerations are maximised within the footprint, with suitable provision for relevant contingency plans that take the layout into account.

The main single component in terms of surface area is the TSF and the possibility of extending the TSF is limited. However, as described in Appendix 13, the TSF has sufficient capacity for the proposed 4-year mine life (plus additional material such as water treatment plant sludge and sedimentation trap sludge). Development of additional deposits or the underlying sulfide deposit will therefore require additional permitting that will accommodate an expanded footprint, and this has been Compass' consistent position.

E14 Sediment Trap, Closure

Maintenance of the sedimentation traps during operations will be incorporated into the project's day-to-day monitoring, maintenance and management schedule. Depending on

the sediment chemistry, sediment recovered from the traps may be used as a rehabilitation 'soil'. Alternatively, if contaminated, it could be placed into the TSF and buried with the tailing.

Closure will involve appropriate rehabilitation and stabilising of the traps, most likely leaving the main sedimentation trap with its emergency spillway. Post-closure maintenance requirements will be agreed between Compass and the Department of Primary Industry, Fisheries and Mines (DPIFM) as part of the lease relinquishment process.

E15 Sedimentation Trap Design

The main sedimentation trap will have a volume of 118,000 m^3, with water discharge occurring via a pipeline to the East Finniss River (see Section 4.14.6 of the PER); an emergency spillway will be provided for extreme rainfall events. Further details of the capacity and management regime of the trap will be developed during detailed design.

E16 TSF Closure

The preliminary design of the TSF final cover described in Appendix 13 has considered current best practice and design factors contributing to the failure of covers at Rum Jungle. Compass therefore considers that an expanded, documented review of TSF covers to include areas beyond Australia is not warranted.

E17 TSF Design

Further details on the TSF design, for a storage capacity of 4 MT of tailing, are provided in Appendix 13. Key points to note include:

- A design philosophy based on the storage being raised and managed so that there is no discharge from the storage up to a 1 in 200 ARI (Average Recurrence Interval) rainfall year.
- Provision for all PAF waste rock to be incorporated in a specific, designated area within the TSF (see response to Issue B3).
- An emergency-level spillway capable of accommodating an extreme rainfall event without compromising safety and integrity of the storage (in accordance with the ANCOLD (Australian National Committee on Large Dams) consequence category given to the storage). The spillway will be designed to discharge into the main sedimentation trap; details will be provided in the final design.

Emerson tests have been conducted on samples of Zone 1 material that will be used to provide an internal lining to the TSF embankment and indicate that the materials do not show dispersive behaviour. Laboratory permeability tests of compacted Zone 1 materials have returned permeability values in the range $3x10^{-9}$ to $6x10^{-9}$ m/s.

As indicated in the response to Issue E16, preliminary design of the TSF closure cover has taken into account the performance of the Rum Jungle covers. Incorporating this review with the experience of Compass' tailing management consultants has led to the

proposal of different cover treatments for the tailings and the PAF waste rock zones, although both treatments would involve a 'store and release' type cover. Details are provided in Appendix 13, while both options are shown schematically in Figure 3.4.

E18 TSF Design/ARD Management/Groundwater Impacts

See the responses to Issues B4, E2 and E17.

Flora and Fauna (F)

F1 Aquatic Fauna Characterisation

Aquatic fauna were characterised via a desktop study (all fauna) and field studies (amphibians, reptiles and migratory species) during the dry season of 2002 and the wet season of 2005 (see sections 7.2 and 7.8 of the PER, and Appendix 4). Sufficient information was obtained to determine the status of the East Finniss/Finniss River system and to provide the context within which the project will be developed and discharges will occur.

F2 Biting Insects

The additional information provided in the submission from the NT Department of Health and Community Services will be reflected in the final Biological and Land Management Plan (see Section 9.8.3 of the PER for a description of the issues that are addressed in this plan).

F3 Cane Toads

Compass will investigate the practicalities of instigating an inspection program to minimise the likelihood of cane toads being transported into and from the project area. Compass will also seek advice from expert groups (such as FrogWatch) on effective control of cane toads and will endeavour to coordinate such activities with other groups, where practicable.

F4 Clearing Plan (Pit)

Clearing of the pit could occur over the initial two years of the operation. However, given the modest size of the area, Compass' current intention is to clear the total footprint during favourable weather conditions and establish the required erosion, sediment and dust control measures as soon as possible.

F5 Clearing Program

A clearing program will be submitted as part of the MMP prior to work commencing on site and will include management strategies and measures as described in Section 9.8.3 of the PER.

F6 Fauna Impacts (Adequately Addressed)

Compass notes the Australian Government's DEH (Department of the Environment and Heritage) comment that the PER adequately addresses Commonwealth issues.

F7 Fauna Impacts (General)

The fauna survey was undertaken by specialists in this discipline who established sufficient sites to characterise the existing fauna and provide an impact assessment for the Browns Oxide Project.

Avoidance, management and mitigation measures designed to reduce impacts of threatened fauna species (including the Red Goshawk and Partridge Pigeon) are described in Section 7.2.5 of the PER and include reducing habitat loss and fragmentation. Additionally, fauna management procedures (as described in the Biological and Land Management Plan, Section 9.8.3 of the PER) will be implemented for fauna protection.

F8 Fauna Impacts (Noise)

The noise and vibration from haulage trucks and four-wheel drive vehicles within the project area may act as a deterrent to fauna crossing the road during haulage. Other site roads will be speed-limited.

Noise impacts will be controlled to a level that will meet the assessment criteria that would apply to similar mines in NSW based on the use of acoustic treatment or shielding for the process plant and smart alarms on items of mobile plant.

A Noise and Vibration Management Plan will be implemented to minimise the potential impacts to wildlife. Details of the plan are given in Section 9.8.6 of the PER.

F9 Fauna Management

A Biological and Land Management Plan will be incorporated in the MMP completed prior to work commencing on site. Issues, objectives, performance standards, implementation strategies and measures of the plan are described in Section 9.8.3 of the PER. In addition to addressing fauna in general, specific consideration will be given to threatened fauna species.

F10 Flora Impacts (General)

The final Biological and Land Management Plan (see Section 9.8.3 of the PER and responses above to fauna issues) will ensure that impacts to vegetation communities and threatened species are managed in an appropriate manner. Nevertheless, it should be noted that, in the regional context, the conservation value of the terrestrial flora found in the project area is not significant.

The only protected species found or likely to occur in the project area is the cycad *Cycas armstrongii*, with this species being present within several vegetation communities in the

project area (see Section 7.1.2 of the PER). Compass is currently engaged in discussion with Friends of the Batchelor Open Wildlife Sanctuary about possible use of some of these plants in the proposed sanctuary, and Greening Australia has offered their assistance in transplanting the cycads for this sanctuary. Compass will also ensure that the provisions of the draft Management Plan for Cycads (PWCNT, 2003) will be taken into account during site preparation.

F11 Riparian Vegetation

No riparian vegetation along the East Finniss River will be cleared by Compass during project construction and operations. The main sediment trap will be constructed to protect the drainage line in the eastern section of the project area, as shown in Figure 3.5 (which is an updated version of Figure 4.1 in the PER). Construction of the sediment trap is not expected to require the clearing of riparian vegetation but will be sited within 50 m of the drainage line.

F12 Terrestrial Fauna

Compass notes the Museum and Art Gallery NT's comment that the PER adequately addresses issues relating to terrestrial vertebrate fauna.

F13 Threatened Species

Responses to Issues F7 to F11 provide a description of mitigation and management of impacts to threatened flora and fauna species. In particular, the on-going implementation of the site-specific Biological and Land Management Plan (Section 9.8.3 of the PER) will ensure that impacts to vegetation communities and threatened species are managed in a sensitive manner.

In specific relation to the bare-rumped sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*), bat surveys were undertaken during the 2005 wet season in and around the project area by Ecological Management Services (see Appendix 4 of the PER). No evidence of this bat was found in the area during this or previous surveys. However, Compass acknowledges that location of this species during such surveys is very difficult as a result of its high-flying nature that makes net trapping ineffective, and the absence of a known echolocation call making echolocation non-viable (Milne, pers. com., 2006). There have been only two confirmed records of the bare-rumped sheathtail bat in the Northern Territory post-1970, these being at sites about 150 km and 160 km east northeast of the project area. While knowledge of this species is poor, it is thought to roost in tree hollows (*Eucalyptus platyphylla*) and coastal caves (DEH, 2005), and neither of these habitat types occur in the project area. While it is possible that this species may overfly the project area, the likelihood of this occurring is extremely difficult to predict given the paucity of information regarding this species.

F14 Vegetation Clearance/Vine Forest Management and Monitoring

Figure 3.6 shows the project footprint and components superimposed onto Figure 7.1 from the PER so that a better spatial understanding of vegetation communities that will be impacted can occur.

Responses to Issues F10 and F11 describe the proposed mitigation and management methods to minimise impacts to threatened flora species, including vine forest.

Pit dewatering and groundwater level monitoring will occur as discussed in the response to Issue O6. Monitoring will allow management of vegetation communities VC10 (*Acacia auriculiformis)* and VC12 (*Acacia auriculiformis/Melaleuca dealbata/Lophostemon grandiflorus)* to ensure that impacts to these communities are minimised (as discussed in response to Issue F15).

F15 Vine Forest Impacts

Further to the information provided in the response to Issue F14 and in specific reference to the vine forest patches, the likely impacts of lowering the water table will depend largely on the degree of reliance that the forest patches actually have on any underlying water table (as opposed to being maintained by seasonal rainfall). The vine patches in the project area possibly rely more heavily on seasonal rainfall and on moisture transferred through the soil from the adjacent Finniss River than from a geologically defined water table.

However, if the forest patches are indeed reliant on an underlying water table, then the effects of lowering the water table would also depend on the extent by which it is lowered and the duration for which the lowered water table is maintained. Wet season rainfall is typically predictable and substantial in the project area and full recharge of the rivers, aquifers and soil-borne moisture usually occurs each wet season.

If drying out of the vine forest were observed and could be attributed to the project, Compass would consider irrigating the vine forest. Possible irrigation methods could include spraying from water tankers (with the attendant issues of providing access through the forest, creating greater access for weeds and dissecting the forest patches further) or dripper tape or similar (although this would require greater maintenance as it is sometimes chewed by animals) (Egan, pers. com., 2006).

F16 Weeds

Finalisation and implementation of the Biological and Land Management Plan (Section 9.8.3 of the PER) as part of the MMP will ensure improved weed control relative to the current status of the site, where the central and eastern sections of the project area are dominated by weeds and introduced grasses.

Compass has already committed to submitting a detailed weed management plan as part of the Mining Management Plan (see the PER Table of Commitments and Appendix 11).

Greenhouse Gases (G)

G1 GHG Commitments

The Mining Management Plan will address actions to reduce greenhouse gas emissions and will include these as specific commitments.

G2 GHG Management

The project is not classified as a large energy user (>9.5 PJ/a) and is not required to publicly report GHG emissions. Therefore, Compass does not propose to join the Greenhouse Challenge Plus Program. However, Compass is committed to reducing GHG emissions associated with the project and has committed to best practice GHG emission reductions as described in Section 7.4.3 of the PER and as will be reflected in the Mine Management Plan.

Compass has already committed to submitting a detailed fire management plan as part of the Mine Management Plan (see the PER Table of Commitments and Appendix 11). This plan includes consideration of minimising GHG emissions.

Assessment of greenhouse gas emissions associated with the provision of a power line will be the responsibility of the Power and Water Corporation (PAWC), which has agreed with Compass to undertake the permitting for, and construction and operation of, such a power line.

G3 GHG Targets

No initial target for GHG emissions exists as such. However, the estimate for initial GHG emissions of 4,200 t CO2-equivalent during construction and 47,400 t CO2-equivalent during operations (with 39,000 t CO2-equivalent resulting from electricity generation by PAWC for use in the processing plant and on-site power) can be adopted as initial emission targets.

Impacts on Landuse and Infrastructure (H)

H1 Landscapes

Landscapes have been identified in the region and are detailed in Section 3.1.2 of the PER. The final landforms created, including the TSF, will be compatible with the surrounding landscape (which is already significantly modified).

H2 Planning Conflicts

The PER addresses all seven of the key objectives contained within Section 2.3 of the Coomalie Planning Concepts and Land Use Objectives, which include the need to protect the environmental qualities of the area while promoting the development of mining and extractive industries (see Section 7.7.1).

The proposed project is therefore consistent with the relevant planning scheme.

H3 Public Infrastructure

Compass has undertaken to provide significant new bitumen roads near the mine site. Traffic studies by Sinclair Knight Mertz (Appendix 16) have demonstrated a relatively small increase in traffic volumes over existing roads (see response to Issue R2 and Table 3.10). The small number of predicted heavy vehicle movements (3.35 return trips per day) is not expected to lead to a significant increase in road maintenance requirements. Any contribution options to increased maintenance will be considered in keeping with maintenance contributions from present heavy vehicle users (including the cattle industry).

Legislation/Approvals (I)

I1 Additional Inclusions

In response to comments regarding additional inclusions to the PER, Compass:

- Acknowledges that the Northern Aboriginal Sacred Sites Protection Authority (1989) is an omission from the list of other relevant Northern Territory legislation (see Section A1).
- Acknowledges that the *Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal and Reuse of Sewage Effluent* is an omission from the list of applicable standards and codes.
- Acknowledges that the following comment from the Aboriginal Areas Protection Authority provides additional relevant information:

  Under the Northern Territory Aboriginal Sacred Sites Act (1989) all sacred sites in the NT are protected and it is an offence to damage, or illegally enter, a sacred site. The NTASSA allows land users to apply for an Authority Certificate. Compliance with an Authority Certificate is indemnity against prosecution.

I2 Approvals for Accommodation Facilities

Compass acknowledges that facilities that may be used to accommodate staff would need to be registered as boarding houses in accordance to the Public Health Act and regulations.

I3 Beneficial Use

Compass acknowledges that the process that needs to be undertaken to declare a beneficial use for the East Finniss/Finniss river system under the Water Act involves stakeholder consultation and that this can take some months to complete.

Management Systems/Plans (J)

J1 ISO Standards

As stated in Section 9.2 of the PER, Compass is committed to working within the framework of an environmental management system (EMS) in accordance with the international EMS standard, ISO 14001:1996, adapted for use in Australia and New Zealand as AS/NZS ISO 14001:1996. Compass will not develop full certification but will include its own management systems adapted from the international EMS standard.

J2 Management Plans

The DHCS will have an opportunity to view and make comment on relevant management plans (as part of the MMP) as they are developed by Compass within the framework of the Public Health Act.

PER Process/Contents/Specialists (K)

K1 Lack of Alternatives

Chapter 5 of the PER discussed project alternatives, including not proceeding with the project and alternatives considered in project planning.

K2 No Comment

Compass notes that the PER does not come under the jurisdiction of NT Worksafe.

K3 No Cooperative Programs

To date no co-operative research programs have been entered into with either the Batchelor Institute or Charles Darwin University. However, Compass has already used the services of both of these institutions over the past few years, with BIITE contributing to the studies undertaken in the early 2000s for the sulfide project and Charles Darwin University providing water quality data for the East Finniss/Finniss river system for the PER (see Appendix 2, Attachment A). Compass remains receptive to any research proposals that these two institutes (or others) may wish to submit.

K4 PER Premature

Compass is advancing with the planning and development of the Browns Oxide Project as a stand-alone project. All project decisions made by Compass are based on the project as described in the PER (and supplemented by additional information contained herein), i.e., development of an oxide resource over a 4-year mine life to produce copper, cobalt and nickel.

Nevertheless, Compass has spent a number of years building a resource asset base at Browns and surrounding areas, in addition to the oxide ore at Browns. This includes 37.2 Mt of sulfide resources on the Browns mineral leases. Therefore, the stand-alone

Browns Oxide Project has a closure plan that has been specifically designed to ensure that these sulfide resources are not sterilised, but remain a resource asset for the future.

At the appropriate time, Compass plans to process other oxide and sulfide resources in the area. Before this occurs, each project will be subjected to a separate environmental assessment via the NT's approval process (and including Australian Government participation, if required under the EPBC Act).

The Rum Jungle mineral field, well known for its uranium potential, is close to the Browns mine site. Compass has been actively exploring for uranium and, on successful delineation of economic uranium resources, would aim to become a uranium producer in the short term. As with the sulfide resources, any such proposal would be subject to a separate environmental assessment and approval.

K5 Power Line

Compass has continued discussions with PAWC since completion of the PER, with the outcome being that Compass still intends to connect to the Northern Territory grid, with the environmental assessment and subsequent construction and operation of this power line being PAWC's responsibility.

Responsibility for permitting, including the opportunity for stakeholders to comment on the final preferred option (which is still under consideration), will be part of the permitting process that PAWC will undertake.

K6 Aerial Photograph Doctoring

No aerial photographs in the PER have been intentionally or unintentionally modified, blurred or filtered in any way by Compass or its consultants/contractors. Considerable care has been taken to ensure that overlays on aerial photographs have not obscured important data.

K7 ANSTO

ANSTO is Australia's premier organisation with respect to radiological issues and is in an un-paralled position to provide expert advice concerning such matters. Compass believes that such advice is unbiased, and that Appendix 7 of the PER appropriately reflects the experience, expert knowledge and professionalism of the ANSTO personnel responsible for its preparation.

ANSTO's assessment, as presented in Appendix 7, is based on both historical data (including ore and flotation concentrates from the sulfide ore body) and more recent assays of ore samples (which has focussed on drill samples of Browns oxide material. As described in the response to Issue N2, Compass will undertake additional sampling of the ore (as well as other media such as process streams, possible scale build-up, equipment, green tissue and dust/air) to confirm that the concentrations used in ANSTO's assessment are appropriate. If warranted, the assessment will be repeated using updated assay data and the required management and mitigation measures implemented.

K8 Baseline Conditions

The information presented in Chapter 7 of the PER allows an impact assessment to be undertaken and is sufficient to provide a basis for ongoing monitoring, although additional information will need to be obtained in some areas (as described in the response to Issue O6. However, as stated in Section 7.8.2 in relation to surface water quality, baseline conditions are difficult to establish when the existing environment is in a state of flux. For example, it is possible that, even with no further activity on the Rum Jungle site, water quality and the ecological health of the Finniss River system may deteriorate due to the failure of the Rum Jungle waste rock dump covers. Compass will discuss this issue with NRETA during its application for a discharge licence under the *Water Act*.

K9 Bioremediation

Compass will implement clean up and remediation procedures, as required. This involves treating and disposing of spilt substances, contaminated materials and debris in accordance with MSDS requirements, relevant guidelines and waste management procedures (Section 9.8.7 of the PER).

Compass will not implement new bioremediation technologies such as phytoremediation, since existing remediation strategies are adequate. Should the need arise, Compass welcomes suggestions concerning possible bioremediation technologies.

K10 Community Complaints Process

Persons wishing to make a complaint during the construction and operation stages of the mine are invited to make submissions in writing to:

Mr Rod Elvish

Compass Resources NL

Level 5, 384 Eastern Valley Way

Roseville NSW 2069

Fax 02 9417 8750

Email admin@compass.com.au

Alternatively, the Northern Territory's EPA can be contacted as follows:

Ms Sally-Anne Strohmayr

EPA, NT

PO Box 496, Palmerston NT 0831

Phone 08 8924 4123

sally-anne.strohmayr@nt.gov.au

OR

Pollution Hotline 1800 064 567

K11 Consultation

Compass acknowledges that further consultation will be undertaken with the Officer in Charge of Batchelor Police Station in his role as the local Fire and Emergency Response Group Coordinator.

Compass will continue to expand the consultation program described in Chapter 6 of the PER and will make a concentrated effort to ensure that the goals described in Section 6.1 of the PER are met. In particular, and as described in Section 6.5.2 of the PER and the Table of Commitments (Appendix 11), a particular focus of the consultation program will be on indigenous groups.

Pollution (L)

L1 Arsenic Concentration

As stated in Section 4.9.1 of the PER, elements of most concern from an environmental perspective are copper, lead, cobalt and arsenic, and hence particular attention will be given to monitoring these metals in project water quality monitoring programs (see the response to Issue O6).

L2 Cobalt Production

The Cobalt 60 isotope does not occur naturally and no process used at Browns will result in the production of this isotope.

L3 Contaminated Soil Removal

Compass acknowledges that approval is required from the Northern Territory EPA to remove contaminated soil from site. Management and mitigation measures for both hazardous and general wastes are described in Section 9.8.7 of the PER.

L4 Hazardous Materials Storage

Compass will ensure that the final Hazardous Materials and Waste Storage Plan will include the information that, in the event of a hazardous materials spill, the General Manager Operations should report the spill containment within 24 hours of the incident to the Pollution Hotline (1800 064 567) to ensure notification under Section 14 of the Waste Management and Pollution Control Act.

As described in the response to Issue K11, Compass will consult with the local Fire and Emergency Response Group Coordinator in relation to the storage of chemicals and explosives on site.

Risks associated with stockpiling tyres on site, such as fire, mosquitoes/cane toad breeding, weeds and vermin, will be considered during finalisation of the Hazardous Materials and Waste Storage Plan, with inclusion of appropriate mitigation and management measures.

L5 Pollution Pathways

Groundwater movement is discussed in Section 7.9.1 of the PER, although it should be noted that, despite the considerable time and sums of money spent on investigating the Rum Jungle site, detailed information about this subject is lacking. Nevertheless, the occurrence of significant levels of contamination in seepage from the Rum Jungle waste rock dumps, and in Whites Open Cut, would be expected to have already caused significant adverse impacts on regional groundwater quality if such pathways were to exist.

Proponent (M)

M1 Capability

Compass is assembling a project management team that will include the required expertise to ensure that construction, commissioning and ongoing operations proceed with minimal interruptions.

Compass acknowledges that such personnel are a key requirement for successful project development and has already initiated the recruitment of senior staff. This is augmented by the use of appropriately qualified consultants and contractors.

M2 Credibility

As described in the response to Issue K4, Compass is advancing with the planning and development of the Browns Oxide Project as a stand-alone project. However, Compass has consistently been transparent in stating that the company objectives include further development, if possible, of the sulfide resources on the Browns mineral leases, other oxide and sulfide resources in the area, and the definition and development of uranium resources elsewhere in the area. Meeting these objectives will require separate environmental assessment via the NT's approval process (and including Australian Government participation, if required under the EPBC Act).

M3 Future Plans

Compass rejects the proposal that approval of the Browns Oxide Project should be denied on the basis that the company intends to develop other projects in the area. The approach adopted by Compass and reflected in the PER is consistent with that used by resource development companies throughout Australia, i.e., the scale of the project is consistent with the proponent's resources and provides a suitable basis for other

projects (or expansions thereof), taking into account environmental assessment and permitting requirements.

M4 Subsidy

Compass works closely with both the Northern Territory and Commonwealth governments. No subsidies have been provided by either government for the Browns Oxide Project.

Compass has applied for and received a qualification to apply for Research and Development Taxation Status for certain of its expenditures on the Browns Oxide Project. To date no benefit has been claimed.

In 1999 Compass received a Research and Development State Grant for the development of sulfide ore processing technologies. This program cost some $9.4 million of which the Commonwealth Government paid 50%.

Radiology (N)

N1 EPBC Nuclear Action

In December 2001, Compass lodged a Referral under the EPBC Act with Environment Australia (which is now DEH). That document referred to the proposed development of a large-scale mining project, i.e., the Browns Polymetallic Project, that would produce lead, cobalt, copper, nickel and silver over a project life of at least 15 years through the extraction of about 45 Mt of mainly sulphide ore and up to 700 Mt of waste rock. Two options were being considered by Compass, with the footprint associated with the larger option overlapping the Rum Jungle Mine. The possible pit outline for this larger option notionally included Rum Jungle's Intermediate and Whites pits, while it was anticipated that the waste rock dumps would probably incorporate some of Rum Jungle's waste dumps.

As indicated in the 2001 Referral, Compass considered that the Browns Polymetallic Project was a 'nuclear action' under the EPBC Act, on the basis that the project could be considered to include rehabilitating a facility or area in which mining or milling of uranium ore has been undertaken.

As described in the PER, the Browns Oxide Project is substantially different from the Browns Polymetallic Project, having only a 4-year life, extracting 4 Mt of ore and 4.7 Mt of waste rock, and with a project footprint that is next to, but does not impinge upon, the Rum Jungle site. Uranium occurs only at low concentrations in the oxide project ore and waste, and will not be a product of the operation. The Browns Oxide Project therefore does not trigger the nuclear action controlling provisions of the EPBC Act, although it has been declared a controlled action under the listed threatened species and communities provisions (see Section 2.2.1 of the PER).

N2 Radiological Assessment

Compass considers ANSTO to be the best-credentialled organisation in Australia to undertake a radiological assessment of the project, as presented in the PER. Furthermore, Compass refutes any inference that the Browns Oxide Project is an attempt to construct and operate a uranium mine by stealth. Should Compass discover an economically-viable uranium resource and subsequently wish to pursue it, all required environmental assessment and permitting processes would be followed, including referral under the EPBC Act.

Compass together with ANSTO have provided estimated radiological doses (Table 7.32 in the PER), avoidance, mitigation and management measures and a residual impact assessment on radiology. Section 7.13 describes the radiological assessment undertaken by ANSTO.

N3 Radiological Baseline

Background radiological data is presented in Appendix 7 of the PER (which also includes reference to data sources such as an airborne gamma-ray survey of the Rum Jungle area in 1996) and summarised in Section 7.13.1. However, Compass acknowledges that, while the existing database is sufficient for impact assessment, additional monitoring is required before and during construction and operations. Appendix 14 therefore describes a radiation monitoring program that involves:

- Site radiation surveys prior to commencement of mining activities, early in the life of the operation (i.e., after 6 months to one year) to obtain baseline radioactivity levels associated with the process, and then repeated surveys after extended plant operation (i.e., 2 to 3 years) to ascertain whether radioactivity concentrations are increasing due to the process chemistry, and and/or changes in ore and operating practices/procedures and equipment.

  The frequency of radiation surveys will be determined by the history of results obtained from progressive surveys of the operation (including baseline data collected prior to commencement of mining activities).

- Regular sampling and assaying of process streams to assess the likelihood of build-up of radionuclides. Accumulation of radioactivity will depend on the natural bleed-off of various streams in the process, and sampling and monitoring during the first 6 months to 2 years of operation will identify whether or not radionuclides are accumulating.

- Monitoring of radionuclides, e.g., ^{238}U, in seepage water from ore stockpiles and waste disposal facilities.

Compass is committed to undertake the quarterly radiation monitoring program proposed by ANSTO and summarised in Table 3.5.

Table 3.5 Radiological monitoring program

Sample Type			Assays	Method
Nº.	Description	Medium		
1	Ore	solids	U	DNA, XRF, other
2	Leach solution	solution	U, progeny	ICP MS, gamma spectrometry
3a-x*	Process scales	solids	^{226}Ra	gamma spectrometry
4	SX raffinate	solution	U, progeny	ICP MS, gamma spectrometry
5	SX other	solution	U, progeny	ICP MS, gamma spectrometry
6	Co/Ni precipitate	solids	U	DNA, other
7a-x	Ore and waste stockpile seepage	solution	U	ICP MS
8a-x	Tailing storage facility seepage	solution	U, progeny	ICP MS, gamma spectrometry
9	Treated water	solution	U, progeny	ICP MS, gamma spectrometry
10a-x	Bleed stream products	solid	U, progeny	DNA, gamma spectrometry
		solution	U, progeny	ICP MS, gamma spectrometry
11a-x	Green tissue (local plants, crops)	solids	U, progeny	gamma spectrometry
12a-x	Dusts and air samples	solids	U, progeny	DNA, gamma spectrometry
13-x	Other streams as identified in early surveys for radioactivity	solutions and solids		

* The number of samples will vary depending on experience gained.

N4 Radiological Impacts

As stated in Section 7.13.3 of the PER, the entry of NORM into the environment will be minimised through management measures relating to waste rock (see Section 4.9.2), tailing (see Section 4.10.3), erosion (see Section 4.5.2), surface water (see sections 4.14.2 and 7.8), discharge of excess water from the TSF (see Section 9.8.4), seepage from the TSF (see Section 9.8.4) and dust (see Section 7.3.3).

Compass acknowledges that accumulation of radiation may occur anywhere during mining, ore stockpiling, plant processing, water management and waste disposal (see Appendix 14), and is therefore committed to undertake the monitoring program described in Table 3.5. Management strategies that will be implemented are described in Appendix 14 and include:

- Development of a Radiation Management Plan as part of the MMP.
- Regular reporting.
- Specific measures such as appropriate equipment and procedures, instruction and training programs, and designating controlled or supervised areas.

N5 Regional Implications

The level of radiation associated with Browns Oxide Project will be low (see Section 7.13 of the PER) and hence is expected to have only minor, if any, impact in terms of regional implications.

N6 Uranium

As noted in Section 4.9.2 of the PER, 'the concentration of uranium in Browns oxide ore is very low', with uranium concentrations in the waste rock likely to be lower again. These low levels of uranium are not considered likely to require specific management measures (or impose specific constraints) concerning the use of waste rock in the construction of the TSF embankment.

Uranium dissolution in the process leach stage is addressed in Section 7.13.4 of the PER, where the accumulation of uranium in recycled process water (to be removed as part of the neutralisation waste) is described. In addition, ^{226}Ra may also be present at low concentrations in the leach solutions and could appear at higher concentrations in scales on equipment surfaces and/or absorbed into synthetic materials such as filter cloths and rubber linings.

The monitoring program described in Table 3.5 addresses the deportment of uranium through the process and in waste streams.

N7 Uranium Impacts/Management

See the responses to Issues K7, N2, N3, N4, N5 and N6.

N8 Uranium Levels

Appendix 9 of the PER presents results from multi-element analysis of one sample of sulfidic dolomite and four samples of black shale. Uranium concentrations in these waste rock samples ranged from 5.8 to 14 ppm.

As described in the response to Issue B1, five leach columns have been established to further examine the acid-forming potential of waste rock from the Browns Oxide deposit. The material in these columns ranges from high sulfur black shale through to weathered ferriginous dolomite/magnesite. Analysis of these samples, which includes uranium determination, is currently in progress. For comparison, the mean uranium concentration in ten core samples reported by ANSTO (Appendix 7) was 13.9 ppm (8.1 to 28.6 ppm).

N9 Uranium Management

The monitoring program described in Table 3.5 will allow Compass to determine if elevated radiation levels are encountered during mining or occur during processing. Possible management measures are discussed in the response to Issue N4 (and see Appendix 14).

N10 Uranium Mining

The Browns Oxide Project does not involve mining of uranium ore. Development of a uranium orebody, should Compass discover one and choose to proceed in this direction, will involve environmental assessment and permitting separate from, and additional to, that required for the Browns Oxide Project (see also the response to Issue N2).

N11 Uranium Production

Compass rejects any inference that uranium will be produced as part of the Browns Oxide Project (see also the response to Issue N2 and Issue N10).

Rehabilitation, Monitoring and Decommissioning (O)

O1 Closure and Rehabilitation

Compass rejects any analysis of the PER that describes parallels between closure of the Browns Oxide Project and that at Rum Jungle.

Rehabilitation and closure of the Browns Oxide Project will reflect current standards and will follow a process that is agreed between Compass and the NT authorities. Post-closure radiological monitoring requirements will be determined during operations, and will be based on the results from the monitoring program described in Table 3.5.

O2 Closure Criteria

Section 9.10.5 of the PER addresses end land uses within the context that the proposed final landforms and uses will be subject to ongoing discussion with stakeholders. Table 3.6 below (which is based on Table 9.5 from the PER) includes proposed final landforms that will act essentially as closure criteria for the project, with the final Mine Closure Plan being focused on achieving these criteria (or agreed variations thereof).

Water quality guidelines or criteria that might apply to the project will be determined as part of the application for a waste discharge licence under the *Water Act*. However, Compass remains committed to ensuring that the quality of the existing aquatic ecosystem in the Finniss/East Finniss River is maintained and, if possible, improved (see response to Issue O3 and Issue O6).

Table 3.6 Proposed closure criteria

Component	Final Landform
Mine pit	Walls left in stable condition, perimeter secured by fence. Final void left to naturally fill with groundwater/rainfall unless ARD is a significant issue, in which case the final void may be rapidly filled by diverting the East Finniss River through the pit. A bund will be constructed around the final excavation to prevent accidental ingress.
TSF	Tailing material capped with a 'store and release' type cover (see Figure 3.4). Excavation of a long-term spillway. Possible additional flattening of external slopes of the embankments. See Appendix 13 for further details.

Table 3.6 Proposed closure criteria (cont'd)

Component	Final Landform
Ore stockpiles	Ore removed for processing or returned to pit, area ripped, topsoiled and revegetated.
Processing plant, mine contractor area and site offices	Plant and material salvaged, structures removed, area ripped, topsoiled and revegetated. 'Clean' concrete foundations may be left in situ.
Magazine	Material salvaged, structures removed, area ripped, topsoiled and revegetated. 'Clean' concrete foundations may be left in situ.
Topsoil stockpiles	Topsoil removed for rehabilitation of other project components and base revegetated.
Sediment traps	Cleaned out, stabilised and left. The main sedimentation trap will remain with its emergency spillway.
Runoff drainage	Cleaned out, stabilised and left.
Haul and site roads	Ripped and revegetated.
Rum Jungle Road	Ripped and revegetated (unless consultation outcomes suggest otherwise).

O3 Closure Monitoring

Compass has acknowledged in Section 9.10.7 of the PER that ongoing sampling and monitoring of selected groundwater, surface water and final void water will continue for a period of not less than three years from the cessation of operations. The responsibility for ongoing monitoring, if required, will be negotiated with the government once stable conditions have been reached and water quality reflects the agreed closure criteria, and will be based on the program described in the response to Issue O6.

Post-closure monitoring will also involve the TSF and revegetation works.

O4 Closure Planning

Planning for mine closure has already commenced. Compass acknowledges that the final decommissioning plan will require further development in the early stages of operation, and will be developed in consultation with regulatory authorities and other key stakeholders during operations. The final closure plan will detail completion criteria and establish the timeline for decommissioning and determination of compliance with regulatory authority requirements.

This dynamic nature of the closure plan was acknowledged in Section 9.10.1 of the PER where it was stated that:

> Mine closure planning is a continuous process and this strategic plan is the first step. The mine closure plan will be refined as inputs from detailed project design, stakeholder consultation on end land uses and completion criteria, and various investigations/studies become available.

Compass' commitment to this is reflected in the fact that this statement is contained in the summary Table of Commitments in the PER (and updated as Appendix 11).

O5 Mine Closure

As noted in Table 9.5 of the PER, the sediment traps will be cleaned out, stabilised and left. The main sedimentation trap will be left with its emergency spillway.

Other aspects of closure will be addressed in subsequent versions of the closure plan (see response to Issue O4).

O6 Monitoring

Compass acknowledges that, prior to project development, the monitoring program (based on that described in Section 9.9 of the PER) will be agreed with DPIFM. Given the focus of a number of the submissions matters relating to water discharges, surface water and groundwater, additional detail concerning the discharge and ambient stream and groundwater monitoring programs (and based on sections 9.9.3 and 9.9.4 of the PER) is provided below. A waste discharge licence under the Water Act will be agreed with EPA prior to water discharge from the project. These programs will be reviewed and revised after 12 months of data has been obtained, and at 12-monthly intervals thereafter.

Discharge (Emission) Monitoring

Discharge or emission monitoring records the passage of contaminants at points outside the perimeter of activity. Discharge monitoring provides direct information concerning the concentrations and loads of contaminants being discharged from the operation, and also serves as a link between ambient monitoring results and the operation itself.

National Environment Protection Measure for National Pollutant Inventory (NEPC, 2000) provides lists of contaminants that must be reported if they are emitted to water above a certain annual mass threshold. Reporting requirements will be determined during detailed design and will be incorporated into the final monitoring program.

Main Sedimentation Trap

Water discharge from the site will occur primarily via the main sedimentation trap. Monitoring will therefore be undertaken (based on fortnightly sampling intervals during the wet season and monthly sampling intervals during the dry season) to characterise the nature of the water contained within this trap. Variables to be determined are described in Table 3.7. These results will be reported to DPIFM and EPA on a regular basis. Water will be treated prior to discharge if water quality does not meet water discharge requirements.

Excess Water Discharges (interception bores and main sedimentation trap)

Water quality will be monitored at the discharge point to the East Finniss River (near where the Rum Jungle Road crosses the river immediately upstream of gauging station

GS8150200) on a weekly basis during periods of discharge. Discharge rates to the East Finniss River will also be automatically monitored. Monitoring details for excess water discharges from the main sedimentation trap are provided in Table 3.7, whereas details on monitoring of interception bores are provided in Table 3.9 later in this section.

Pit Water

Pit water produced during operations, comprising groundwater inflows and incident rainfall over the pit area, will be pumped to the main sedimentation trap. The quality of pit water will be monitored on a monthly basis to provide a link between water quality in the main sedimentation trap and inputs from mine water. Pumping rates will also be automatically monitored. This will allow alternate water management practices to be implemented should pit water prove to be a major contaminant source, e.g., preferential re-use of this water in the process plant. Other water sources flowing to the main sedimentation trap, e.g., runoff from low grade ore and lead ore stockpiles, would also be monitored in the event that further investigation of poor water quality in the main sedimentation trap was required. The variables to be determined in the pit water are described in Table 3.7.

Tailing Decant

Tailing decant will be recovered and returned to the process circuit via the process water dam. The probability of excess water occurring in the TSF during the 4-year mine life is low since it is designed to retain water from major rainfall events, including the wettest year on record (1996/97) for the period 1958 to 2004. However, monitoring of TSF decant will be undertaken on a monthly basis to determine the quality of water contained within the TSF (see Table 3.7).

TSF Embankment Runoff/Seepage

Encapsulation of PAF waste rock in a designated area within the TSF means that monitoring is required to ensure that formation of ARD has been minimised. Monitoring of TSF seepage will therefore be undertaken on a monthly basis for the parameters described in Table 3.7.

Table 3.7 Summary of discharge monitoring program

Site	Sampling Frequency	Parameters
Discharge monitoring		
Main sedimentation dam	Fortnightly during wet season Monthly during dry season	• pH, conductivity, turbidity • TSS • Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered and unfiltered) • Ca, Mg, SO_4 • Alkalinity • Oil and grease • Total N and total P

Table 3.7 Summary of discharge monitoring program (cont'd)

Site	Sampling Frequency	Parameters
Discharge monitoring (cont'd)		
Discharge point to East Finniss River	Weekly during discharge Automatic monitoring of discharge rates	• pH, conductivity, turbidity • TSS • Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered and unfiltered) • Ca, Mg, SO_4
Pit water	Monthly Automatic monitoring of pumping rates	• pH, conductivity, turbidity • TSS • Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered and unfiltered) • Ca, Mg, SO_4 • Oil and grease
TSF decant	Monthly	• pH, conductivity, turbidity • TSS • Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered) • Ca, Mg, SO_4
TSF embankment runoff/seepage	Monthly	• pH, conductivity, turbidity • TSS • Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered and unfiltered) • Ca, Mg, SO_4 • Alkalinity

Ambient Monitoring

While operational and discharge monitoring should determine if environmentally significant releases have occurred, effects on the ultimate receptors within the receiving environment can be determined only by ambient monitoring.

Stream Water Quality Monitoring

Key factors to be considered in the design of the ambient stream water quality monitoring program include:

- Statistical and spatial design and sampling frequency.
- Physico-chemical and biological indicators.
- Sampling site access.
- Possible mixing zone(s) downstream of project inputs.
- Procedural details, e.g., detection limits for trace metal determinations and sampling methods, and the availability of appropriately experienced laboratories to undertake the analyses.

Monitoring Design. The goal of the ambient water quality monitoring program is to determine the status of the aquatic ecosystems that potentially can be affected by the project, and to detect improvements or deterioration over time.

Establishment of specific water quality targets for the East Finniss River (and subsequently discharge limits for water discharges) can only be achieved after beneficial uses have been declared after consultation with relevant stakeholders. A key objective in selecting sampling site locations has been to allow assessment of a management target of maintaining, and allowing improvement of, the existing aquatic ecosystem. Sites have therefore been selected to characterise existing water quality of the East Finniss River downstream of influences from the Rum Jungle site, but upstream of influences from the Browns Oxide Project. This would allow a management strategy of comparing water quality in the main sedimentation dam and water produced from interception bores with existing water quality in the East Finniss River prior to any release. Sites have also been selected downstream of the proposed discharge point to assess the impact of discharges on existing water quality (by comparison with upstream sites).

Sampling Sites. The proposed water quality monitoring site locations are shown in Figure 3.7. The proposed sites coincide with stream gauging locations previously monitored under the Rum Jungle Rehabilitation Project, where appropriate. Monitoring locations have been selected to characterise water quality of the:

- East Finniss River upstream of the discharge point:
  - New site upstream of the Rum Jungle Bridge, but downstream of diversion through Intermediate Open Cut (to capture water quality when the river diverts through the Rum Jungle mine pits during the wet season, and water quality during lower flows when water flows through the East Finniss Diversion past Intermediate and Whites overburden heaps).
  - New site upstream of Whites Open Cut and overburden heaps (to capture water quality prior to influences from the Rum Jungle site).
- East Finniss River downstream of the discharge point:
  - Immediately downstream of the discharge point near GS8150200 (at a location where the discharge is fully mixed within the East Finniss River).
  - At gauging station GS8150097, approximately 5 km downstream from the discharge point. This site has been the designated site for estimating annual pollutant loads for the Rum Jungle Rehabilitation Project.
- Finniss River downstream of the confluence with the East Finniss River (at gauging station site GS8150204).
- Finniss River upstream of the confluence with the East Finniss River (new site).

Note that the final location of the new monitoring sites will be determined taking into consideration factors such as sampling access and suitability for achieving monitoring objectives.

Water Quality Indicators. A range of factors has been examined to allow selection of monitoring indicators that would:

- Be affected by the mine.
- Are significant in terms of the quality of the receiving aquatic ecosystems.

These considerations are reflected in the program's subsequent emphasis on the following variables:

- Physical characteristics (e.g., TSS, turbidity and conductivity).
- Water chemistry (e.g., pH, sulfate, calcium, magnesium, trace metals, nutrients, chlorophyll–a, dissolved organic carbon (which ameliorates toxicity due to metals)).
- Stream flow rate.

Water sampling will include both routine monthly sampling (at all sites) and opportunistic event sampling (at a selected site) where the latter is focused on obtaining samples from the river during a flood event, thereby taking into account flow-related variations in water quality.

Sediment. Chemical analysis of sediment complements water quality data, in that the latter provides instantaneous information about the water column while the former, in its capacity as a sink for many contaminants, provides an integrated picture of stream quality over time. Bed sediment samples will be sampled annually (in conjunction with the biological monitoring described below) from river water quality sampling sites. Analyses will be undertaken for total metals in the <2000 μm fraction and particle size distribution (PSD).

Monitoring of sediment aggradation will also be undertaken, involving cross-sectional surveys at sites GS8150200 and GS8150097, to determine changes to the fate and movement of sediment within the East Finniss River.

Stream Biological Monitoring

Benthic macroinvertebrate surveys of the East Finniss and Finniss rivers will also be undertaken to determine indices of stream health and identify spatial and temporal changes in the river system. Macroinvertebrates will be sampled annually using standard methods outlined by AUSRIVAS (Australian River Assessment Scheme) or other appropriate sampling protocols.

Given the interest of a number of parties in determining the ongoing water quality and ecological status of the East Finniss and Finniss rivers due to the impacts from the Rum Jungle Mine site, Compass intends to discuss the proposed sampling program with the relevant Northern Territory and Commonwealth authorities with a view to ensuring that a cost-effective, integrated program is implemented. Details of the monitoring program will therefore be determined during these discussions.

A summary of the ambient stream monitoring program is provided in Table 3.8.

Table 3.8 Summary of ambient stream monitoring program

Site	Sampling Frequency	Parameters
Project area streams — water quality		
East Finniss River: – u/s of Rum Jungle Bridge (new site) – u/s of Whites Open Cut (new site) – d/s of discharge @ GS8150200 – d/s of discharge @ GS8150097 Finniss River: – d/s of confluence @ GS8150204 – u/s of confluence (new site)	Monthly	• pH, conductivity, turbidity • TSS • Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered and unfiltered) • Ca, Mg, SO_4 • Alkalinity (quarterly) • Chlorophyll-a and nutrients (quarterly) • DOC (quarterly) Stream flow rate (at gauging station sites)
East Finniss River @ GS8150097	Flood-event sampling	• pH, conductivity, turbidity • TSS • Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered and unfiltered) • Ca, Mg, SO_4 • Nutrients Stream flow rate
Project area streams — sediment quality		
East Finniss River: – u/s of Rum Jungle Bridge (new site) – u/s of Whites Open Cut (new site) – d/s of discharge @ GS8150200 – d/s of discharge @ GS8150097 Finniss River – d/s of confluence @ GS8150204 – u/s of confluence (new site)	Annually	• Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (<2000 μm) • Particle size distribution
Project area streams — sediment aggradation		
East Finniss River @ GS8150200 East Finniss River @ GS8150097	Quarterly during construction, then annually	• Sediment aggradation (cross-sectional surveys)
Project area streams — biological monitoring		
East Finniss and Finniss rivers – locations to be determined in consultation with relevant NT and Commonwealth authorities	Annually	• Benthic macroinvertebrate survey (AUSRIVAS)

Groundwater Monitoring

Compass will undertake groundwater monitoring to provide a better understanding of hydrogeology and groundwater quality in the surrounding area and assess changes due to the project. This monitoring will provide information concerning groundwater transmissivity and drawdown, seepage from the TSF, groundwater quality (including

impacts due to the project and influences from the Rum Jungle mine site) and effects on regional groundwater uses.

Mine Monitoring. Groundwater monitoring will be undertaken at ten bores in the mine vicinity as shown in Figure 3.5:

- Five bores located around the perimeter of the TSF (BH 1 to BH 5). These will detect seepage and, if necessary, will provide a focus for collection and recycling of seepage plumes, should this prove necessary.
- Three interception bores installed for mine dewatering, located north of the pit. These will also provide make-up water for the process plant as required, with excess water being discharged to the East Finniss River (after treatment if necessary). Volumes of water extracted from these boreholes will be recorded, in addition to monitoring of water levels and water quality.
- One monitoring bore located between the Browns pit and the Rum Jungle pits and waste rock dumps, to assess groundwater quality in inflows from these areas.
- One monitoring bore located to the north of the interception bores, to assess groundwater drawdown impacts on root zones of vegetation in this area.

Table 3.9 describes the parameters that will be monitored and the sampling frequency of the program.

Regional Monitoring. Compass will undertake monitoring at a number of existing bores in the surrounding area to reduce uncertainties identified in the conceptual groundwater model. Objectives of this monitoring include identification of the nature of aquifer boundaries and drawdown along geological faults in the direction of the irrigation area, southwest of the project area.

It is proposed that monitoring will be undertaken at 12 existing bores shown in Figure 3.8, many of which were established to monitor the impact of the Rum Jungle Mine. The position of these sites will be reviewed to take into consideration the location of project infrastructure (e.g., RN023138 is located in the area of the proposed main sedimentation trap). The 12 monitoring locations shown in Figure 3.8 cover groundwater conditions to the northeast and southeast of the project area. Monitoring sites will also be established to the northwest and southwest of the project area at locations selected to provide information concerning hydrogeology and impacts on other groundwater users, including Batchelor's groundwater supply. A number of key landholder bores will be included in the monitoring program, after negotiation with landholders once appropriate bores are identified.

Table 3.9 describes the parameters that will be monitored and the sampling frequency of the program.

Table 3.9 Summary of ambient groundwater monitoring program

Site	Sampling Frequency	Parameters
Groundwater		
Mine monitoring: • TSF periphery (BH1, BH2, BH3, BH4, BH5) • Three interception bores • One bore b/n Browns pit and Rum Jungle pits and waste rock dumps • One bore north of interception bores in area of vegetation (water level, pH and conductivity only)	Fortnightly	• Water levels • pH, conductivity
	Monthly (Quarterly when steady conditions are established)	• Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered) • Ca, Mg, Na, K, Cl, SO_4, CO_3, HCO_3
Regional monitoring: RN022039 RN022081 RN022083 RN022084 RN022085 RN022107 RN022544 RN023137 RN023138 RN023140 RN023515 RN023790 Further sites to be established to the northwest and southwest of the project area Selected bores of other regional groundwater users	Fortnightly	• Water levels • pH, conductivity
	Monthly (Quarterly when steady conditions are established)	• Al, As, Cd, Co, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Ag, Zn, U (filtered) • Ca, Mg, Na, K, Cl, SO_4, CO_3, HCO_3

O7 Rehabilitation

The mine closure and rehabilitation measures described in Section 9.10 of the PER and further addressed above relate solely to the Browns Oxide Project. Rehabilitation and closure of any other project that may be developed by Compass will be addressed separately as part of the environmental assessment and permitting process for that project.

O8 Revegetation

Revegetation measures to be included in the final Mine Closure Plan and the final Biological and Land Management Plan will focus initially on erosion control and then on habitat reinstatement for fauna species.

The clearing program (referred to in the response to Issue F5) will include an optimisation of the clearing schedule.

O9 Seepage

This is addressed in response to Issue E2.

O10 Surface Water Monitoring

See the response to Issue O4 and O6 regarding the duration of post-closure monitoring of groundwater, surface water and sediment.

O11 Topsoil

Topsoil management during construction is addressed in Section 4.5.2 of the PER. Key points include:

- The topsoil stockpiles will be formed into low, uncompacted, flat-topped mounds, up to 2 m high.
- Unnecessary compaction of the topsoil will be avoided in order to minimise degradation of soil structure.
- Where stockpiles are to be left for more than several months before re-use, they will be sowed with cover crops of fast-growing grass species (such as Cynodan, Urochloa or various sorghums) to prevent them becoming a source of dust or sediment.

Additional detail will be included in the final Biological and Land Management Plan.

O12 TSF Monitoring

See the response to Issue O6 for a description of proposed TSF drainage monitoring.

O13 TSF Seepage Management

This is addressed in response to Issue E2.

Rum Jungle (P)

P1 Groundwater Impacts

Consideration of possible impacts of drawdown on the Rum Jungle Mine pits is given in Section 7.8.4 of the PER. The proposed groundwater monitoring program (described in

the response to Issue O6), which contains monitoring bores on the Rum Jungle site, will provide information as to possible changes to the local groundwater regime.

P2 Increased ARD at Rum Jungle

This issue was addressed in Section 7.9.4 of the PER.

P3 Links with Rum Jungle Rehabilitation

Compass recognises its obligations with respect to the Browns Oxide Project area and will implement a rehabilitation program that reflects current standards and requirements. Responsibility for rehabilitation of the Rum Jungle Mine or associated impacts does not belong to Compass. Similarly, determination of the future of the Rum Jungle Mine site is likely to involve a number of stakeholders, of whom Compass is one.

Nevertheless, Compass is of the view that sufficient recognition must be given to the fact that the Browns Oxide Project will be developed within a modified natural landscape that has varying degrees of disturbance from previous exploration activities and, more importantly, from previous mining at Rum Jungle (see Chapter 3 of the PER). Notwithstanding the constraints imposed by this existing environment, Compass has committed to a management target of maintaining, and allowing improvement of, the existing aquatic ecosystem.

P4 Mining in Rum Jungle Area

A decision as to whether the Rum Jungle Mine site could be mined or not, assuming the existence of an economically-viable deposit, does not lie with Compass alone. Key stakeholders involved in such a decision would be the Northern Territory and Australian governments, and Indigenous groups.

Additional information is contained in responses to Issue P3 and Issue S1.

P5 Rum Jungle Interactions

See the response to Issue P1, P2, P3, P4 and S1.

P6 Source of Material from Rum Jungle Site

As noted in Section 4.5.1 of the PER, the main requirement for external borrow material will be the first stage of the TSF construction, and this material will be sourced from within the project footprint or, if this is not possible, from within the footprint of a possible future pit for the sulfide deposit on the Browns mineral leases. This list is preliminary and will be refined once detailed engineering is completed.

Socio-economic Impacts (Q)

Q1 Local Impacts

The socio-economic impacts of the project are described in Section 7.10 of the PER and address matters such as employment, economic benefits, existing services and facilities, education, accommodation and tourism. Concerning the last of these issues, the project area is located some 14 km from Litchfield National Park and is not expected to materially affect the conservation values of that park.

Possible impacts on Batchelor inhabitants from factors such as noise and dust are also addressed within the PER, with additional information on risks associated with increased traffic being given in the response to Issues R4, R5, R6 and R7 (and Appendices 15 and 16).

Compass acknowledges that a development of a project such as the Browns Oxide Project may not be compatible with the lifestyle preferences of all inhabitants in Batchelor and the surrounding area. However, the project is consistent with both a key land use objective for the Coomalie region, i.e., to promote the development of mining and extractive industries (see Section 7.7.1 of the PER) and historic land uses in the area.

Q2 More Information Required

Compass contends that the information presented in Section 7.10 of the PER is sufficient for the purpose of impact assessment. The social monitoring program described in the PER (Section 9.9.5) will be reviewed after 12 months of data have been obtained.

Q3 Regional and NT Impacts

Compass notes the NT Department of Business, Economic and Regional Development comment that the department has no issues of concern in relation to the PER.

Q4 Health Service Interactions

Given that the workforce will be sourced locally and from Darwin, there is expected to be little additional demand on the Batchelor Community Health Centre. Nevertheless, Compass will undertake discussion with the centre to further explore possible concerns.

Q5 Potential Risk to BIITE

The Batchelor Institute of Indigenous Tertiary Education (BIITE) is one stakeholder that may be potentially affected by the project. While adverse environmental impacts are unlikely (as described within the context of the various issues addressed in Chapter 7 of the PER), the project is likely to result in beneficial socio-economic impacts, particularly in terms of training and employment opportunities.

Traffic and Roads (R)

R1 Future Expansion

Compass acknowledges that any proposal for future expansion may require further detailed traffic assessments.

R2 Impact on Local Roads

Appendices 15 and 16 describe a Level 5 — Road Safety Audit of the Batchelor and Rum Jungle roads from the Stuart Highway to the Litchfield Park Road intersection, and a review of traffic-related risks and impacts associated with project development, respectively.

Average Annual Daily Traffic (AADT) counts for the Batchelor Road and Litchfield Road in 2004 are 645 and 353, respectively, with more than 85% of traffic being cars/cars and trailers, and 8 to 12% being rigid vehicles and buses. The corresponding estimated AADT count for both Rum Jungle Road and Litchfield Park Road is 492 vehicles.

Taking into account the existing traffic movements and those that will be associated with the project (see Section 4.12.4 and Appendix 16), projected combined traffic estimates have been calculated (Table 3.10).

Table 3.10 Projected combined traffic*

Traffic	Road	Cars/ Cars+trailers	Rigid Vehicles	Articulated Vehicles	B-Doubles, Double Road Trains	Triple Road Trains
Existing	Batchelor	559	75	9	0.65	0
	Rum Jungle	425	55	11	0.65	0
	Litchfield Park	425	55	11	0.65	0
Mine construction	Batchelor	57	4	0	2	0
	Rum Jungle	57	4	0	2	0
	Litchfield Park	0	0	0	0	0
Mine operational	Batchelor	100	0	0.5	4.7	2
	Rum Jungle	100	0	0.5	4.7	2
	Litchfield Park	0	0	0	0	0
Total (including construction phase)	Batchelor	616	79	9	3	0
	Rum Jungle	525	55	11.5	5.3	2
	Litchfield Park	425	55	11	0.65	0
Total (including operational phase)	Batchelor	659	75	9.5	5.3	2
	Rum Jungle	525	55	11.5	5.3	2
	Litchfield Park	425	55	11	0.65	0

Table 3.10 Projected combined traffic* (cont'd)

Traffic	Road	Cars/ Cars+trailers	Rigid Vehicles	Articulated Vehicles	B-Doubles, Double Road Trains	Triple Road Trains
Relative increase in construction phase	**Batchelor**	**0.10**	**0.05**	**0.00**	**3.08**	**0.00**
	Rum Jungle	**0.13**	**0.07**	**0.00**	**3.08**	**0.00**
	Litchfield Park	**0**	**0**	**0**	**0**	**0**
Relative increase in operational phase	**Batchelor**	**0.18**	**0.00**	**0.06**	**7.18**	**2.00**
	Rum Jungle	**0.24**	**0.00**	**0.05**	**7.18**	**2.00**
	Litchfield Park	**0**	**0**	**0**	**0**	**0**

*Bold rows show relative increases due to the Browns Oxide Project (calculated as a fraction of the existing traffic, except for triple road trains where absolute vehicle numbers are used).

The impact of project-related traffic is expected to be marginal with respect to road carrying capacity, with the geometry and carriageways of the road sections being adequate.

The heavy vehicle proportion of the marginal increase to current traffic will comprise only a low number of trips through Batchelor and the road network. No significant increase in risk within Batchelor is expected, primarily due to the slower speed environment (Appendix 16).

R3 Impacts on Future Arterial Road Corridor

Compass acknowledges that the final Mine Closure Plan will take into account Coomalie planning requirements such as future arterial road corridors and similar. The forming and bituminising of Lithgow Road has been considered in the light of future arterial road corridors and present plans can be readily adopted along this route.

R4 More Information Required

See the response to Issue R2.

R5 Risk Assessment

See the response to Issue R2.

R6 Road Safety

Compass will enter into discussions with the Road Networks Division concerning improvements to the local road network that may be required. Possible measures to be considered include (see Appendix 15):

- Lowered speed limit on rough and windy road sections.
- Improved guideposts and line marking.
- Removal of poles and other obstructions.

R7 Upgrade Road Intersection

Further to the response to Issue R6, Compass will specifically consider improvements to the intersection of Rum Jungle Road and Litchfield Road, where these may include (see Appendix 16):

- Additional/improved signage.
- Contrasting aggregate seal to reinforce the signage and line marking.
- Reduced speed limit on Rum Jungle road to 80 km/h from the currently unlimited speed limit.

Water and Waste Management (S)

S1 Contaminated Groundwater

Compass recognises that there is some uncertainty associated with the quality and quantity of groundwater that will be produced during dewatering, due primarily to the influence of contamination from the Rum Jungle Mine site and uncertainties in the hydrogeology of the area. Despite 12 years of monitoring conducted in the area as part of the Rum Jungle Rehabilitation Project by the Federal and Northern Territory governments, costing approximately $3 M (Supervising Scientist, 2002), there remains a general lack of information on groundwater movement and contamination at the Rum Jungle site, as noted in ANSTO (2002). Due to this knowledge gap, it is currently not possible to accurately predict the implications of contamination from the Rum Jungle Mine site for the Browns Oxide Project.

Compass will extend its groundwater monitoring as described in the response to Issue O6 to provide a better understanding of the area's hydrogeology (including groundwater quality). This benefit associated with development of the project is recognised in ANSTO (2002). Compass will consult with the managers of the Rum Jungle Mine site regarding this monitoring program as part of its stakeholder consultation program. Should monitoring indicate that the quality of water produced from interception bores is unacceptable for discharge to the East Finniss River, Compass will provide treatment as described in the response to Issue S27. Consideration of the possible impact of drawdown of water contained in Rum Jungle mine pits is given in Section 7.8.4 of the PER.

S2 Darwin River Dam Impacts

The Darwin River Dam is located in a different catchment to the Browns Oxide Project and beyond the area of predicted groundwater drawdown, and is unlikely to be impacted by the project, including dust emissions. Dust will be managed as described in Section 7.3.3 of the PER to comply with relevant dust assessment criteria. As described

in Section 7.3.4, levels of total suspended particulates are expected to comply with ambient air quality criteria well before the dam. Radiological levels in dust are assessed in Section 7.13.4 of the PER and are not considered to present a significant risk.

S3 Downstream Water Quality Impacts

As discussed in the response for Issue S1, it is not currently possible to accurately predict the quality of excess water discharges (from interception bores and the main sedimentation trap), and hence the consequent downstream water quality impacts, due to uncertainties concerning groundwater quality and hydrogeology.

However, Compass proposes to manage excess water discharges such that existing water quality of the East Finniss and Finniss rivers is maintained and allowed to improve. Water treatment will be undertaken if required to achieve this objective, as described in the response to Issue S23. Monitoring will also be undertaken as described in the response to Issue O6 to ensure that water discharges are of suitable quality and that there is no deterioration of existing water quality in the East Finniss and Finniss rivers. Magnesium and calcium will be included in the water quality monitoring program.

S4 Fate of Browns Test Pit Water

Water in the existing trial pit will be used in the process plant, treated to a suitable quality for direct discharge to the East Finniss River or pumped to the main sedimentation trap.

S5 Groundwater Discharge

Groundwater from the interception bores will be discharged to the East Finniss River at the same location as the discharge point from the main sedimentation trap. The discharge will be monitored as described in the response to Issue O6. Erosion at the discharge point will be controlled by installing rip rap lining, gabion lining or a concrete filled 'revetment' mattress (to be determined during detailed design).

S6 Groundwater Impacts

The issue of potentially contaminated groundwater as a legacy of the Rum Jungle Mine and the impact on downstream water quality is addressed in the response to Issue S1.

A number of submissions have expressed concerns regarding reduced groundwater availability for other users and impacts on vegetation. As discussed on Section 7.9.4 of the PER, it is considered unlikely that drawdown due to pit dewatering will reduce water availability for other users. Monitoring of the local and regional groundwater will be undertaken as described in the response to Issue O6, consistent with recommended bore locations described in Appendix 3 of the PER, to identify material impacts on other groundwater users and provide a better understanding of regional groundwater behaviour. Monitoring will also be undertaken to identify if water in root zones of sensitive vegetation communities is impacted by mine dewatering, as described under Issue O6. Possible management measures should such impacts be determined are discussed in the response to Issue F15.

S7 Groundwater Impacts/Monitoring/Rum Jungle Interactions

These issues are addressed in response to Issue S1.

S8 Groundwater Mitigation

Compass will consult with local groundwater users as part of its community consultation program. Appropriate mitigation measures will be developed, including identification of alternative water sources, in consultation with affected parties should loss of groundwater resource occur due to project activities.

S9 Groundwater Understanding

See the response to Issue S1.

S10 Management Plans

The management of effluent from the package sewage treatment plant will be included in either the revised water or waste management plan prepared for the Mining Management Plan (and see the response to Issue E6).

S11 Mine Pit – End Use

The potential for development of ARD from pit walls will be monitored during development of the mine. If necessary, various management strategies will be investigated to control ARD, such as application of layers of Virotech Terra B® and shotcrete to PAF material in pit walls to inhibit oxidation. Temporary diversion of the East Finniss River to rapidly fill the mined-out pit will be considered only if ARD from pit walls is likely to have a detrimental effect on agreed beneficial uses of the pit lake, as determined in consultation with relevant stakeholders. The consequences for water flow and quality of the East Finniss River would be considered prior to implementation of this management strategy.

Modelling will be undertaken prior to mine closure to determine the time to fill the final void, the probability of any overflow during the wet season and likely pit water quality.

S12 Mine Pit Water Quality

The closure objective for the mine pit is that water quality is suitable for the agreed beneficial use. Description of any treatment that may be required to achieve this objective will be provided in the final Mine Closure Plan, taking into consideration information obtained during operations.

S13 Mine Water

See the response to Issues S1, S11 and S12.

S14 Mt Bennet Dam Catchment

Water discharges from the project will be licensed under the Water Act and hence will be compatible with the relevant beneficial uses of the Finniss/East Finniss river system (once declared).

S15 Potable Water Supply

The project's potable water supply will be trucked to the site.

S16 Surface Water Management

Runoff from the ROM, low grade ore and lead stockpiles will report to the main sedimentation trap, where water quality will be routinely monitored (see the response to Issue O6). Excess water requiring discharge to the East Finniss River will, if required, be treated to a suitable quality prior to release. The quality and quantity of these discharges will be monitored at the discharge point as described under Issue O6. Should poor water quality in the main sedimentation trap be an issue, the sources of contamination would be identified through additional monitoring. Alternate management strategies for this water would be pursued, such as reuse in the process plant.

S17 Surface Water Management/Sedimentation Trap Design

The locations of all three sedimentation traps are shown in Figure 3.5. Most of the surface flow is towards the east, only flowing to the west from the west end of the plant site. The operating plan for the main sedimentation trap will be to provide sufficient freeboard to allow capture of water from the two smaller sedimentation traps.

S18 Surface Water Management/Water Structures Design

Detailed design of the sedimentation traps, TSF, process water dam and other structures involved in surface water management will occur once project approval has been obtained. The design philosophy incorporates zero discharge from the TSF (except under extreme rainfall conditions) with discharges from the main sedimentation trap to occur primarily during the wet season.

S19 Surface Water Monitoring

Further details on proposed water monitoring programs is provided in response to Issue O6.

S20 Surface/Groundwater Quality

The management target for surface waters proposed by Compass to maintain, and allow improvement of, the existing ecosystem is consistent with the approach recommended by ANZECC/ARMCANZ (2000) for highly disturbed ecosystems, such as the East Finniss River. Compass proposes to treat any contaminated groundwater drawn from the Rum Jungle site to a suitable quality prior to release to the East Finniss River.

S21 Tailing Management

Returning tailing to the pit would sterilise deeper sulfide resources should Compass (or other parties) wish to develop this resource in the future (subject to obtaining necessary approvals).

S22 TSF Seepage Water Quality

See the response to Issue E2.

S23 Waste Management

Compass will maximise the extent to which waste is managed via waste facilities at Batchelor and/or Darwin rather than using on site facilities (and being consistent with the standard waste minimisation principles of avoid, minimise, reuse, recycle/reclaim, treat and dispose (see Section 9.8.7 of the PER).

S24 Waste Rock

Stage 1 material for construction of Zone 1 of the TSF will be sourced from a borrow pit located within the storage area of the TSF (see Appendix 13). It is intended to limit material taken from this borrow to a depth of around 1.0 to 1.5 m, with the intent of leaving at least 3 m of the existing soil layer in place over the entire base of the storage area.

Maximum utilisation will be made of the NAF waste rock from the open pit to provide the necessary rockfill for the TSF embankment. The embankment has been sized to provide capacity for both the tailing and the projected PAF waste within the confines of the low permeability liner to the external embankment. An internal dividing bund will separate the tailing from the PAF waste rock within the embankment (see Appendix 13 and the response to Issue B3).

S25 Water Balance

Discharge rates from the main sedimentation determined in the preliminary water balance modelling for various scenarios are as presented in Figure 4.16 of the PER. Further refinement of the water modelling will be undertaken during detailed design, which will also include design of the sedimentation traps.

S26 Water Management

Issues such as water quality targets and discharge quality from the main sedimentation trap are addressed in response to Issue S3 and O6.

S27 Water Treatment

During the peak of the wet season, the main sedimentation trap (containing surface runoff and pit water) may contain more water than necessary for processing requirements. If the capacity of the sedimentation trap is exceeded, water will be discharged to the East Finniss River. Similarly, groundwater extracted from interception

bores, in excess of plant requirements, will also be discharged to the East Finniss River. Any discharge to the East Finniss River will be treated as necessary to ensure conformance with the water discharge licence. The proposed location for the water treatment plant is shown in Figure 3.5.

The treatment process will use a conventional precipitation treatment plant system, with specifications to be finalised during detailed design. The operation of this process involves precipitation of metals as insoluble metal hydroxides under alkaline conditions. Water requiring treatment will be neutralised in a mix tank by controlled addition of hydrated lime to attain a desired pH set-point, typically pH 9.5 but dependent on the metals to be removed. If high amounts of iron are present in the water, aeration may also be undertaken to reduce the amount of lime required to precipitate this metal. After a suitable reaction time, the slurry will then be fed to a clarifier for solid/liquid separation, where a flocculant may be added to improve the settling characteristics of the precipitate. This sludge will be pumped to the TSF and the clarifier overflow will be released to the East Finniss River after appropriate monitoring. A sand filtration system or polishing pond could be used to reduce residual concentrations of suspended solids if necessary. Such a treatment system has been used for the past 25 years to treat contaminated water from the Brukunga Mine Site in South Australia (Taylor and Cox, 2003).

Each of the metals has a specific pH at which its solubility is minimal. The selection of the pH at which the metal hydroxides are to be precipitated will therefore be dependent on the mixture of metals in the water. Effective precipitation of metal hydroxides of Al, Cu, Fe, Pb, and Zn (to a concentration of 0.1 mg/L or lower) can be achieved at a typical pH set-point of 9.5 (Environment Canada, 1987; EPA, 1982). Other metals such as Ni and Cd require a higher pH, in the range 10.5 to 11 to effectively precipitate the hydroxides. Manganese precipitation is variable due to its many oxidation states, but will generally precipitate at a pH of 9.0 to 9.5 (although a pH of 10.5 is sometimes necessary for complete removal of manganese (Skousen et al., 2006)). Interactions among metals will also influence the rate and degree to which metals precipitate, e.g., co-precipitation with Fe will largely remove Mn from water, if Fe concentrations are much greater than Mn (Skousen et al., 2006). Metal hydroxides also become increasingly soluble if the pH increases above the level at which the solubility is a minimum (Environment Canada, 1987).

Since the minimum solubility of metal hydroxides occur at different pHs, it will be necessary to determine an optimum pH control set-point. This may be based on the need to reach a low concentration for a particular metal that is regulated to a lower concentration than other metals. The level of residual dissolved metals after treatment will therefore be dependent on the mixture of metals at elevated concentrations in the water and the pH control set-point in the treatment plant. Adjustment of the final discharge pH may be required (by the addition of acid) to lower the pH to a suitable level for discharge to the environment (although it may be considered more beneficial to maintain an alkaline discharge to provide some neutralisation to the acidic water of the East Finniss River).

As discussed in Section 7.9.1 of the PER, monitoring of groundwater undertaken for the Rum Jungle Rehabilitation Project indicated that leachate had contaminated the ‘shallow

aquifer' in the vicinity of the Rum Jungle waste dumps with Cu, Mn, Ni and Co, with typical concentrations being 10 to 100 mg/L. However, it is unlikely that groundwater extracted during pit dewatering for the Browns Oxide Project will be of such poor quality since ARD-impacted groundwater would be diluted with water drawn from deeper, cleaner groundwater.

The water quality of the East Finniss River adjacent to the Browns Oxide Project at gauging station site GS8150200, as measured in recent years, is shown in Table 7.25 of the PER. Metal concentrations measured in pools during the dry season are higher than contained in contaminated shallow groundwater in the vicinity of the Rum Jungle waste dumps. With water treatment at an appropriate pH control set-point, it is expected that any contaminated groundwater drawn to interception bores can be successfully treated to reduce metal concentrations to levels currently existing in the East Finniss River during the wet season.