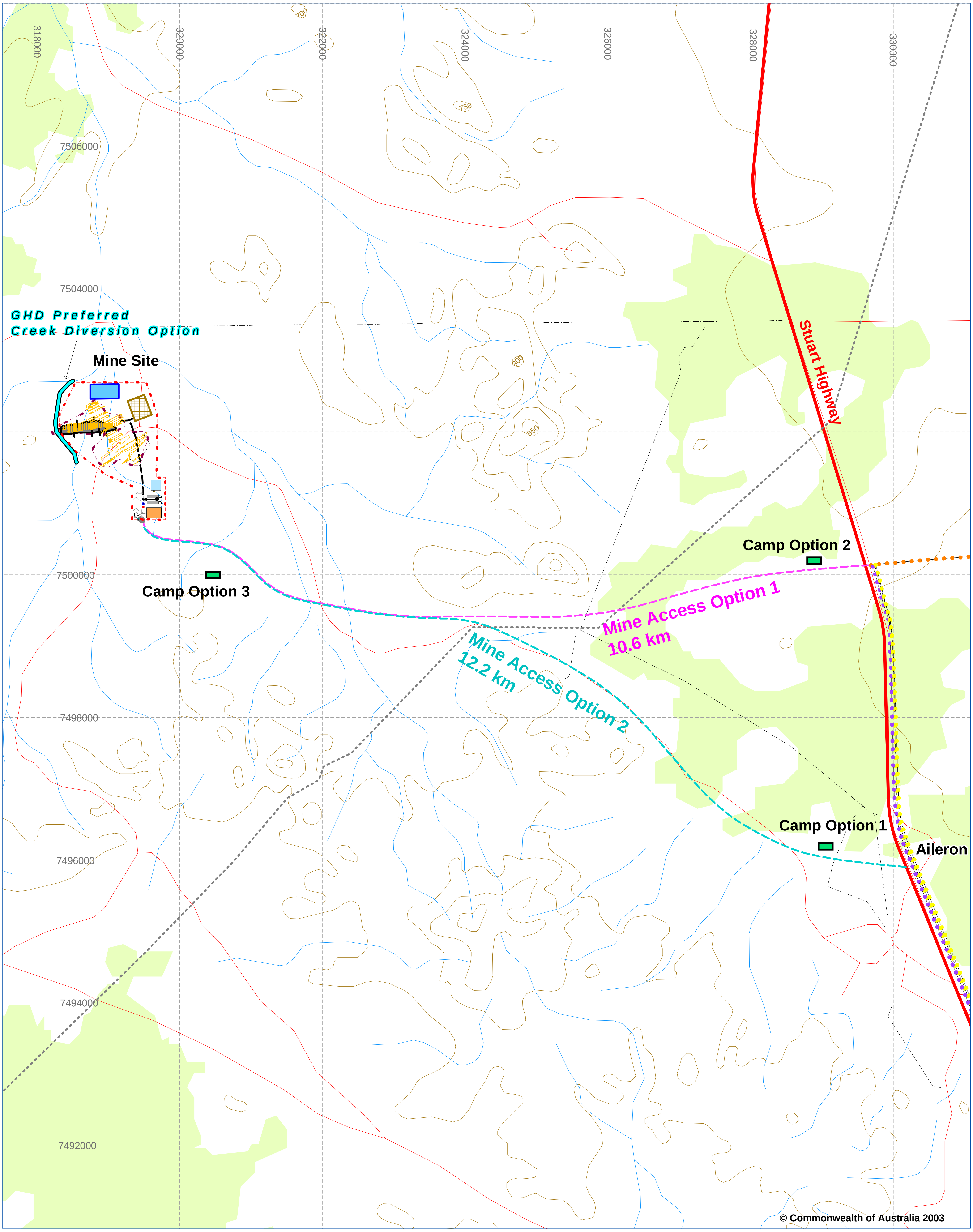
5. Mine Operations

5.1 Mine Design

The mine design study (currently underway) involves:

- Location of the initial pit top bench in the area of the northern ore zone. This area has been subject to a number of exploration drilling campaigns providing a considerable amount of information on the extent and quality of the ore body;
- An initial pit large enough to provide up to 1,000,000 tpa of ore over a 15 year period;
- An initial pit design that minimises the amount of waste mined over the first five years;
- A limit of oxidization (LOX line) assumed to be 25m in depth;
- A water table assumed to be at 12m depth from the surface;
- A mine designed to incorporate 10m benches with 5m safety berms;
- A pit wall angle of repose through the oxidized zone assumed to be stable at 45°;
- A pit wall angle through competent and unoxidized zones stable at 70°;
- A maximum 10% grade access haulroad; and
- An access haulroad designed to accommodate 40 tonne haultrucks.



Native Vegetation	Major Roads and Highways	Existing Gas Pipeline	Contour Lines
Watercources	Minor Roads and Tracks	Fence Lines	

Topographic data provided the Commonwealth of Australia, Geoscience Australia 2007. In consideration of the Commonwealth permitting use of data, you acknowledge and agree that the Commonwealth and GHD Pty Ltd gives no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or cost (including consequential damage) relating to any use of the data.

Prepared.	BM	Date	Workspace	Mine Area Layout A3P 50k
Approved.	JH	Date	Location	G:43\21188\GIS\Projects\MapInfo_MineSites

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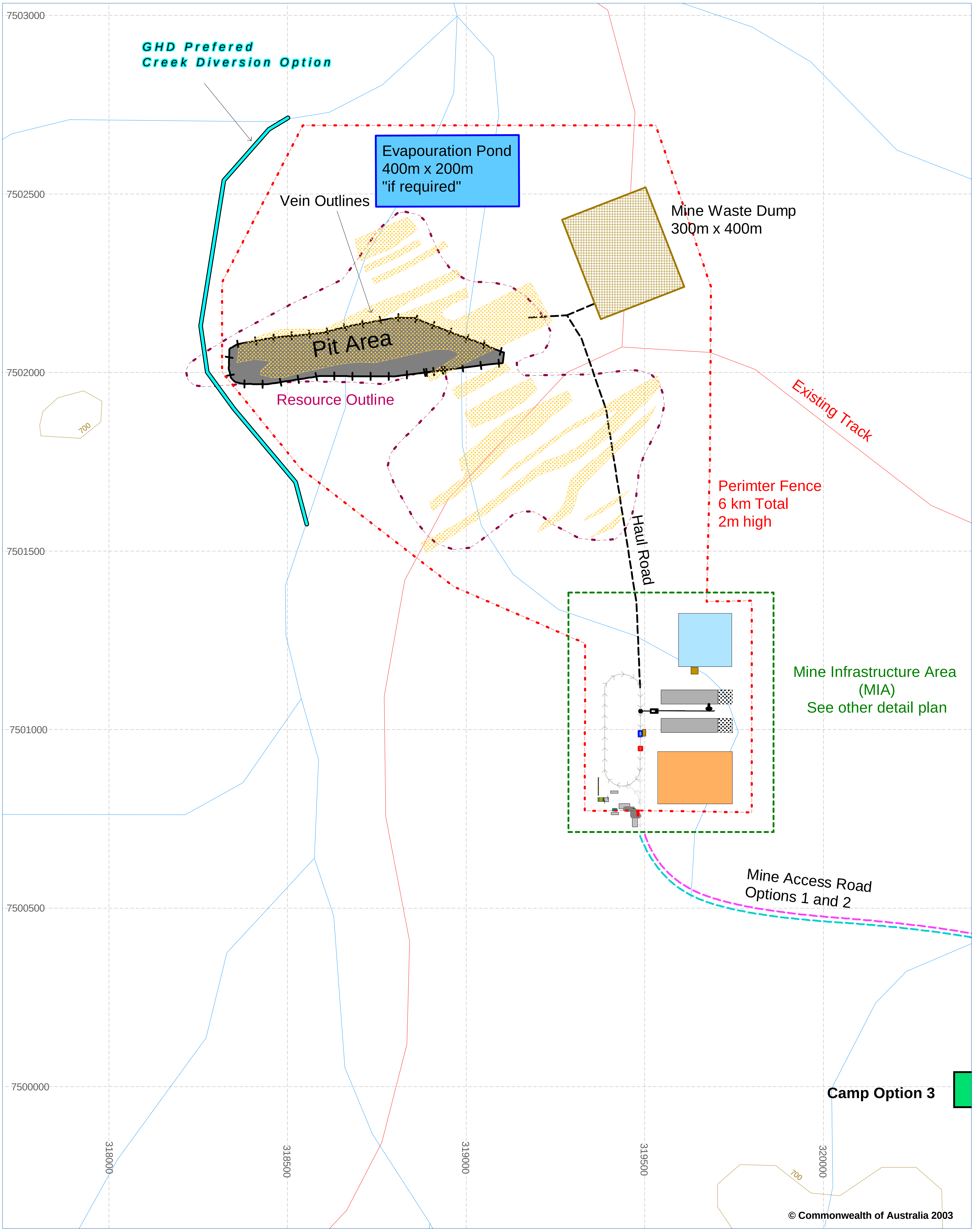
Nolans Bore NOI

Figure 4 Mine And Camp Areas

Project No: 41 / 21188	Date: 12/07/2007	A3	Scale: 1:50 000	Map Grid GDA 94 (MGA Zone 53)



Native Vegetation

Watercources

Minor Roads and Tracks

Contour Lines

Prepared.	BM	Date	Workspace **Mine Site Layout A3P 10k**
Approved.	JH	Date	Location **G:43\21188\GIS\Project\MapInfo_MineSite**

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Figure 5 Mine Site Arrangement

Project No: **43 / 21188** | Date: **12/07/2007** | **A3** | Scale: **1:10 000** | Map Grid **GDA 94 (MGA Zone 53)**

The initial pit location was chosen to minimise the movement of waste and maximise ore recovery to a Rare Earth Elements (REE) cut off of 1%.

5.2 Mine Schedule

Current geological interpretations and preliminary mine design investigations indicate a minimal amount of waste needs to be moved over the life of the mine. It is expected that ore in the oxidised zone will be freely dug with an excavator. The un-oxidized ore and the host rock (a granitic gneiss) appear to be relatively competent and will require drilling and blasting.

5.3 Mining Equipment

It is envisaged that where possible the mine will operate to maximise the productivity of the selected mining equipment. It is envisaged that a combination of blasting with low powder factor and high breakout force of the mining excavator will produce ore with a top size of <1m. This technique reduces the amount of fines generated by the mining process. Ore will be loaded into 40 tonne haul trucks for transport to the ROM pad and crushing station. Ore in the pit will be freely dug with a Hitachi EX1200 (or equivalent) excavator and transported to the ROM pad in 40 tonne Cat 740 articulated haul trucks (or equivalent). This may result in the targeted production of up to 1,000,000 tpa of ore being achieved by campaign mining. Other options will be considered as the studies are completed. If campaign mining were selected, ore stockpiled on the ROM pad would be progressively reclaimed over the remainder of the year to meet the ore transport schedule. The equipment listed is indicative. Other equipment of similar size/capacity may be used.

Table 1 Proposed Mining Equipment

Equipment Item	Units
Generator (3 x 200 Kw)	3
Light vehicles	10
Pumps	3
Lighting plant	6
CAT 740 articulated trucks	2
Water truck	1
CAT 12H grader	1
Multipurpose crane	1
CAT 988 loader	1
Hitachi EX1200 excavator	1
CAT D10 dozer	1
Fitters truck	1

5.4 Creek Diversion

A Sinclair Knight Merz (SKM) study completed in September 2006 discusses the potential routes for diversion of the ephemeral creek (locally named Kerosene Camp Creek). They considered two diversion options to the west of the site, and two options to the east. They determined the most efficient means of creek diversion would be their E1 option. This option would be approximately 2km in length. Most of the length would require an excavated channel and construction of levees.

Both eastern diversion options from the SKM study present major issues with the necessity of the diversion passing through the proposed Mine Infrastructure Area (MIA), waste dump and service roads in the confines of the proposed mine site.

One possible solution would be to divert the creek around the western side of the open cut, avoiding the granite outcrop and keeping it outside the controlled mine area so as to allow for future expansion. This however requires a substantial amount of excavation. Refer to the mine layout plan in Figure 4.

The creek diversion is not required until after year three of the mining operation. The intermediate pit shell can be altered to allow continued operations behind bund walls east of the existing Kerosene Camp Creek. This would allow for additional consideration of options for diversion of the creek.

A detailed surface terrain survey is required to select the route that avoids excessive excavation in rock, and whether works can be staged at later date. Studies in relation to the creek diversion are underway and will be submitted with future approvals.

5.4.1 Creek Diversion Design Basis

The creek diversion will require a levee across the original creek channel, an excavated diversion channel and possibly flood protection levees along one or both sides of the diversion channel.

Typical design criteria for creek diversions are:

- 100 year Average Recurrence Interval (ARI) design flood event;
- Freeboard provided between the 100 year ARI flood level and the top of diversion channel or top of flood protection levee to allow for wave action, settlement of levees, and a margin of safety against flood events larger than the design flood; and
- A diversion channel that is stable in the long-term. Flow velocities need to be limited to minimise the risk of erosion (generally less than 3 m/s) with scour protection provided where necessary.

Water quality in the diversion channel must be acceptable to regulated standards.

5.5 Blasting Requirements

It has been considered that specialist contractors would undertake drill and blast at Nolans Mine.

The objective of blasting is to provide fragmentation to < 1m-particle size with minimal heave and vibration, limiting dust generation. It is expected that 10m benches will be blasted with relatively low powder factors to fracture the rock *in situ*. It is expected that all production shots adjacent to permanent highwalls will include pre-split blasting. The excavator will dislodge any hang up material to maintain batters free of loose material. Metallurgical test work indicates that coarse material feed to the washing plant optimises the heavy media separation process. Therefore an objective of drilling and blasting will be to minimise blast fragmentation.

5.6 Waste Rock Dump

A waste rock dump will be designed according to sound engineering principles. It will be stable and located in close proximity to the mine, away from drainage features, creeks or heritage sites. Access roads to the dump will be built in accordance with sound engineering practice. Construction material characterisation and geochemical assessment will be completed on the anticipated waste rock types prior to mining. This will ensure appropriate designs are incorporated into the dump. Appropriate procedures will be implemented to control dump construction activities including tipping.

5.7 Grade Control

It is apparent from current geological information that ores with variable grades, material types, and differing geochemistry will be mined during the initial fiveyear mining period (particularly the oxidised ores). The current block model does not provide sufficient information on ore properties to adequately define a grade control system for mining operations. No specific grade control function has been applied at this stage of development. It has been assumed that ore stacking on the two ROM stockpiles will provide a reasonably blended ore product for feeding to the wash plant.

5.8 Ore Handling

Ore hauled from the mine in 40t haul-trucks would dump directly onto a ROM pad. A dozer or front-end loader (FEL) would be used to heap the ore for storage, feed the reclaimer or the crusher directly as part of the crushing/beneficiation process.

Stockpiles and all other ore transfers will be managed with appropriate dust suppression measures to reduce dust emissions to acceptable levels.

5.8.1 Stockpile Reclaiming

Ore would be progressively reclaimed from the ROM pad over the year in accordance with the ore transport schedule and processing requirements. The initial concept design of two ore stockpiles (160m x 40m x 15m) with 40 x 40m extensions should be sufficient for the operation.

A separate oxidised ore ROM stockpile may be required.

The use of apron feed stockpile reclaimation negates the need for complex and expensive dump station structures to house multi-stage crushers. Two options for reclaimation are listed below.

5.8.1.1 Option 1 FEL Reclaim

It is proposed to recover ROM ore from the stockpile using a:

- Loader – 988;
- Dump truck - Cat 740;
- Feeder/breaker;
- 200 tonnes per hour (tph) sizer;
- 80 m inclined conveyor; and
- 400 tonne road truck load bin after the washing plant.

5.8.1.2 Option 2 Stockpile Reclaimer

As an alternative to FEL/truck reclaimation, a stockpile reclaimer with breaker can be used to feed <250mm ore onto a conveyor that passes a 200 tph sizer. The product from this process would be a < 50mm ore to be washed and then loaded into a 400 t road truck-loading bin by an inclined conveyor.

5.8.2 Crushing

It is assumed that a 2-stage crushing process will be required to produce an ore grade that has <50mm topsize. A product size of <50mm with low quantities of fines should be self-cleaning when tipping ore from containers. It has been assumed that the crushing circuit will require a breaker and a crusher/sizer.

Unconfined shear strength (UCS), ROM ore size distribution analysis and handling management studies will need to be completed to determine the most appropriate crushing equipment.

It is proposed that ore will be reclaimed from the ROM stockpile and loaded to the conveyor/crushing system. The crushing system will be designed and constructed to minimise the creation of airborne dust.

Dust from the crushed ore presents a radiation dose risk if inhaled. Therefore all crushing, storage and loading will be performed under rigorously controlled conditions (see 5.10).

Primary ore separation or beneficiation, performed at the mine site, may provide an alternative processing option. The <50mm product may be further reduced to a <6mm product that undergoes primary ore separation through a jig plant or other washing plant. Reducing the product size from <50mm to <6mm will require another crushing step. This step will produce dust and will require rigorous dust mitigation measures. Cone crushers are suitable for fine crushing of the materials with a UCS of 30 megapascals (Mpa) as they can be easily fitted with dust suppression equipment.

5.8.2.1 Primary Breaker

A Stamler stockpile reclaimer breaker feeder is proposed as the primary breaker for the project. The ultimate choice of equipment will depend upon the hardness of the ore. It is assumed that a skid mounted stockpile breaker will be sufficiently robust to handle the ore.

5.8.2.2 Secondary Sizing

The crusher proposed is of a 200 tph size, being a relatively simple item of equipment. Its use will reduce the generation of fines during the crushing process.

5.8.3 Primary Ore Separation

Ore may undergo primary separation using a heavy media or jig plant. The Nolans ore is reported to be 99% fluorapatite/cheralite, which is relatively soft and friable with a high specific gravity (SG) of approximately 3.0. The granite gneiss waste is hard, brittle and has a moderate SG (2.2). These points will be clarified once further bulk sample analysis data are available. A jig plant would be suitable for the Nolans project given the above differences in SG between the ore and the waste. A jig plant is small in size and does not require expensive media.

A jig is a gravity separator that separates particles of varying density in a medium of known density such as water or a bed of homogenously blended solid material. The ore having a greater SG will ‘sink’ and be collected while waste products of a lesser SG will ‘float’ and be discarded. Air pulsation of water in the jig bath releases a homogenous layer of particles on the screen deck of the jig. This results in the separation of particles into layers based on their density. The denser, heavier particles (in this case the ore) sink or settle and the lighter particles (waste material) float to the top. Materials are then discharged into respective vessels through a gate that is controlled by a float. The system is designed to suit an input feed system and the appropriate density cut-off points employed in the system. Current benification testwork indicates that a plant of this type will work favourably with the Nolans ore. The wet product from this plant will be partially dried to reduce weight for transportation. tA number of options are being investigated. Arafura's preferred method for drying is to utilize solar drying thereby reducing site energy requirements. The use of a thickener is being considered, to optimise water recovery form the beneficiation pocess. Recyling would provide obvious benefits in reducing makeup water demand.

5.8.4 Primary Ore Separation Waste

Depending on mining rates and ore separation recovery criteria, approximately 300,000 of waste will be produced each year from the primary separation jig. It is envisaged that the waste may be suitable for co-disposal with mine waste within the mine waste rock dump. Waste products produced by the jig will typically be <6mm - 0.5mm and have the consistency of fine gravel. A fine fraction may also be produced from the beneficiation and this product would be pumped to a tailings dam for storage, water recovery and eventual rehabilitation. This product would be kept moist to prevent dust generation.

Co-disposal will involve dumping the jig tailings into designated areas within the mine waste rock dump. This will allow future recovery should the economics of this material change. All plant waste geochemistry will be regularly monitored to ensure that no future problems will arise from this material. If geochemical changes do occur or are likely then further studies will be undertaken to assess the need for separate tailings disposal. It is envisaged that empty haul trucks leaving the ROM Pad would be loaded with waste, and haul the product to the rock dump on the return journey to the mine pit.

5.8.5 Continuous Surface Miners

Continuous surface miner technology is an alternative to the conventional mining methods suggested above. Continuous surface miners may be used where drilling and blasting is not possible or can be eliminated.

The major advantages of this method include:

- Reduced drill and blast and crushing costs;
- ROM can be discharged directly onto conveyor belts or load trucks;
- Low environmental impact from vibration and potential for dust containment (when an appropraite dust skirt is installed on miner);
- Selective mining is possible in horizontal tabular or seam deposits such as coal, salt, potash and associated interburden;
- Machines can cut low to medium strength materials. Typical nominated ratings are based on ~40 MPa UACS (Uni-axial Compressive Strength) material. Larger units can mine over 80 MPa with reduced productivity;
- Other applications such as road maintenance are possible;
- Primary crushing and fragmentation of product occurs in the field, i.e.; Product is of <100 mm size range. Secondary crushing to <6mm could be achieved by tipping into a sizer station; and
- Higher yield of product through selective mining (less dilution of product).

Major disadvantages of this method include:

- They can produce large amounts of dust; and
- The method is not normally suited to vertical ore body deposits, short in length such as that at Nolans Bore (the technique is more suited to mining long horizontal seams such as coal).

5.9 Beneficiated Ore Storage and Loading

The crushed, screened and washed product will be stored in an approximate 400 tonne storage bin. This bin volume will allow for the loading of three quad-haul road trains (comprising 4 x 30 tonne containers or 33 kibbles at 12 tonne payload), which equates to 2.5 quad-haul trains at 156 tonnes per road train. This will minimise the amount of ore storage. Haul trucks or road trains can drive under the bin with the ore loaded directly into the haulage containers.

The nature of the beneficiated ore requires it be loaded into transport containers through a dust minimisation apparatus, (such as a sealed top hatch arrangement) from an elephant-trunk style unit. As any dust emission from ore crushing, storage and loading probably will conatin radioactives material it will be performed under rigorously controlled dust free conditions to reduce the hazard and prevent the distributions of these minerals. Further control information can be found in Section 6 (residue handling and transport).

5.10 Surface Contamination Monitoring Station

Off site vehicle and plant movement and the transport of ore will require purpose-specific wash down bays and radiation measurement facilities. All vehicles and equipment including haul trucks will exit the ore-loading bay driving forward through the wash bay. After washing, vehicles and trucks will continue forward to the radiation scanning bay. Surface radiation levels of the vehicles and containers will be measured. Vehicles may not leave the mine site or re-circulate through the wash bay until acceptable levels of radiation are achieved. The radiation levels will be measured at the outer surface of the ore containers. It is known from Arafura's exploration, drilling and sampling activities and recent bulk sampling that the steel containers will provide more than adequate shielding to control the expected radiation levels. Dust (from the ore) on the outer surface of the containers can provide a source of radioactivity that can be easily removed and controlled by the wash-down processes.

The maximum radiation level at any point on any external surface of the freight container used to transport or store radioactive material will not exceed 10mSv/h. Arafura's recent works shows that operations will be well below this limit.

The operating procedures for all vehicles including haulage vehicles, container washdown and scanning to transit the controlled area of the mine site, will form part of the updated Radiation Monitoring Plan.

5.11 Mining Fines and Dust Control

One of the objectives of the mine plan is to minimise the production of fines. Fines are created by activities like drilling and blasting, excessive handling, hauling, crushing and loading.

It is expected that during mining and crushing activities some radioactive elements in the ore will report to the fines fraction. This means that when crushed or processed, some of the ore with radioactive elements will end up in the finer grain fraction. The adoption of suitable mining management practices, regular watering of work places and selection of suitable mining equipment will assist in mitigating the generation of dust.

Blasting using a low powder factor explosive coupled with mining by excavator, the use of single stage sizing of ore product and a minimal requirement for ore stockpile rehandle will be adopted to minimise the creation of fines.

It is proposed to reuse grey water from showers and laundry facilities as a source of water for amelioration of dust in the immediate vicinity of administration, workshops and adjacent infrastructure. In addition to grey water, roads may receive regular treatment with the addition of a biodegradable binding agent (such as Weslig 120). These strategies will help to control dust generated from heavy vehicles.

In addition, camapign mining, instead of continuous mining practices will assist in reducing the exposue to and duration of dust generation during mining.

5.11.1 Respirable Dust

Personal protective equipment (PPE) will be used to prevent inhalation of dust. Personnel will wear breathing filters or self-contained breathing apparatus in any area designated as containing hazardous quantities of dust.

A Radiation Safety Officer appointed by the manager will periodically monitor, collect and analyse respirable dust and fallout dust gauges at the mine. Regular monitoring of the exposure of workers to airborne respirable dust will be done using personal air samplers.

The results of respirable dust sampling programs will be posted on the mine notice board as soon as practicable after they have been received. Dust fallout will be monitored by positioning dust gauges at strategic points around the operations. Dust gauges will be checked on a monthly basis.

5.12 Grey Water

Initial investigations indicate that sufficient water should be available for general mining operations. Further investigations will be done to determine water availability. It will be a site condition that all personnel will need to have their clothing laundered on a daily basis. The recycling of grey water after filtering and monitoring will help to reduce the overall water take-off. It is proposed to look at a variety of techniques including filtration, reverse osmosis and electrode dialysis reversal as possible means of clarifying grey water. Water reuse strategies will be developed as part of the approvals process.

5.13 Containers

A major transport design objective is to enable use of same containers for the transportation of ore and return of waste residues from the process plant. A further design consideration is to use containers that can handle a broad range of material types and phases from a dry crushed product to a milled product (filter cake) with varying degrees of radioactive mineral content.

Initial investigations considered containers similar in dimension to standard shipping containers that could move ~30 tonnes of ore at <50mm size. This size of ore would be self-cleaning when tipped from the container and would require limited washing.

An alternative includes the movement of <6mm size ore in containers or kibbles from the mine to the process plant. Each container or kibble would need to be washed down to remove any compacted ore after being subjected to 60km of road and 1350km of rail transport.

Containers or kibbles of waste residues with low levels of radiation and benign fines can be transported via rail to a rail siding in central Northern Territory, transfered to a truck, transported to the mine, emptied, washed out and reused for shipment of ore and waste. These and other options will be further investigated to verify the most practical and safe solution to ore and waste management.

5.13.1 International Standards Organisation (ISO) Configuration Shipping Containers

It is assumed that shipping containers (if selected) would be constructed of 3mm thick plate steel to meet safety and transport requirements (Figure 6). If required to meet the transport and radiation safety requirements, shipping containers, of ISO configuration, could effectively be double skinned or veneer skinned with two standard 1.6mm plate steel layers. This will minimise exposure of people and the environment to low levels of radiation. This method has been proposed as it provides adequate protection from the low levels of radiation and importantly is robust enough to handle the abrasive nature of the ore. Further study and risk assessment will be required to determine the exact container properties required to meet all regulations. The dimensions of the container should be the standard ISO container configuration (namely length 6.2m, width 2.4m, height 2.6m). This allows for multiple container handling methods. Design of the containers will accommodate top hatch loading and end hatch-dumping facilities.

Containers will have a nominal payload of ~30 tonnes. This number has been arrived at by reference to road-haulage and rail freight requirements (see Section 5.14 - Transportation). Bulk ore containers will be designed in accordance with Australian standard (AS) 3711.

Containers for dry bulk materials can be constructed from steel plate as per AS 3711.1: 2000 whilst bulk liquid based materials are primarily transported in stainless steel tank configurations as per AS 3711.7: 2000.

Figure 6. Shipping Containers

(Courtesy Royal Wolf Trading Australia Pty Ltd)

5.13.2 Kibble Bulk System

The “Kibble” bulk system used by Western Australian trucking company Giacci Brothers (used to ship lead-zinc and copper gold concentrates at various mines) is an alternative to shipping containers (Figure 7). The bulk kibbles are purpose built and are 2.45m² and 1.55m deep. It is proposed to seal any radioactive material in the kibble using a large pin hinged lid with neoprene seal and camlock type locking system. The kibbles are loaded/unloaded using a Cat 980 or equivalent loader with a quick hitch rotator device that permits the rotation of the kibbles through 180 degrees or even up to 360 degrees to empty into bins or chutes. The loader can be quickly adapted to a normal bucket system through the quick hitch system.

Kibbles used to transport ore can also be used to bring the processing plant waste residues for disposal/storage at the mine, thus reducing the total number of units in circulation at any one time. It is proposed to use a washing/drying plant at the mine site and/or processing plant to clean kibbles prior to their reuse in the transportation cycle.

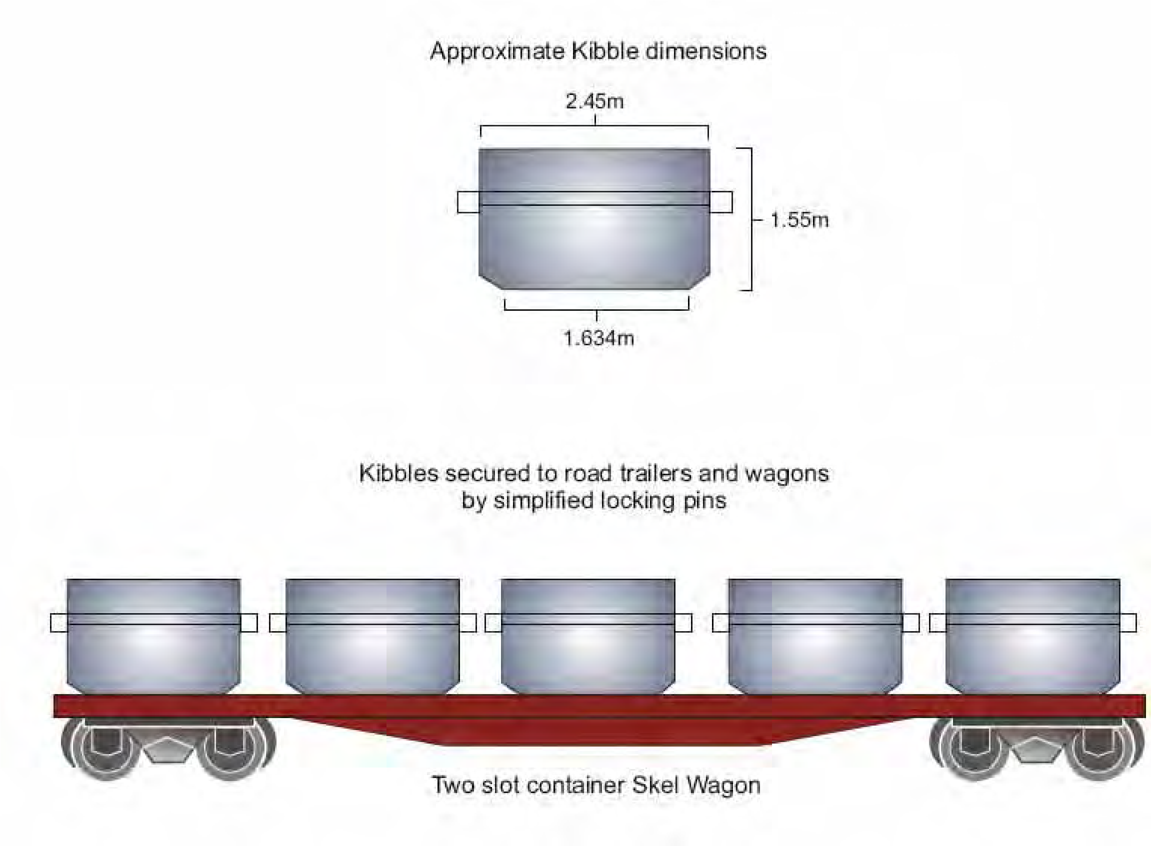


Figure 7. Kibble System

(Courtesy Giacci Brothers)

5.13.3 Process Plant Residues Containers

Another alternative would be to use the ore transport containers as described above, and have a small number (between two and four) of dedicated bulk hazardous liquid containers for plant residues transport. The Total Specific Activity of the Nolans Project plant residues is estimated to be 4,000 Bq/g. The plant residues (slurry of assumed pulp density of between 40 and 45%) could be transported in these containers. The plant residues could be pumped out of the vessel at the mine.

The final form of the plant residues is unknown at this stage. The product from the process plant is more likely to be thorium oxide in a paste/slurry form or hydroxide in a slurry form.

The advantages of using these containers are:

- The vessels are suited to carrying liquid residues and are more resistant to extreme temperature and pressure variations;

- Time and money will be saved in handling and washing of the containers, resulting in more efficient operations; and
- Bulk hazardous liquid vessels could be fitted with agitators and pumps to allow the extraction of the waste slurry material into a pond or pit.

5.14 Transportation

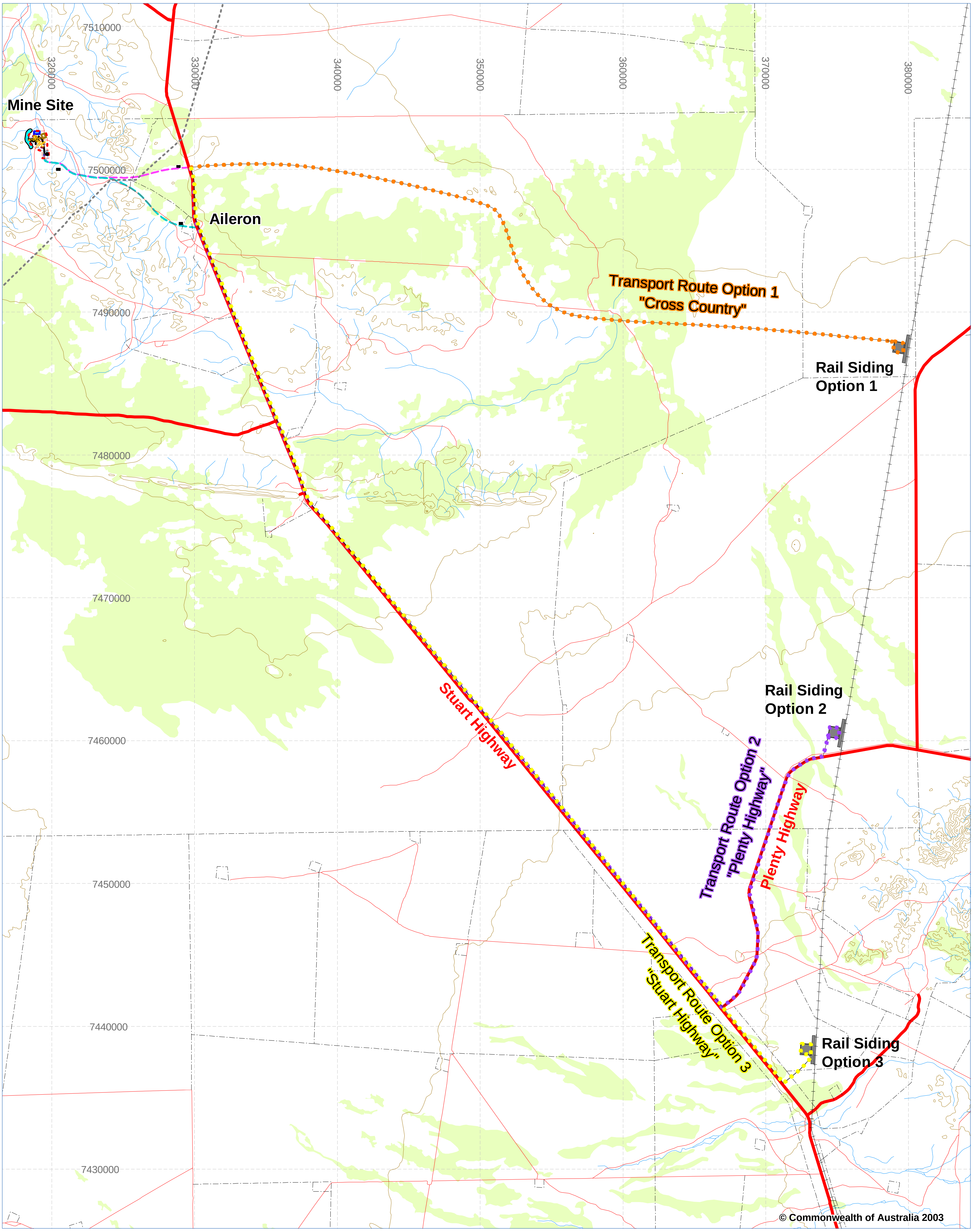
The final sizing of the ore is currently being optimised, and is likely to range from a <30mm dry crushed product to a <6mm product (wet filter cake) product.

Early investigations indicate the ore from the Nolans site has a measurable radioactivity of 400 Bq/g. This qualifies the ore as a radioactive substance and must be handled through all aspects of the operation according to acts and regulations listed in Section 7.

It is proposed that an Emergency Response Plan will be prepared outlining the management of these products to a range of emergency response situatations including the emergency response to a leakage/spillage event during transport, storage or handling of ore or waste products. Guidelines would be prepared that describe the roles/tasks of mine staff, NT Emergency Services personnel and transport personnel in the event of a leakage or spill. The plan would be prepared in consultation with the various agencies charged with NT Emergency Response Activities. This plan would be reviewed regulary and the relevant agencies updated as necessary.

5.14.1 Haulage

Transport options under consideration include road-rail options and a wholly road or rail haul operation. Options 1, 2 and 3 listed in Table 2 below involve road-haul from the mine site to rail sidings (yet to be constructed) at three potential separate locations. These options are illustrated in Figure 8.**Error! Reference source not found.**Containers will be loaded and unloaded from haul trucks at the rail siding and held in a secure yard ready to be loaded on to a train.



Prepared.	BM	Date	Workspace	Figure 8 Transport Options A3P 250k.wor
Approved.	JH	Date	Location	G:43\21188\GIS\Projects\MapInfo_MineSites

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Nolans Bore NOI

Figure 8 Transport Options Layout

Project No:	43/21188	Date:	11/07/2007	A3	Scale:	1:250 000	Map Grid	GDA 94 (MGA Zone 53)

All options will require some road works. Vehicle loads, speed and dimensions will be within legal road limits. Speed restrictions will apply through a number of small comunities along the route. Road trains are of legal dimensions and are within the loads allowed on public roads. A number of transport options have been assessed within the modal areas of road/rail, road only and rail only.

Table 2 Transport Options Assessed

Mode	Options	Option Number
Road/Rail (containerised)	**Road**	
Mine to railhead by road	Cross-country – mine to railhead	1
	Plenty Highway – mine to railhead	2
	Stuart Highway – mine to railhead	3
Railhead to Darwin railhead by rail	**Rail**	
	Railhead	
	Short rail 2.5km	
Darwin railhead to processing plant	Long rail 4km	
	Darwin railhead at East Arm Port (EAP)/Rail Freight Park – allowed 30km by road to processing plant	
Road only (containerised)	Mine direct to processing plant	
Rail only (containerised)		

Preliminary discussions with senior officers of the NT Department of Planning and Infrastructure, the body responsible for the Stuart and Plenty Highways, indicate agreement, in principle, to road haulage along these highways provided that:

- Vehicle loads, speed and dimensions are within legal limits eg a triple road train configuration would be an overall length of 53.5m, limited to approx 90 tonnes (three containers) payload due to axle/pavement loadings. There are opportunities to use an innovative vehicle configuration eg a tri drive 2A + B Quad that would enable approximately 120 tonnes payload. The on-road dynamic performance of innovative combinations meets or exceeds that of a range of existing compliant road train combinations;
- Option 1 will require an underpass for the Stuart Highway crossing;

- For Option 2, the Plenty Highway will need to be upgraded to 7m wide seal to meet road safety requirements;
- For Options 2 &3, a seagull type intersection with approximately 800 – 900 m merge and left turn lane is constructed at the intersection of the mine haul road and the Stuart Highway; and
- For Option 3, a similar seagull type intersection is constructed at the railhead access and Stuart Highway.

5.14.1.1 Option 1 – Cross Country

Trucks would leave the mine site heading east for 13km to the intersection of the mine haul road and Stuart Highway. Trucks will continue 55km east to where the road intersects the Darwin-Adelaide Rail line at the railhead. This road has not been constructed, but investigations for sealed and unsealed options are underway.

Option 1 Total Distance = 68km (one way).

5.14.1.2 Option 2 – Plenty Highway

Trucks leave the mine site heading east for 13km to the intersection of mine haul road and Stuart Highway. Trucks will then continue southeast along the Stuart Highway. At the intersection of the Stuart (Sealed National Highway) and Plenty Highway (assumed full width seal 7m+) the trucks will turn north-east until the Plenty Highway intersects the Darwin-Adelaide Rail line at the Railhead. This route covers 82 km.

Option 2 Total Distance = 95km (one way).

5.14.1.3 Option 3 – Stuart Highway

Trucks leave the mine site heading east 13km to the intersection of the mine haul road and the Stuart Highway. Trucks will then continue 75km south-east along the Stuart Highway until the road converges with the Darwin-Adelaide rail line at the rail siding. At this stage, this is the preferred route as the Stuart Highway is of an 8.m wide sealed National Highway standard. The route is flat and straight and the trucks will be able to travel at approximately 100km/hr (National speed limit heavy vehicles). Innovative combinations are normally restricted to 90km/hr.

Option 3 Total Distance = 88km (one way).

5.14.1.4 Road Only Haulage

Trucks leave the Mine site heading east for 13 km to the intersection of the mine haul road and Stuart Highway. Although it is unlikely that the Road Only Haul option will be economically viable in comparison with the road/rail option, it has been investigated for its capacity to reduce excessive container handling time anticipated with the Road-Rail options.

5.14.2 Rail Haulage

The container options for rail are:

- Road and rail combination using containers; or
- Kibble systems.

Freightlink has advised that transporting bulk ore in belly dumpers, in this instance, is not feasible because of the requirement to have a fully sealed system for the handling the proposed ore.

Any road/rail option requires a new rail siding with lay down facilities for container storage and loading/unloading within a secure area. Two alternative rail siding configurations have been considered, a short rail (2.5km) siding and a long rail (4km) siding (see Figure 8).

- The long rail siding permits a dedicated train to load from the one point as the train moves forward. This has the advantage of a reduced lay down area but a major disadvantage is the increased capital cost of additional rail.
- The short rail siding permits loading of the stationary wagons from say three container storage areas to reduce tramming distances. This has the advantage of reduced capital cost of rail but the disadvantage of increased lay down area for loading/unloading containers.

The most practical option, even with a dedicated train, is expected to be the short rail siding. Freightlink indicated that if using a dedicated train as part of their train plan, the locomotives would drop wagons into the siding on their way south to Alice Springs and then pick up on the way back when loading is completed (eg five hours on). The same principle would apply to partly loaded trains.

5.14.3 Central Australian Rail Head

The preferred short 2km rail siding option will need to be constructed at an agreed location in close proximity to the convergence of the Stuart Highway and Darwin-Adelaide Rail. A secure fenced yard and lay-down pad will be required, along with suitable road access for road trains entering and exiting the rail siding site and operation of container handling machinery (possibly a 40 tonne forklift) at the site.

5.15 Mine Infrastructure

The mine infrastructure is likely to include the following items:

- Mine camp and facilities (may be built near the Aileron road house);
- Mine offices and facilities;
- Mine maintenance and stores areas;
- Mine access and haul roads; and
- Services for all mine and camp facilities including water, sewerage, communications and power.

The Nolans Mine site will handle a prescribed substance under the *Radioactive Act* of 1982. Arafura will include a system of control and supervision in certain areas as part of the radiation management process. The infrastructure described in this section includes all facilities and amenities within both controlled and supervised areas of the site.

The radiation management plan (RMP) in place at the site for our current activities includes site access and control procedures for all personnel and materials entering and leaving the site. More rigorous controls will be implemented once development commences. These will control all access and prevent all plant, equipment and vehicles from leaving the site without washing and screening.

5.15.1 Site Manning

Mine infrastructure planning required the approximation of manning levels at the site, including all mining, plant, office, security, road haulage and camp personnel. The mining sequence proposed in this document allows for campaign extraction of ores from the mine and year-round crushing and transport of the ore to the process plant. It is expected that return of residues from the process plant will incur some manning requirement. This style of operation means that manning levels at the mine fluctuate depending on the sequence. A likely sequence is presented in Table 3.

Table 3 Manning Numbers

Position	Manning Nos.	
	Mining Phase	Rest of year (Nov-Feb)
Mine Manager	1	1
Site Engineer/Geologist	0.5	0
Mechanical Engineer	1	1
Production Superintendent	1	0
Shift Supervisor	1	0
Shift Engineer	1	0
General Duties Clerk	1	0
Security/Environmental	4	4
RSO/OHSE	1	1
Shotfirer	1	0
Driller	2	0
Haul Truck	4	0
Fitter	2	2
Electrician	1	1
Spare Operator	2	0
Pit Digger	2	0
Grader/Water	1	1
Dozer	2	2
Stockpile Loader	2	2
Stockpile Truck	2	2
Camp Staff	4	4
Haulage Supervisor	1	1

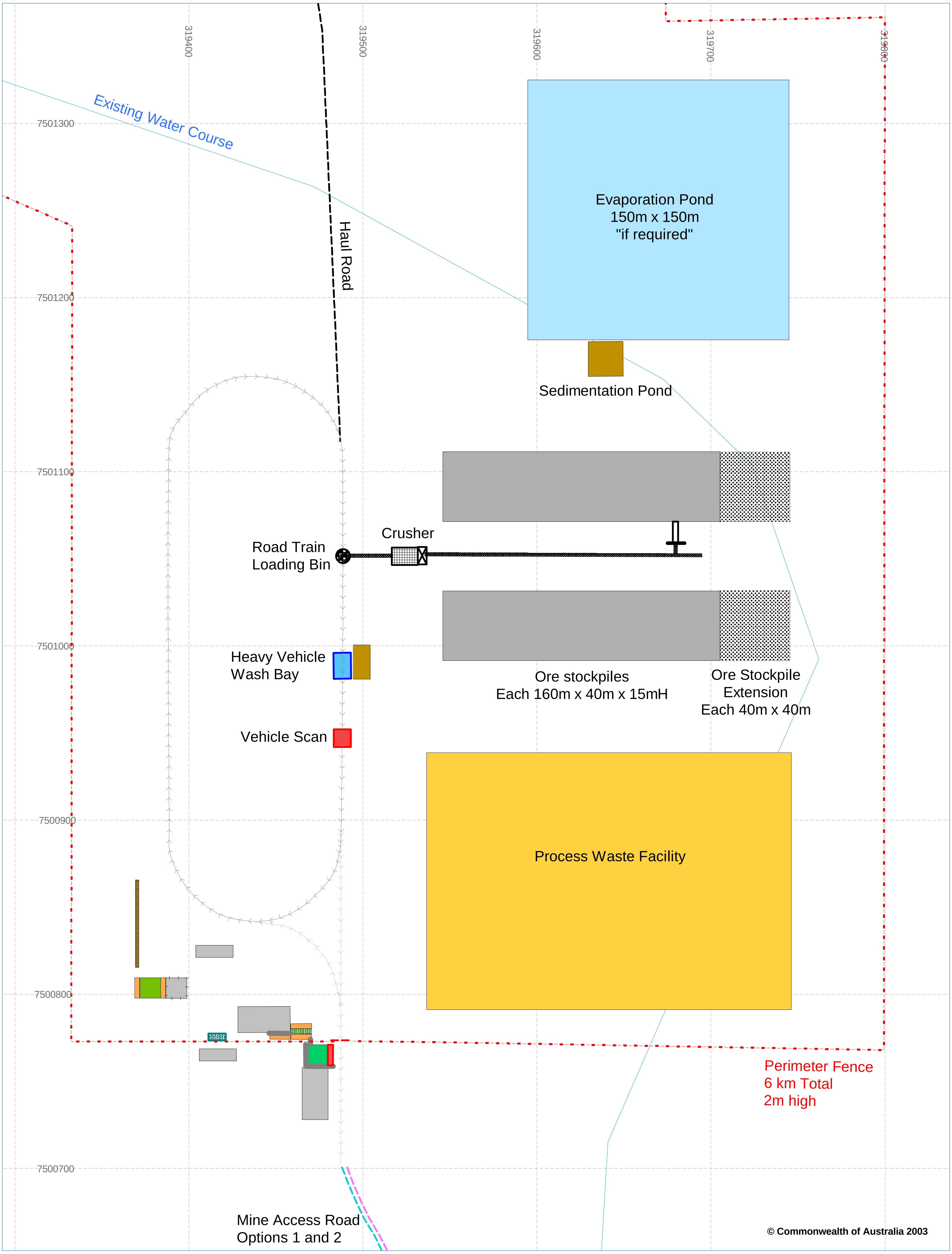
Position	Manning Nos.	
	Mining Phase	Rest of year (Nov-Feb)
Haulage Truck	16	16
Haulage Fitters	2	2
Totals	**55.5**	**40**

5.15.2 Mine Industrial Area

The mine industrial area (MIA) will comprise all the facilities required to operate Nolans Mine, including:

- Administration offices and equipment;
- Employee and contractor car park;
- Inspection and radiometric detection facilities;
- Process plant and benficiation plant storage facilities;
- Workshop and service bay or apron, and store and stockyard;
- Wash down bays;
- Fire detection/suppression;
- Wash house;
- Fuel farm;
- Security gate house;
- Perimeter fencing and gates;
- Raw and potable water supply for the camp, mine and potentially other users (Aileron and Alyuen);
- Sewerage services for the camp, mine and others; and
- Fuel and oil services.

A stylised layout is shown below in Figure 9.



Prepared.	BM	Date	Workspace	MIA Layout A3P 2k.wor
Approved.	JH	Date	Location	G:43\21188\GIS\Projects\MapInfo_MineSite\

Level 5 66 Smith St
Darwin NT 0810

Tel: 61 8 8982 0100
Fax: 61 8 8981 1075

Nolans Mine NOI

Figure 8 MIA Layout

Project No:	43 / 21188	Date:	12/07/2007	A3	Scale:	1:2000	Map Grid	GDA 94 (MGA Zone 53)

The scope of requirements for civil works in the mine area includes:

- Relocation of existing gazetted roads and associated property accesses;
- Access to mine site, plant and infrastructure;
- Internal roads for road registered and dedicated mine vehicles;
- Haul roads generally designed in accordance with good engineering practice and following normal mining standards; and
- Earthworks pads for buildings, ROM pad, plus pads for the raw, product and reject stockpiles.

The scope of facilities includes mine infrastructure/industrial area facilities, including but not limited to the following main areas of the works:

- Power generation options;
- Site wide reticulation of HV (11kV) power;
- Site wide distribution substations 11kV/415V as required;
- LV power to main infrastructure load centres;
- HV Power supply to construction compounds facilities including substation;
- HV Power to remote infrastructure loads: pumping stations, dams and treatment plants;
- Infrastructure area lighting protection; and
- Raw and potable water supply for the camp, mine and potentially other users (Aileron and Alyuen), including:
  - Sewerage services for the camp, mine and others; and
  - Fuel and oil services.

5.15.2.1 Offices

A demountable office system is currently proposed. Facilities for both the mine camp and mine site will be constructed of semi-elevated demountable, prefabricated buildings. It is assumed these buildings will be customized 14.4 x 3m air-conditioned demountable blocks. The buildings will be erected on pad footings and connected to power, water and sewerage as required.

The office has been sized to allow for three separate offices plus an open plan area for general usage. An additional office area would be joined to the office block that would allow for provisional security and first aid facilities. The office and security block will be located alongside the main access gate into the controlled area of the site. This will ensure that security personnel can monitor all vehicles and persons entering the site.

5.15.2.2 Car Parks

The controlled (at mine site) and uncontrolled (at camp) light vehicle parks will be sized to suit typical large 4WD utilities or wagons. A total of 10,000 m^2 for car parks is proposed. This space will be sufficient for extra vehicles such as mini-buses and coaches when required. The car park will be constructed of compacted road base to reduce dust.

5.15.2.3 Workshop and stores

Workshops, service bays, heavy vehicle parking areas, go line and dead lines have been sized to accommodate CAT 777 rear-dump trucks (larger than the required minimum CAT 740 articulated trucks).

The proposed facility consists of a 24 x 12m concrete slab with customized shipping containers either side. One container will be used for storage of tools and light plant equipment whilst the other will be an office/storage combination. A 12 x 12m canopy will span the containers, protecting the facility from the environment. The canopy includes an end-wall allowing for control of airflow through the service bay area.

It is proposed to where possible provide positive pressure air conditioning to maintain a clean work environment in the workshop and associated buildings. The use of air curtains across large openings may provide an effective barrier to the ingress of fugitive dust.

5.15.2.4 Chemical Storage

All chemical, fuel and reagent storage areas will be constructed in accordance with relevant regulations and legislation. This includes appropriate bunding and segregation of chemicals as needed.

5.15.2.5 Wash Down

A vehicle, plant and equipment wash down bay will be installed in accordance with the NT Act and Regulations regarding the handling of prescibed substances. All vehicles, plant and equipment leaving the mine site will be washed and measured for radiation. No vehicles or equipment may leave the controlled area of the mine site without meeting safety limitations of radiation levels.

The radiation level at any point on any external surface of the freight container used to transport or store radioactive material will not exceed a maximum permissible level of 10mSv/h.

The wash down area will comprise a drive-through style automated high-pressure wash bay and a separate wash down pad. The wash down pad is 10 x 25m in size with inlaid rails for the trafficking of tracked vehicles. A single large pump will provide high-pressure water to the automated and manual washing bays. An example of the washdown bay is illustrated in Figure 10.

Wastewater will pass through a loader accessible sedimentation pond and oil recovery unit prior to being directed to the evaporation ponds.

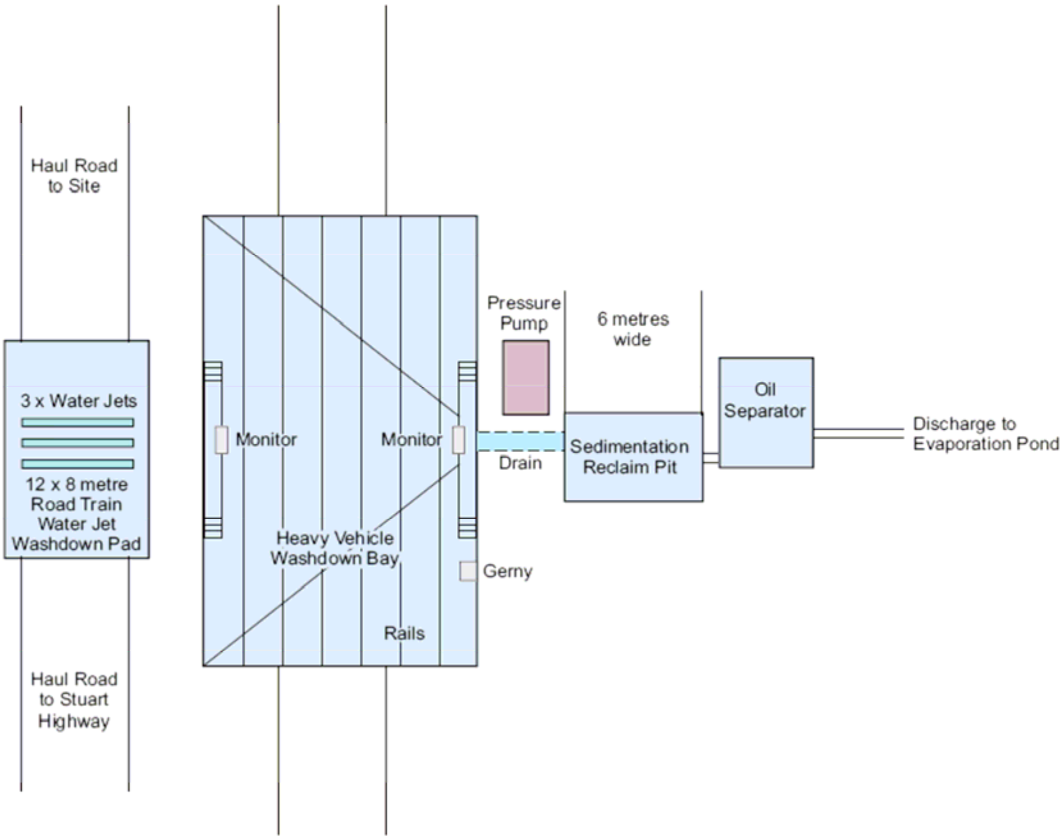


Figure 10. Washdown Bay Example

5.15.2.6 Fire

Fire fighting equipment and provisions will be supplied at all facilities as required by the *Workplace Health and Safety Act*.

It is assumed the watercart for the operation can be used as an emergency fire-fighting vehicle if ever required. A Fire Safety Officer will be appointed.

5.15.2.7 Ablutions and Crib

The following facilities have been proposed for this area:

- 1 x ablution/shower block;
- 1 x crib room;
- 1 x change room;
- 1 x laundry; and
- 1 x store room.

It is assumed these buildings will be customized 14.4 x 3m demountable blocks. The buildings will be erected on pad footings and connected to power, water, sewage and air-conditioning as required.

Shower and laundry facilities will be available to workers on site in accordance with the NT *Radiation Safety Act*. Workers leaving the site will enter the facilities; shower and change, then exit the facilities in clean clothes where radiation levels will be assessed.

The *Radiation Safety Act* decontamination processes will be complied with before personnel use any of the facilities such as crib and toilets.

5.15.2.8 Geologists Office and Core Sample Storage

An office facility and core sample storage facility will be provided for the operation. Given the nature of the materials in the core samples, it is assumed these items and the storage facility will be located at the mine site. It is assumed the office will be a customized 14.4 x 3m air-conditioned demountable blocks attached to the core shed. The shed will be a 20 x 15 x 10m prefabricated building (compliant with NT Building Code Standards) complete with shelving for up to 1,000 core boxes. The buildings will be erected on pad footings and connected to power, water and sewerage as required.

5.15.2.9 Security and Fencing

Controlled areas of the mine site, mine offices, rail laydown facilities and container yards are usually fenced and patrolled to prevent unauthorized access. The need for this will be assessed prior during the construction phase. Security personnel may be employed or directly contracted by the owner.

5.15.3 Roads

The service roads within the site layout are sized to accommodate the requirements of 777 trucks. Turning circles will not be full lock turning circles. They will be approximately 50% greater than listed to reduce stress on roads and vehicles. Roads will be 25m wide including safety bunds and drainage with a running surface of 18m to suit two haul trucks passing with additional room for light vehicles, service vehicles or broken down equipment parked on the roadside without impeding the flow of ore production. See Figure 11 for preliminary design.

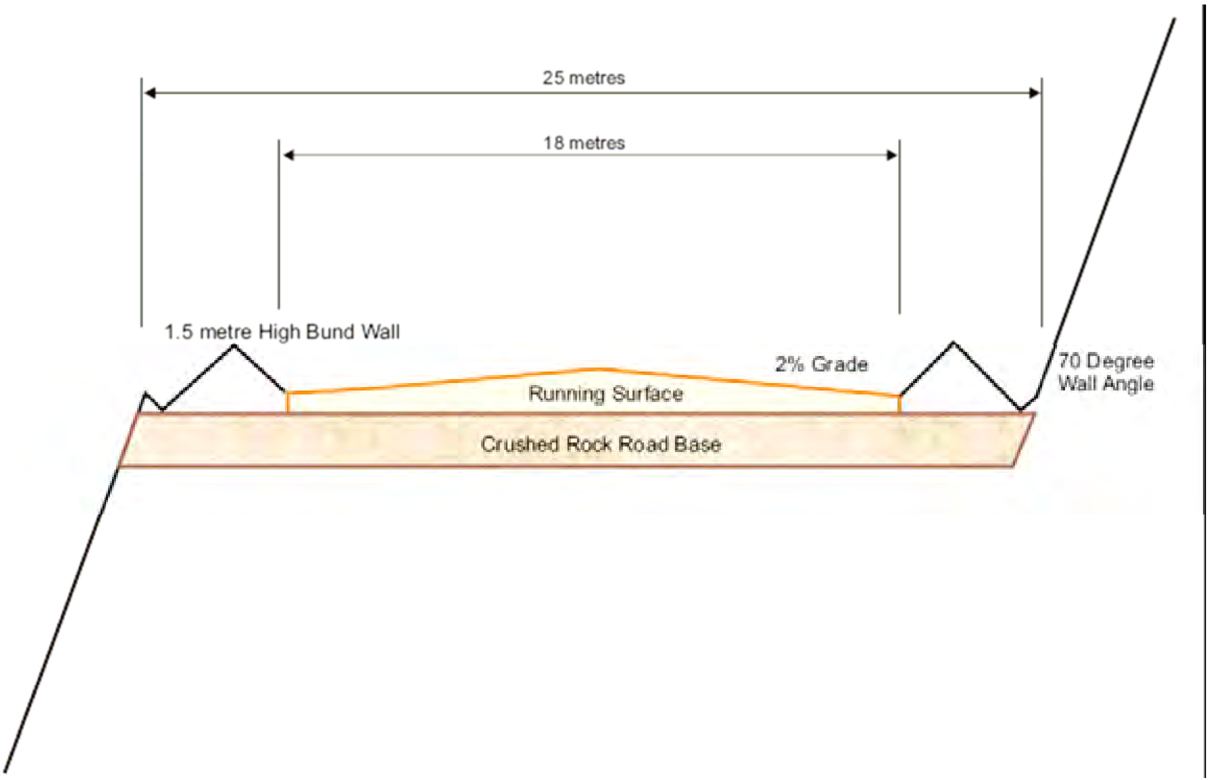


Figure 11 Preliminary Haul Road Design

It is proposed that the following criteria be used to ensure safe trafficability of road constructed in the general course of operations:

- Roads will be constructed such that vertical curves maintain a site distance equal to the required stopping distance for the vehicle. Horizontal curves have obstructions removed that limit the line of site (trees, rocks, structures);
- Grades of haul roads where possible are limited to a maximum of 10%;
- Curves of haul roads are super-elevated to minimise centrifugal force while vehicles are negotiating. Roads will be constructed with sufficient cross grade to enable water to drain freely into adjacent "v" drains for removal;
- Haul roads will be constructed of sufficient width to accommodate two-way passing of the largest vehicles using the road;
- Roads shall be constructed with sufficient sub base and surface gravel compacted in layers to provide a stable running surface for vehicle movements;
- Where "v" drains and watercourses cut the haul roads, culverts will be installed to convey water away from the haul road, (where possible culverts will be placed in natural water-courses); and
- Haul roads will be designed generally in accordance with the normal industry standards for haul roads. Existing roads will need to remain in operation while new haul roads connect into them.

There is no obvious major risk to the construction of haul roads from a purely engineering viewpoint.

Roads are to be constructed to the following specifications:

- Pavement width of 18m (3.5 times width of widest vehicle);
- Roads to be unsealed but surfaced with 200mm of suitable non abrasive material < 20mm compacted to a Californian Bearing Ratio (CBR) of 80;
- Maximum grade of 10%;
- Drainage to pass the 1 in 1 year ARI event with floodways for higher rainfall events; and
- Pavement to use naturally occurring material where possible.

5.15.4 Mine Access Roads

It is proposed, where practical, to separate heavy vehicles and light vehicles and adopt a uni-directional flow around the crusher and road truck loading station. This will promote safety throughout the mine site.

Roads are to:

- Have a formation width of 11m with additional 1m width if a guard rail is required;
- Be sealed in controlled areas;
- Have a maximum grade of 8%;
- Allow drainage to pass the 1 in 1 year ARI event with floodways for higher rainfall events; and
- Have a pavement of naturally occurring material where possible.

Design of the roads is generally based on the requirements of Department of Planning and Infrastructure and Austroads standards. Existing roads, railway and utility services will need to remain in operation during construction of new roads.

Option 1 – New Mine Access Route

The new mine access road route follows the existing access route from Nolans towards Aileron, but veers due east to the Stuart Highway at the gas pipeline crossing. This route has the advantage of being approximately 10km long (3km shorter than the existing route). This will require lower maintenance over the duration of mining.

Option 2 – Upgrade Existing Access Route

This option entails upgrading the existing access track to haul road standard. The access route runs from Nolans to the Stuart Highway at Aileron. The route is approximately 13km in length, and may affect residents of Aileron.

5.15.5 Sewage Treatment

Two separate sewage treatment plant systems would be constructed to provide tertiary treatment to sewage from the mine and plant offices, workshops and amenities. The treated effluent would be pumped to the process water pond at the mine site and a spray irrigation system at the accommodation camp (see Figure 12). These treatment plants would be installed during the construction phase to provide for construction camp requirements.

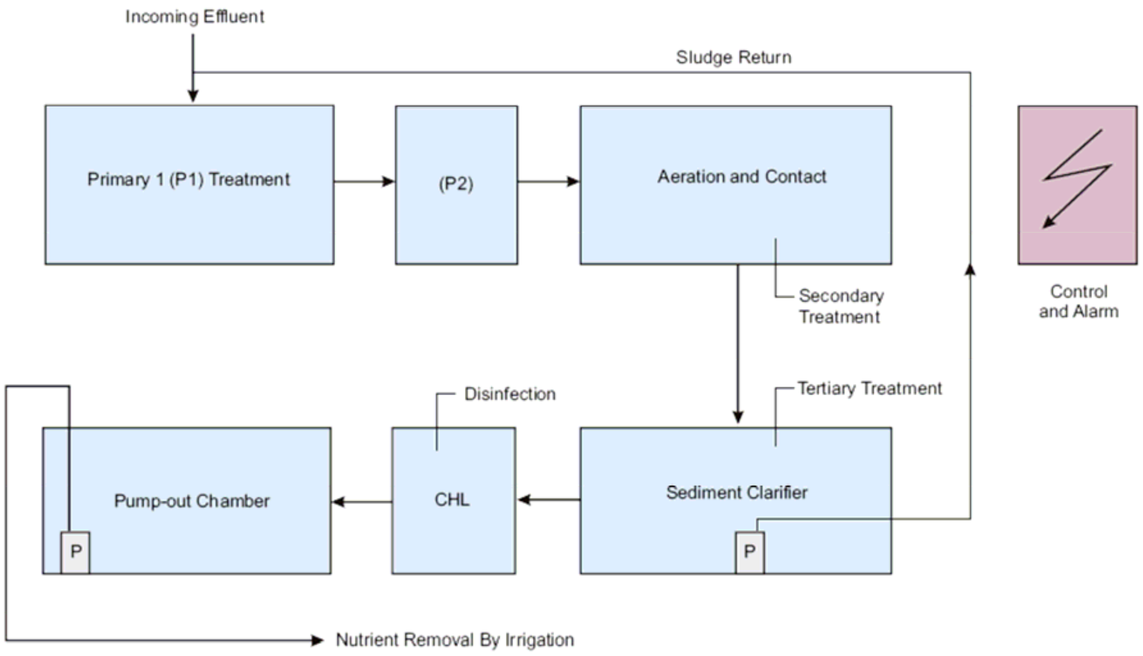


Figure 12 Sewage Systems

(Courtesy Aqua-Treat (NT) Pty Ltd)

5.15.6 Electrical

Electricity supply will be generated by diesel-powered generators at the mine and campsite (whether new or upgrade to the existing at the Aileron Roadhouse).

The options of solar power and connection to the Natural Gas line were investigated and not considered for the following reasons:

1. Solar was rejected because of the electrical load at both locations was of such a magnitude that solar was not economically viable; and
2. Two generator suppliers were contacted and both confirmed that the gas currently supplied from the pipeline has a Methane value of 61, while gas turbine generators of the size and type for this project require a Methane value of 80.

Three generator sets, each of 0.5 MW capacities, would be installed to meet the demand of 953 kVA at the campsite. The sets would be paralleled with two sets on line sharing the load. As the load decreases then one of the two sets comes off line. The third set is off line and rotated to ensure that each set has similar running hours. This allows for maintenance of sets without having to load-shed. The generators would be housed in acoustic enclosures.

Power would be reticulated through the campsite at 415 volts by overhead power lines from the campsite generator and main switchboard.

Three generator sets, each of 350 kVA each would be installed to meet the demand of 600 -700 kVA at the mine site. The sets would be connected and operate in the same configuration as at the campsite.

Power would be reticulated underground through the Mine site from the main switchboard to the Crusher and the transportable buildings.

There may be the potential to use the Natural Gas line. Although not described in more detail in this NOI, the option should remain.

5.15.7 Water Supply

Water supply for the mine site will be from groundwater.

Water supply will need to follow the *NT Water Act* (1992) protocols of obtaining a drilling permit and application for a water extraction licence, as the site is located within the Ti Tree Water Control District. Injection of waste water from the RO plant is an option under consideration, and will require a licence. Another option under consideration is evaporation of waste water.

The proposed mine site location is situated about 10km north of Aileron community, potentially within the boundaries of the Ti Tree basin water resource (further studies will be required to determine the Ti Tree basin resource boundaries). If the water supply bores are to be located within the basin itself, this could potentially impact on the amount of bore water avialable to supply the mine site with approximately .65 ML/day (~7.5 L/sec). Applications for extraction would need to be approved by the NT Government and investigations into the aquifer yield at the edge of the basin would need to be completed to assess if 7.5L/sec can be sustained. Salinity maps indicate salinity on the edge of the basin is between 1,000 to 1,500mg/L. Disposal water from the RO plant could be less than 3,000 mg/L. The disposal of the RO wastewater could not occur within the Ti Tree basin sediments and would have to be injected further south. It would then have potential for reuse. Feasibility studies into reuse would have to be completed, and has the potential then for reuse. Feasibility studies into reuse would have to be completed.

The bores would be located adjacent to the mine facilities. It is estimated that three bores may be sufficient to supply a total flow of 3L/s, however further work will be completed to confirm this.

Raw water would be pumped from the bores to a holding pond/storage tank and then to a reverse osmosis (RO) plant for processing to potable water. A standpipe would be provided at the raw water storage for use by the mine contractor for dust supression.

5.15.7.1 Reverse Osmosis (RO) Plant Design Basis

The footprint for the RO plant would be as follows:

- Raw Water storage tank;
- The RO plant to be built in a 40 foot shipping container or similar;
- Potable water storage tank;
- Potable water reticulation pumpset;

- Potable water level transmitter;
- Raw water tank level transmitter;
- pH correction chemical dosing;
- Chlorine chemical dosing; and
- Recirculation pumping system from the potable water tank to incorporate a residual chlorine analyser to keep the potable water storage chlorine level at a constant 1-1.5ppm.

Two options have been assessed to provide water to the mine, camp, and local communities. The first is a single RO plant and piping water to the other users. The second is to provide separate RO plants at the mine, camp and community.

Option 1 – Single RO and Piping to Users

- It is proposed that Arafura will provide potable water to Aileron Roadhouse (15km) and the Alyuen Community (25km) via a new buried pipeline connecting to their existing water storage/reticulation network, or via a water truck.

Option 2 – Multiple RO Plants

The major cost in providing RO treated potable water between a single RO plant and multiple user sites is the cost of the pipeline. This cost can be reduced by:

- Installation of a new RO plant at the mine;
- Installation of a new RO plant at the camp; and
- Installation of a new RO plant and connection to the existing water infrastructure at Aileron and Alyuen.

5.15.7.2 Potable Water

Approximately 10ML/year of potable water is required for a population of 50 people for the Nolans mine site. Three options for potable water are:

- Local groundwater at the mine site;
- Pipe from Aileron Community; and
- Piped from Ti Tree Basin.

5.15.7.3 Injection Site

There are two options for the disposal of the RO wastewater:

- Dispose into the mine site evaporation pond; and
- Re-inject into existing aquifers.

Re-injection of waste water from the RO plant would need to occur south of the Nolans site to ensure that minimal impact occurs to regional stock and domestic bores. Evaporation may be a better option for disposal of this water, and these options will be assessed. There are a small number of bores south of Nolan Bore site along the road to Napperby Station. This region would be proposed, because as it is located outside the Ti Tree water control district, there is limited use of the formation for stock and domestic bores and the current salinity is approximately from 2,000mg/L to 4,000mg/L (indicated by regional bores). This is within the expected salinty range of the RO waste water. There is however limited yield information on the geology in the region. This will need to be investigated further.

5.15.7.4 Mine Dewatering

Two separate calculations were used to estimate flow into the open-cut pit (Table 4). Please note that the calculations are based on broad assumptions and not field-collected data. The calculations are intended to be indicative only. A detailed hydrogeological assessment is required to provide a true indication of seepage into the proposed open cut pit.

Assumptions are:

- An area of pit: 400m long by 12m of saturated formation;
- An aquifer thickness of approximately 50m and the Standing Water Level (SWL) of 13m (as reported in SKM, 2006); and
- An hydraulic conductivity of the formation ranges of:

  $K = 3.3\text{x}10^{-6}$ to $5.2\text{x}10^{-5}$m/sec for Weathered Granite (Domenico and Schwartz, 1997).

Table 4 Flow Calculation Summary

	Basic Formula **(K multiplied by area of the pit)**	**Dupuit Equation**
Minimum Flow ($K=3.3\text{x}10^{-6}$m/sec)	22,800 L/day	354 L/day
Maximum Flow ($K=5.2\text{x}10^{-5}$m/sec)	359,400 L/day	5,570 L/day

Preliminary investigation indicates that groundwater in the region has elevated concentrations of radionuclides.

5.15.8 Water Management Infrastructure

Rainfall in the region varies, as discussed in more detail in Section 9. This indicates a requirement for relatively high rainfall design parameters. The evaporation ponds and all surface drainage networks will appear to be grossly over-designed for the majority of the mine's life, if not for the entire mine life. This minimises any potential mine impact on the surrounding environment and water-courses.

Numerous earth structures must be built to ensure separation of surface water inside and outside the mine. The structures must prevent all water entry into the mine from outside the boundaries and stop water that falls within the mine from flowing to the existing external creeks.

Mine water management is concerned with:

- Meeting the needs of the mining operation (both quantity and quality) while avoiding or minimising impacts to the environment and downstream water resources throughout the operating phase, and

- Facilitating an agreed, acceptable long-term post-mining environment.

The fundamental pre-requisite for mine site water management is recognising the need to develop and implement a comprehensive and coordinated mine site water management plan (MWMP) including ongoing monitoring, interpretation, reporting and maintenance.

Different types of surface water may be defined as follows:

Clean water: Water from undisturbed vegetated parts of the site fit for diversion or direct discharge to receiving streams.

Dirty water: Water from disturbed but otherwise uncontaminated parts of the site, fit for discharge, except for suspended solids that may require settling prior to release.

Controlled discharge water: Typically saline, but otherwise uncontaminated water, collected as a result of groundwater seepage. In the case of Nolans, preliminary investigations revealed the presence of uranium radionuclides in local bore waters. These may render them unsuitable for discharge without treatment.

Contaminated water: Water containing potential contaminants or pollutants and not fit for discharge.

The MWMP should be prepared to deliver the following key outcomes:

- Segregate clean runoff from dirty runoff from disturbed areas and clean water pumped from the pit;
- Capture water for re-use for on-site dust suppression;
- No unplanned off-site discharges;
- Temporary retention of water in sediment dams before off-site release (subject to meeting water quality criteria); and
- Compliance with licensing requirements for all water emissions and extractions.

During periods of high rainfall, the system is capable of processing and removing all additional surface water from the wash down area to the evaporation ponds.

5.15.8.1 Proposed Wash Down Bay

The proposed wash down bay will be a major water user as it includes a capacity of approximately 3000l/min to ensure proper removal of all contaminants before any vehicle leaves the site. This water is largely independent as the recycling system enables water to recirculate and minimise top up with additional water.

5.15.8.2 Mine Site Outline Bunding

It is of prime importance to isolate the mine site from outside surface water. An earthen bund should be built in areas around the perimeter of the mine site where significant surface flows could occur. This bund may be up to 3km in length. A channel will be dug in front of the bund (on the outer side of the bund) and the material from the channel used to build the bund (see Figure 13).

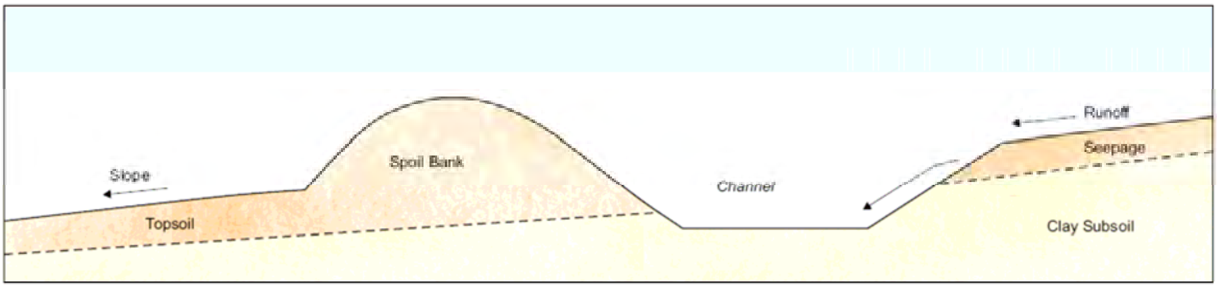
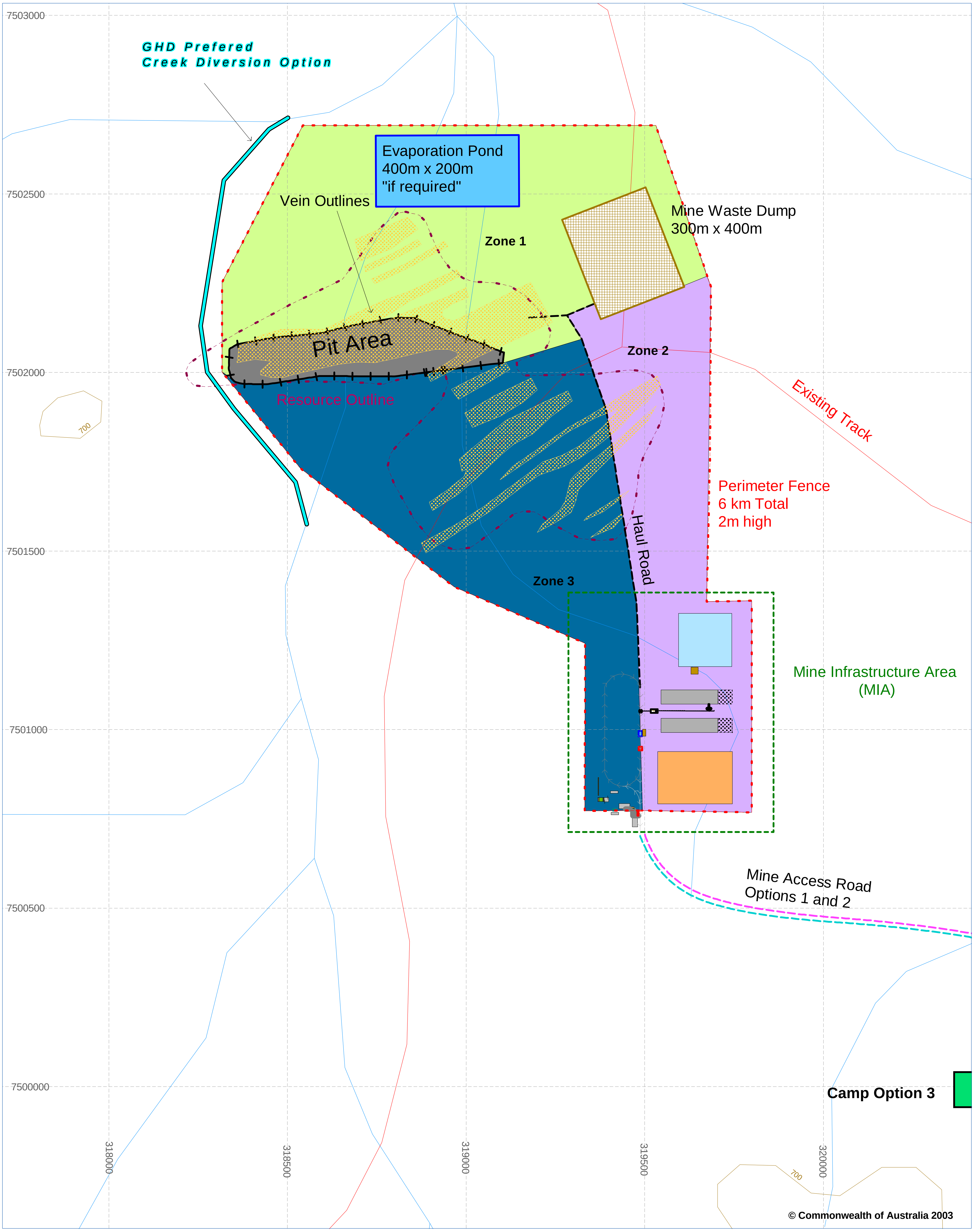


Figure 13 Earthen Bund Surrounding the Mine Site

5.15.8.3 Evaporation Ponds

Water (from both surface and dewatering) associated with the mining and mining service areas will be analysed to determine the quality prior to allowing discharge from site. Should the analysis indicate that the water quality was not suitable for discharge, treatment or evaporation ponds will be considered as a means of environmental control. The evaporation ponds are one method of water emission from the controlled area of the mine site.

The mine site has been divided into catchment zones, namely: Zone 1, Zone 2 and Zone 3 (see Figure 14. Each of these zones has an associated evaporation pond to catch the surface water from that section. The ponds are located within their corresponding zones and in positions that enable efficient catchment of all surface water.



Topographic data provided the Commonwealth of Australia, Geoscience Australia 2007. In consideration of the Commonwealth permitting use of data, you acknowledge and agree that the Commonwealth and GHD Pty Ltd gives no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or cost (including consequential damage) relating to any use of the data.

Prepared.	BM	Date	Workspace Mine Site Layout and Catchment Zones A3P 10k
Approved.	JH	Date	Location G:43\21188\GIS\Project\MapInfo_MineSite

GHD
Level 5 66 Smith St
Darwin NT 0810
Tel: 61 8 8982 0100
Fax: 61 8 8981 1075

Nolans Mine NOI

Figure 14 Catchment Zone Map

Project No: 43 / 21188	Date: 09/11/2007	A3	Scale: 1:10 000	Map Grid GDA 94 (MGA Zone 53)

Rainfall data for up to the last 66 years was used (BoM for Alice Springs) to calculate the required size of the evaporation ponds. The mean rainfall and the estimated volume of water from dewatering of the pit were then used to determine the required capacity of the evaporation ponds. All surface water (i.e first flush from rainfall events) will report to the evaporation ponds.

The dimensions of the evaporation ponds provide sufficient area to ensure the ponds do not exceed their design capacity at any stage. These will be determined prior to any further environmental approval submissions. The option of diverting additional overflow (after the first flush event) will be considered.

5.15.9 Fuel Supply

Fuel will be stored in internally bunded above ground tanks (4 x 30,000L) (Figure 15). Two tanks are to be located adjacent to the generators at the Aileron camp, and another two near the mine workshop.

5.15.10 Camp Tanks

The campsite diesel tanks are sized to meet the requirements diesel generator sets located at the camp. These 500 KVA generators have a peak load fuel usage of 240L/hr, and an approximated base load usage of 180L/hr. The base load equates to 30,000L per week minimum usage. Two 30,000L diesel tanks will allow for up to 13 days diesel supply being available at the site before resupply is required.

Use of local fuel suppliers to refill the diesel tanks more frequently would allow for a reduction in the tank volume required. It is not intended that the diesel tanks at the camp be fitted with fuel bowsers to refuel light vehicles. It is anticipated that this would occur at the mine site.

Figure 15 Internally Bunded Fuel Tank

(Courtesy Transtank)

5.15.11 Mine Tanks

The mine site diesel tanks are sized to suit the peak fuel usage required during the mining cycle. Table 5 lists the approximate fuel requirements for the mine site. Note that this estimate does not include the fuel requirements of the contracted haulage (mine to rail head) contractor fleet (contractors provide their own fuelling).

Vehicles permanently within the controlled area (such as the mining and stockpile reclaim fleet) will be required to wash down prior to refuelling.

Table 5 Mine Site Fuel Requirements

	Cons./hr (L)	No. of Units	No. Op Hrs/day	No. days/week	Fuel (L) per week
CAT 740 truck	34	2	16.5	7	7,854
D10R dozer	75	1	12.5	7	6,563
12G grader	26	1	8.25	7	1,502
Crane	15	1	2	7	210
385CL digger	68	1	16.5	7	7,854
Light plant	10	6	12	7	5,040
Generator	286	1	24	7	48,048
Water cart	15	1	3	7	315
Fitters truck	10	1	6	7	420
Light vehicles	10	9	8.25	7	5,198
CAT 988 loader	50	1	16.5	7	5,775
Total					**88,778**

5.15.12 Communications

Two communications systems have been scoped: fixed line services and UHF radios. These are discussed below.

5.15.12.1 Land-line and Data

The following have been considered:

- Provision of phone and data services for the mine and 60-man camp (all camp rooms to have data access for internet);
- Fibre-optic off take at Stuart Highway;
- Buried 16 km of cable between highway, camp and mine; and
- Telstra providing containerised accommodation for its equipment.

5.15.12.2 UHF System

The mining and vehicle-vehicle communications across the camp and mine will consist of a 25w UHF radio system with repeaters at both sites. A 30m high mast with antennae and solar power will be strategically located to provide coverage for the mine and campsite. Transceivers will be at the base, vehicle mounted or hand held.

5.15.13 Airstrip

It is proposed that the Aileron Airstrip may need upgrading to a size and capacity required by the Royal Flying Doctor Service (RFDS).

If required, the airstrip will have:

- A 1,200m long by 20m metre wide unsealed airstrip;
- A 90m wide runway strip width; and
- Two 25m by 25m turning nodes at each end of the airstrip.

Design will be in accordance with the RFDS Recommended Airstrip Standards and Reporting Arrangements 1998 and the Civil Aviation Authority Guidelines for Aeroplane Landing Areas 92-1(1).