Tropicana Gold Project: Public Environmental Review

2. Proposal Description

INDEPENDENCE GROUP NL

360 environmental

2. PROPOSAL DESCRIPTION

This Chapter provides a comprehensive description of the Project and details the key characteristics of the Project with respect to the resource, the proposed utilisation of the resources, the mining method, and the other major components of the Project.

2.1. Proposal Summary

2.1.1. Location

The Tropicana Gold Project is a greenfields project located on the western edge of the Great Victoria Desert biogeographic region (Figure 1.2). The focus of the Project is the Tropicana and Havana deposits which are located 330 km east northeast of Kalgoorlie and 230 km east of Laverton (Figure 1.2). Current access to the proposed Operational Area is via approximately 480 km of unsealed track through the Pinjin Station. Alternate access from Laverton can be gained from the north via the Lake Rason track (approximately 300 km) and from Kalgoorlie via the Transline Access Road to a track, illustrated on some published maps as the Cable Haul Road (260 km), then 200 km north to Salt Creek Junction and a further 50 km north along historic tracks suitable for small, lightweight 4WD vehicles. None of these existing routes are of an appropriate standard for the increased traffic requirements of the Project. In addition, some of the existing tracks cross Nature Reserves and environmentally sensitive areas, e.g. the existing tracks from the Pinjin dissect the largest known population of a Declared Rare Flora species (*Eucalyptus articulata*) and realignment of the tracks could lessen direct and indirect impacts on these areas.

The key areas of infrastructure for the Operational Area are shown in Figure 2.1.

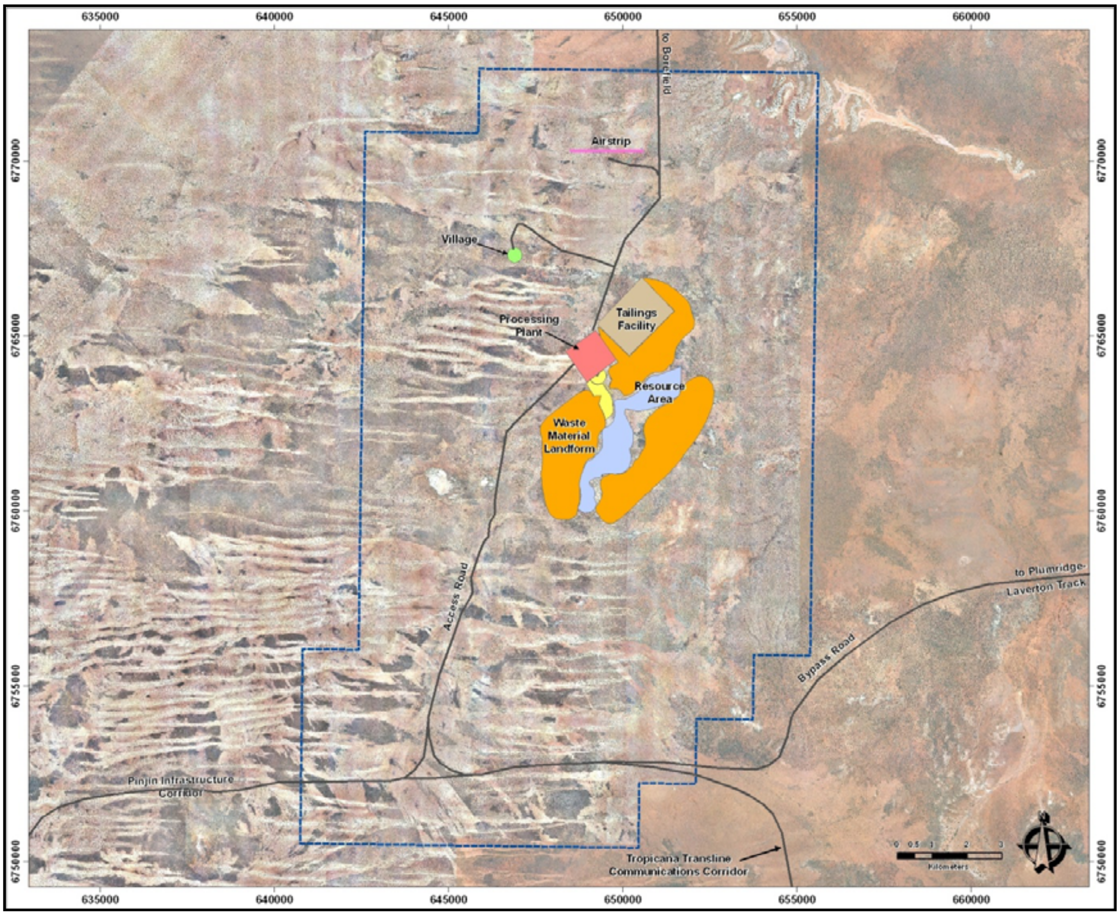

Figure 2.1: Conceptual Site Layout

Of note, the proposed Project is located in a low to moderate seismic hazard region of Australian (Figure 2.2). The Joint Venture does not anticipate stability problems with water dams, pit and tailing storage facilities associated with earth-quakes and tremors.

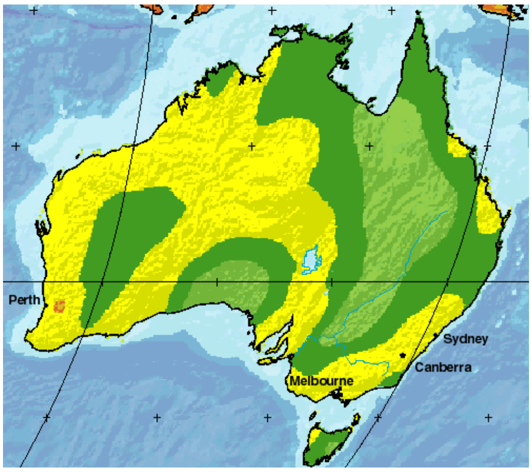

Figure 2.2 Seismic Hazard Map of Australia (green areas indicate low risk, yellow areas indicate moderate risk)
(source http://geology.about.com/library/bl/maps/blaustraliaseismap.htm)

2.1.2. Overview

The elements of the project covered by this PER are:

- Mining of up to 75 Mtpa of gold-bearing ore and waste from the Tropicana and Havana deposits, with an estimated viable resource of 5.01 Moz.
- Disposal of up to 800 Mt of waste material in adjacent waste material landforms;
- Processing plant (Carbon In Leach) with a processing rate of up to 7 Mtpa of primary ore;
- Disposal of up to 7 Mtpa of tailings in a two-cell Paddock tailings storage facility with possible in-pit deposition
- Water will be sourced from the borefield approximately 50 km from the processing plant and will be pumped via a bunded (or buried) pipeline.
- Linear Infrastructure Corridors:
  - Mine Access Road from the Operational Area to Kalgoorlie.
  - Communications Corridor.
- A power station of up to 40 MW total installed capacity.
- Supporting infrastructure and facilities such as emergency and start-up power generation, workshops, laboratory, internal roads, administration buildings, aerodrome, village communication system, water and wastewater treatment plants and other supporting infrastructure.

The above elements are described in detail in the following sections. The key statistics of the estimated resource and Life of Mine requirements are shown in Table 2.1. The Project will result in the clearing of up to approximately 3,440 ha if the Project reaches the maximum predicted capacity. The Joint Venture seek approval for the total proposed disturbance area as onground requirements may result in minor variations to the configuration and location of infrastructure at the Operational Area. A breakdown of the estimated disturbance area per activity is shown in Table 2.2.

Table 2.1: Estimated Project Statistics

Element	Description
Current Resource:	
Resource Tonnes	75.3 Mt
Resource Grade	2.07 g/t
Estimated Gold Resource	5.01 Moz
Proposed Utilisation of Resource:	
Construction Period	Approximately 30 months, commencing 2010
Mining Rate (ore and waste)	Up to 75 Mtpa
Stripping Ratio	Up to 8:1
Number of Pits	Up to 4
Open Pit Void(s)	Up to 400 ha
Maximum length of pit	6 km (if pits combine)
Maximum width of pit	1.5 km
Overburden Volume	Up to 800 Mt
Waste Landform	Up to 1,200 ha; some in-pit dumping being considered. Maximum height of 375 mRL Slope with a maximum angle of 15˚
Processing Plant and Rate	Carbon In Leach plant with processing rate of up to 7 Mtpa
Water Supply	Up to 7 Mm^3 /annum Borefield located 50 km NNW of Operational Area Pipeline length of 50 km
Dewatering Rate	1,000 – 5, 000 kL/ day
Major Components:	
Mine Access Road	Pinjin Option – 370 km (~ 210 km of road construction)
Communications	Fibre Optic or Microwave via either Pinjin or TT
Aerodrome	All weather strip 2.4 km long
Power Supply	Onsite power station with an installed capacity of up to 40 MW during the operational phase
Tailings Storage Facility	Up to 7 Mtpa; two-cell Paddock tailings storage facility with possible in-pit deposition Maximum height of 372 mRL Approximately 1330 m wide by 1850 m
Village	Construction phase – up to 700 rooms Operational phase – up to 450 rooms
Workforce	Construction – up to 700 Operational – up to 400
Life of Mine:	
Project Life	Approximately 15 years of mining; total project duration up to 25 years (including post closure monitoring)
Approximate maximum area of disturbance	3,440 ha
Estimated CO_2 Emissions	Up to 330 kt $CO_{2\text{-}e}$ / year during operations and 4,500 kt $CO_{2\text{-}e}$ over the life of the Project.

Table 2.2: Estimated Maximum Disturbance Area for Tropicana Gold Project Infrastructure Areas

Activity	Area (ha)
Operational Area [1]	2,570
Water Supply Area	200
Infrastructure Areas[2]	670
Disturbance Estimate – Total[3]	3,440 ha

1. Covers all the site activities located within the mining lease except the Access Road and Communication corridor
2. Includes both potential infrastructure corridors – one road and a separate communications corridor
3. Total disturbance proposed includes area required to establish borrow pits and quarry.

2.1.3. Tenure

Mining Leases have been granted for the Operational Area (Table 2.3). Miscellaneous Licenses have also been granted for the infrastructure requirements (Table 2.3).

Table 2.3: Granted Mining and Miscellaneous Licenses for the Proposed Project

<table>
<tr><th colspan="5">Infrastructure Corridors</th></tr>
<tr><td colspan="2">Pinjin</td><td>L31/56</td><td>L31/57</td><td>L39/185</td></tr>
<tr><td colspan="2">TT Corridor</td><td colspan="2">L39/188</td><td>L39/186</td></tr>
<tr><td colspan="4">Bypass Road</td><td>L39/189</td></tr>
<tr><th colspan="5">Operational Area</th></tr>
<tr><td>M39/978</td><td>M39/979</td><td colspan="2">M39/980</td><td>M39/981</td></tr>
<tr><td>M39/982</td><td>M39/983</td><td colspan="2">M39/984</td><td>M39/985</td></tr>
<tr><td>M39/986</td><td>M39/987</td><td colspan="2">M39/988</td><td>M39/1010</td></tr>
<tr><td>M39/1011</td><td>M39/1012</td><td colspan="2">M39/1013</td><td>M39/1014</td></tr>
<tr><td>M39/1015</td><td>M39/1016</td><td colspan="2">M39/1017</td><td>M39/1018</td></tr>
<tr><td>M39/1019</td><td>M39/1020</td><td colspan="2">M39/1021</td><td>M39/1028</td></tr>
<tr><td>M39/1029</td><td>M39/1030</td><td colspan="2">M39/1048</td><td>M39/1049</td></tr>
<tr><td>M39/1050</td><td>M39/1051</td><td colspan="2">M39/1052</td><td>L39/172</td></tr>
<tr><th colspan="5">Water Supply Area and Pipeline</th></tr>
<tr><td>Minigwal Trough</td><td>L38/150</td><td>L38/113</td><td>L38/114</td><td>L39/178</td></tr>
</table>

2.1.4. Timing

It is currently expected that the Project would have an active mining and processing life of approximately 15 years based on known resources and potential growth from exploration (Table 2.4) while the Project's total life including construction and closure activities is expected to be up to 25 years.

Table 2.4: Key Milestones for the Tropicana Gold Project

Item	Start Date	End Date	Comments
Environmental Approvals (State and Federal)	June 2008	2010	The period of public comment is anticipated to occur at approximately August – October 2009 (8 weeks).
Construction	0 month	28 month	The access road is the first item to be constructed due to the necessity of a safe and environmentally acceptable route of transport to the Operational Area.
Commissioning	27 month	30 month	
Operations	27 month	Year 17	
Rehabilitation/ Closure	Year 7	Year 23	Rehabilitation will occur progressively throughout the Life Of Mine, though the bulk will be completed at closure.
Rehabilitation Monitoring	Year 10	Year 25	Monitoring of revegetation success.

2.2. RESOURCES TO BE MINED/ MANAGED

The primary resource to be extracted and utilised by the Project is gold-bearing ore. In the process of extracting this resource, waste material will be removed and stockpiled at the waste landform. Other resources, including sandalwood and retrievable rehabilitation materials, will also be recovered and stored. The following sections describe the resources and mineral waste that will be extracted and managed during the construction and operational phases of the Project.

2.2.1. Mineral Resources

The gold mineralisation is hosted in gneissic metamorphic rocks. The deposits are broadly stratiform, with both the host rock and mineralised zone dipping approximately 30^{o} towards the east southeast. The Tropicana deposit is predominantly a single lens of mineralised ore, while the Havana deposit is composed of several lenses (Figure 2.3). Both deposits are controlled by a series of discontinuous and linked shears. The more northern Tropicana deposit is bound to the north by the Boston Shaker Shear Zone. The Tropicana and Havana deposits are separated by northeasterly- to easterly-striking shears (Muddler, Swizzler and Cobbler). At Havana, the boundary between the northern and southern domains is coincident with the Don Lino Shear, and the deposit is open (although low-grade) at its southern end (Figure 2.4).

Mineralisation has been tested to a typical vertical depth of 300 to 400 m, with the drilling depth largely determined by a number of pit optimisation studies completed progressively during the exploration and pre-feasibility phases of the Project. The approach utilised was aimed at optimising the efficiency of drilling within the limits of likely pit depths for open-cut mining.

Two mineralisation styles are identifiable based on sulfide mineral occurrence and host rock type. They are:

- gneiss-hosted mineralisation: Pyrite ± pyrrhotite ± chalcopyrite disseminations, bands and crackle breccia veins within altered quartzo-feldspathic gneiss and rare garnet gneiss divisions; and,
- metasedimentary-associated mineralisation: Patchy and vein style pyrite-pyrrhotite selectively replacing thin intervals of the ferruginous chert association and 10 - 30 cm wide shear and cataclasite zones interleaved with, and at the base of, the hanging wall garnet gneiss.

Higher grades of gold are associated with the gneiss-hosted mineralisation, rather than the metasedimentary mineralisation. The estimated, economically viable resource (current at 31 December 2008) is 5.01 Moz (Table 2.5). Ongoing exploration in the Operational Area is being conducted with the objective of expanding the resource; however the full-extent of clearing and environmental impacts will not exceed that described in this PER documentation.

As mining progresses through the operational phase, excavated material (mineralised ore and waste rock) will be hauled from the active mine face(s). Ore will be hauled to the run of mine before processing to extract gold (see section 2.5 for further details). Marginal material will be stockpiled separately so that it can be recovered for processing should economic conditions allow gold recovery.

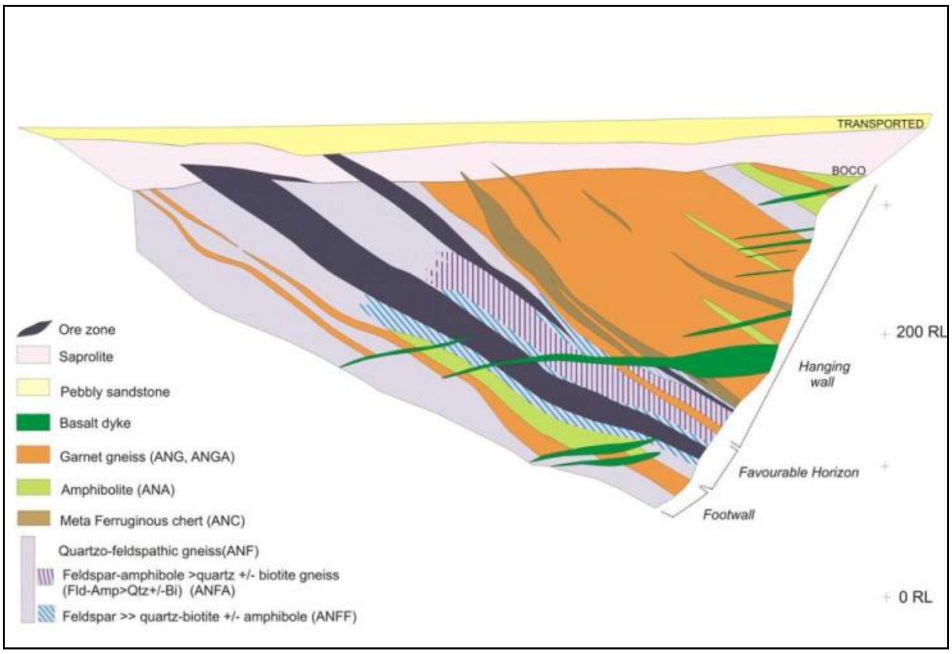

Figure 2.3: Schematic cross section of the Havana Deposit

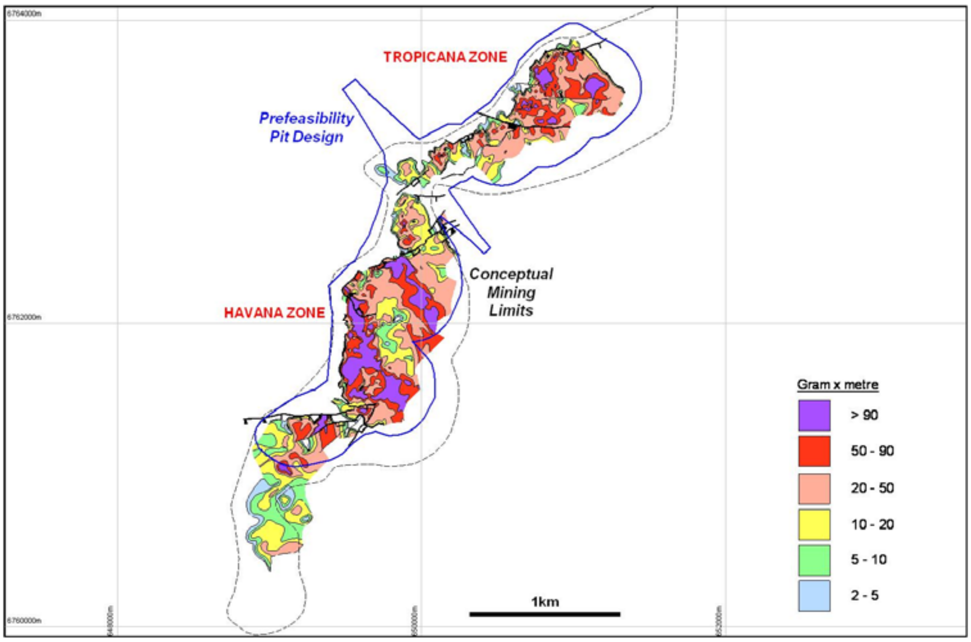

Figure 2.4: Pit Design and Conceptual Mining Limits

Table 2.5: Estimated resource (current at 30 June 2009)

Classification	Quantity (Mt)	Grade (g/t)	Contained Gold (Moz)
Measured	24.2	2.3	1.79
Indicated	39.8	2.0	2.58
Inferred	11.3	1.8	0.64
Total	75.3	2.1	5.01

2.2.2. Mining Waste Material

Extraction of the mineralised ore will require the removal of overburden and waste material surrounding the mineralised deposits. During the construction phase, waste material with appropriate physical and geochemical characteristics (e.g. Non-acid Forming), will be used to build up the crusher area, initial tailings storage facility, run of mine pad, stockpile bases and internal haul roads. The remaining waste will be placed on the waste landform. Geochemical characterisation of waste (Appendix 2-B18) has indicated that a proportion of the waste generated could be Potential Acid Forming material (predominantly ferruginous cherts). The remainder of the waste material is either not classified (i.e. neither neutralising nor potentially acid forming), non-acid forming or acid neutralising (e.g. contains carbonate mineral). A strategy of blending potentially acid forming with neutralising waste and the appropriate placement of potentially acid forming materials away from the margins of the final waste landform will be used to avoid any risks associated with acid mine drainage.

Very low levels of fibrous minerals have been observed in diamond drilling cores using Scanning Electron Microscopy to determine fibre type and morphology. The majority of fibres identified were actinolite with some other fibrous minerals present. Appropriate operating procedures and dust suppression techniques are considered adequate to address the potential risk. Section 6.2.5 contains further details on material characterisation. Waste will be placed to create waste landforms situated close to the proposed pits (see sections 2.3 and 2.4, and Figure 2.5 for further details of site layout). Section 7.2.8 contains specific detail on the management of potentially acid forming, and fibrous materials.

2.2.3. Botanical Resources: Vegetation and Sandalwood

During the construction phase areas beneath the proposed infrastructure footprint (including the waste landform) and the areas proposed for mining will be cleared of vegetation. Sandalwood (*Santalum spicatum*) is known to exist in the Great Victoria Desert and has been encountered within the Project footprint. Sandalwood has economic value as a natural resource. If economically viable, sandalwood resources will be harvested by contractors with appropriate licenses from the Forest Products Commission. Sandalwood has been recorded during all surveys conducted to date. Other vegetation will be cleared and stockpiled for use in erosion control, windrows and as fauna refuge in denuded areas prior and during rehabilitation activities.

2.2.4. Rehabilitation Substrate: Topsoil/ Sand

Following the removal of vegetation (or in conjunction with), the topsoil/ sand medium will be removed, stockpiled and managed in such a way as to minimise dust production, erosion, sedimentation of adjacent areas and limit degradation of propagule viability. The topsoil/ sand medium will be primarily of use in the rehabilitation of the site, both as a source of cover (e.g. for the waste landform) and a source of propagules for revegetation (i.e. a natural seed bank). An estimated volume of 18.8 Mm^3 of topsoil/ sand medium will be removed and available for use as rehabilitation substrate (refer to section 10.2 for further information). The harvest and storage of the topsoil/ sand medium is further discussed in the Conceptual Closure and Rehabilitation Management Strategy (Chapter 10).

2.2.5. Schedule of Removal/ Extraction

The removal of surface resources and extraction of ore and waste material will occur progressively throughout the life of the Project. As the early construction of the Mine Access Road is timing-critical to the construction and operation of the Project (to allow improved access to the Operational Area) the removal of surface resources (sandalwood [if present] and other vegetation) from the proposed alignment will occur early in the Project's life to allow road-base to be laid and traffic flows to increase. At the Operational Area, vegetation clearing and topsoil/ sand medium will be removed, followed by the extraction of overburden from the pits which will be used to construct the run of mine and for foundation material under other items of key infrastructure. As the Project progresses into the operational phase, the clearing of vegetation and removal of topsoil/ sand medium will slow, and primarily be restricted to areas under the expanding waste landform or pit cut-backs. An indicative schedule summarizing the harvest and removal of resources and waste is shown in Table 2.6.

Table 2.6: Indicative Schedule of Harvest of Resources and Removal of Waste

Resource/ Waste	Approximate Timing	Destination/ Use
Cleared vegetation	Primarily within the first 12 months and continuing throughout the life of the Project – 50 % completed within the first five years. Vegetation clearing will progress slowly through the operational phase as the waste landform and the mining area expands to its final limit.	Vegetation stockpile, for use as erosion control and fauna refuge as required.
Topsoil/ sand from cleared areas	Topsoil/ sand primarily within the first 12 months from Project approval. Topsoil/ sand removal will progress slowly throughout the operational phase as the waste landform expands to its final limit.	Substrate stockpile, for use in rehabilitation/ revegetation.
Overburden	Primarily within the first two years from Project approval.	Construction of the run of mine, access road, and other infrastructure/ foundations.
	Primarily during the second year after Project approval.	Excess/ inappropriate foundation material to the initial waste landform.
	Throughout operational phase.	Waste landform.
Mineralised ore	Throughout operational phase.	Processing.

2.3. MINING

The mining method selected for use for the Project is open pit mining with conventional drill and blast techniques and a typical mining fleet (e.g. diesel fuelled trucks and excavators), consistent with typical open cut gold mining practices within Western Australia.

Depending on economic conditions and the actual depth/ volume of ore beneath the resources identified to date, there may be potential for underground mining to proceed in the future. The establishment of underground mining is not directly in the scope of this assessment. Should the Joint Venture decide to proceed with underground mining, additional approvals would be obtained where required. The following sections provide further detail on the proposed open pit mining operation at the Project.

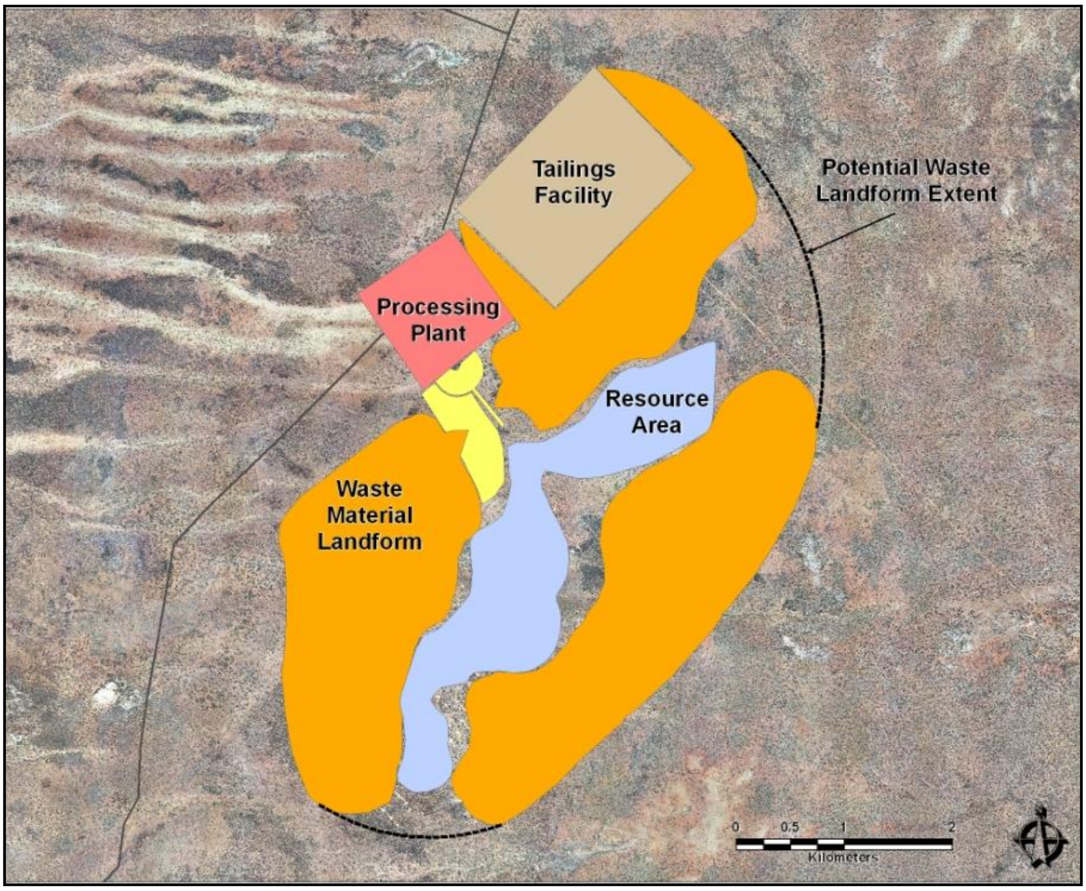

Figure 2.5: Layout of the Mine and Associated Infrastructure

2.3.1. Pit Arrangement/ Design

A key decision in the design phase is the positioning of the ramp systems, to enable practical and efficient movement of ore and waste material out of the pit. Other key considerations are the slope and length of the ramp which have implications for fuel usage, and the overall engineering of the structure (stability). The design slope configurations (Table 2.7) for the weathered and fresh rock domains differ to allow for the different physical characteristics of these areas. Changes to this design are anticipated with further exploration, design and project optimisation, but these changes will have no significant impact on the environmental parameters of this impact assessment (e.g. the area cleared will not increase).

Table 2.7: Pit Design Slope Configuration

Slope configuration	Weathered	Fresh
Bench height	10 m	20 m
Batter angle	60°	90°
Berm width	8 m	12 m
Inter-ramp slope angle	36°	59°

The annual mining volume (ore and waste), based on current resources within in the Tropicana and Havana deposits and adjacent satellite pits is illustrated in Figure 2.6. The total volume of material (i.e. ore and waste) mined will be up to a volume consistent with the maximum pit and waste landform areas.

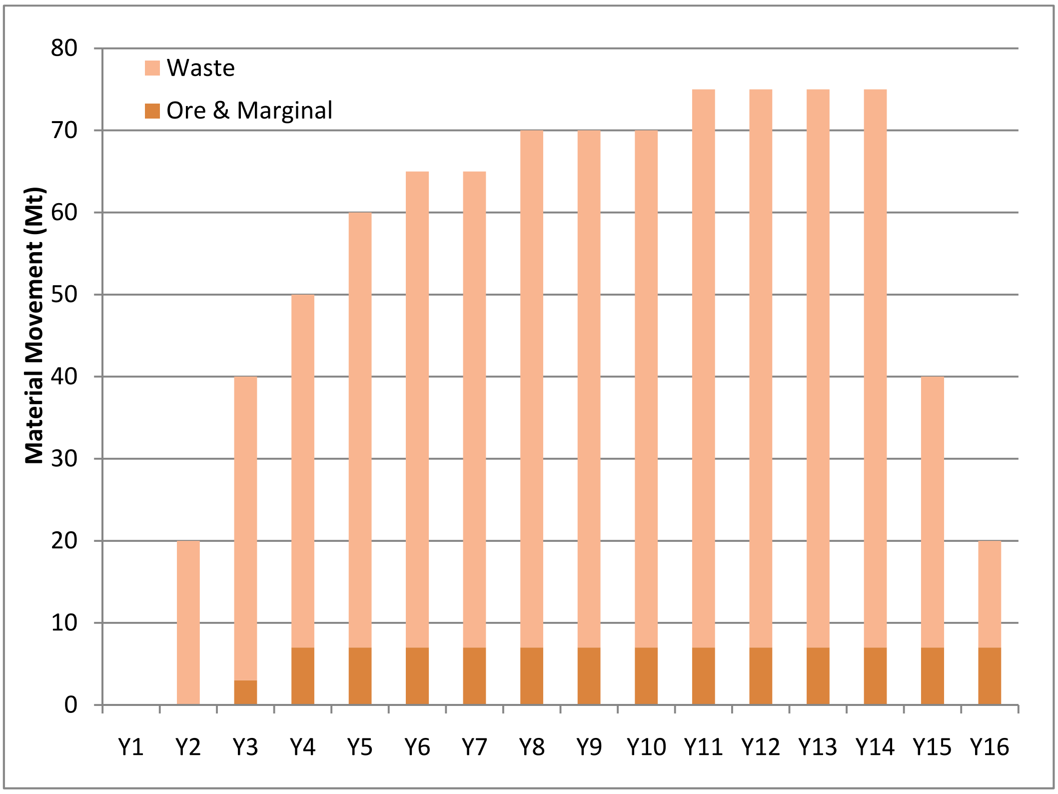

Figure 2.6: Anticipated Annual Mining Rate for Ore and Waste Materials

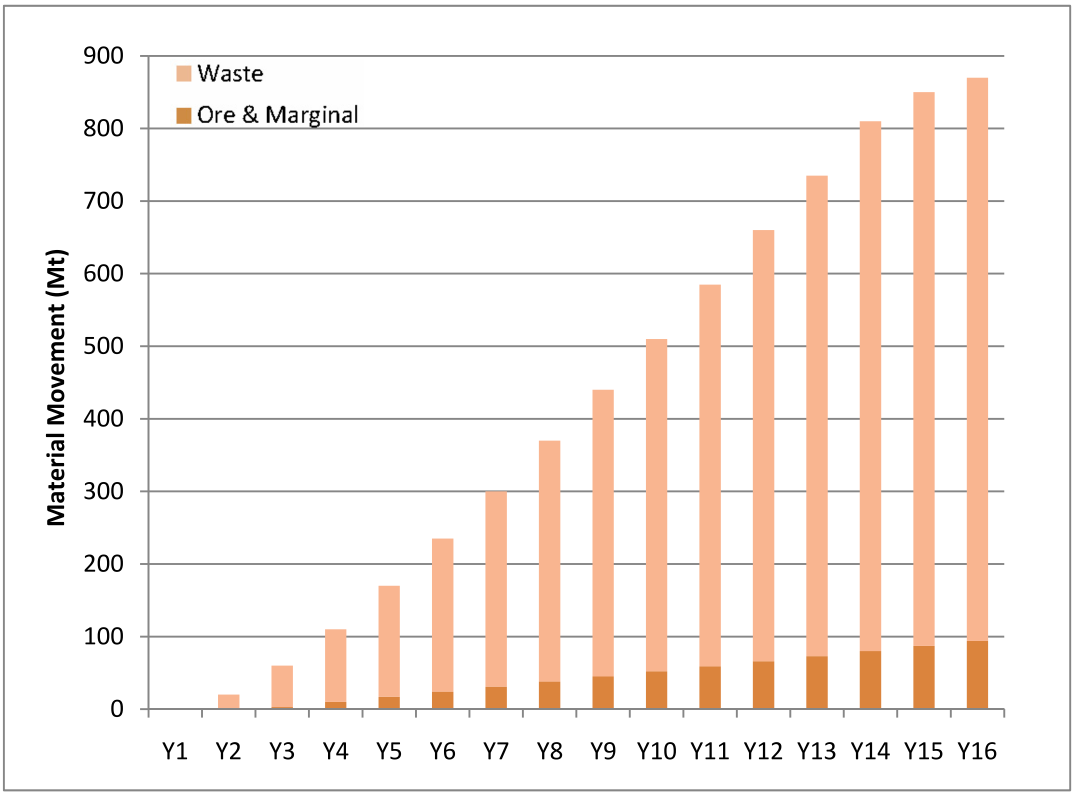

Figure 2.7: Anticipated Accumulative Material Movement

2.3.2. Mining Method

Ore and waste material extraction will be by conventional, open pit mining methods. Drill and blast techniques will be used to fragment the ore and waste material in the pits. Truck and excavator mining methods would be utilised for all ore, marginal and waste material. The primary mining fleet would include a fleet of trucks in the 200 to 300 tonne class and excavators in the 1,800 to 5,500 tonne class range. Initially, free dig, and later on blasted rock, will be mined using hydraulic excavators (shovel or backhoe configuration) to load trucks on each mining bench. The trucks will then transport the material on haulage roads and ramps to the required destinations. Ore will be hauled to the run of mine and either stockpiled and rehandled or dumped directly to the primary crusher according to the characterisation of the ore, the optimal mine sequencing and the plant operating requirements.

Overburden above the starter pits will be removed, sorted (e.g. growth medium separated from waste material) and stockpiled or dumped on the waste landform as appropriate. Waste stripping of free dig material in the starter pits will continue in order to expose the first layer of harder material (e.g. ore/ solid waste material) which will be drilled and blasted. Blast patterns and the selection of explosives will be determined by material type and taking operational conditions. Subsequent pits and cut-backs will be opened following a similar procedure.

As discussed previously some of the waste material generated in the first year of the Project will be utilised for infrastructure construction. The majority of waste mined over the Project life will be dumped on the waste landform. Potential for the backfilling of completed pit stages will be considered during mining. Backfilling of pits may reduce the size of the waste landforms and have other favourable environmental benefits. However, once backfilling has commenced the possibility of future pit expansions or underground mining will be compromised. This may result in the sterilisation of gold resources at depth that are currently considered uneconomic, but may be viable under favourable economic conditions. The environmental impact of the Project is therefore discussed on the basis of no backfilling of pits being completed.

2.3.3. Dewatering

Dewatering will need to accompany pit development as the proposed pits extend below the water table. Analysis of the hydrogeology and pit dewatering requirements is summarised in Chapters 6 and 7 based on the work undertaken by Pennington Scott (Appendix 2-B17). All water produced as part of the dewatering operation will be utilised in the processing facility and for dust suppression purposes, thereby offsetting requirements from the borefield. There will be no discharge of pit water to the environment. Pit water may be used in dust suppression; however, run-off to the surrounding environment will be prevented. Mine dewatering infrastructure is described in Chapter 7.

2.3.4. Mining Equipment

The mining equipment (e.g. excavators and trucks) required for the Project has been selected with consideration of the pit/ ramp design, with the overall aim of maximising efficiencies of extraction and minimising fuel requirements, and the associated emissions. The mining equipment will vary through the mine life according to the mining and ore processing schedule. The mining fleet could include:

- up to five excavators (1,800 to 5,500 tonne class range);
- up to 20 haul trucks (200 to 300 tonne class range);
- up to two auxiliary excavators (1,000 to 1,600 tonne class range);
- up to five auxiliary trucks (80 to 150 tonne class range);
- up to two run of mine loaders; and,
- up to 15 production, presplit and grade control drills.

2.4. WASTE LANDFORM

Planning for the progressive expansion of the waste landform (a series of interconnected dumps; Figure 2.5) over the life of the Project has considered a range of variables, including:

- locations of the pit ramp exit points from the starter and main pits;
- schedule for the generation of waste material;
- relationship between travel time and travel distance for horizontal and vertical haulage;
- relationship between fuel consumption rates and travel distance for horizontal and vertical haulage; and,
- engineering constraints (e.g. zone of instability).

During the operational phase, the final slopes of the waste landform will be progressively battered down to 15˚ to meet environmental closure specifications. Modelling and waste/ substrate stability analysis has demonstrated that traditional berms are not appropriate as they can cause water to pool which can affect the stability of the landform by encouraging tunnel erosion. Thus the final shape of the waste landform will be gently sloped, elevated hills on which local vegetation will be established. The northern waste landform will surround the tailings storage facility. The final waste landform will not project above the surrounding landforms to blend into the landscape at closure (pending successful rehabilitation, refer Chapter 7 for further details).

2.5. ORE PROCESSING

Gold-bearing ore will be processed through a central facility, located to the western side of the mining area. A conceptual processing facility is illustrated in Figure 2.8. The facility is sized to treat up to 7 Mtpa of primary ore. The plant operating throughput will vary according to the grade and type of ore being processed (particularly the blend of oxide and fresh rock). The processing pathway adopted is presented in block form in Figure 2.9. The processing facility will consists of the following major process steps:

- primary and secondary crushing;
- high pressure grinding rolls (HPGR);
- ball milling to 80% passing 75 μm;
- thickening, followed by leaching and carbon adsorption;
- carbon elution and regeneration;
- thickening and tailings disposal; and,
- tailings water recovery.

The metallurgical treatment response of the Tropicana and Havana primary ores has been shown to be relatively similar in testwork conducted to date, and the adopted processing methodology is suitable for both ore sources. The processing plant and its associated services are based on the typical gold plant flowsheet presented in Figure 2.9 with the exception of HPGR and two stage thickening in the circuit. The optimisation process for determining the preferred processing methodology is based on numerous testwork programs and associated modelling to achieve the most energy and water efficient processing flowsheet that includes:

- HPGR, a relatively new technology in hard rock processing, was selected in preference to the other technologies due to its lower levels of power consumption. The comminution modelling and initial evaluation of the major comminution options for the project concluded that the HPGR-grinding mill option offered the greatest economic benefit which reflects the increasing impact of more power efficient grinding; and,

- two stages of thickening were included in the process flowsheet one stage prior to leaching and the other stage prior to the final discharge to tailings. Utilising two stage thickening will maximise reagent and water recycling.

The mineralisation hosting the Tropicana and Havana resource does not contain significant amounts of copper, removing the potential for problems with copper-cyanide complexing (during processing). The gold within Tropicana and Havana deposits is not associated with refractory ores, therefore roasting is not required as part of the processing pathway, avoiding the generation of environmentally hazardous emissions such as sulphur dioxide or arsenic trioxide.

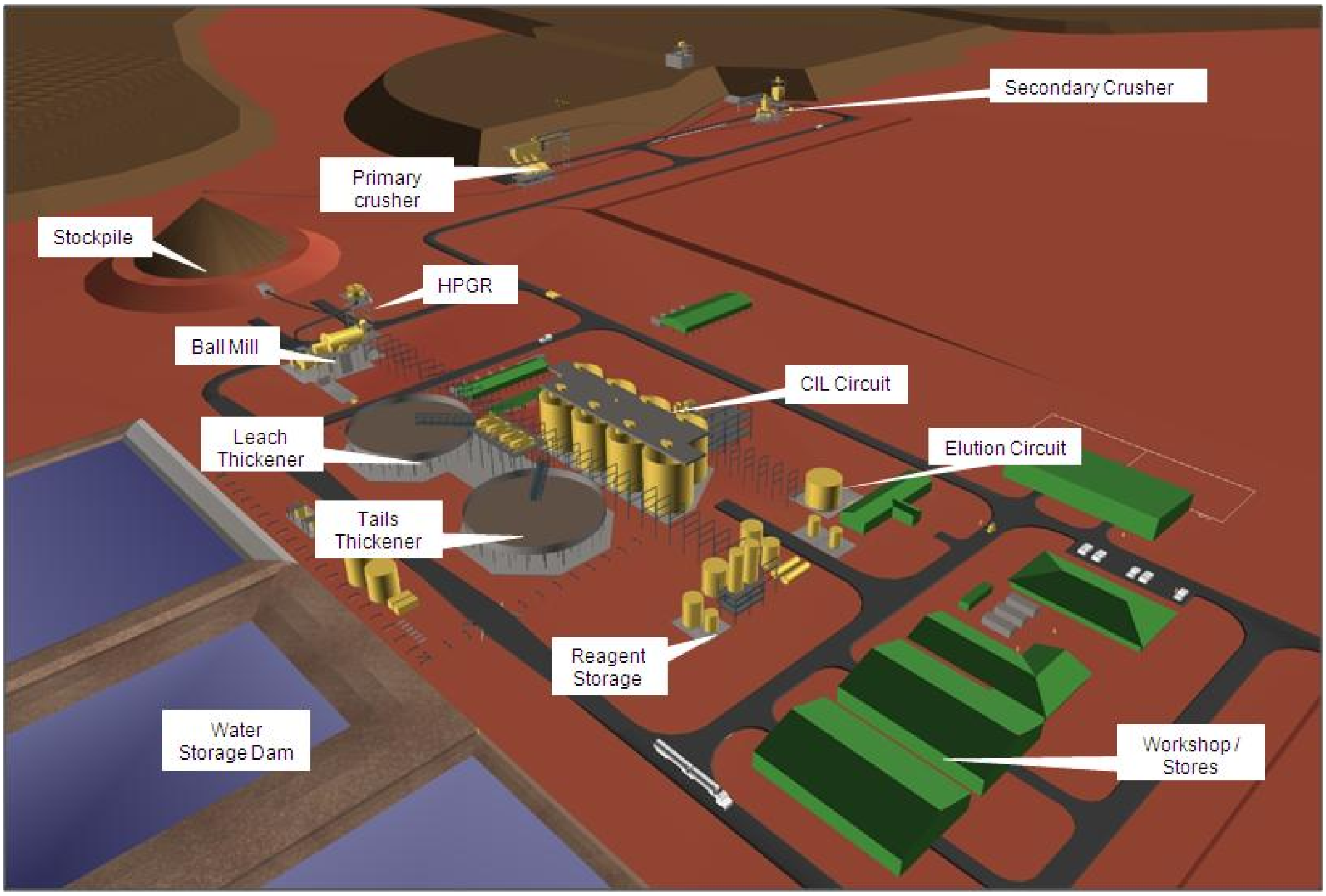

Figure 2.8: Conceptual Processing Plant

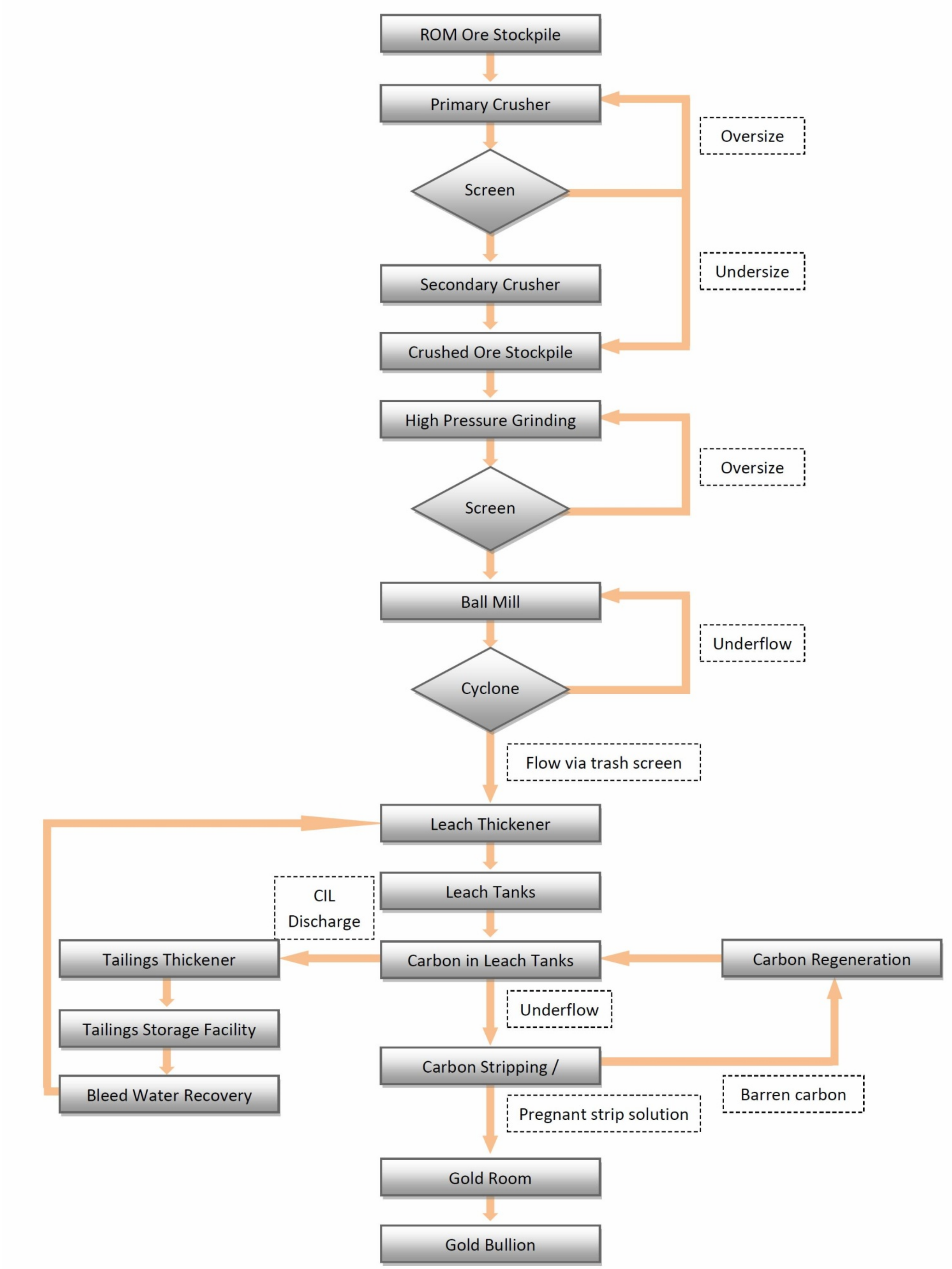

Figure 2.9: Processing Pathway for the Tropicana Gold Project

2.5.1. Crushing

The proposed crushing plant will be comprised of two stage primary and secondary crushing which are sized to operate on a 12 hour per day basis. Gold-bearing ore (< 1,000 mm) will be trucked to the run of mine pad and the majority will be direct tipped into the primary crusher and crushed to a nominal size of 80% less than 150 mm. Ore requiring rehandling may either be trucked to the crusher, or trammed by front end loader. After stage one primary crushing, ore will be conveyed into the secondary crushers which will be operating in closed circuit with screens for further crushing and sizing. The final product from the crushing plant will be directed to the crushed ore stockpile. Dust control in the crushing plant includes dust suppression and dust extraction systems. Each section of the crushing plant will include a dedicated dust extraction unit (wet scrubber) to ensure that the airborne dust generation around the crushing plant is minimised.

2.5.2. Grinding

The grinding circuit will consist of a HPGR in closed circuit with sizing screen followed by a ball mill in closed circuit with hydrocyclones. The feed for the HPGR is via reclaimed stockpile material which undergoes two stages of grinding with the final product being 80% less than 75 µm that is classified by hydrocyclone. The cyclone over flow will be directed to the leach circuit via leach feed thickener and under flow will be recycled into the grinding circuit for further grinding. The installation of the leach feed thickener will achieve more efficient size separation and hence more efficient grinding, increase leach feed density, and thus require smaller tanks and other equipment and minimise loss of cyanide to the plant tailings. The grinding circuit is the most power consuming section in the processing plant with approximately 50% of the total power generated being used in this circuit. The selected HPGR/ ball mill grinding process pathway including leach thickening will provide the most economical, power and reagent efficient circuit for the Project.

2.5.3. Leach Circuit

The leach circuit will consist of two leach tanks, followed by six carbon in leach (CIL) tanks (in series). The tanks will be interconnected with launders and slurry will flow by gravity through the tank train. The first leach tank will receive fresh feed from the Leach Feed Thickener together with sodium cyanide solution to facilitate gold leaching. Additional sodium cyanide may be added into the second leach tank and/ or any of the first four CIL tanks. CIL circuit design incorporates the requirements of the International Cyanide Management Code, which is the industry standard for best practice. The International Cyanide Management Code is a voluntary industry program for the gold mining industry to promote:

- responsible management of cyanide used in gold mining;
- enhance the protection of human health; and,
- reduce the potential for environmental impacts.

Fresh and/ or regenerated carbon will enter the circuit via the last CIL tank and will be advanced counter-current to the slurry flow. As the gold in the slurry is leached moving through the CIL circuit, activated carbon suspended in the slurry will adsorb the leached gold. Loaded carbon with a concentration up to 10,000 ppm gold will be collected from the first CIL tank and directed to the elution plant for stripping and electrowinning. Barren slurry will be discharged from the last CIL tank to the Tailings Thickener via carbon safety screens. A tails thickener has been included to maximise reagent and water recovery prior to tailings being pumped to the tailings storage facility. Lime slurry will be used for pH control. The pH in the CIL circuit will be monitored and a slow acting control loop will control quicklime addition based on the ball mill feed rate and the measured pH.

2.5.4. Elution Circuit

Loaded carbon from the CIL will enter a stripping circuit which will contain separate acid wash and elution columns. During the acid washing stage, a dilute solution of hydrochloric acid will be pumped into the acid column to remove contaminants. After the acid wash, loaded carbon will be hydraulically transferred to the elution column.

The strip solution of sodium hydroxide (2.0 % [w/v]) and sodium cyanide (0.2 % [w/v]) concentration will be injected into the base of the pressurised elution column at a temperature of 125^{o}C to strip the gold from loaded carbon. The pregnant strip solution will be circulated to the electrowinning circuit.

2.5.5. Electrowinning and Carbon Regeneration

The electrowinning circuit consists of four electrowinning cells, to which gold will precipitate from the strip solution onto the cathodes. The electrowinning cells will be of polypropylene construction and will be located within the security area of the gold room. Gold from the cathodes will be washed, filtered, dried in calcination ovens and direct smelted with fluxes in a furnace to produce doré bars. Fume extraction will be provided to remove noxious and explosive gases from the cells and the calcine ovens. In addition to this, fresh air fans will be provided to ensure there is adequate ventilation inside the goldroom.

When the strip solution exits the electrowinning cells, it will gravitate back to the strip solution tank and then be recirculated to the elution column. The strip solution will be recirculated continuously for 10 - 12 hours, or until the gold level of the strip solution exiting the elution column reaches a pre-determined cut-off level. The used strip solution will be directed to the CIL circuit, allowing any residual gold to be recovered in the CIL circuit.

For carbon regeneration, the barren carbon (from the elution column, after removal of the gold) will be transferred to the regeneration kiln. The carbon will be regenerated at 650-750°C in the absence of oxygen. Regenerated carbon from the kiln will be returned to the CIL circuit.

2.6. Tailings Storage Facility

2.6.1. Design of the Tailings Storage Facility

The tailings storage facility planned for the Project has been designed around the following requirements:

- permanent and secure containment of all solid waste materials;
- maximisation of tailings density;
- removal and reuse of free water;
- minimisation of seepage;
- excess storage capacity to retain a 1 in 100 year 72 hour rainfall event;
- effective rehabilitation; and,
- ease of operation.

Several tailings disposal methods were evaluated including thickened tailings, paste tailings and conventional tailings. The thickened tailings disposal method was selected from the above alternatives due to the more efficient use of power and substantial water recycling.

An initial site layout study to compare the potential locations for the tailings storage facility was performed and included:

- conventional paddock tailings storage facility;
- valley storage tailings storage facility situated in the sand dunes west of the processing plant location;
- central thickened discharge tailings storage facility; and,
- integrated tailings storage facility (waste landform).

Of the above options, the valley storage tailings storage facility was eliminated based on the environmental impact, despite it being the most economical tailings storage facility option. The central thickened discharge requires a large footprint in comparison with the alternatives. A conventional paddock tailings storage facility integrated into the waste landform was selected as the preferred option. This tailings storage facility is a two-cell paddock, incorporated into the northwestern waste landform, with the waste landform surrounding the north eastern and southern sides of the facility (see Figure 2.10 for proposed configuration within the northern waste landform). Initially, the tailings storage facility will be constructed to store one year of tailings production. As the Project progresses, the tailings storage facility embankments will be raised. Construction of the stage raises be completed to ensure there is adequate storage volume, including provision for major rain events, available throughout the life of the mine. Initially, the embankment raises will be constructed downstream, but when a suitable tailings beach is formed, future raises may be constructed upstream. All embankments will be constructed using suitable waste material. The tailings storage facility height will not exceed the adjacent waste landform height of 375 mRL (~35 m); which equates to a maximum tailings volume of 93 Mt.

Figure 2.10: Combined Waste Landform/ Tailings Storage Facility

The basin surrounding the decant tower of the tailings storage facility will be lined with High-Density Polyethylene (HDPE) lined to prevent seepage to the underlying substrate and groundwater. The remaining area will be lined with a clay liner. The basin liner and underdrainage system for the facility have been optimised to make best use of naturally occurring materials on the site. On this basis, the basin area will consist of the following components (Figures 2.11 and 2.12):

- subgrade layer covering the bottom of the tailings storage facility basin, consisting predominantly of reworked in-situ material (which is sandy);
- 1.5 mm HDPE smooth geomembrane liner over the subgrade beneath the supernatant pond of each cell (textured liner will be used below causeways). The total area covered by the geomembrane is equivalent to approximately 20% of the basin area for each cell or equal to the area of highest seepage risk;
- the rest of the basin area (approximately 80% of the basin) will be covered with a 200 mm thick clay liner (material sourced from the mining area);
- collector drains along the main drainage paths consisting of a collection channel excavation into the basin subgrade and a 160 mm diameter draincoil pipe, surrounded by drainage medium and wrapped with geotextile; and,
- branch drains at 50 m intervals reporting to the collector drains, consisting of a 100 mm diameter draincoil pipe, surrounded by drainage medium and wrapped with geotextile.

The decant system for the facility will consist of the following components:

- 2.1 m diameter slotted precast concrete tower for each operating cell;
- general fill causeway to provide access to the tower;
- coarse rockfill material surrounding the slotted decant tower; and,
- associated pump and pipeline infrastructure.

The decant system (causeway, tower and rockfill) will be raised with each embankment raise.

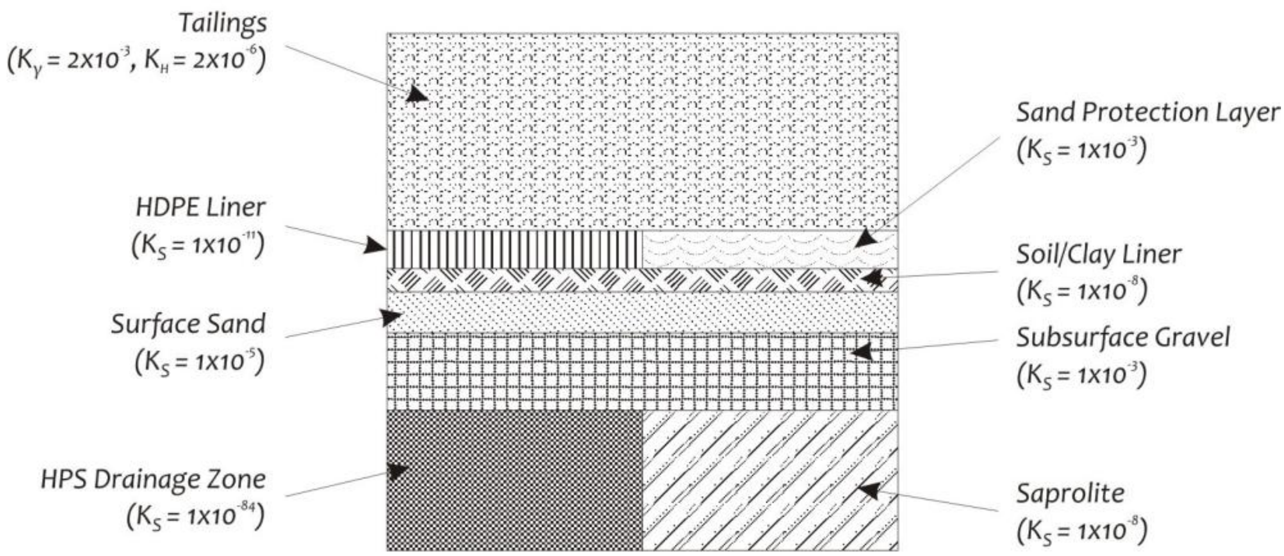

Figure 2.11: Tailings Storage Facility Liner Schematic

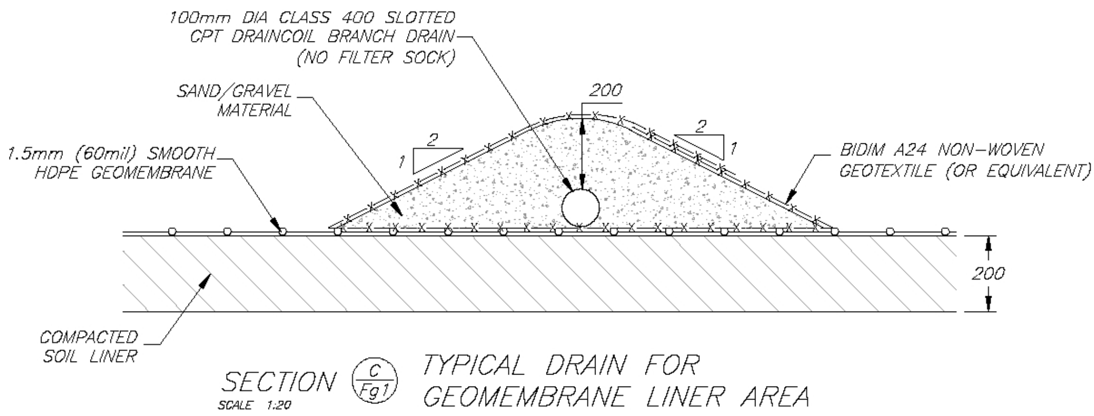

Figure 2.12: Under Drain Configuration over High Density Polyethylene Liner Area

2.6.2. Operation of the Tailings Storage Facility

Prior to entering the tailings storage facility, pre-tailings slurry will be de-aerated and treated with flocculent in the Tailings Thickener. The tailings-thickening is designed to remove a proportion of the liquid from the tailings slurry prior to deposition. The purpose of the tailings thickener is to accelerate the process of settling and dewatering solids in the feed slurry at the processing plant prior to release in the storage facility. This process is accelerated by the addition of flocculent and agglomeration of fine particles. Tailings' thickening only increases the percentage of solid in a given volume and does not change the concentration of the contained metal or chemicals within the solid per unit of measure. Traditional tailings slurry has a consistency of 40 - 60% solids whereas thickened tailings are more likely to be 60 – 70% solids.

Environmental benefits of thickened tailings include:

- increased storage capacity in the tailings storage facility;
- increased water recovery from the tailings which reduces cyanide management, seepage risk and animal issues;
- treated water recovered and reused in the process reducing the consumption of cyanide and other processing chemicals; and,
- the tailings thickening process does not result in a concentration of deleterious elements in the tailings and the process reduces the potential for the concentration of salt (derived from the use of saline water) through evaporation.

Thickener overflow will report to the process water pond. Thickener underflow will gravitate to the tailings hopper, from where the tailings pumps will pump the thickened slurry to the tailings storage facility. Discharge into the tailings storage facility will be by sub-aerial deposition methods, using a combination of banks of spigots at regular intervals. The active tailings beach will be regularly rotated around the facility so as to maximise tailings density and evaporation of water. Deposition will be from all four sides to maintain the supernatant pond centrally in the basin area.

A comprehensive monitoring program will be developed to monitor potential problems. The monitoring will include survey pins to check embankment movements, piezometers in the embankment and monitoring bores downstream of the embankment. The piezometers and bores will be monitored monthly for water levels and bores will be sampled quarterly for water quality.

2.6.3. Cyanide Management

The tailings storage facility will be monitored for levels of Weak Acid Dissociable Cyanide (WAD cyanide; a form of cyanide that can be environmentally harmful once dissociated) to ensure that wildlife are protected (by keeping the WAD cyanide to below 50 mg/L). The Tailings Storage Facility Environmental Management Strategy (Appendix-3G) incorporates cyanide monitoring procedures and management strategies to meet the requirements of the International Cyanide Management Code to which AngloGold Ashanti is a signatory. The preferred management option is to actively control cyanide levels at the CIL circuit to maintain residual WAD cyanide in tailings bleed water at an acceptable level (in accordance with the requirements of the International Cyanide Management Code). However, should monitoring in the first year of operation demonstrate that this is not possible, an alternative method will be evaluated and implemented to meet the required standards. If required, the alternative methods to reduce cyanide levels in the tailings bleed water could include measures such as ultra-violet irradiation of the clear supernatant water, tailings washing by counter-current decantation, additional thickening prior to discharge, partial or full detoxification of tailings slurry.

2.7. Water Supply

2.7.1. Water Requirements

Water is required for numerous uses in the mine, processing facilities, administration areas and village including:

- processing water will be predominantly saline, raw water from the borefield. The processing plant is the major point of consumption of water for the Project, an estimated maximum volume of 7 Mm^3/annum will be required during full production;
- higher quality water from the Reverse Osmosis (RO) plant will be required for some aspects of processing including elution and potable water supplies for administration areas, and the village;
- the firewater system will draw off the raw water pond; however, some potable water is required for flushing, maintenance and testing the pipeline to keep the system free of salt crystallisation and other contaminants. Pumps (main and back-up) will provide a secure water supply for fire-fighting in the event of a fire; and,
- raw water will be used for dust suppression.

Water will be pumped via a bunded or buried pipeline from the borefield approximately 50 km from the processing plant. Significant effort has been made to maximise resource efficiency and minimise abstraction from the Minigwal Trough. The processing plant has been designed based on highly efficient water management practices and to maximise water recycling. Water will be recycled/ reclaimed at several points including:

- water recovered from the mining area from dewatering and rain events will be directed to dust control or processing rather than directly discharged to the environment;
- prior to discharge, tailings will be thickened to minimise the amount of water reporting to the facility and to maximise water recycling in the processing plant;
- tailings pond will be kept to a minimum to reduce evaporation and decant water will be recovered for processing; and,
- Reverse Osmosis reject stream water will be used in the processing plant.

2.7.2. Minigwal Trough

Water exploration was being undertaken at the Minigwal Trough and Officer Basin at the time of referral of the Project to the EPA and DEWHA for consideration. Since that time, the Joint Venture has determined that the Minigwal Trough is the preferable water source, predominantly due to the shorter pumping distance and therefore greater energy efficiency. Public data indicates the Officer Basin contains better quality water resources and while this water resource is not currently utilised the water quality is amenable to development for other applications. Selection of the Minigwal Trough reduces potential for future conflicting usage requirements as the water is of lower quality and is therefore less likely to be in demand by other users.

Analysis of water from the Minigwal Trough has indicated quality characteristics of approximately:

- pH range from 6.2 - 7.5;
- specific gravity of 1.04; and,
- total dissolved solids (TDS) of 35,000 to 80,000 mg/L.

This water is suitable for processing and the low salinity water will be suitable for input into the Project's Reverse Osmosis plant. Without Reverse Osmosis treatment it is unsuitable for domestic, agricultural and most industrial applications.

The permeability of the sandstone in the Minigwal Trough is poor relative to other basin aquifers in Western Australia and a relatively large field (approximately 40 bores) of moderate yield bores (approximately 0.3 - 0.5 ML/day) will be required to meet the estimated peak summer water requirements. Abstraction from the aquifer will be regulated under the *Rights in Water and Irrigation Act 1914*.

Further details of the target aquifer can be found in section 6.5.

The exact location of each bore and the pipeline to connect the borefield to the Operational Area is yet to be determined. The borefield and pipelines will be located within the areas identified in Figure 1.2 and shown in more detail in Figure 6.21 and 6.23. The location of bores and the pipeline will take into account the following criteria:

- All disturbance areas will avoid DRF.
- All disturbance areas will avoid known locations of listed fauna.
- All disturbance areas will avoid known heritage sites.
- All disturbance areas will avoid impacts to conservation significant vegetation communities.
- Disturbance areas will minimise impacts to locally restricted vegetation communities.
- Disturbance areas will be selected to minimise impacts to Priority and other conservation significant flora.
- Disturbance areas will minimise impacts to the preferred habitat of conservation significant fauna.

2.8. MINE ACCESS ROAD

The construction of a Mine Access Road that is appropriate for the volume and type of road traffic is a critical item for the success of the Project. The Project will require the construction of an upgraded road to connect the Operational Area to existing road infrastructure in the region. None of the existing vehicle access routes into the region are suitable to support the Project, being unable to support increased traffic flows (both number and size of vehicles) that will result from the Project for the following reasons:

- upgrading of the tracks to road standards required for heavy vehicles would require extensive realignment and widening resulting in unnecessary environmental damage; and,
- the existing tracks cut though sensitive landforms including sand dunes, important flora, fauna and ecological communities. Upgrading of these tracks could directly impact these aspects, or result in increased public access and indirect impacts.

Two Mine Access Road options were evaluated by the Joint Venture - the TT Corridor Option and Pinjin Option. The Pinjin Option has been selected, primarily due to the reduced distance from Kalgoorlie. Refer to section 3.3 for further discussion on alternatives considered. The Pinjin option will utilise the existing road from Kalgoorlie for the first 170 km and then require the construction of a new road for the remaining 220 km to the Operational Area.

The main entry to the Operational Area will branch off the new Mine Access Road at a point approximately 210 km from the start of the corridor and will pass along the western side of the pits, terminating at the administration area (Figure 2.1). From here new gravel roads will be constructed to service the new accommodation facilities and other areas of supporting infrastructure (section 2.11).

Borrow pits will be located approximately every 10 - 25 km depending on the availability of appropriate material. The borrow pits will be located to avoid environmental considerations.

The Mine Access Road will be a private road, with tenure granted under the *Mining Act 1978* as a Miscellaneous License. The Mine Access Road will be used for freight and general site vehicle traffic only (i.e. not haul vehicles). Management of traffic along the Mine Access Road will require ongoing consultation and cooperation between the Joint Venture, adjacent land holders, local councils and other State regulators.

As the Mine Access Road will be a private road, the Joint Venture will endeavour to control unauthorised use to manage to minimise safety risks and increased public access to the region that could result in indirect environmental impacts. While the Mine Access Road will be a private road, the Joint Venture will be allowing authorised access to adjoining land users (e.g. the DEC) and thus plans to establish a dry weather track between the Project Operational Area turn-off and the existing track from Plumridge Lakes Nature Reserve and Laverton (~ 23 km; refer to Figure 2.1). Authorised road users will be required to comply with the Joint Venture’s prescribed safety and environmental standards.

2.9. COMMUNICATIONS

2.9.1. Communication Requirements

The Project area has no existing high-quality communications link to the national infrastructure. The nearest telecommunications facilities are Laverton, 300 km west, or privately owned optic fibre service located within the Australian Rail Track Corporation’s rail line easement 200 km to the south. Internal communications will also be required within the Operational Area and between mobile plant and vehicles/ personnel. Key internal communications include:

- multi-channel 2-way radio system to support fixed, in-vehicle and mobile radios across Operations and Closure; and,
- radio telemetry and/ or optic fibre system for the borefield, water storage dam, fire control system and tailings storage facility.

These internal systems have limited direct environmental impacts in comparison to the external communications system (e.g. clearing which has been incorporated into the Project’s clearing footprint).

Key external communications include:

- temporary external connection to support staff and contractors in the early stages of construction. It is most likely that this temporary system will be via mobile satellite communication, allowing voice and data transfer; and,
- long-term (high data carriage) internet and phone communications to service later stages of construction and commissioning, operations, de-commissioning and closure.

2.9.2. External Service Options

The Joint Venture has assessed fibre optic, microwave, satellite and radio based communications linkages for the Project. A final decision has not yet been made. At the present time, fibre optic technology is the preferred option as it provides greater bandwidth and management options, and provides the most reliable connection. Both microwave and radio based communication options would require a communications corridor with a supporting light vehicle track or road access for maintenance. The clearing for fibre optic cable communications will be between two and four metres wide and will not require a maintenance track. The area cleared for installation will be revegetated post-installation. A satellite based communication system would require no corridor, but has high operating costs and poor performance specifications. Further discussion of these options is provided in section 3.3.

Two options for a communications corridor are still under investigation - the Pinjin and TT Corridor Options. The preferred option at this point is the TT Corridor because there is currently no communication infrastructure in the vicinity of Pinjin and because the proposed TT corridor runs predominantly along the existing Cable Haul track. Should the Project establish a gas pipeline (refer following section) there will be no need to establish a separate communication corridor with fibre optic cable being installed with the pipeline. See section 3.3 for further discussion of the advantages and challenges of the various corridor options.

2.10. POWER SUPPLY

2.10.1. Operational Power Requirements

A power station of up to 40 MW total installed capacity is required to service the Project. The average continuous electrical load for the Project is estimated at 27 MW. Electric power accounts for approximately half of the direct process operating costs, hence both the efficient use of electric power and unit cost are critical drivers for the Project.

Several options have been considered by the Project, and these include:

- generator fuelled with diesel;
- generator/ boiler fuelled with waste oil;
- solar thermal generation with fossil fuel back up power (hybrid system);
- gas fuelled generator; and,
- grid power from Kalgoorlie.

Power options for the Project are constrained by the lack of regional infrastructure and supply shortages of gas and electrical power within the regional infrastructure. New gas developments in the Northwest Shelf of Western Australia may address the current gas shortages in WA making gas a viable option for the project. The lack of capacity in existing grid infrastructure between Perth and Kalgoorlie, the lack of gas to generate additional power in Kalgoorlie and the very high costs of powerline infrastructure between Kalgoorlie and Tropicana are constraints to grid power being a viable option for the Project. Based on the current infrastructure and energy market constraints, on-site fossil fuel power generation run on diesel is the only option that can be confidently implemented at this point in time. Diesel is not an ideal solution for the Project due to the high operating costs, uncertainty in oil prices, high emissions and emissions costs.

Although gas is not currently considered to be viable, the Joint Venture will ensure that the power station is designed to be capable of running on gas should gas become available in the future. If piped gas does become viable, a pipeline to supply the Operational Area would be laid predominantly within the Pinjin Infrastructure

Corridor, alongside the Mine Access Road. Any additional surveys and approvals will be progressed outside of this PER process.

Diesel substitutes, including waste oil and biodiesel, are being assessed, but their use application is likely to be limited by a lack of guaranteed supply and short storage life.

The Joint Venture has evaluated Solar Thermal as a power source for the Project. The technology is at a demonstration stage, and is not technically or commercially proven in an off-grid situation proposed for this Project. Significant government grants, tax concessions and Renewable Energy Credits would be required for the technology to be economically viable for the Project. Given that the technology is yet to be proven in an off-grid application, the risk of failure is not acceptable for the Project. While Solar Thermal power has a low Greenhouse Gas emission, it requires substantial additional clearing for a solar field. The advantages and challenges associated with the options considered are discussed further in section 3.3.

2.10.2. Other Power Requirements

Temporary power during construction will be provided by onsite portable diesel generator sets. The following facilities will also require a power source:

- the elution heaters, carbon regeneration kiln and furnace will use LPG or natural gas as a fuel source during operations;
- the air strip power supplies may be provided by generators at the sites in lieu of overhead powerlines from the mine
- the borefield power supply will either utilise a centralised mini power station with a maximum capacity of 2 MW feeding each bore via an overhead powerlines or, decentralised power supply comprising up to 40 generators and storage tanks (one per bore); and,
- solar power will be considered to provide a portion of power requirements at the village.

2.10.3. Greenhouse and Carbon Trading

During 2008, the Federal Government initiated debate on new environmental legislation with the objective being to reduce the amount of carbon emitted by Australia. The discussion provided here represents the current situation which may change prior to, or during, the life of the Project. The Joint Venture will monitor legislative and market developments in order to understand compliance requirements, costs and opportunities that may arise.

From 2012, it is anticipated that all $CO_{2\text{-}e}$[1] emitters that exceed an emission threshold will be required to purchase pollution permits to balance their emissions as part of an Australian Carbon Pollution Reduction Scheme (CPRS). To reduce the need to purchase permits, companies will need to reduce their carbon emissions. If the emissions threshold is set at 25,000 t $CO_{2\text{-}e}$/annum, as is expected, the Project will be subject to the CPRS due to the expected emissions of the Project being up to 330,000 t $CO_{2\text{-}e}$/annum (depending on whether the Project reaches its maximum anticipated size and the power source configuration).

To facilitate the expansion of renewable energy power generation and to reduce Australia's greenhouse gas emissions, the Federal Government will also establish a Renewable Energy Target. The Project is unlikely to be directly impacted by the Renewable Energy Target as the power station proposed for the Project is less than the proposed 100 MW cut-off for inclusion in the scheme. Refer to Chapters 7 and 14 for further discussions on emissions.

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[1] In order to accommodate the different warming potential of these gases, their global warming potential is commonly expressed in terms of their CO_2 equivalence, which is abbreviated to $CO_{2\text{-}e}$.

2.11. Supporting Infrastructure and Facilities

2.11.1. Village

An accommodation village with associated amenities will be required to support the Construction and Operational phase of the Project. The village will have the ability to house between 400 - 700 people and will be located approximately 4 km northwest of the processing area (Figure 2.1).

The existing exploration camp currently has capacity for 60 beds with basic facilities. The camp will be expanded to approximately 100 beds for the early part of the Construction phase of the Project. Once the exploration camp upgrade has been completed, work will commence on the establishment of a permanent 450 room village for use during both the construction and operational phase. An additional temporary construction camp with a further 250 beds (approximate) will be added to the long-term village to cater for the 6 - 8 month peak in personnel during the latter stages of Construction as Operational personnel progressively occupy the long-term village. This temporary construction camp will be built with a modest approach to space and amenities; the clearing footprint of the temporary camp has been included in the overall Project footprint.

The permanent village will be located as shown in Figure 2.1. Within this general location, the Joint Venture will position each aspect of the village (e.g. accommodation blocks, mess, recreational areas) according to the following criteria:

- All disturbance areas will avoid DRF.
- All disturbance areas will avoid known locations of listed fauna.
- All disturbance areas will avoid known heritage sites.
- All disturbance areas will avoid Priority or other conservation significant flora.
- All disturbance areas will avoid impacts to conservation significant vegetation communities.
- All disturbance areas will avoid the preferred habitat of conservation significant fauna.

The temporary and overflow villages will also be positioned according to these criteria.

The long-term accommodation village will be constructed to a standard that will make it attractive to employees. The village will be designed with energy and water saving initiatives. Environmental initiatives being considered in the long-term village facility may include:

- grey water recycling;
- solar hot water services;
- energy efficient equipment; and,
- village buildings being constructed with a minimum five star energy efficiency rating.

The accommodation blocks are proposed to consist of en-suite single units in transportable modules of three or four, with netted verandas. Common facilities to be provided at the long-term village include a wet mess, dry mess, laundries, gymnasium, sport and recreation facilities.

2.11.2. Aerodrome

The Project will require an aerodrome to accommodate jet and turboprop planes carrying fly-in, fly-out personnel. The preferred site for the airstrip and associated infrastructure (e.g. terminal building and fuel storage) is a flat and minimally vegetated area approximately 6 km northwest of the processing plant. The existing exploration airstrip is of uncompacted gravel construction and is only suitable for light aircraft. A substantial upgrade would be necessary for the Project requirements. If the exploration airstrip is not required, it would be rehabilitated once the new facility is constructed. A comparison between the existing exploration airstrip and the requirements for the Project airstrip is provided in Table 2.8. It is envisaged that fly-in, fly-out services would operate from Kalgoorlie-Boulder and Perth or other locations as required.

Table 2.8: Comparison of the Existing Exploration Airstrip and Proposed Project Airstrip

Factor	Exploration Airstrip	Project Airstrip	Comment
Maximum capacity	up to 12-seater	BAE-146 eighty seat jet	The BAE-146 is the most commonly used aircraft for WA based fly-in/ fly-out operations of this size and distance from Perth.
Length of strip	1,803 m	2,100 m	
Width of strip	20 m	30 m plus 3 m shoulders	The surface surrounding the strip will have to be graded, resulting in a total cleared width of 90 m.
Usage	Day time only	Day and night flights	The Project will require lights for routine morning/ evening use whereas the Exploration Strip has emergency lighting only.
Medium	Gravel	Sealed	A sealed airstrip is required to support more efficient jet aircraft, enables greater accessibility in wet weather and is suitable for emergency evacuation of personnel under inclement weather conditions.

The Project aerodrome will be fenced and appropriately monitored and maintained to prevent plane-fauna interactions.

2.11.3. Internal Roads

The main entry to the mining area and village will branch off the selected Mine Access Road at a point south of the pit(s), terminating at the administration area (Figure 2.1). From that point, gravel roads will be constructed to service the village, aerodrome and other facilities. The Mine Access Road will continue as a track past the mine and connect with existing tracks in the area to provide a bypass for traffic around the mining operation and reduce the potential for traffic accessing the Laverton road through the Plumridge Lakes Nature Reserve.

The internal road layout includes a central road running approximately south-north from the Mine Access Road to the borefield. The central road will also service other facilities including the aerodrome and village. This layout will enable maximum use of the roads with minimal clearing. Current track developments for the existing (and approved) exploration activities have been designed with this final outlay in mind to minimise new clearing. Surplus tracks generated by exploration activities will be rehabilitated either before or during the construction and operational phase.

2.11.4. Supporting Buildings

A range of buildings will be constructed for administration, maintenance storage and workforce amenities. Smaller buildings (e.g. Village) will generally be transportable. Larger buildings (e.g. Workshop) will generally be steel framed, panel clad structures. Workshops and reagent storage will be steel framed and steel clad. Motor Control Centres will be transportables with fire protection, pressurisation and air conditioning. The clearing footprint for all buildings has been included in the overall Project footprint. Design and construction of the buildings and layout will seek to maximise efficiencies in water and power use.

2.11.5. Borrow Pits and Quarry

Borrow pits will be required at intervals of approximately 10 - 25 km along the Pinjin Infrastructure Corridor; the exact locations have not been determined but will avoid environmental constraints such as conservation significant species and restricted habitats. In addition, the location of borrow pits will be determined by the availability of appropriate material, all of which will be sourced locally (i.e. not transported in from a remote source such as Kalgoorlie). The Joint Venture will locate borrow pits along the Pinjin Infrastructure Corridor according to the following criteria:

- Borrow pit locations will avoid DRF.
- Borrow pit locations will avoid known locations of listed fauna.
- Borrow pit locations will avoid known heritage sites.
- Impacts to Priority or other conservation significant flora will be minimised.
- Impacts to vegetation communities of conservation significance will be minimised.
- Impacts to the preferred habitat of conservation significant fauna will be minimised.

In the Operational Area, there will be a series of up to three borrow and gravel pits. The clearing required for these has been incorporated into the 70 ha clearing footprint and will not require any clearing outside of the proposed Operational Area. The Joint Venture will locate borrow pits and the quarry within the Operational Area footprint according to the same criteria as for the borrow pits along the Pinjin Infrastructure Corridor.

A quarry of approximately 100 ha will be required to provide aggregate for construction activities. The proposed quarry has been included in the Project footprint. It is envisaged that the quarry will be located near the aerodrome approximately 6 km north of the processing area.