2. Project Description

2.1 Key Project Components

Mining will be an open pit truck and shovel operation using hydraulic shovels, front end loaders and haul trucks that will transport materials to the crusher. The crushed material will be stockpiled and the gold will be extracted using Carbon in Leach (CIL) followed by adsorption, desorption and recovery lending process. The product out of the gold room will be gold dore (unrefined gold bars). The crusher area will also be equipped with Run of Mine (ROM) pad for emergency stock and blending.

Approximately 17.8Mtpa of ore will be processed. The CIL tailing will be detoxified and sent to an impoundment from which plant process water will be recycled. Gold dore will be transported for onward secure shipment to a refinery.

Mining and associated operations will occur on primarily on Mineral Leases MLN 1070, MLN 1071 and MLN 1127, covering 5,365ha. A small portion of EL 29886 will be inundated due to raising of the raw water dam (RWD) and a Special Purpose Licence will be applied for to accommodate this.

The Project, based on current known data, will have a life of around 19 years inclusive of construction, operations and closure. Construction is anticipated to commence in the first quarter of 2014 and take two years, including six months pre-production. The mine is scheduled to operate for a further 13 years followed by a four year closure and rehabilitation period. The key elements of the Project are outlined below and depicted in Figure 2-1. Existing conditions at Mt Todd are presented in Plates 2-1 to 2-7.

2.1.1 Mining and Mining Infrastructure

- extension of the existing Batman Pit from its current depth of 114 metres (m) to approximately 588m (Relative Level (RL) 396m) and surface area of 40ha to approximately 137ha;
- expansion of the existing waste rock dump (WRD) from a height of 24m to approximately 350m (RL 470m), and a footprint of 70ha to approximately 217ha. The dump currently contains 16 million tonnes (Mt) of waste rock and the expansion will provide a total capacity of up to 510Mt;
- processing and / or reclamation of the existing low grade ore (LGO) stockpile, heap leach pad (HLP) and scats stockpile;
- construction and processing of a new LGO stockpile with a footprint of approximately 47ha;
- construction of a Run of Mine (ROM) pad;
- construction of an ammonium nitrate fuel oil (ANFO) facility;
- construction of heavy and light vehicle workshop and administration offices, and facilities comprising wash down area, tyre change facility, lube storage facility etc; and
- construction of haul roads.

2.1.2 Process Plant and Associated Facilities

- ore processing plant capable of processing approximately 50,000 tonnes per day (tpd) of ore;
- raising the existing tailings storage facility (TSF1) from 16m to approximately 34m;
- construction of a new TSF2, approximately 300ha in area and up to 60m high (RL 175m);

- diversion of Horseshoe Creek and Stow Creek adjacent to TSF2 to provide flood protection;
- rehabilitation of the existing HLP, if residual HLP material is not processed through the new plant;
- chemical and reagent storage and handling facility; and
- process plant workshops, administration offices, control room etc.

2.1.3 Other Infrastructure

- gas fired power station, including re-routing of the existing gas pipeline;
- anaerobic treatment wetlands, approximately 10ha in area;
- a 2m high raising of the RWD and an increase in the area of inundation;
- construction of saddle dams at the RWD and TSF1;
- construction of three coffer dams at Retention Pond 1 (RP1) and deepening of RP1;
- water treatment plant;
- security gate house;
- potential re-alignment of the access road;
- site wide drainage and sediment traps; and
- relocation of existing fuel storage and distribution facility.

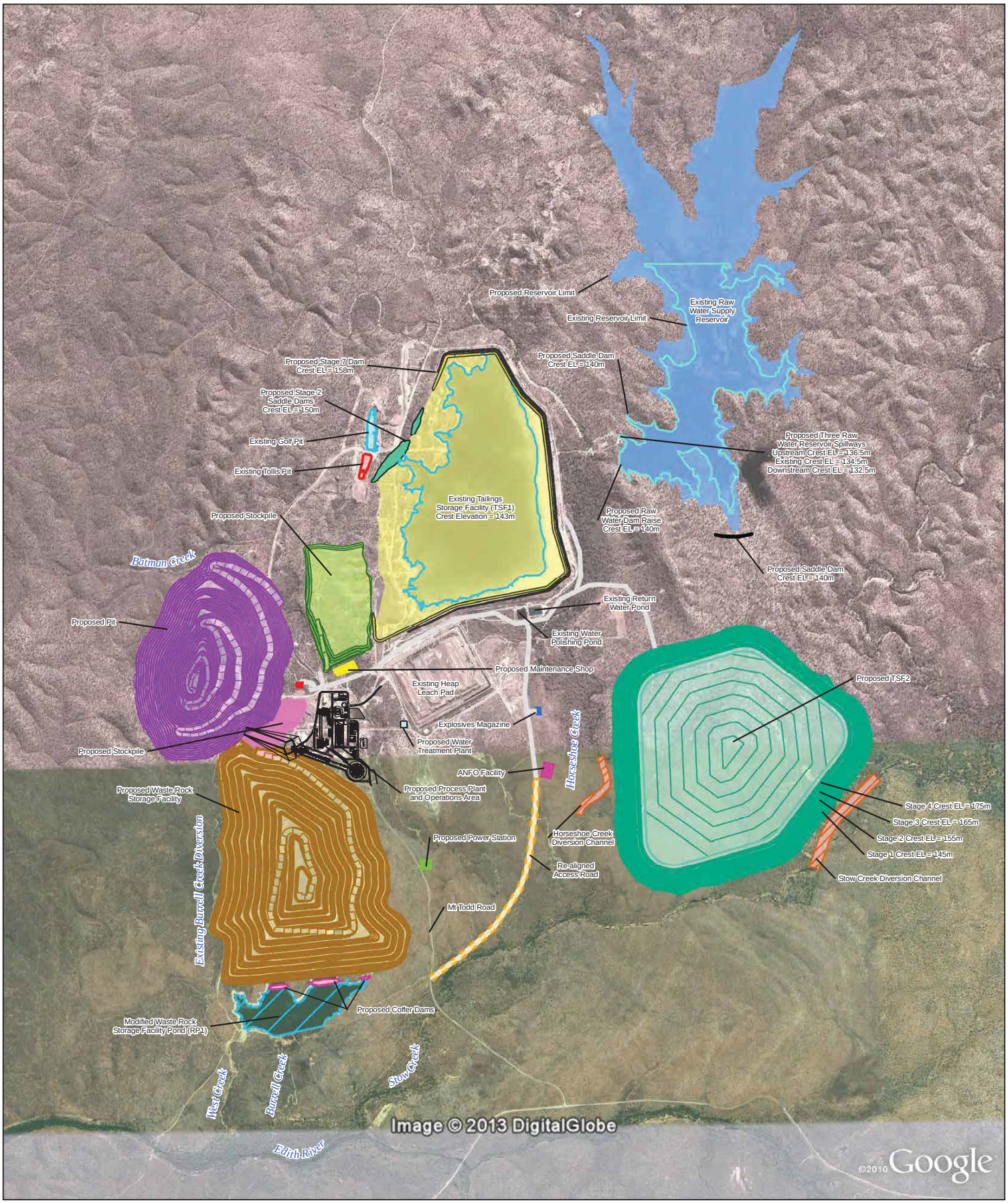
2.1.4 Workforce

The construction and operations workforces are expected to peak at 450 and 350 personnel respectively.

2.1.5 Existing Facilities

Existing facilities that will be used by the Project are the:

- WRD, WRD retention pond (RP1) and pumping system;
- TSF1 and TSF1 decant and polishing ponds;
- Retention Pond 5 (RP5);
- LGO stockpile, LGO Pond (RP2) and pumping system;
- scats stockpile;
- RWD;
- gas pipeline;
- production and monitoring bores;
- power transmission lines from the main electricity grid;
- sealed road to site and mine roads and other ancillary facilities (e.g. pipelines); and
- fuel facility.



LEGEND

Process Plant	Power Plant	Explosives Magazine	TSF1 Existing Water Body	TSF2 Impounded Surface Area (Year 12)	Proposed Saddle Dam (Raw Water Dam)	Stockpile
Golf Pit	Proposed Haul Road	Diversion Channels	Proposed Saddle Dam	TSF2 Contours (Year 12)	Retention Pond 1	
Tollis Pit	Re-aligned Access Road	Raw Water Dam Existing Water Body	TSF1	TSF2 Footprint (Year 12)	Batman Pit Footprint (Year 12)	
Fuel Bays	Coffer Dams	Indicative Raw Water Dam	Low Grade Ore Stockpile Contours	Water Treatment Plant	Waste Rock Dump Contours (Year 10)	
Proposed Maintenance Shop	ANFO Facility	TSF1 Contours	Low Grade Ore Stockpile	Batman Pit Contours (Year 12)	Waste Rock Dump Footprint (Year 10)	

0 0.25 0.5 0.75 1
Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

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Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	1
Date	21 Jun 2013

Mt Todd General Facilities Arrangement

Figure 2-1

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66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Tetra Tech - Process Plant, Golf Pit, Tollis Pit, Fuel Bays, Proposed Maintenance Shop, Power Plant, Realigned Roads, Proposed Haul Road, Coffer Dams, ANFO Facility, Explosives, Diversion Channels, Raw Water Dam Existing Water Body, Indicative Raw Water Dam, TSF1 Contours, TSF1 Existing Water Body, Proposed Saddle Dam, TSF1, Low Grade Ore Stockpile Contours, Low Grade Ore Stockpile, TSF2 Impounded Surface Area, TSF2 Contours, TSF2 Footprint, Water Treatment Plant, Batman Pit Contours, Proposed Saddle Dam (Raw Water Dam), Retention Pond 1, Batman Pit Footprint, Waste Rock Dump Contours, Waste Rock Dump Footprint, Stockpile (2013). Google Earth Pro - Imagery (Date extracted: 17/05/2013). GHD - Creek Names (2011). Created by: CM

Plate 2-1 Batman Pit and Low Grade Ore Stockpile

(Photo taken looking south, March 2012)

Plate 2-2 Tailings Storage Facility 1

(Photo taken looking south west, March 2012)

Plate 2-3 Tailings Storage Facility 1

(Photo taken looking south east, March 2012)

Plate 2-4 Retention Pond 1 (RP1) and WRD

(Photo taken looking north east, March 2012)

Plate 2-5 Heap Leach Pad

(Photo taken of Heap leach Pad southern extent looking west, March 2012)

Plate 2-6 Waste Rock Dump

(Photo taken looking north from RP1 of the southern extent of the WRD, March 2012)

Plate 2-7 Existing Mine Site Processing Plant and Lime Kiln

(Photo taken from the WRD looking north east, March 2012)

2.2 Construction Activities

2.2.1 Overview

Subject to statutory approvals and a favourable Vista Gold final investment decision, construction activities will commence during the first quarter of 2014.

Construction works will take place largely between 6am and 6pm, with construction workers operating on 12 hour rotating shifts. Administration and management personnel will work a standard 5 x 2 day roster. Construction works will include the following:

- demolition and disposal of existing process plant and other facilities such as the gate house;
- construction of temporary facilities (i.e. lay down areas, offices, workshops, etc);
- construction camp (located within 25km of the mine site and subject to separate approval);
- on site concrete batch plant(s);
- administration and plant site buildings including:
  - mine and plant workshops, warehouses and maintenance facilities;
  - offices, medical facilities and training facilities;
  - security gate house, weighbridge etc;
  - crib room and ablutions;
  - laboratory.
- Ore Processing Plant;
- power station;
- water treatment plant (WTP);
- sludge disposal cell and equalisation pond;
- site roads;
- pumps and pipelines; and
- new sumps, decant towers, decant ponds, collection ditches and diversions.

In addition, associated with ongoing operations the following activities will progressively occur:

- raising of TSF1 from 16m in height to approximately 34m in height in six stages;
- construction of TSF2 to 60m in height over four stages
- increase in the height of the existing waste rock dump from 24m to approximately 350m;
- development of a clay borrow area(s);
- construction of LGO stockpile, collection ditch and lined sump;
- construction of water treatment wetlands; and
- potential construction of a re-aligned access road.

2.2.2 Materials and Equipment

The indicative types and quantities of construction materials required for the Project are shown in Table 2-1. Vista Gold will endeavour to source the required materials and equipment locally but in some instances the items will need to be sourced nationally or internationally.

Table 2-1 Construction Phase Material Requirements

Construction Materials	Estimated Quantity
Steel	5,780 tonnes (t)
Plate work	1,150t
Concrete	24,500 cubic metres (m^3)
Cable	220,600m

Fuel consumption during the two year construction period is expected to be 3.3 megalitres (ML). Fuel will be delivered to site as required and stored in a contained fuel facility (existing fuel infrastructure – 600 kilolitres (kL) American Petroleum Institute (API) 650 tank).

The Project will use standard construction machinery, general trade equipment and specialised equipment as required. The indicative number and type of construction equipment required is shown in Table 2-2.

Table 2-2 Indicative Construction Equipment

Equipment	Indicative Number
Scraper / Roller 11T	4
Excavator	4
Front-end loader	6
Grader	2
Crane	6
Water tanker	2
Concrete trucks / pumps	6
Concrete batch plant	1
Dozer D8	2
Dozer D7	1
Rear Dumps or Highway Trucks	10
Forklift	2

Plant, equipment and construction materials will be transported to the site by road. Transportation vehicles will be a combination of standard and oversize loads. Larger plant and equipment that cannot be assembled on-site will be transported under appropriate permits. Any imports via the Port of Darwin will use existing freight receiving and staging areas. Trucking numbers will be established by contractors involved in the construction phase.

2.3 Mining and Processing

2.3.1 Resource Estimates

Table 2-3 provides the resource estimates for the Batman Pit.

Table 2-3 Batman Deposit – Resource Estimates

Resource	Ore (tonnes)	Average Grade (grams per tonne)	Oz of Gold
Measured Resources[1]	77,793,000	0.88	2,193
Indicated Resources[2]	201,792,000	0.80	5,209
Inferred Resources[3]	279,585,000	0.82	7,401

2.3.2 Mine Plan and Pit Development

The production schedule of approximately 223Mt of processed ore will occur over a 13 year period (Table 2-4).

Based on a review of geological data and current bench slopes, a detailed pit design has been completed. The ultimate pit is achieved by mining in four separate phases, or cut backs, outlined below:

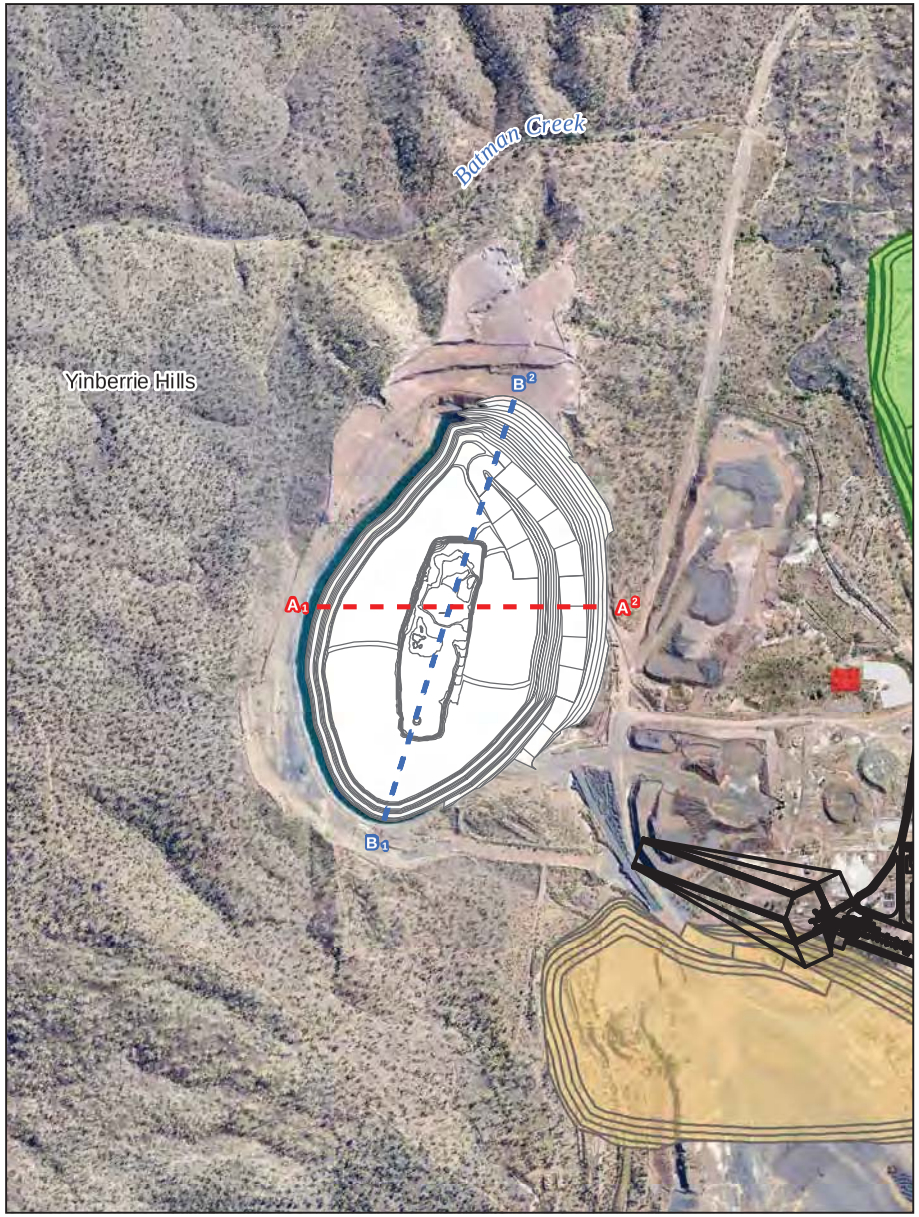
- Phase 1 pit design during pre-production starts from the current pit pushback limit on the eastern side of the pit and mines it to RL 188m (Figure 2-2);
- Phase 2 commences during year 1 and mines around the phase 1 pit to a depth of RL 246m, with the exception of a short common wall on the west side of the pit (Figure 2-3);
- Phase 3 commences during year 3 and expands the pit to the south and west, to a depth of RL 336m (Figure 2-4); and
- Phase 4 establishes the ultimate pit, from year 5 to year 13, expanding the previous phases to the north and west to a pit depth of RL 396m (Figure 2-5).

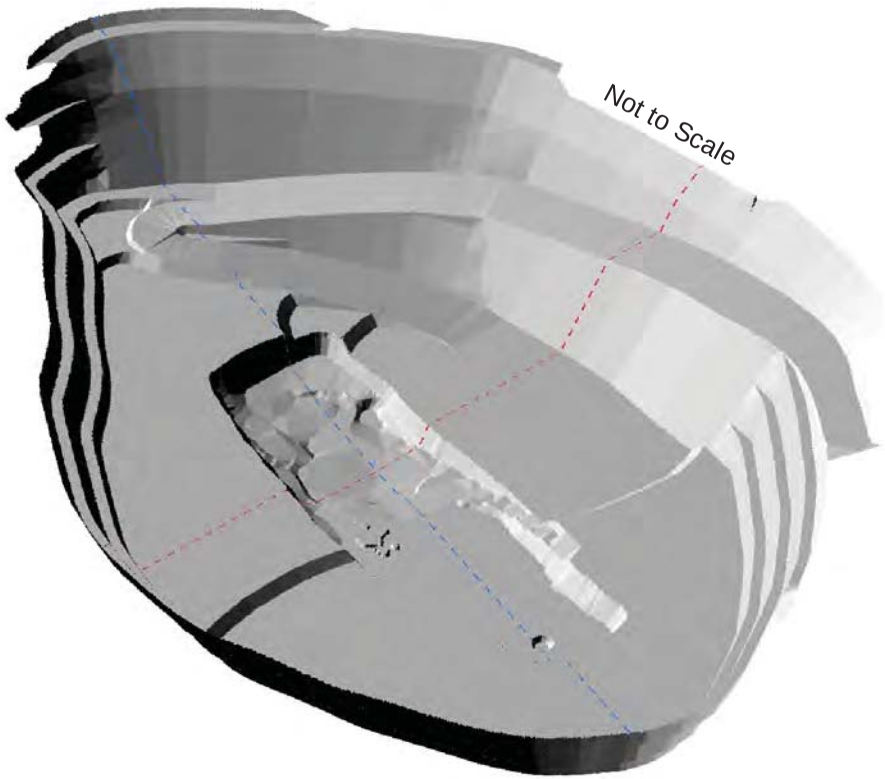
1 Measured Resources – resources that have undergone enough further sampling that a 'competent person' (defined by the norms of the relevant mining code; usually a geologist) has declared them to be an acceptable estimate, at a high degree of confidence, of the grade, tonnage, shape, densities, physical characteristics and mineral content of the mineral occurrence.
2 Indicated Resources – economic mineral occurrences that have been sampled (from locations such as outcrops, trenches, pits and drill holes) to a point where an estimate has been made, at a reasonable level of confidence, of their contained metal, grade, tonnage, shape, densities, physical characteristics.
3 Inferred Resources – that part of a mineral resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological / or grade continuity. It is based on information gathered through appropriate techniques from location such as outcrops, trenches, pits, workings and drill holes which may be of limited or uncertain quality and reliability.

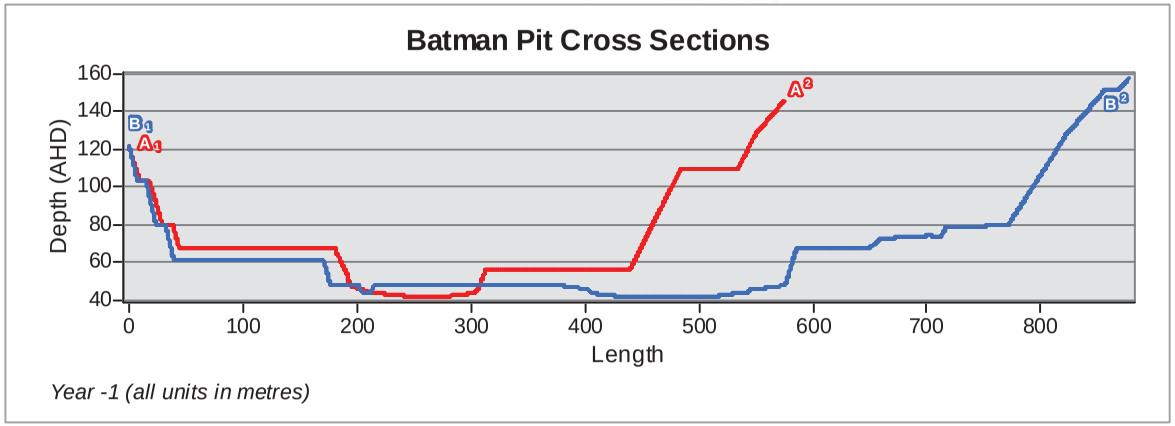
Table 2-4 Annual Mine Production Schedule

Mining year	Total ore mined	Total waste mined	Total tonnes mined	Strip ratio	Total rehandle	Total ore processed
000 tonnes (numbers rounded)						
Pre-production	11,764	24,761	36,525	2.10	-	-
1	28,101	33,803	61,905	1.20	316	17,799
2	20,983	55,290	76,273	2.64	5,085	17,750
3	23,941	78,227	102,169	3.27	1,108	17,750
4	18,285	71,608	89,893	3.92	6,061	17,750
5	29,066	58,329	87,395	2.01	-	17,799
6	7,561	71,279	78,840	9.43	10,770	17,750
7	4,777	54,405	59,182	11.39	12,973	17,750
8	7,078	45,482	52,560	6.43	10,672	17,750
9	10,700	38,710	49,410	3.62	7,099	17,799
10	24,331	27,864	52,195	1.15	-	17,750
11	22,861	2,592	25,454	0.11	-	17,750
12	Heap Leach & Stockpile			-	17,750	17,750
13	Heap Leach Only			-	9,505	9,505
Total	**209,451**	**562,349**	**771,800**	**2.68**	**81,339**	**222,651**

Note: Rehandle includes 13,200t from the existing Heap Leach Pad







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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

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LEGEND

- Cross Section A
- Cross Section B
- Contours (6m Interval)
- Process Plant
- Low Grade Ore Stockpile
- Waste Rock Dump
- Realigned Roads
- Fuel Bays

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	2
Date	13 Jun 2013

Batman Pit End of Phase 1

Figure 2-2

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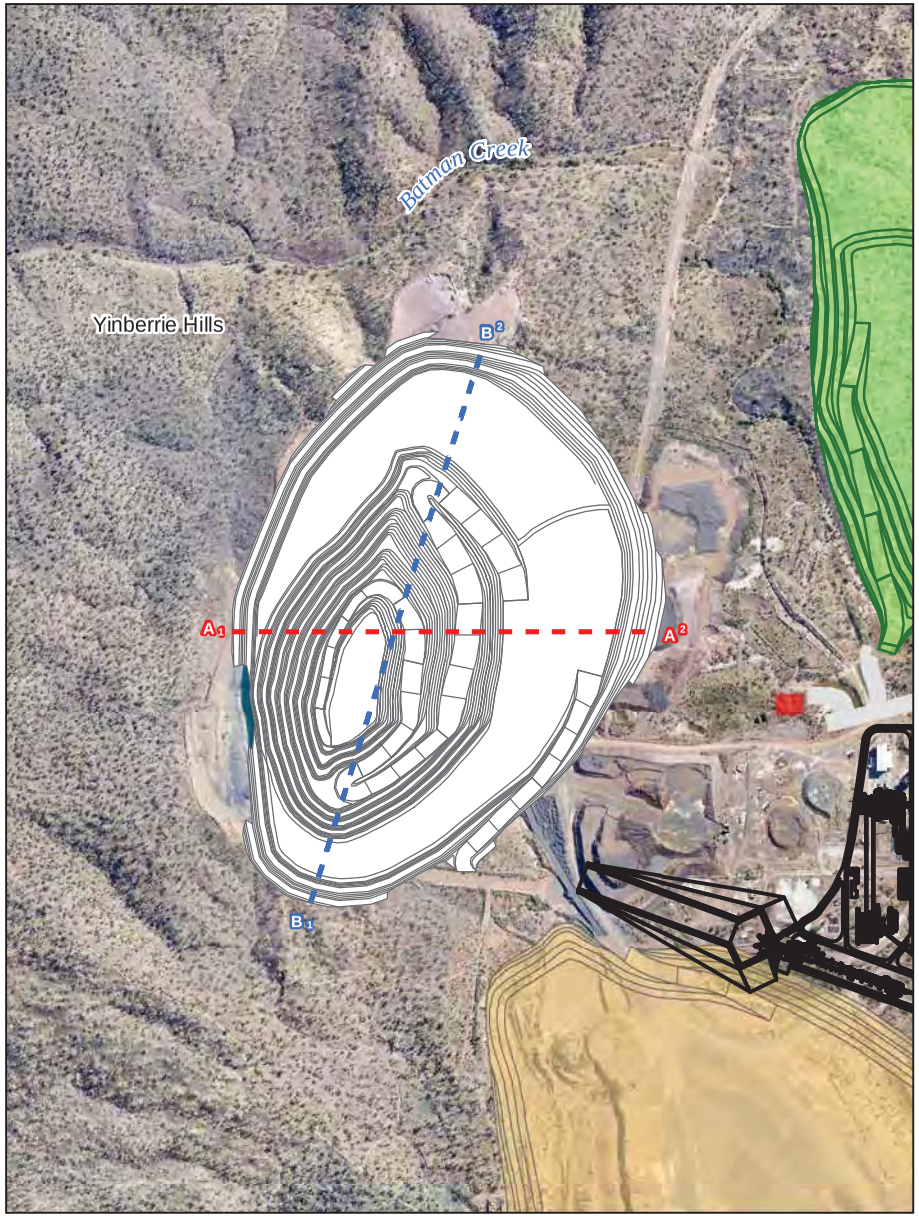
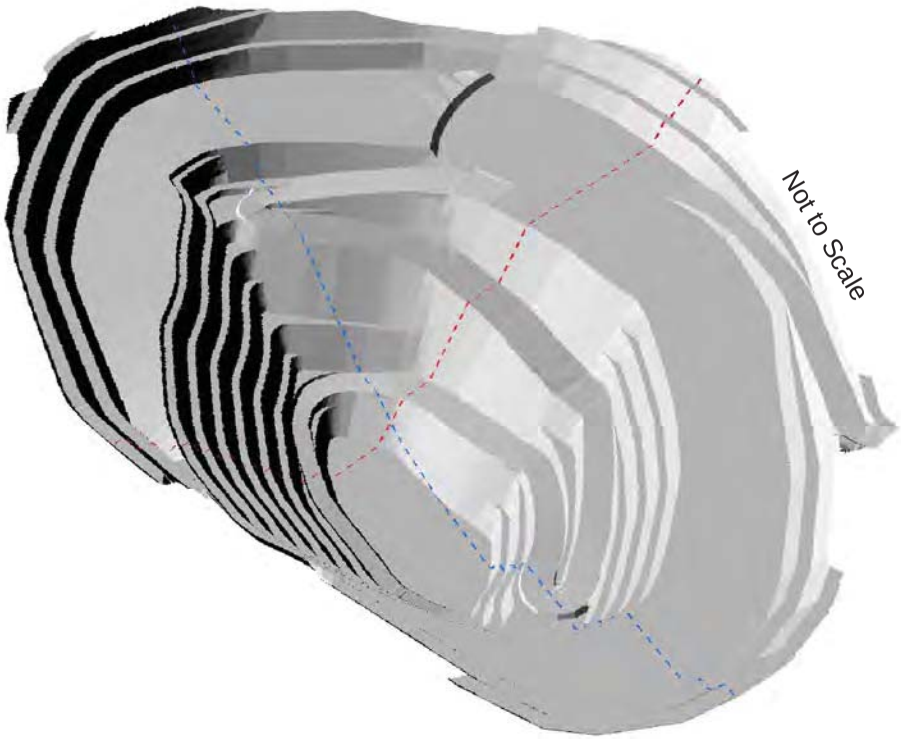
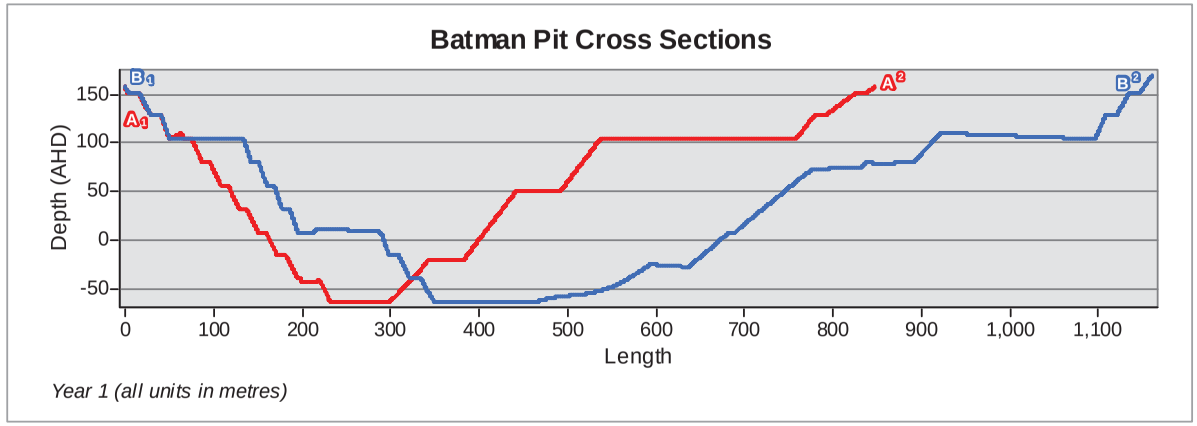
66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Low Grade Ore Stockpile, Realigned Roads, Fuel Bays (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

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LEGEND

- Cross Section A
- Cross Section B
- Contours (6m Interval)
- Process Plant
- Low Grade Ore Stockpile
- Waste Rock Dump
- Fuel Bays
- Realigned Roads

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	2
Date	13 Jun 2013

Batman Pit End of Phase 2

Figure 2-3

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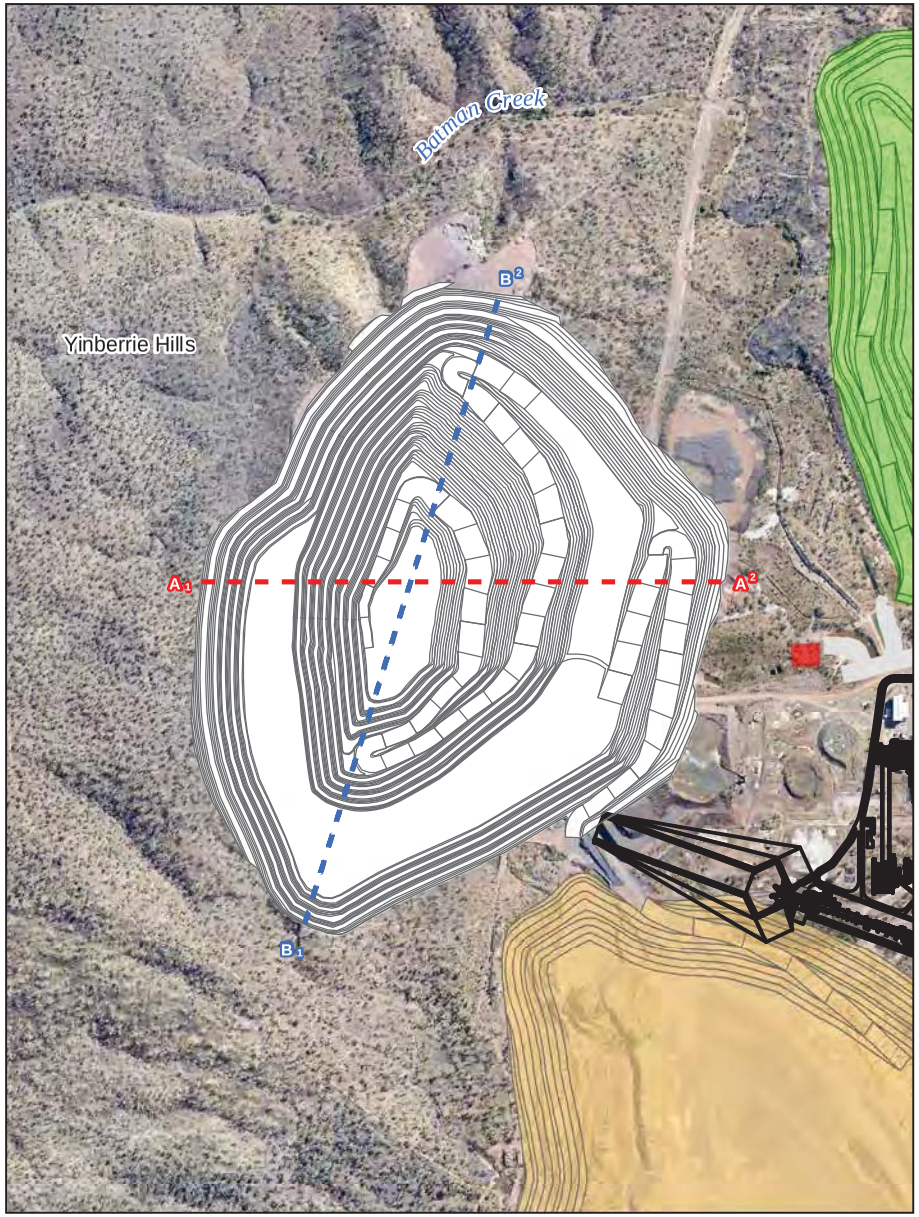
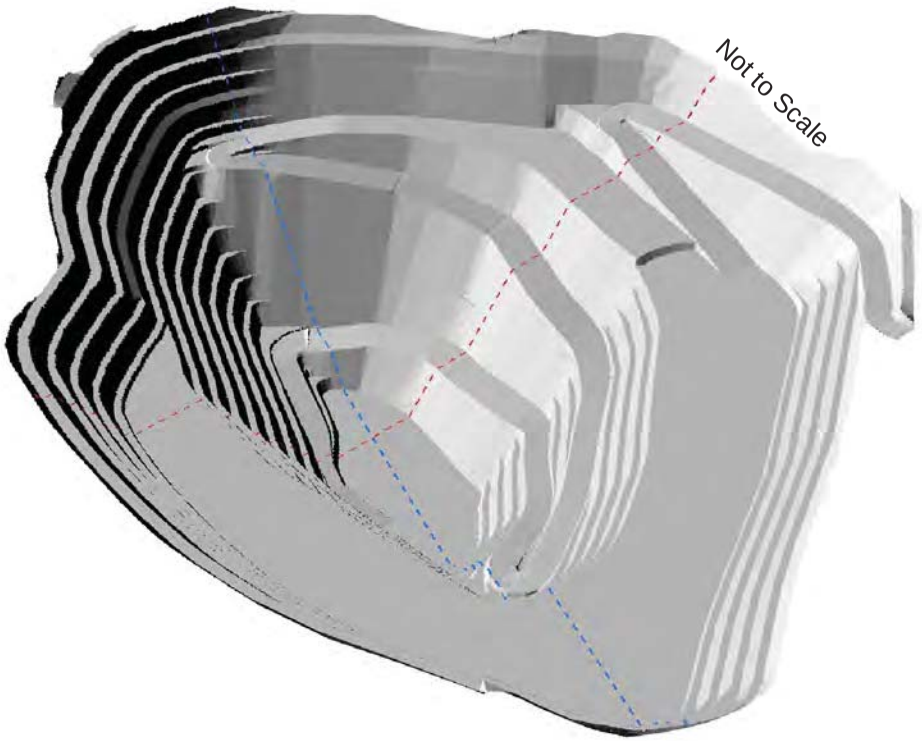
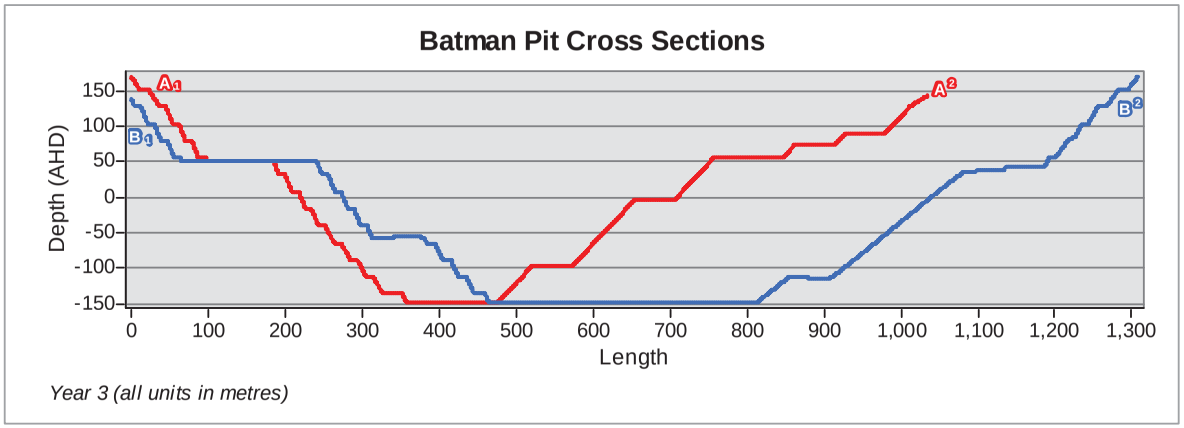
Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Low Grade Ore Stockpile, Realigned Roads, Fuel Bays (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

- Cross Section A
- Cross Section B
- Contours (6m interval)
- Process Plant
- Waste Rock Dump
- Low Grade Ore Stockpile
- Fuel Bays
- Realigned Roads

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	2
Date	13 Jun 2013

Batman Pit End of Phase 3

Figure 2-4

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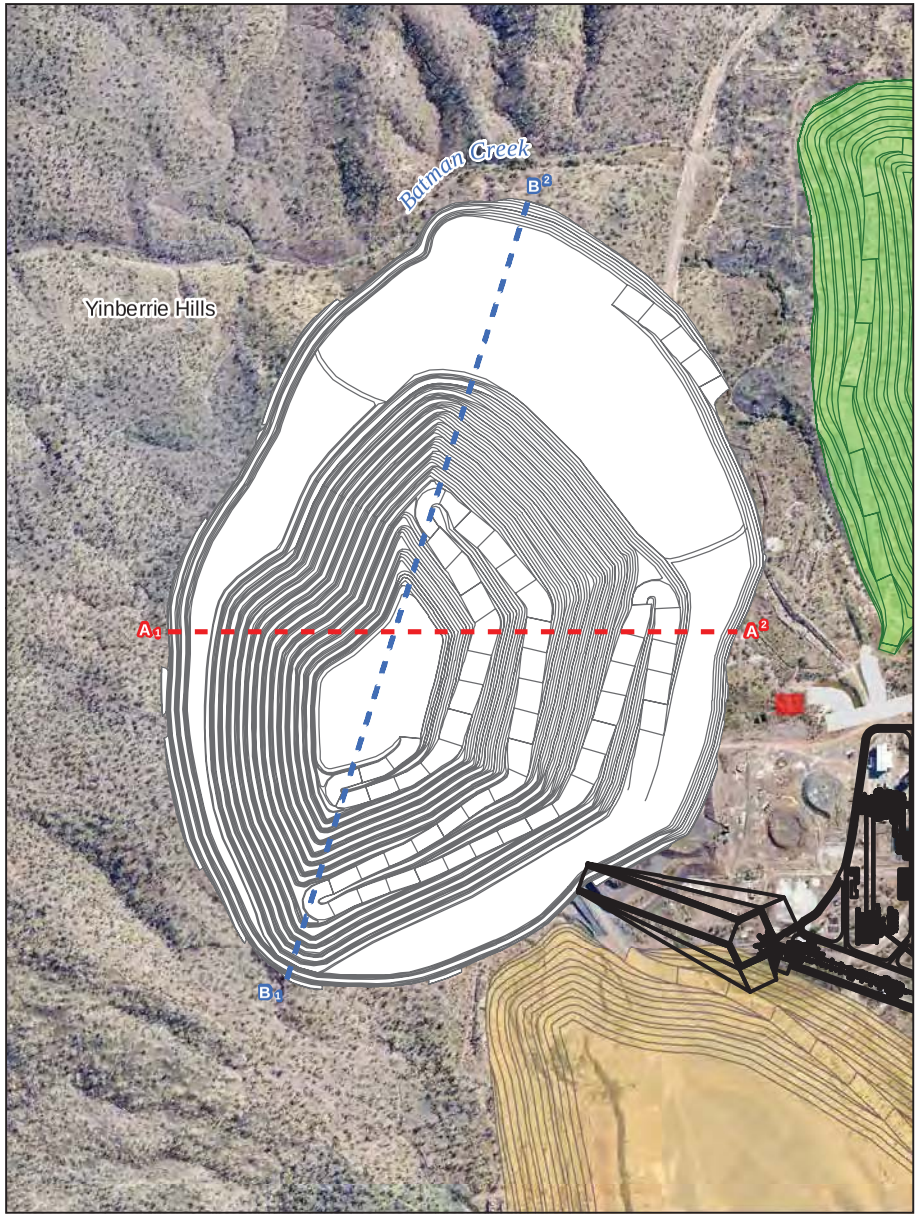
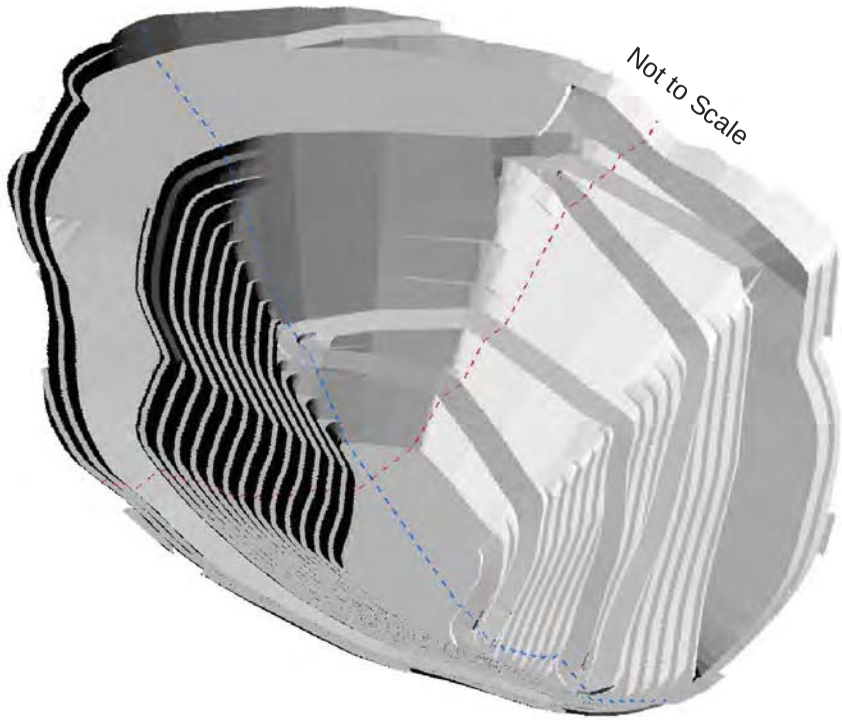
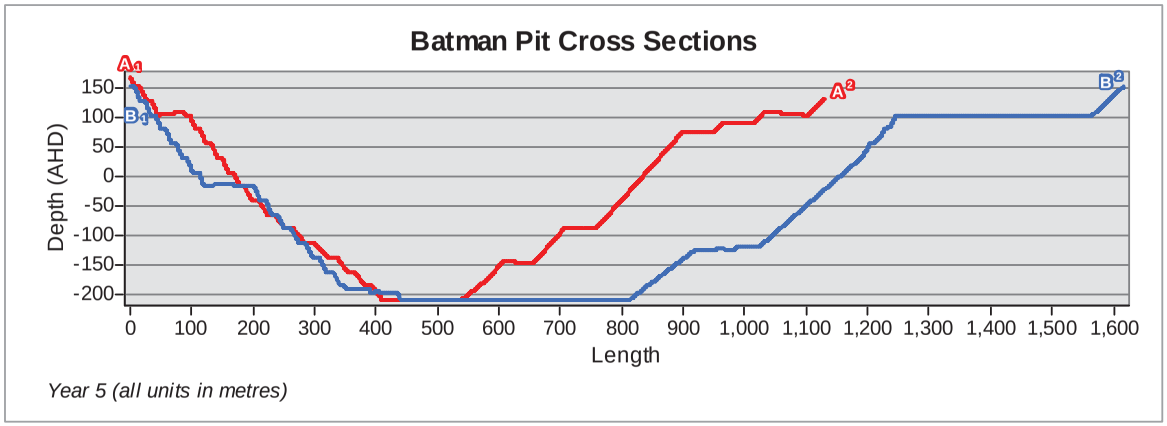
66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Low Grade Ore Stockpile, Realigned Roads, Fuel Bays (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

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LEGEND

- Cross Section A
- Cross Section B
- Contours (6m Interval)
- Process Plant
- Low Grade Ore Stockpile
- Waste Rock Dump
- Fuel Bays
- Realigned Roads

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	2
Date	13 Jun 2013

Batman Pit End of Phase 4

Figure 2-5

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66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Low Grade Ore Stockpile, Realigned Roads, Fuel Bays (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM

2.3.3 Mining

Mine operations will be 24-hour, split across two shifts (6am – 6pm and 6pm – 6am).

Drilling and blasting, to loosen rock ahead of mining, will be undertaken to produce rock sizes that conform to processing requirements. Blasted ore will be loaded into haul trucks for transportation either directly to the primary crusher, ROM pad or LGO stockpile. Ore will be reclaimed from the ROM pad and LGO stockpile by front-end loader and fed to the primary crusher.

The Batman Pit will be significantly deepened and enlarged from its current depth of 114m to a proposed depth of 588m (RL 396). The surface area of the pit will be increased from approximately 40ha to 137ha.

Rock will be blasted and mined by conventional truck and shovel methods. Walls will be scaled during mining to maintain a safe work place. Safety berms will be utilised as required to maintain safe working areas. In some cases, primarily on the east wall, these safety berms will be incorporated into haul roads. Where this is done, a berm along the road will be built to contain any sloughing material.

The pit will incorporate 6m benches for mining. In areas where the material is consistently ore or waste, benches may be mined in 12m heights.

Water will be sprayed onto roads to suppress dust using a water cart. Environmentally benign surfactants will also be used on road surfaces to reduce the water demand for dust suppression where practical and economically viable.

2.3.4 Ore Processing

A new Ore Processing Plant will be constructed on the previous process plant site. The existing disturbed area will not change significantly.

The process plant has been designed to treat free milling ore using conventional technology to recover cyanide leachable gold using a CIL process.

The process plant will consist of a gyrator crusher (Figure 2-6), secondary crushers (Figure 2-6), coarse screening, coarse ore stockpile, high pressure grinding rolls (HPGR) (Figure 2-6), fine screening, classification, ball mills (Figure 2-6), pre-leach thickener, CIL circuit (Figure 2-7), elution circuit, gold room, cyanide detoxification and tailings pumps. Support services include reagent mixing and dosing facilities, and a centralised control room. A simplified plant layout is provided in Figure 2-8 and a process flow in Figure 2-9.

The following are key components of the Ore Processing Plant:

- comminution (crushing and grinding of ore);
- adsorption and detoxification; and
- gold extraction.

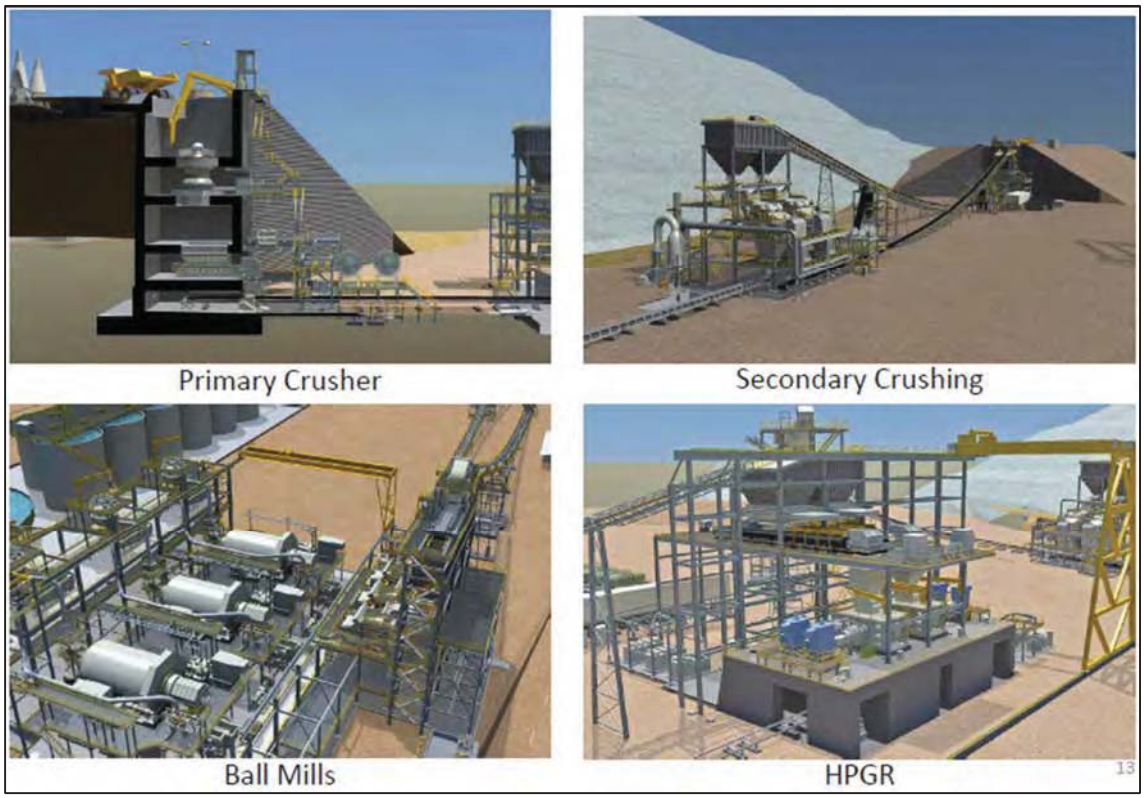


Figure 2-6 Primary Crusher, Secondary Crusher, Ball Mills and HPGR

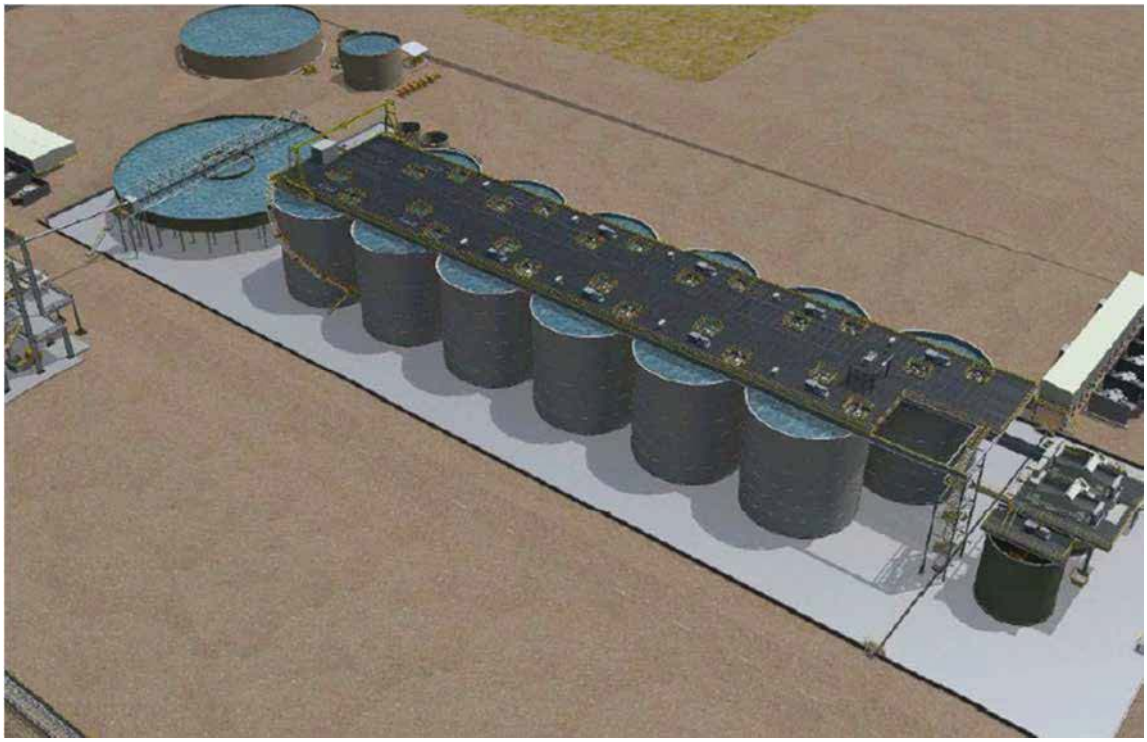
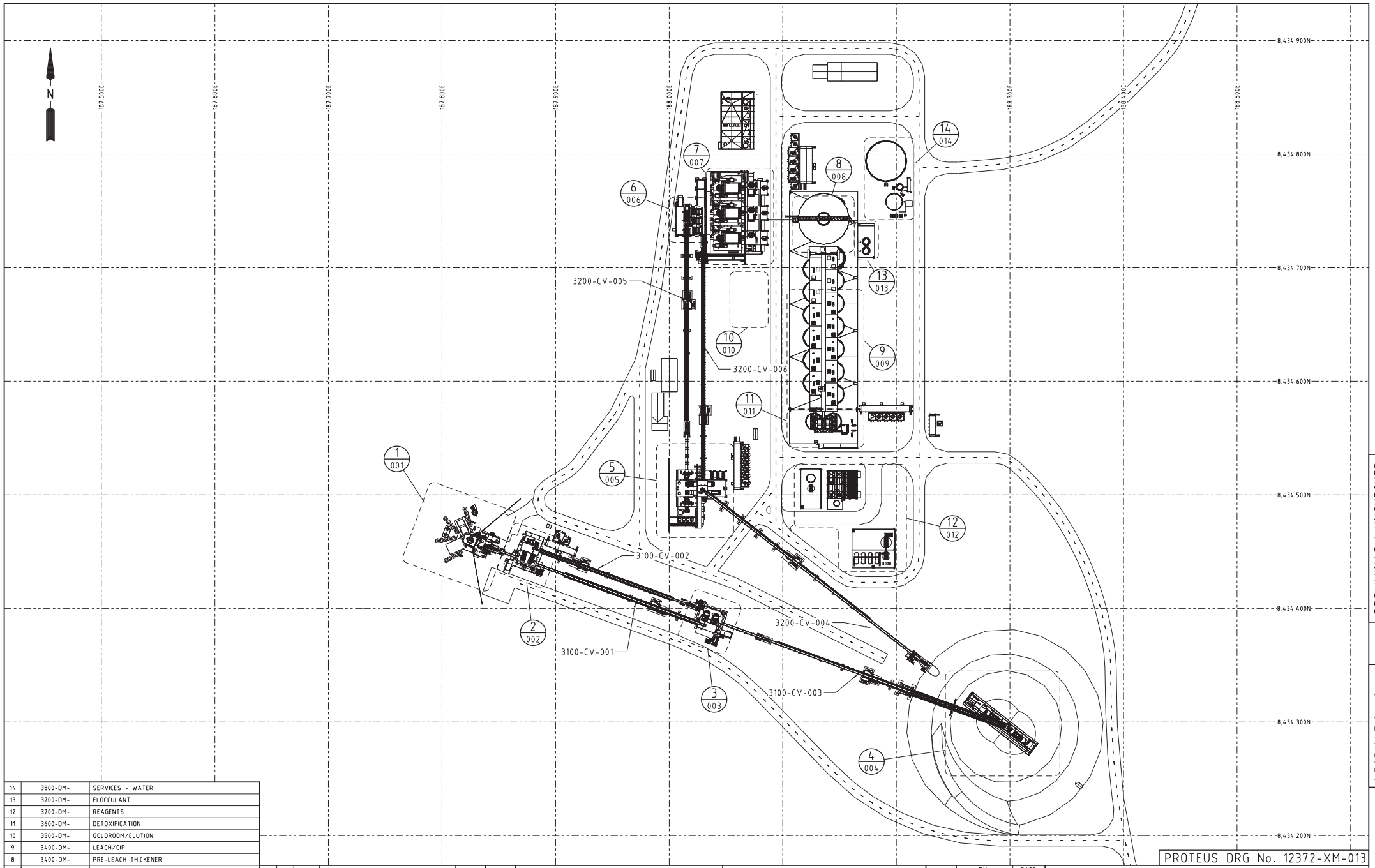


Figure 2-7 Pre Leach Thickening, Leach and CIL Circuit



PRELIMINARY UNCHECKED

INFORMATION ONLY

PROTEUS DRG No. 12372-XM-013

No	REF. DRG. No.	TITLE	REV	BY	DATE	DESCRIPTION	CHK'D	APP'D
14	3800-DM-	SERVICES - WATER						
13	3700-DM-	FLOCCULANT						
12	3700-DM-	REAGENTS						
11	3600-DM-	DETOXIFICATION						
10	3500-DM-	GOLDROOM/ELUTION						
9	3400-DM-	LEACH/CIP						
8	3400-DM-	PRE-LEACH THICKENER						
7	3300-DM-	GRINDING AND CLASSIFICATION						
6	3200-DM-	FINE SCREENING						
5	3200-DM-	HPGR						
4	3200-DM-	RECLAIM						
3	3100-DM-	COARSE SCREENING						
2	3100-DM-	SECONDARY CRUSHING						
1	3100-DM-	PRIMARY CRUSHING	A	MOS	20.05.13	ISSUED FOR INFORMATION		

VISTA GOLD

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TITLE
VISTA GOLD Australia Pty Ltd
MT TODD GOLD PROJECT
PROCESS PLANT
GENERAL ARRANGEMENT - 50 KTPD

SCALE		DRG. No.	REV.
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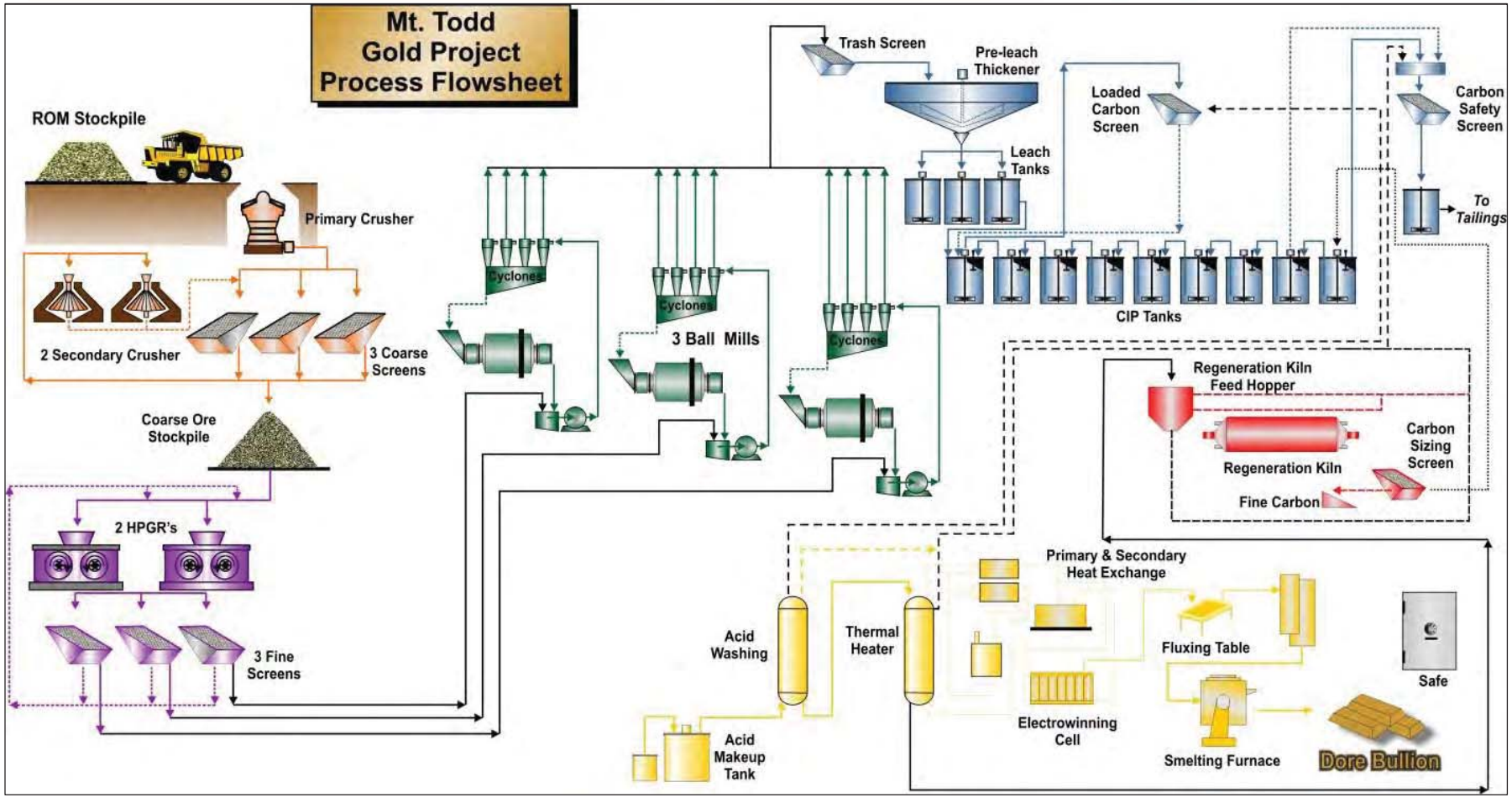


Figure 2-9 Simplified Process Flowsheet

Comminution

Ore will be fed into a primary gyratory crusher, either directly by haul truck from the pit or by front-end loader from the ROM pad and LGO stockpile. Ore contained within the existing LGO stockpile and scats from the scats stockpile may also be reprocessed, depending on the economics of the day. Primary crusher product will be reclaimed from the discharge vault by the apron feeder and discharged onto a conveyor.

Primary crushed ore will be secondary crushed using cone crushers. Crusher product will be screened on banana screens with oversize material transferred back to the secondary crusher feed conveyor. Screen undersize material will be transferred onto a coarse ore stockpile where ore will be reclaimed by a feeder onto a conveyor to the HPGR. HPGR product will be conveyed by belt conveyors to a fine ore splitter where it will be transferred across a fine ore screen by two belt conveyors operating in parallel. Screen oversize will be conveyed back to the HPGR feed conveyor with undersize gravitating to a hydrocyclone feed sump. Slurry from the feed sump will be pumped into a hydrocyclone cluster. Hydrocyclone underflow gravitates to two ball mills where it will undergo further size reduction. The hydrocyclone overflow slurry will flow by gravity onto three trash removal screens. Screen undersize slurry will gravitate into a pre-leach thickener, after which thickened slurry will be pumped to the CIL circuit.

Adsorption and Detoxification

The CIL circuit will consist of a pre-leach thickening stage followed by conventional leaching and adsorption. Pre-aeration reduces cyanide consumption during CIL leaching. Cyanide will be added to the slurry to dissolve the gold after which carbon is added to adsorb the solubilised gold. Reactivated carbon, supplemented with fresh carbon as necessary, will be added to the final tank in the circuit.

CIL plant tailing will be directed to a cyanide detoxification circuit in which the cyanide is reduced and / or eliminated (Section 2.3.5). The slurry exiting the detoxification tanks will gravitate into a tailings pump hopper. From here the slurry will be pumped to tailings storage.

Gold Extraction

Loaded carbon will be separated by screen from the CIL tank located immediately after the leach tanks and transferred to a carbon strip vessel. Prior to gold stripping, copper will be stripped from the loaded carbon via a cold cyanide strip.

Gold will be removed from the loaded carbon using a modified Anglo American Research Laboratories carbon strip. Pregnant solution will be stored in a pregnant solution tank in preparation for electrowinning. Electrowinning will commence once the solution level in the pregnant solution tank is sufficient to cover the electrowinning feed pump intakes. Pregnant solution will be circulated from the pregnant solution tank through electrowinning cells wherein gold will be electrochemically plated onto stainless steel wool. Recirculation of pregnant solution will occur until gold grades are below economic levels. The barren solution will be reintroduced into the CIL circuit to recover any residual gold that was not electrowon.

Gold adhering to the stainless steel cathodes in the electrowinning cells will be washed under high pressure from the cathodes into the bottom of the cell and transferred into a vacuum pan filter. Solids from the filter will be transferred into a drying oven. The dried gold sludge will then be transferred into an induction furnace, fluxed, smelted and poured into dore bars.

2.3.5 Cyanide Detoxification Circuit

The air / sulfur dioxide (SO_2) process will be used for cyanide reduction. The circuit design uses two reactors in series, which reduces the chance of short circuiting and allows for continued detoxification at reduced capacity should one tank need to be bypassed for maintenance.

Copper in solution is required as a catalyst for the detoxification reactions and there is sufficient cyanide soluble copper leach in the CIL circuit for this purpose.

Weak acid dissociable (WAD) cyanide levels within the detoxification tanks will be measured by a WAD Cyanide Analyser. The analyser will extract sample streams from the two tanks and analyse their composition for the presence of hydrogen cyanide, free cyanide ions and WAD cyanide ions. WAD cyanide will be determined by colorimetric analysis that will provide reliable discrimination between total cyanide content and WAD cyanide content. The WAD cyanide reading will be used to determine the required dosing rate of sodium metabisulfite.

The residual WAD cyanide target for the final tailings of <10 parts per million (ppm) is low by industry standards and has been selected to reduce the quantity of copper and cyanide in the return water from the tailings dam.

Samples of the detoxification discharge to the tailings hopper will be taken and analysed in the on-site laboratory using the WAD Picric method to ensure the required WAD cyanide levels are being achieved and adjust the SO_2 dosing rate if required. It is expected that the SO_2 dosing rate will be monitored and tested throughout commissioning to determine the exact required dosing rate as opposed to the dosing rate determined from test work.

2.3.6 Lead Nitrate

Lead nitrate may be required during processing of some of the ore because it contains chalcocite, a secondary copper mineral that may be present in up to 4% of the ore mined on site. This ore will be set aside for processing with lead nitrate in order to reduce the consumption of cyanide and make processing of this ore economic. Residual lead nitrate will be locked within the chalcocite minerals in the TSFs.

2.3.7 Transport and Ancillary Operations

The gold bars will be stored in a secured area on-site and transported by secure shipment to a refinery.

Carbon will be regularly washed in a mild cold hydrochloric acid wash which removes carbonates that may have built up on the carbon during the CIL process. Carbon activity is reduced after use in the CIL leaching process. Carbon reactivation will be undertaken in a reactivation kiln after carbon stripping. The reactivated carbon will be screened to remove carbon fines and reintroduced into the CIL circuit.

2.3.8 Reagents and Consumables

Reagents and consumables expected to be used at the Ore Processing Plant are provided in Table 2-5 and Table 2-6.

Table 2-5 Processing Plant Reagents Used

Reagent	Formula	Use	Annual Consumption (t)
Quick Lime	CaO	pH modifier	16,153
Sodium Cyanide	NaCN	Gold lixivant	13,668
Sodium Hydroxide	NaOH	pH modifier	710
Flocculant	Magnafloc 10	Settling aid	266
Sodium Metabisulfite (SMBS)	$Na_2S_2O_5$	Oxidising agent	12,958
Hydrochloric Acid	HCl	Carbon washing	1,441
Lead Nitrate	$PbNO_3$	Leaching aid	1,775
Activated Carbon	C	Gold adsorbent	355
Borax	$Na_2B_4O_7$	Flux	1.25
Silica	SiO_2	Flux	1.25
Soda Ash	Na_2CO_3	Flux	0.85
Potassium Nitrate	KNO_3	Flux	0.25

Table 2-6 Consumables Used

Consumable	Annual Consumption
Crushing	
Primary crusher mantle	5 sets
Primary crusher concaves	1.67 sets
Secondary crusher wear liners	10 sets
Milling	
Mill balls (68mm)	16,893 tonnes
Mill balls (50mm)	8 tonnes
Mill liners	3 sets
HPGR	
HPGR rolls	2.61 sets

2.3.9 Site Vehicles

Vehicles will operate at Mt Todd to undertake a variety of functions at the site including mining, stockpile management, plant feeding, road maintenance, dust suppression, general personnel movement etc. The vehicle fleet will include:

- 8 Atlas Copco Pit Vider 235 blast-hole drills;
- 1 Atlas Copco 45K rotary drill rig;
- 2 ammonium nitrate / fuel oil trucks;
- 1 skid loader;
- 4 Hitachi EX5500 hydraulic shovels;
- 2 Cat 994 loaders;
- up to 38 Cat 793C trucks during the mine life;
- 1 Cat D8 track dozer;
- 2 Cat D9 track dozers;
- 2 Cat 16H motor graders;
- 2 Cat 777B with a 70kL water trucks;
- 2 Cat 834H rubber tyre dozers;
- 1 36t capacity crane;
- 1 Cat 321DL excavator;
- 1 low-boy trailer with 60t haul truck;
- 1 flatbed truck;
- 1 rock breaker attached to the 321DL excavator;
- 4 light plants;
- 1 fuel / lube truck;
- 16 4WD utes; and
- 2 passenger buses.

Fuel consumption for vehicles operating at the mine is estimated at 90,000 litres per day.

2.4 Infrastructure

2.4.1 Power Supply

With respect to the power supply at Mt Todd, the following infrastructure is currently available on site:

- high pressure gas line;
- 22 megawatts (MW) capacity power supply (import) transmission line; and
- 22MW capacity power connection to grid (export) transmission line.

During initial construction and maintenance periods, power will be supplied by these lines.

During operations, normal site electrical demand (steady state) is 86MW and the peak demand is approximately 95MW. Electrical demand will be primarily met by the installation of a Rolls Royce Trent 60 Wet Low Emissions single gas turbine generator (Figure 2-10) and two reciprocating engines (Figure 2-11) located adjacent to the main entrance road. Total power generation capacity (installed) will be approximately 76MW. The shortfall in power will be obtained from the grid.

Water consumption in the power plant is primarily for compressor interstate cooling, injection into the combustor for nitrous oxide (NO_X) control and periodic cleaning of the turbine compressor section. The raw water dam will supply the required 290,000m^3 per annum for power plant operation.

Key specifications of the proposed power plant are provided in Table 2-7.

Figure 2-10 Rolls Royce Trent 60 Gas Turbine

Figure 2-11 MAN 20V35 / 44 SG Recip. Engine

Table 2-7 Power Plant Specifications

Specification	Measurement
Gas Consumption	8.9 Petajoules per annum (PJpa)
Electricity produced	18,000 Gigawatt Hours (GWh) over project life
Estimated Emissions (milligrams per Normal cubic meter (Nm^3))	
NO_X	50
CO	54.5
Particulate matter	5.1
VOC	2.

1. Dry at 15% O_2

2.4.2 Water Supply and Storage

The processing facilities will require up to 30,000m^3/day of water for use in crusher sprays, reagent make-up, potable water production, process water make-up, gland water, filter plant seal water make-up, and fire water reserve. The processing plant demand is scheduled to be supplied from one or more of the following sources:

- TSF reclaim water;
- WTP; and
- RWD.

Potable water for the operational workforce will be supplied from the RWD.

The RWD is located approximately 2.5km north east of the Ore Processing Plant site. The RWD was built across Horseshoe Creek immediately above the mine, forming a sub-catchment covering about 55% of the Horseshoe Creek catchment (approximately 45km^2). The capacity of the RWD reservoir will be enlarged during pre-production to accommodate the increased water storage required to supply mine production. The enlargement will involve an approximate 2m raise to the existing dam, and construction of a new spillway crest at an elevation of 136.5m, approximately 2m higher than the existing crest. The raised dam and new upstream spillway will be of similar construction to the existing dam and spillway. Modifications to the outlet works will accompany the dam enlargement. The enlarged capacity is expected to be approximately 8.4Mm^3.

2.4.3 Water Treatment Plant

Both active and passive approaches have been proposed for water treatment at Mt Todd. The first phase of water treatment at Mt Todd will include active water treatment in the new WTP.

During operations, water will be managed via a 500m^3 per hour WTP. Water will be treated for general on-site use and to meet discharge criteria for release to the Edith River or RWD when required.

The treatment process is based on lime precipitation conducted in a high-rate solids contact clarifier. Water is pumped from an equalisation pond to the high rate clarifier, where lime is added to increase the pH and ferric chloride is injected to promote coagulation (Figure 2-12). The water is then neutralised and sent through a microfiltration (MF) skid. The MF backwash and all sludges are sent to the TSF for disposal. Some of the treated water (about 1%) will be used as process water for the plant, with the rest sent to a pond for monitoring, and then discharge to Batman Creek or use elsewhere on-site.

The WTP will also treat water for drinking purposes. Potable water (1.7m^3/h) will be treated via filtration, chlorination and ultra violet sterilisation, and stored in a potable water tank.

2.4.4 Sewage

Sewage treatment will be via either a septic tank system or package treatment plant with water disposal via either irrigation or a lagoon. The facility will cater for the requirements of up to 450 construction personnel and 350 mining and plant operations personnel. The system will be able to treat 114 litres per minute of effluent. The facility will be licenced by the Department of Health and a waste discharge licence will be applied for if treated effluent is to be discharged from site.

2.4.5 Communications

Site communications will be based upon connection to the existing Telstra fibre optic cable to the site, and personnel will also be equipped with 2-way radios.

2.4.6 Chemical and Hydrocarbon Storage

Diesel will be stored on-site for mining equipment and some vehicles. The current API 650 tank (600kL storage capacity) will store the diesel fuel and distribution of the fuel will be as required basis through combination of pipelines, fuel trucks etc. It is planned to have a single diesel storage area close to the heavy equipment workshop. Refuelling facilities will be provided in the heavy vehicle workshop area for the vehicles belonging to the operation. It is anticipated that up to 90,000L of diesel will be used daily (31.5MLpa). Storage capacity of up to 820,000L will be maintained on-site.

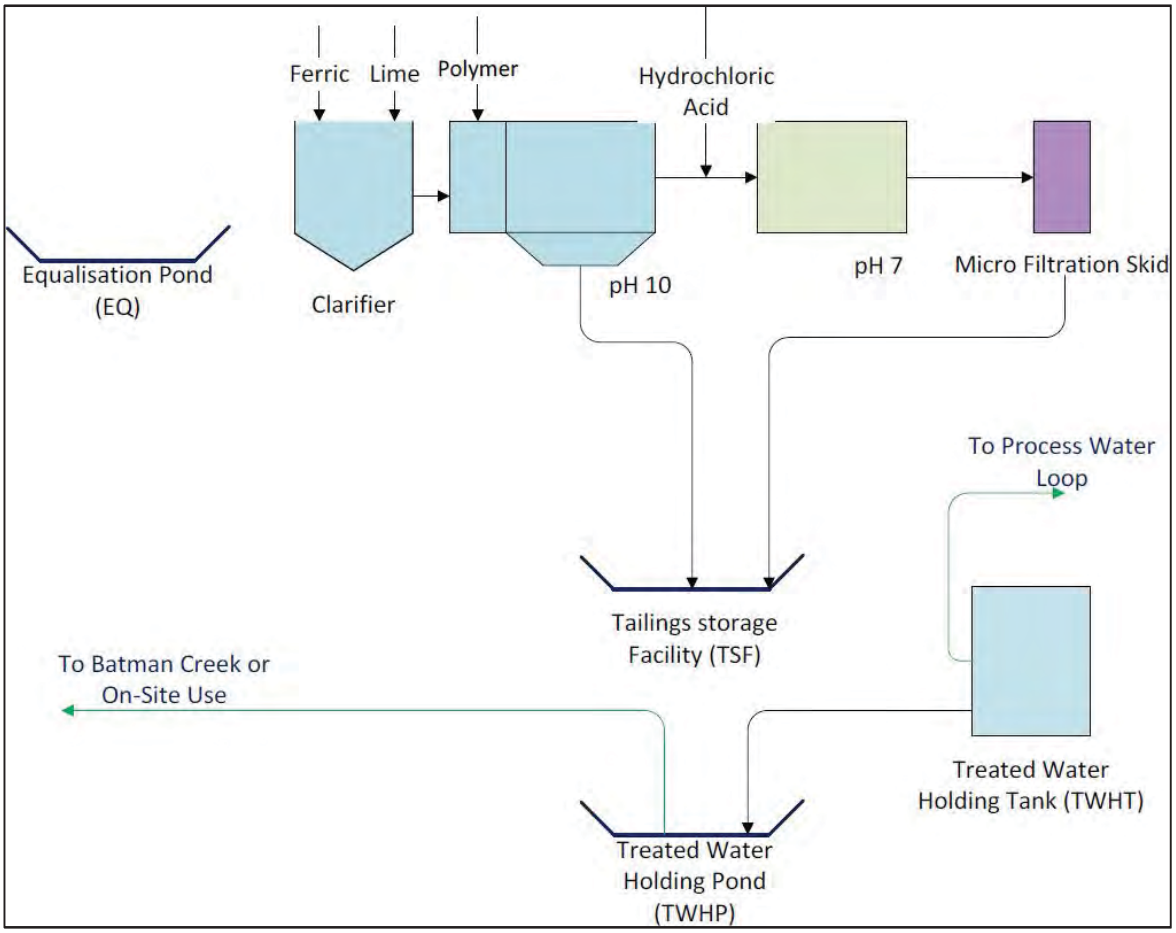


Figure 2-12 WTP Schematic

Cyanide will be predominantly delivered in bulk isotainer for sparge mixing. The site will be equipped with 4 off storage tank (110,000L each) and one mixing tank (220,000L) giving total storage capacity of 660,000L. This equates to around 4.5 days storage on site.

Various other reagents for use in the Ore Processing Plant will also be stored on-site including:

- sodium cyanide (NaCN) solid briquettes will be stored and mixed on site;
- sodium hydroxide will be delivered in 1t bags and made up in a 12m^3 tank;
- flocculant will be transported as a solid, stored in a silo and made up in two 180m^3 tanks;
- sodium metabisulfite will be delivered in loose bulk in 20 foot containers with container liner. Mixed solution will be stored in a 325.4m^3 tank;
- hydrochloric acid will be delivered in 1,150 kilograms (kg) Intermediate Bulk Containers (IBC);
- activated carbon will be delivered in 500kg bulk bags;
- fluxes will be delivered to site, palletised to approximately 1t per pallet;
- lead nitrate will be delivered in powder in 1t bags with 20% solution stored in 102m^3 tank; and
- quick lime will be delivered to site in loose bulk in 20 foot containers.

Lubricating oil will be stored in bulk containers inside a bunded area with spill protection.

Waste oil will be stored in a tank within a bunded area to be held for collection by a contractor for reprocessing and recycling.

All chemicals, fuels and oils will be stored and contained according to Australian Standards.

2.4.7 Explosives Magazines / Depot

The Project will require an explosive storage and handling facility for ANFO. Ammonium nitrate will be stored in sea containers and will be emptied into the hopper / bin for discharge into the ANFO truck. The emulsion in gel form will be stored in the self-contained bullet tank and will be pumped into the mixing truck powder magazines. A cap magazine will be built and operated in accordance with Dangerous Goods Regulations. Applications for a Magazine Licence or a Licence to Store Dangerous goods will be submitted to the relevant authorities before commencing construction of the explosive storage facilities. An average 3,000tpa of explosive will be used. Peak year consumption is about 4,100 tonnes of explosive.

2.4.8 Clay Borrow Area

Clay or other low-permeability materials are a critical component in controlling the moisture retention and release properties of the store and release covers used in rehabilitation.

Based on drill core data, sources of clay are available on-site, although there is uncertainty around the quantity and quality of clay available. The clay borrow area, or a number of smaller borrow areas, will likely be in the vicinity of the previous borrow area, to the south east of TSF1.

Sources of clay have also been identified over a large strike length from Emerald Springs to South of Katherine. Some of the identified sources are on EL28321 held by Vista Gold.

Options for the supply and or purchase of clay will continue to be investigated with the ultimate source(s) being subject to a separate approvals process if required.

2.5 Construction Workforce and Accommodation

2.5.1 Workforce

The construction workforce is expected to peak at about 450. This workforce would be the responsibility of a construction contractor.

The mine workforce, including operations, maintenance, engineering, geological and support personnel, is expected to peak at about 350. It is expected that up to 40 personnel would be required for the decommissioning and closure phases.

2.5.2 Accommodation

The Construction Workforce will be housed in a purpose built camp. The location of this camp is still to be determined but it is likely to be located within 25km of the mine. This does not preclude locating the camp on the Mineral Leases. An onsite accommodation camp (i.e. the retention of a residual part of a construction camp) may be included in the long term on-site project infrastructure. Approval for such a camp would be via a separate approval process.

The operations workforce of 350 is expected to comprise 60 personnel drawn from the region with the remaining 290 personnel being new. Initial work has indicated that these personnel could be accommodated as follows:

- 70 workers at the construction camp. This would accommodate mainly FIFO / DIDO personnel and provide an ability to quickly increase capacity and house overflow peak period personnel to meet mining needs or maintenance shut downs;
- 120 workers (family households with or without children) in a mixture of:
  - new three and four bedroom houses located on existing vacant Katherine and regional land;
  - existing (renovated if required) houses located in Katherine and regionally; and
  - subject to real estate availability at the time of the arrangement, a small contained development on Katherine land.
- 100 workers located in a Katherine based single person accommodation facility.

The ultimate accommodation strategy adopted will be developed following further discussions with local and Northern Territory Government agencies.

For the decommissioning and closure phase, the 40 required workers would be housed in either the previous FIFO / DIDO accommodation or in the Katherine based single person accommodation.

2.6 Waste Management

2.6.1 Waste Rock Characterisation

Geochemical characterisation studies have been conducted on samples of waste rock to characterise waste rock in relation to its potential to generate AMD and to use this information to inform the rehabilitation programs for the key on-site mine waste repositories (TSF1, TSF2 and the WRD). The work undertaken and the study results are discussed in Chapter 12 with a detailed report provided in Appendix L. A summary is provided below.

Preliminary specific sulfur cut-off values for waste rock management were developed based on acid-base accounting (ABA) and net acid generation (NAG) pH. The criteria were:

- non-acid forming (NAF) waste rock is defined by total sulfur content from <0.005 weight percent (wt.%) to 0.25wt.%;
- waste rock with uncertain acid generation potential ranges from >0.25wt.% to 0.4wt.% total sulfur; and
- the total sulfur content of potentially acid forming (PAF) waste rock is >0.4wt.%.

The low sulfur content required to potentially form acid in Mt Todd waste is attributed to the limited neutralising capacity of the bulk of the material.

Waste rock characterisation studies demonstrated that the exploration block model (containing total sulfur) could be used as a robust proxy for preliminary ABA and NAG pH. This method allowed for an initial screen and risk based approach to the prediction of AMD. To demonstrate this, the following tests were undertaken:

- static ABA on 87 waste rock samples from five drill holes;
- six samples were subjected to short term kinetic testing and three samples subjected to long term humidity cell tests;
- mineralogy by quantitative x-ray diffraction on the same subset of nine samples; and
- NAG testing on samples submitted to an assay laboratory.

The 18 mappable geological units at Mt Todd were consolidated down to three key units for the purpose of AMD classification. The sample selection process consisted of taking 18 quarter core samples over 4m intervals from three diamond drill holes (six samples each), over the three key rock units.

Additional sampling was also undertaken on 75 samples from a further two diamond drill holes. These samples were selected from the three key rock units within waste rock with the aim that the samples were geospatially representative of *in situ* waste within the proposed pit at the time of sampling.

Using the sulfur content criteria described above, the block model and proposed pit shell, the quantities of waste material in relation to their potential to produce AMD have been ascertained. In general PAF material dominates the western half of the pit with the non acid forming (NAF) in the east (Figure 2-13).

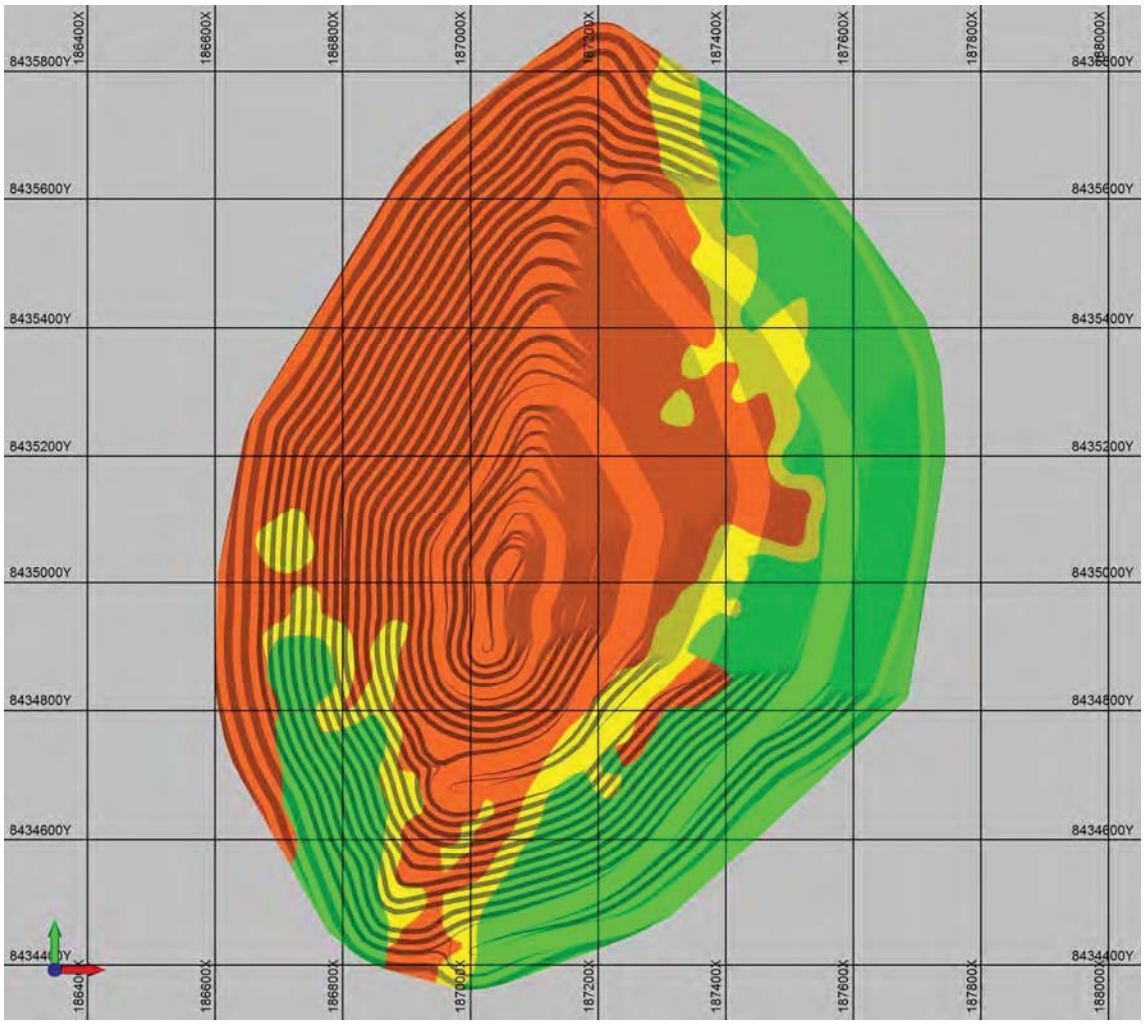


Figure 2-13 Acid-base Accounting Criteria, Proposed Batman Pit

Orange = PAF, yellow = uncertain and green = NAF (Source: Appendix L)

Waste rock proposed to be placed in the WRD will be sourced from the Batman Pit in approximately the following proportions:

- NAF 160Mt (32%);
- uncertain 101Mt (21%); and
- PAF 233Mt (47%).

Waste from ore processing (approximately 172Mt) will be disposed to TSF1 and TSF2. The balance of the NAF material from the pit (approximately 68Mt) will be used for construction (TSF1 raising, TSF2 and site roads) and cover (HLP, TSF1 and TSF2) requirements.

2.6.2 Waste Storage

Table 2-8 details the planned waste storage volumes, whilst Table 2-9 identifies tonnes of NAF waste materials that will be used for construction. The combined capacity of the tables below accommodates the approximate 785Mt of waste produced by the Project.

Table 2-8 Waste Storage Volumes

Structure / Activity	000 tonnes
Waste rock dump	494,043
TSF1	62,000
TSF2	160,651
Total	716,694

Table 2-9 Tonnes of NAF Waste to be Used for Construction

Volumes used for Construction / Rehabilitation	000 tonnes
Reclamation of heap leach pad	10,000*
Heap leach pad cover	191*
TSF1 construction	4,189
TSF1 cover	5,025
TSF2 construction	45,000
TSF2 cover	3,901
Total	68,306

*The current intention is to blend the residual heap leach ore through the process plant and extract residual gold. If this is not economic, this volume of material will be required for rehabilitation purposes.

2.6.3 Waste Rock Dump

The existing WRD will be extended. The staging of the WRD design is shown in Figure 2-14 to Figure 2-17. The WRD at completion is shown in Figure 2-18.

The existing WRD comprises approximately 16Mt of waste rock. The ultimate dump will contain around 510Mt of waste rock, an addition of approximately 494Mt. From its current area of 69ha, the WRD will expand to around 217ha. The current WRD is around 24m high. The ultimate WRD design will be approximately 350m high.

The ultimate WRD will fully encapsulate the current dump. The ultimate design incorporates an angle of repose slope of 1.5 vertical to 1 horizontal with catch benches of 8m every 30m in height. During the construction of the dump, PAG and uncertain waste materials will be dumped in the interior of each lift of the waste dump. Non-PAG material will be dumped to the outer edge of each lift. It is anticipated that at least a 10m rind of Non-PAG material will surround all uncertain and PAG type waste material.

As each 30m is finished, a geosynthetic clay liner (GCL) will be laid on top of the outer 15m of the lift at an outward slope of at least 1.5%. This will promote drainage to the outer portions of the dump where drainage channels will allow storm water to drain without contacting any of the PAG material.

A Waste Rock Management Plan will be developed that specifies how waste rock will be handled in order to minimise the potential for AMD and maximise the beneficial use of NAF waste rock for closure. The Waste Rock Management Plan will include:

- routine waste rock testing procedures such as collecting monthly samples for analysis of carbon and sulfur that can be used to confirm data from the blast hole database;
- staging dump construction to minimise the contact of PAF rock with air and water;
- selective handling and isolation of the highest sulfide material or blending PAF and NAF waste rock;
- contouring WRD surfaces to shed precipitation and runoff away from PAF materials during production and at closure; and
- sequential closure of inactive dump areas and faces as mining progresses.

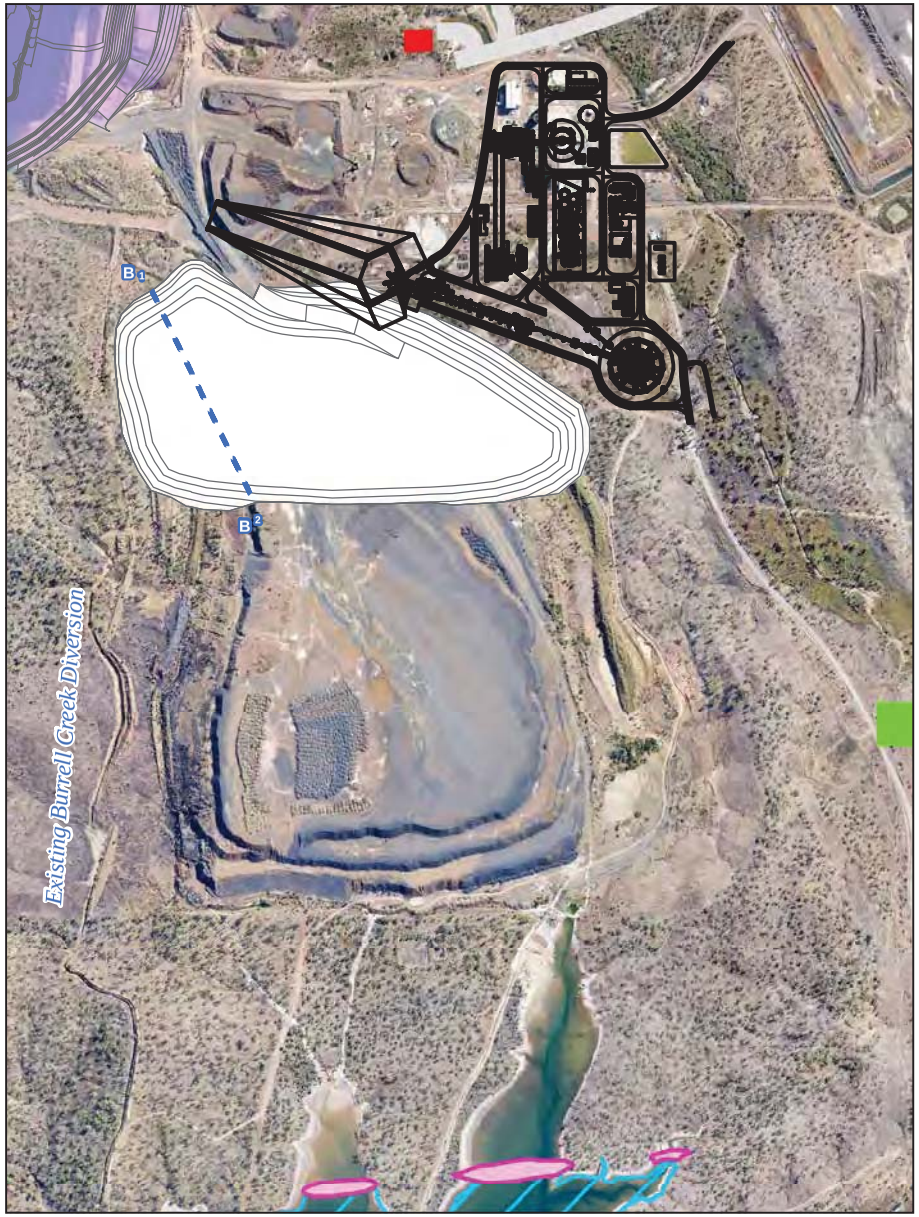
The results of this planning effort will include managing waste rock disposal so the outer layers of the WRD at closure are composed of NAF waste rock. The Waste Rock Management Plan will also emphasise the implementation of operational techniques and dump designs that encourage clean water diversion, rapid internal surface runoff, and seepage control during operations and at closure.

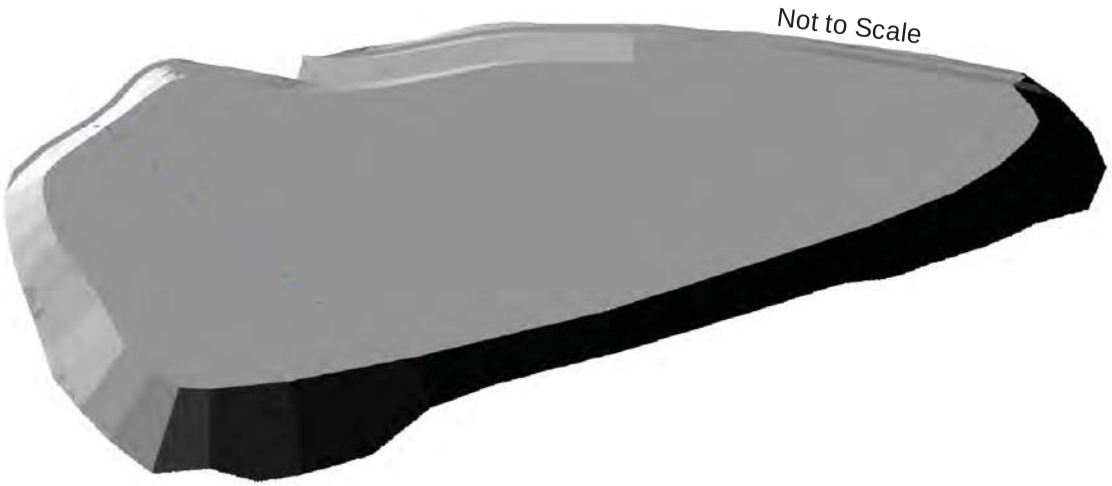
The footprint of the proposed waste rock dump will extend into the northern portions of the existing RP1. This area of RP1 will be backfilled to a level grade prior to deposition of waste rock within the area. Three separate coffer dams (East, Central and West) will be constructed along the southern toe of the proposed waste rock dump within RP1.

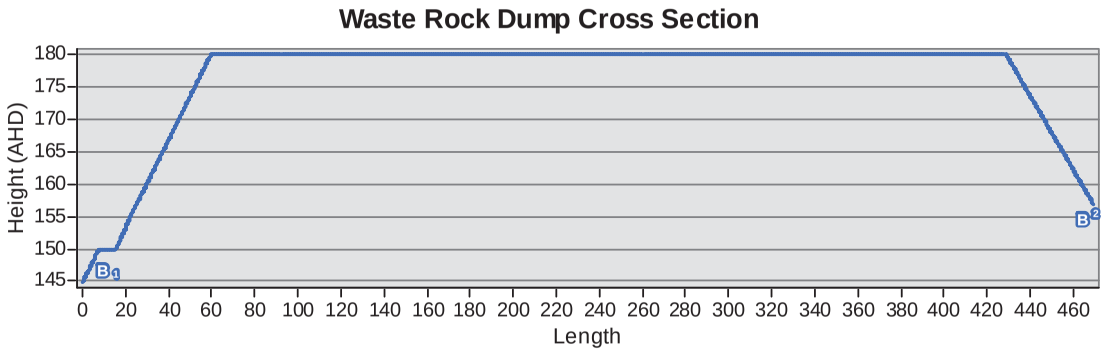
The cofferdams will prevent seepage from RP1 into the waste rock dump. Each cofferdam will be constructed with upstream and downstream slopes of 3H: 1V and a crest width of five meters. The approximate crest elevation of the cofferdams will be at RL 120m. The cofferdams will be constructed using NAF material excavated from within the RP1 footprint or suitable off-site borrow material.

RP1 waters will be treated in the WTP prior to discharge during mining.

In addition to the primary dump, additional waste will be placed to level out an area to the northeast of the waste dump and extend north around the crushing area. This area will be built to provide truck access to the crushing facility and will be constructed of NAF material.







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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

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LEGEND

- Contours (6m Interval)
- Cross Section B
- Process Plant
- Batman Pit
- Fuel Bays
- Power Plant
- Realigned Roads
- Coffer Dams
- Retention Pond 1

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	2
Date	13 Jun 2013

Waste Rock Dump End of Phase 1

Figure 2-14

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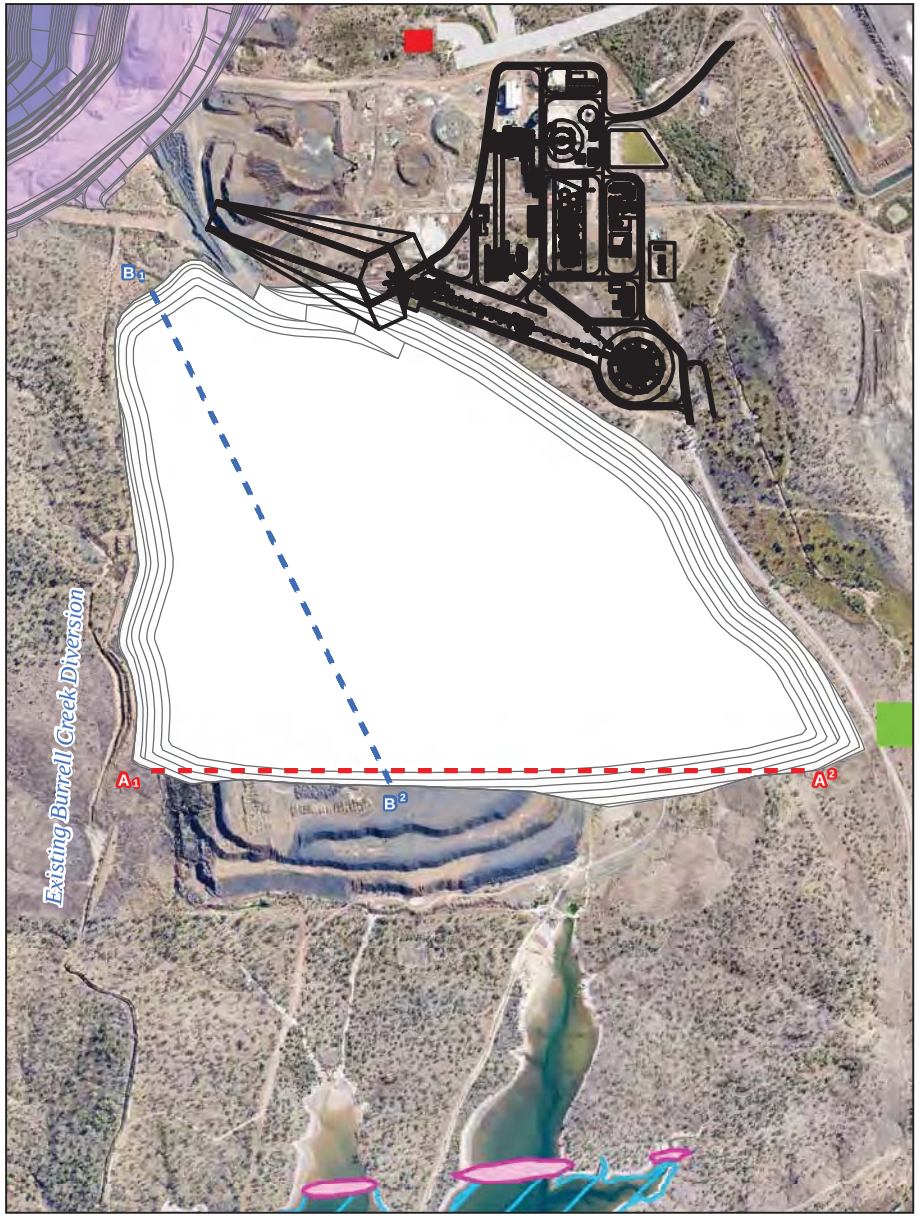
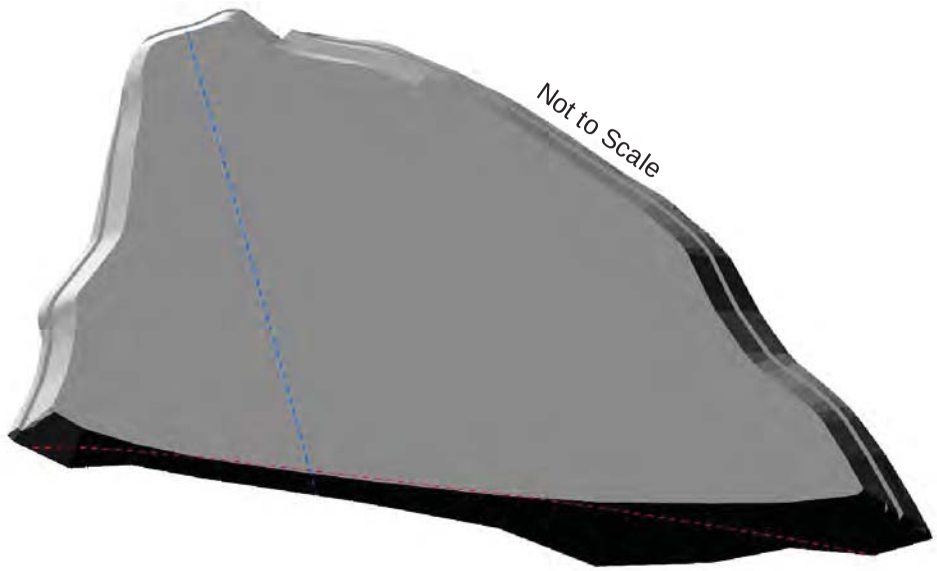
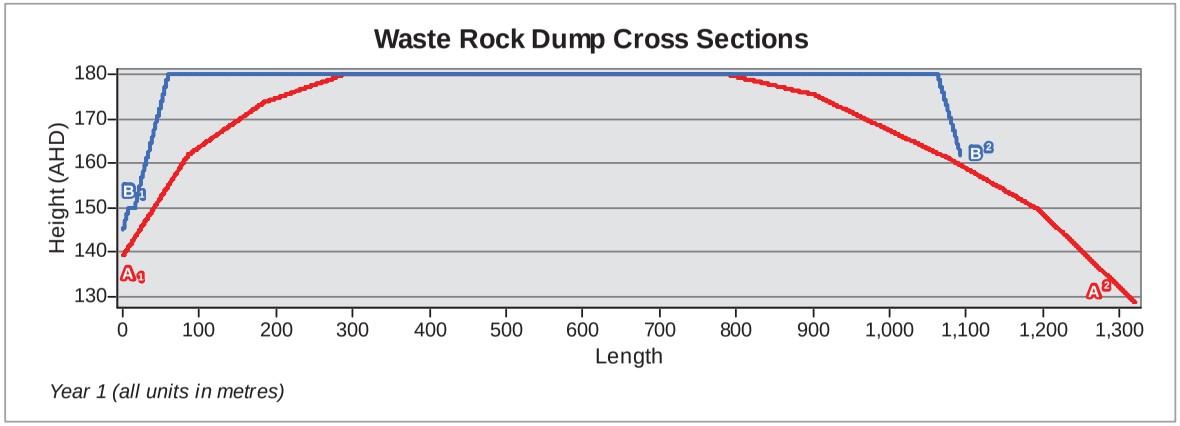
Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Realigned Roads, Fuel Bays, Power Plant, Coffer Dams, Retention Pond 1 (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







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Metres

Map Projection: Universal Transverse Mercator
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Grid: Map Grid of Australia 1994, Zone 53

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LEGEND

- Cross Section A
- Cross Section B
- Contours (6m Interval)
- Process Plant
- Batman Pit
- Fuel Bays
- Power Plant
- Realigned Roads
- Coffer Dams
- Retention Pond 1

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	2
Date	13 Jun 2013

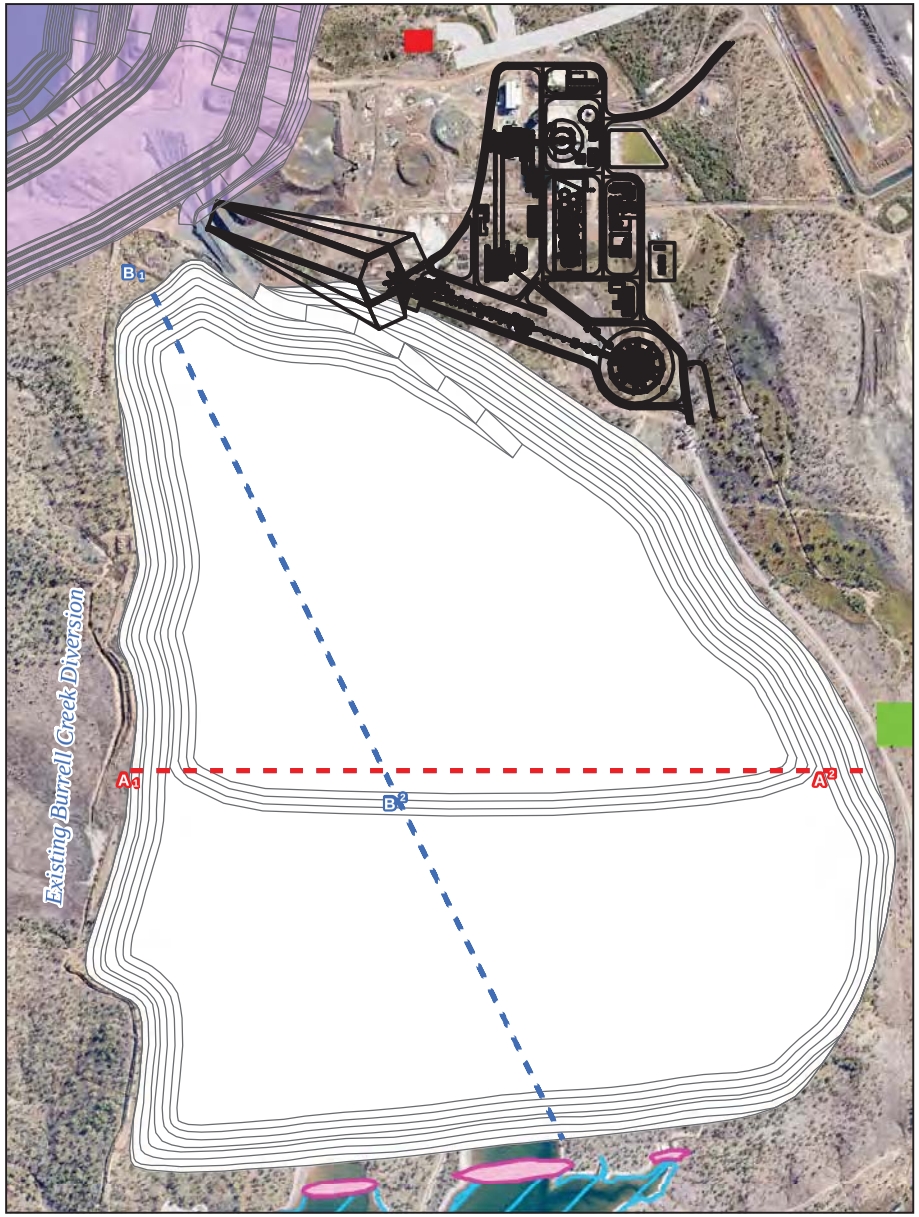
Waste Rock Dump End of Phase 2

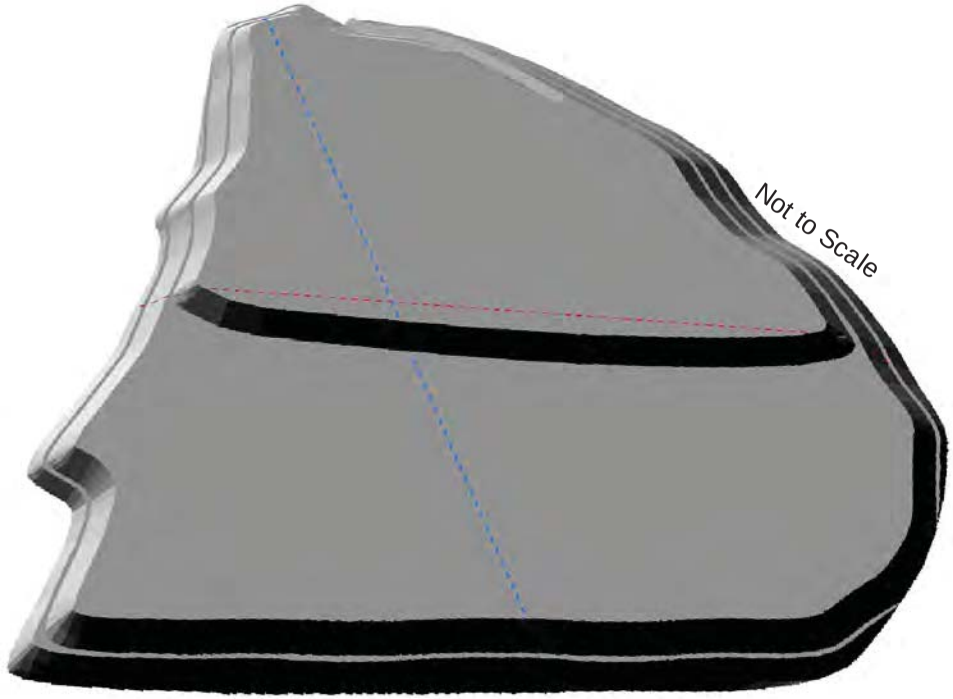
Figure 2-15

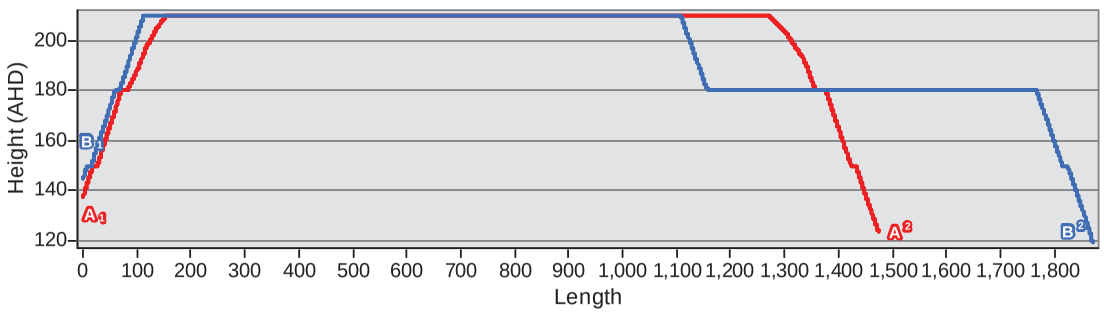
G:\43\21801\GIS\Maps 30000 TPA\EIS\ProjectDescription\4321801_1214E.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Realigned Roads, Fuel Bays, Power Plant, Coffer Dams, Retention Pond 1 (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







Year 3 (all units in metres)

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0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

- Cross Section A
- Cross Section B
- Contours (6m Interval)
- Process Plant
- Batman Pit
- Fuel Bays
- Power Plant
- Realigned Roads
- Coffer Dams
- Retention Pond 1

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	2
Date	13 Jun 2013

Waste Rock Dump End of Phase 3

Figure 2-16

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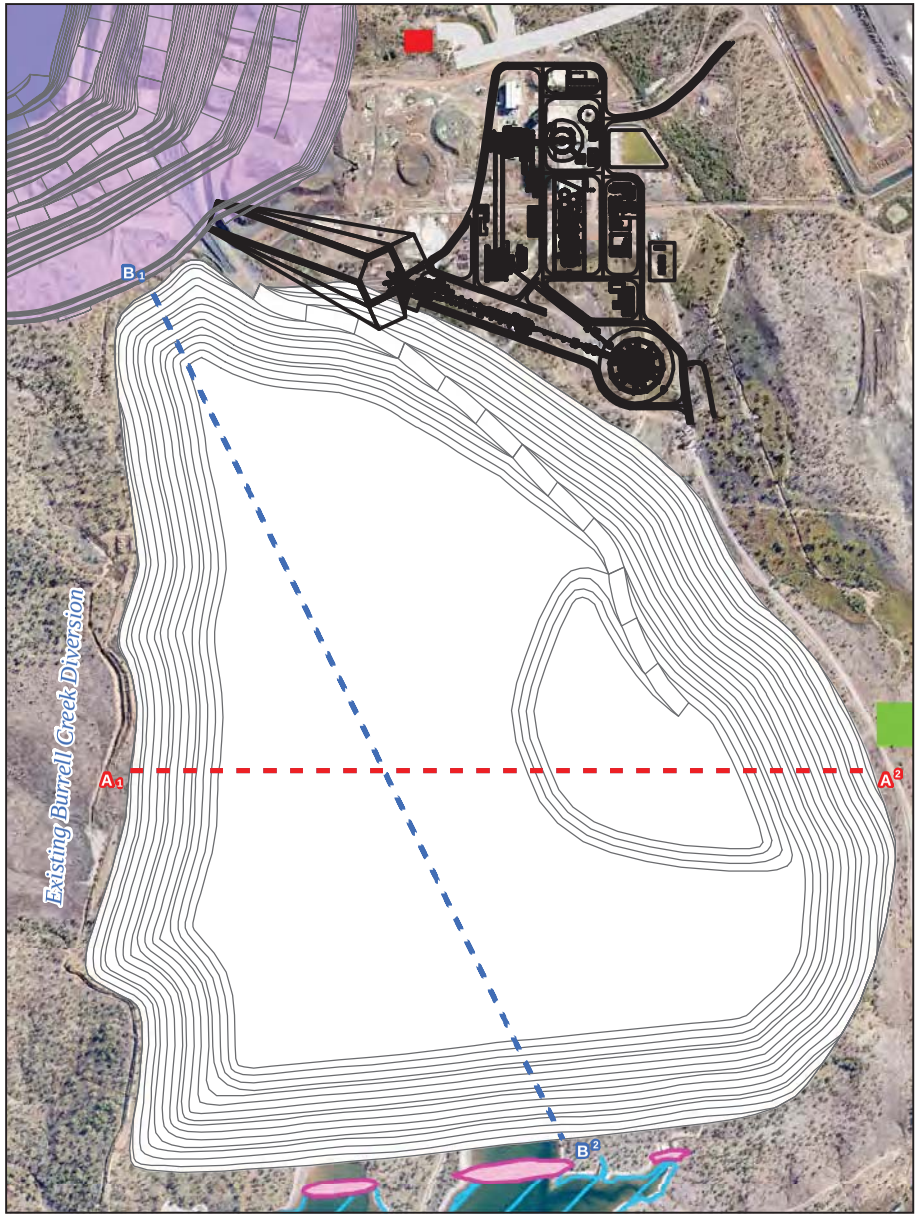
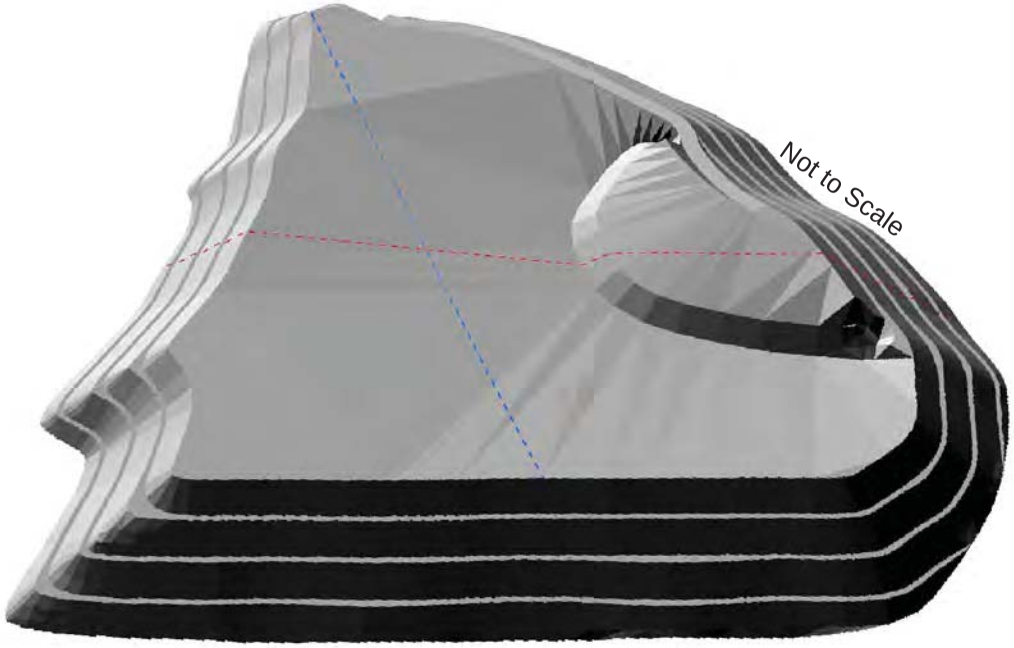
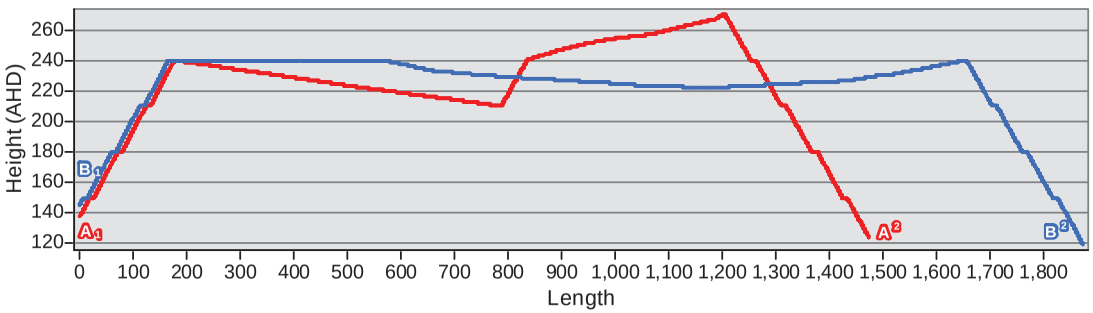
Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Realigned Roads, Fuel Bays, Power Plant, Coffer Dams, Retention Pond 1 (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







Year 5 (all units in metres)

1:15,000 @ A4

0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

- Cross Section A
- Cross Section B
- Contours (6m Interval)
- Process Plant
- Batman Pit
- Fuel Bays
- Power Plant
- Realigned Roads
- Coffer Dams
- Retention Pond 1

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
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Date	13 Jun 2013

Waste Rock Dump - End of Phase 4 **Figure 2-17**

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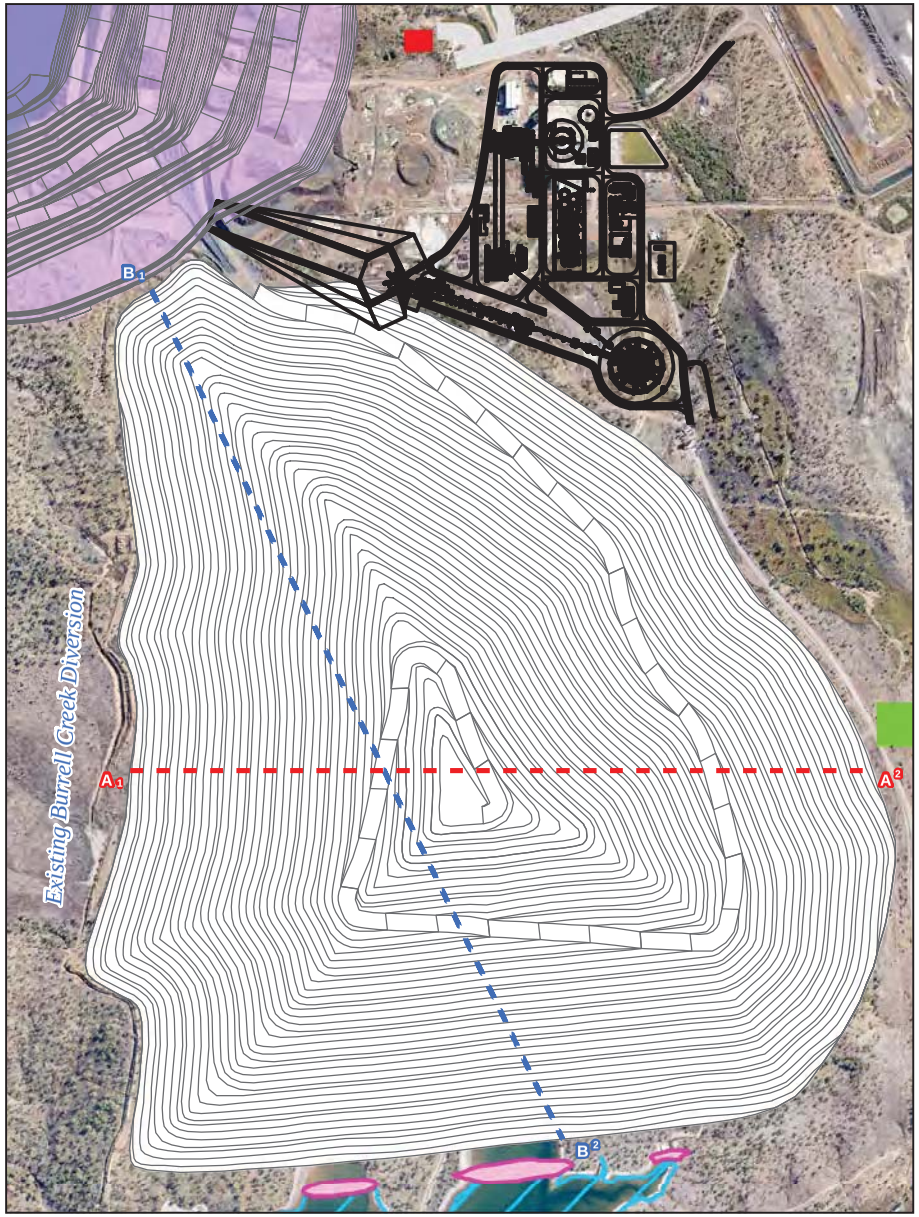
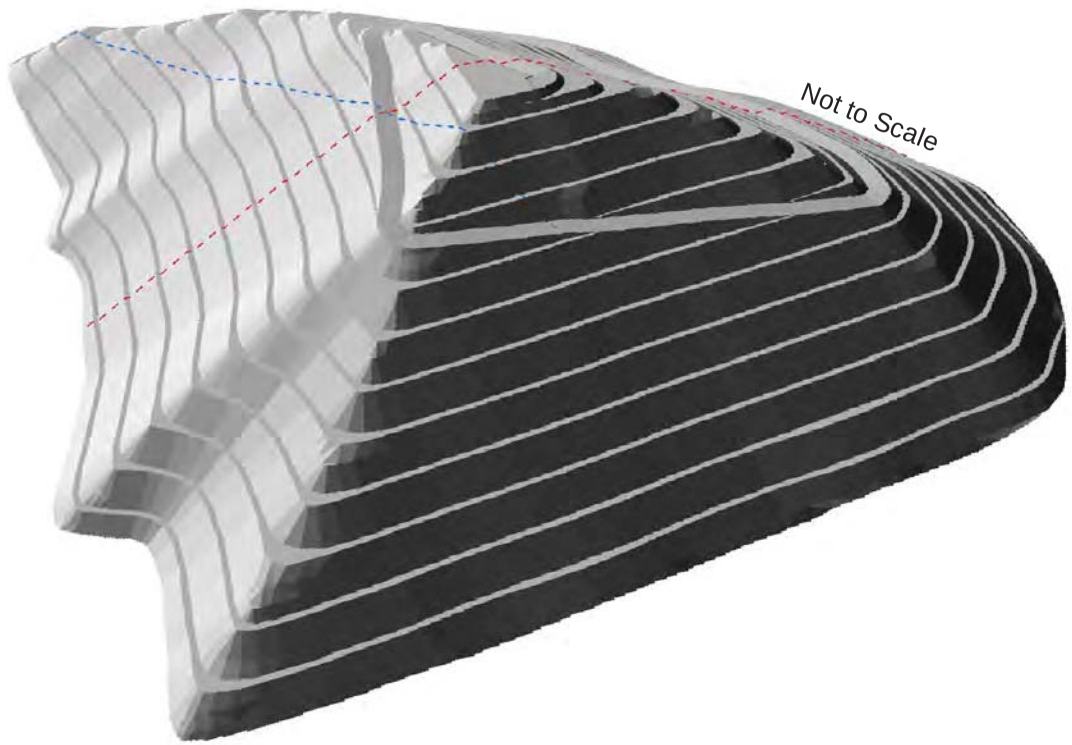
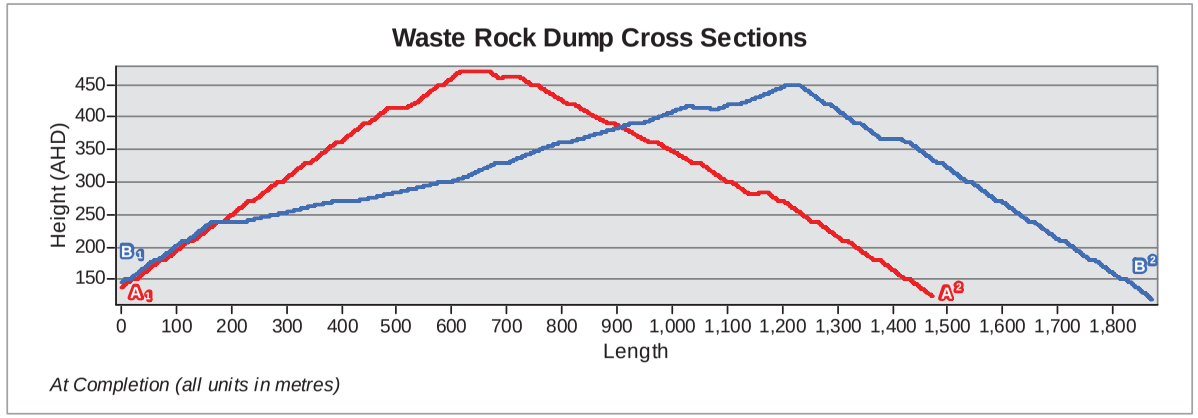
66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Realigned Roads, Fuel Bays, Power Plant, Coffer Dams, Retention Pond 1 (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







1:15,000 @ A4

0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

- Cross Section A
- Cross Section B
- Contours (6m Interval)
- Process Plant
- Batman Pit
- Fuel Bays
- Power Plant
- Realigned Roads
- Coffer Dams
- Retention Pond 1

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	0
Date	18 Jun 2013

Waste Rock Dump - At Completion

Figure 2-18

G:\43\21801\GIS\Maps 30000 TPA\EIS\ProjectDescription\4321801_1223E.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Vista Gold - Imagery (2012). Tetra Tech - Batman Pit, Waste Rock Dump, Realigned Roads, Fuel Bays, Power Plant, Coffer Dams, Retention Pond 1 (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM

2.6.4 Tailings Storage Facilities

Thickened tailings will be generated from the Ore Processing Plant. Over the estimated 13 year mine life, the Project will require a total of approximately 223Mt of new tailings storage. Vista Gold proposes to store tailings in two facilities; the existing TSF1 to the northeast of the existing Ore Processing Plant pad and a proposed new TSF2 in the valley southeast of TSF1 (Figure 2-19 and Figure 2-20).

It is proposed to dispose approximately 62Mt of tailings at the existing TSF1 in the first four to five years of production. TSF1 will be raised from a height of 16m to approximately 34m. Embankment raises will occur in six stages:

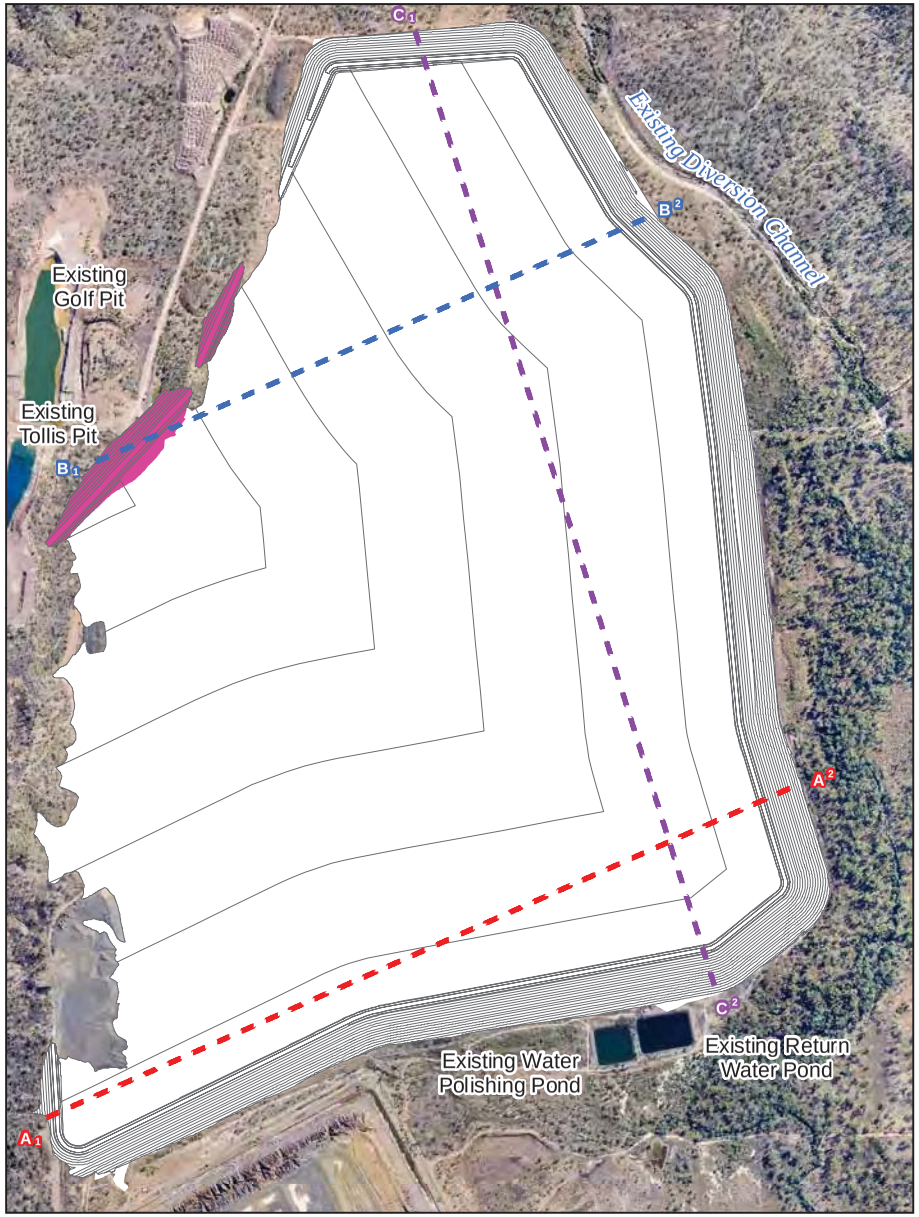
- Stage 1 – The design will involve a centreline raise type of construction. The thickened tailings will be discharged by spigots from the embankment crest to form a beach behind the embankment wall. The embankment crest will be composed of either fill or waste rock, and raised vertically; and
- Stages 2 to 6 – These will require upstream raise construction methods. The thickened tailings will again be discharged by spigots from the embankment crest to form a beach behind the embankment wall, driving the water pool to the west. The embankment crest will be raised upstream as material (fill or waste rock) for the embankment is placed on the tailings beach. Water will be removed from the water pool using the existing decant towers, which will be raised along with the embankment stages. The existing toe drain and under-drains will convey seepage water to the return water pond, where it will be pumped back to the impoundment. Figure 2-19 shows the ultimate raise for TSF1.

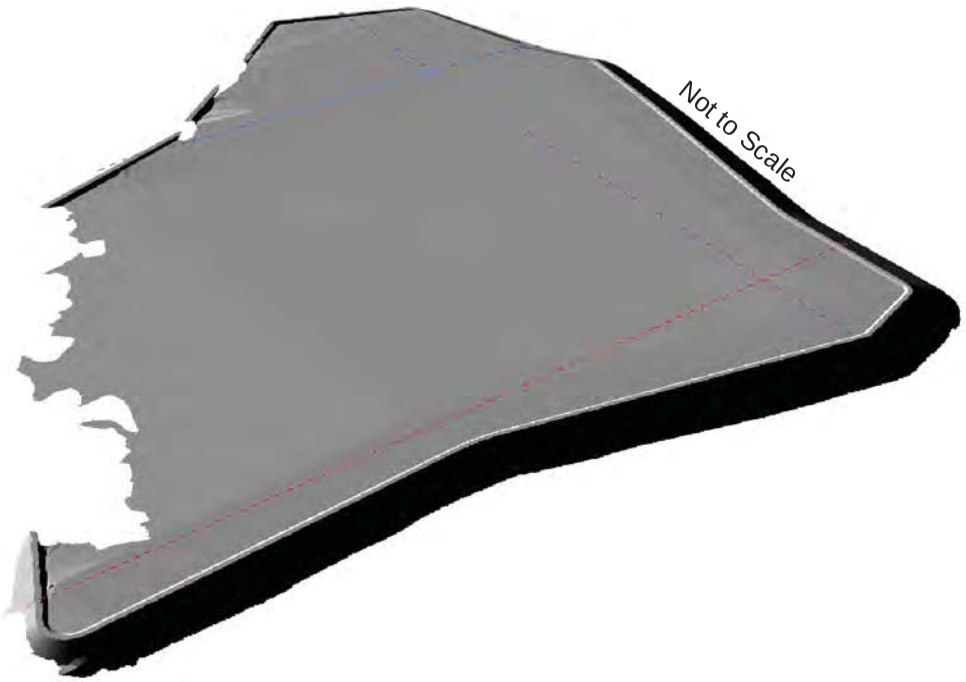
Approximately 4Mt of NAF waste rock will be required for the construction of TSF1.

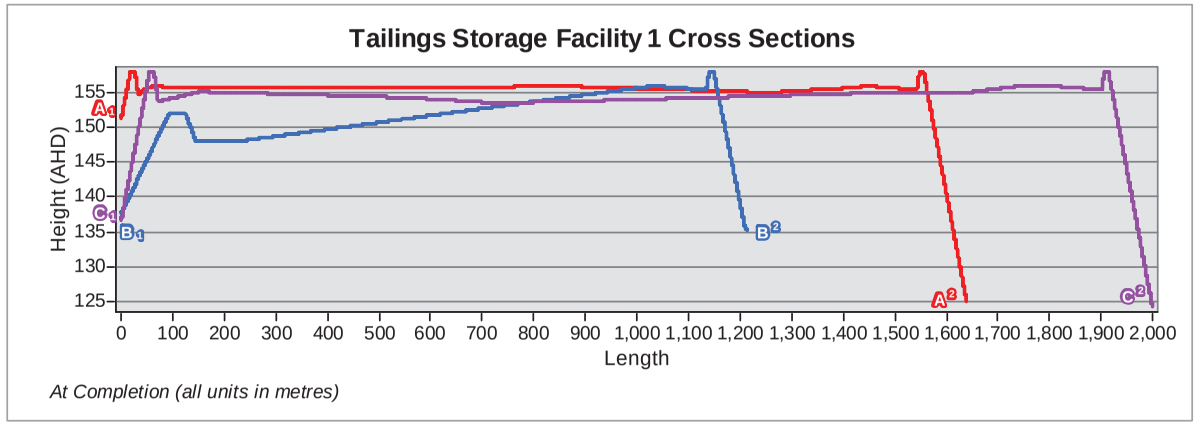
On the west side of TSF1, two saddle dams (Saddle Dam North and Saddle Dam South) will be constructed concurrently with the Stage 2 embankment raise. These dams will be constructed using NAF waste rock and include a three metre thick low permeability upstream face, underlain by a three metre thick transition zone consisting of select rock fill. The transition zone is intended to provide a buffer material between the waste rock and low permeability materials. The low permeability material is intended to prevent seepage through the foundation of the tailings storage facility. These dams will constructed at 2.5H:1V slopes on both the upstream and downstream sides. The design crest width for both the saddle dams is 8m, with a final design crest elevation of 152.5m.

The remaining 161Mt of tailings will be disposed of in the new TSF2. TSF2 will be constructed over four stages commencing in year 4/5 of production. Stage 1 will be constructed entirely on native ground using bulldozers for clearing and grubbing. Soil will be salvaged from the footprint of TSF2 and temporarily stockpiled prior to construction commencing. Stages 2 through 4 will be constructed using embankment raise construction methods in order to contain the tailings deposited in the facility. Approximately 45Mt of NAF waste rock will be required for the construction of TSF2. Figure 2-20 illustrates the ultimate tailings facility plan view and cross sections if TSF2.

The ultimate height of TSF2 will be approximately 60m (RL 175m). The entire facility will be underlain by a system of under-drains, geo-membrane liner, toe drains and over-drains. The underdrain network will consist of primary and secondary underdrains installed in existing drainage paths throughout the impoundment area. Primary underdrains will be constructed from 250mm diameter double-walled, perforated and corrugated high density polyethylene (HDPE) pipe. The underdrain network will be extended at each additional stage.







1:15,000 @ A4

0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

- Cross Section A
- Cross Section B
- Cross Section C
- Contours
- Proposed Saddle Dams

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Tailings Storage Facility 1 at Completion

Job Number	43-21801
Revision	2
Date	18 Jun 2013

Figure 2-19

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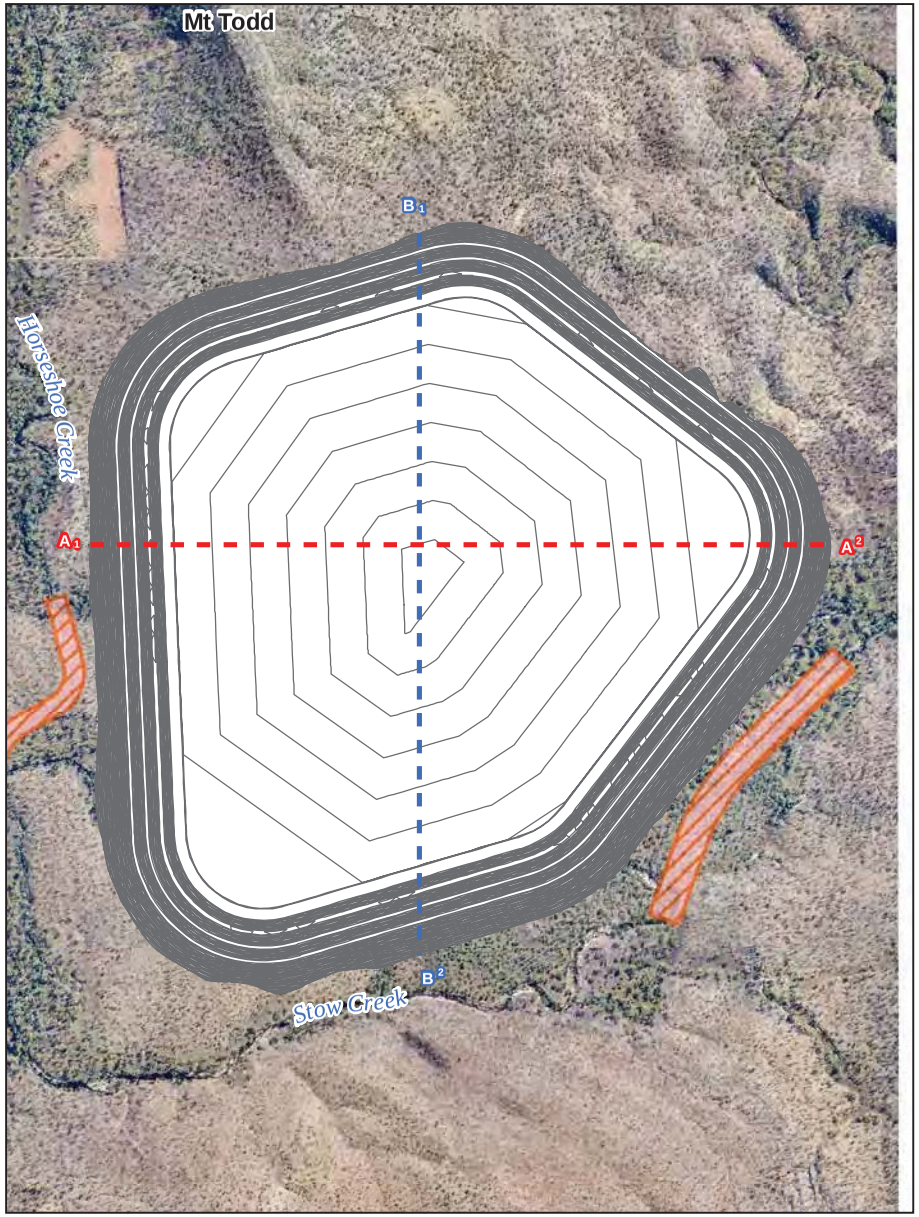
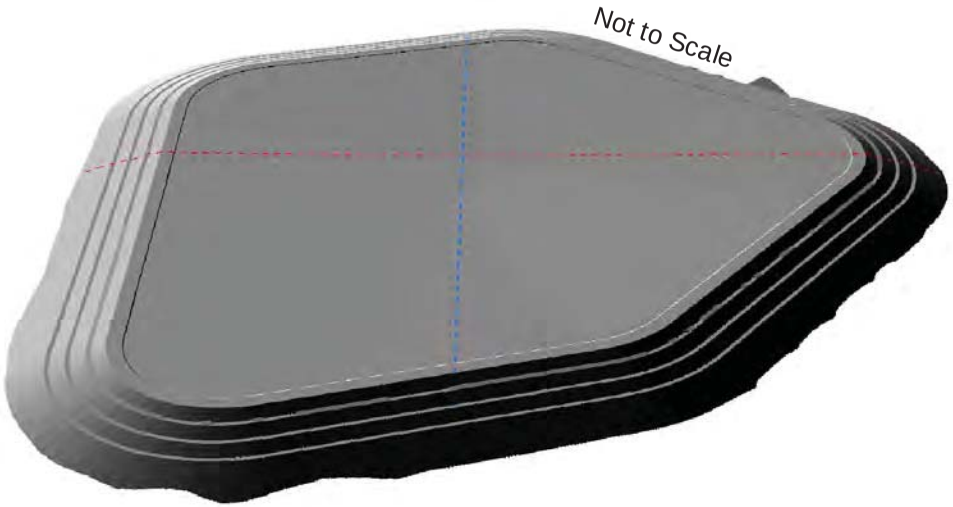
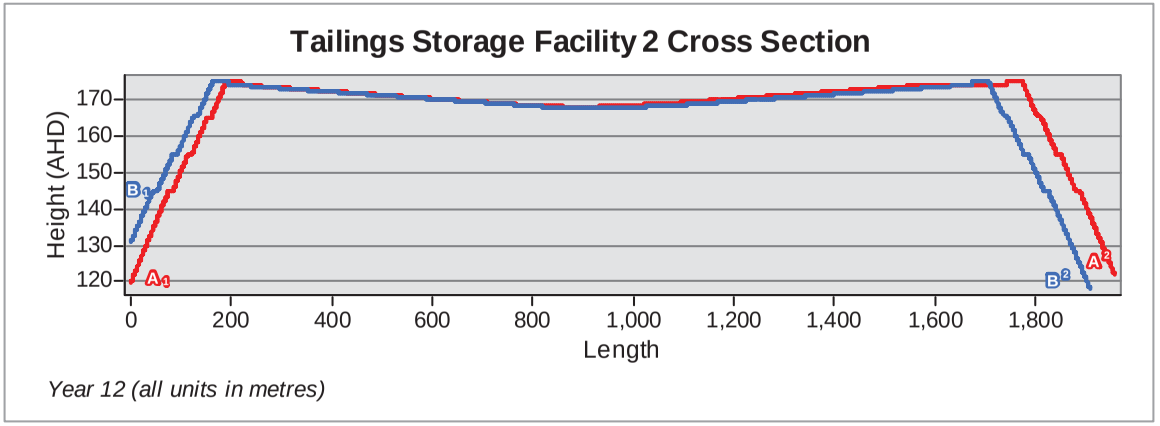
Data source: Vista Gold - Imagery (2011). VG - Contours, Proposed Saddle Dams (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







1:20,000 @ A4

0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

Cross Section A

Cross Section B

Contours

Diversion Channels

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
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Date	18 Jun 2013

Tailings Storage Facility 2
At Completion (Prior to Rehabilitation)

Figure 2-20

G:\43\21801\GIS\Maps 30000 TPA\EIS\ProjectDescription\4321801_1217E.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Vista Gold - Imagery (2011). Tetra Tech - Contours, Diversion Channels (2011). GHD - Cross Sections, 3D Model (2012). Created by: CM

Thickened tailings will be pumped via a pipeline to the crest of the embankment and sub-aerial tailings deposition from spigot points along the crest. The tailings will form a consolidated beach along the crest, creating a water pool towards the centre of the facility. Water will be removed from the water pool using a floating barge with pumps and pipes to convey the reclaimed water back to the processing facilities.

TSF2 has been designed to operate as a zero-discharge facility, so all seepage from the underdrain, toe drain, and overdrain systems will be collected and pumped back to the impoundment during operations.

A surface water diversion west of TSF2 will direct Horseshoe Creek away from the new TSF2 footprint (Figure 2-21). The alignment for the proposed diversion channel was determined to minimise excavation and the channel has been designed to meander to preserve natural conditions as close as possible. The channel has been designed to accommodate a peak flow of approximately 182m^3/s comprising 100m^3/s of runoff from a 100 year, 24-hour storm event in the Horseshoe Creek catchment and 82m^3/s of overflow from the existing raw water supply dam. The channel will be lined with rip-rap to reduce scour and erosion. The channel will have a width and length of approximately 40m and 550m respectively and a nominal depth of 2.5m.

A surface water diversion along the south-eastern edge of TSF2 will direct Stow Creek away from the TSF2 footprint (Figure 2-22). The channel has been designed for a peak flow of approximately 656m^3/s from a 100 year, 2-hour storm event in the Stow Creek catchment. The channel will be lined with rip-rap to reduce potential scour and erosion. The channel will have a width and length of approximately 60m and 850m respectively and a nominal depth of 4.2m.

2.6.5 Drainage

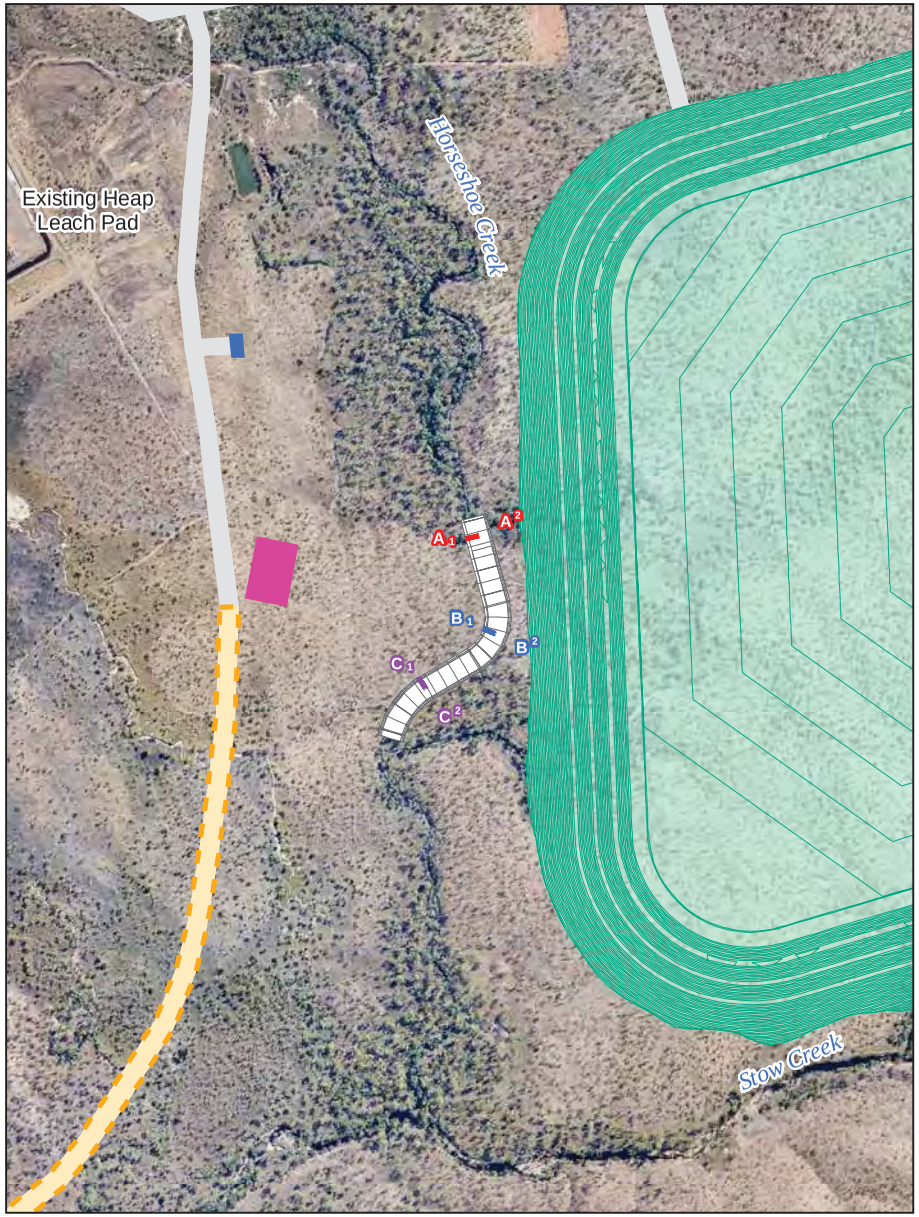
Waste Rock Dump

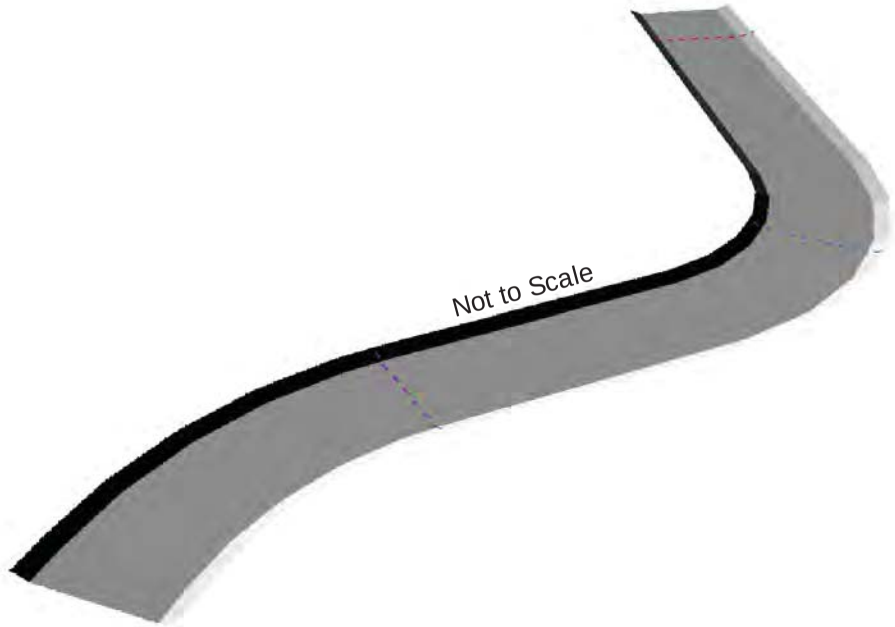
WRD construction will include 8m wide benches at 30m vertical intervals on the face of the WRD. These benches will function as stormwater drainages and as access for closure cover installation, reclamation activities and maintenance.

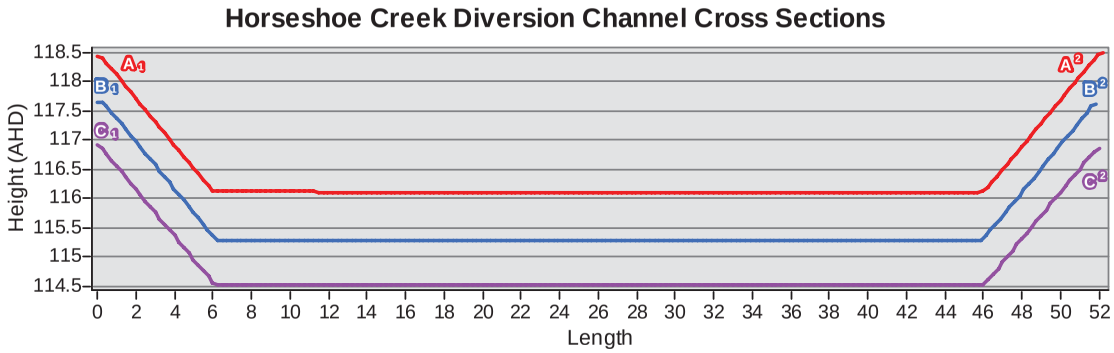
Storm-water drainage, erosion and sediment controls will be designed and constructed to minimise erosion and channel scour. Stormwater collected on benches will be conveyed to the toe of the WRD through an engineered channel located near the centre of the concave slopes. A surface water collection ditch will be constructed along the down-gradient toe of the WRD. Clean surface runoff from the reclaimed WRD will be routed around RP1 and into West Creek to separate it from any AMD seepage from the WRD to RP1.

Process Plant

Bulk earthworks for the process plant have been designed such that there is a mono slope fall from the proposed boundary of the pit toward the existing drainage channel on the east side of the proposed process plant. To minimise the extent of stormwater runoff across the plant site cut-off drainage channels will be installed to divert stormwater run-off around the plant. This will also minimise underground drainage and depth of open drains required on the plant site. Stormwater vee-drains will be designed to collect water alongside plant roads and direct them beneath the roads via corrugated steel culverts to prevent scouring. All stormwater run-off will be directed toward the existing drainage channel on the east side of the proposed process plant. Rip-rap protection to earthwork embankments adjacent to the existing drainage channel on the east side of the proposed process plant will also be installed for flood protection. Process plant run-off (RP5) will be diverted into Batman Creek.







Year 12 (all units in metres)

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0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

- Cross Section A
- Cross Section B
- Cross Section C
- Contours
- New Tailing Storage Facility (TSF2)
- ANFO Facility
- Explosives Magazine
- Proposed Haul Road
- Re-aligned Access Road

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Horseshoe Creek Diversion

Figure 2-21

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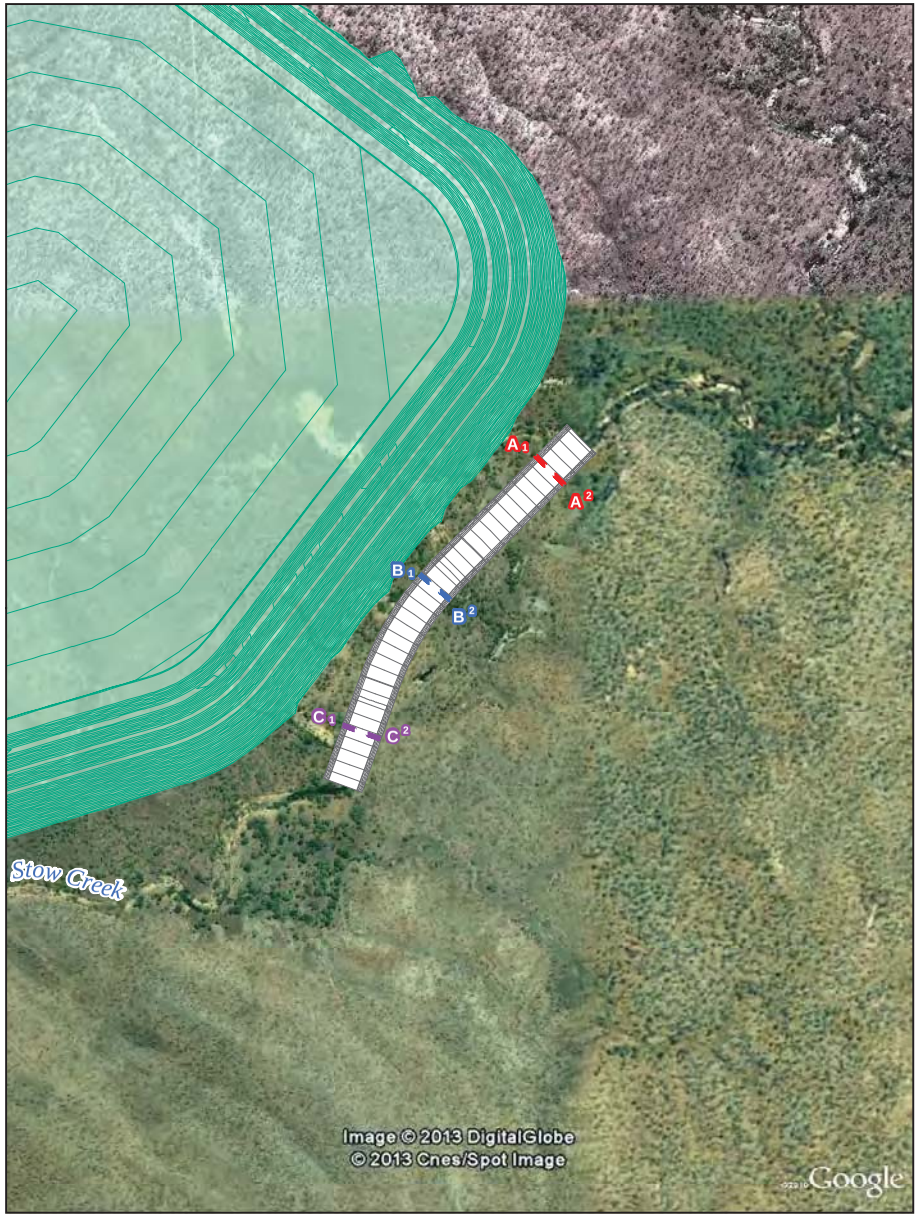
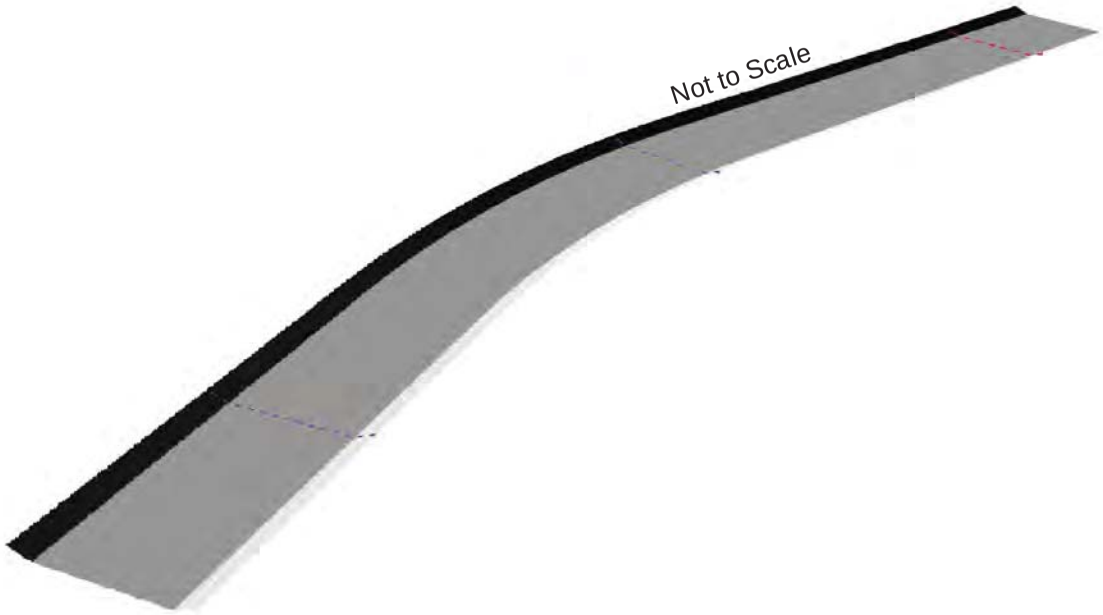
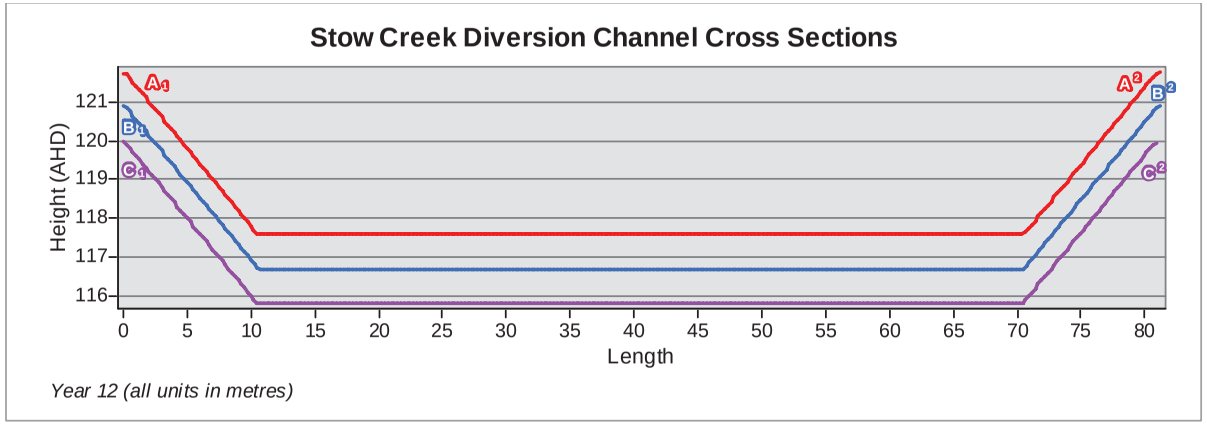
Data source: Vista Gold - Imagery (2012). Tetra Tech - TSF2, ANFO Facility, Explosives, Proposed Haul Roads, Re-aligned Access Road (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM







1:15,000 @ A4

0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

- Cross Section A
- Cross Section B
- Cross Section C
- Diversion Channel Contours
- Tailing Storage Facility 2 Contours
- Tailing Storage Facility 2 (TSF2)

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

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Stow Creek Diversion

Figure 2-22

G:\43\21801\GIS\Maps 30000 TPA\EIS\ProjectDescription\4321801_1222E.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Vista Gold - Imagery (2012). Tetra Tech - TSF2, ANFO Facility, Explosives, Proposed Haul Roads, Re-aligned Access Road (2013). GHD - Cross Sections, 3D Model (2013). Created by: CM

Roads

Stormwater drainage controls, and erosion and sediment controls will be designed and constructed to minimise erosion and channel scour. Where possible, verges will be vegetated.

Water Storage Ponds

During the pre-production phase, an equalisation pond will be constructed for mixing of AMD from various on-site sources prior to treatment, and to temporarily store AMD in case of system upset (i.e. AMD surge due to extreme storm events or shut-down of the new WTP). The equalisation pond will be linear low density polyethylene (LLDPE) lined (or equivalent). The cells will likely include a spillway or decant system and containment structures to address overflows. In the event of a system failure or shut-down for maintenance of the new WTP, the equalisation pond would provide approximately three days of AMD storage.

All ponds at Mt Todd will be maintained for the collection of seepage, stormwater and AMD until the long-term quality of water collected in the ponds meets applicable standards, flows to the collection system cease or an alternative passive water treatment system is installed. The ponds are anticipated to remain in the post-closure phase until site-wide passive treatment of AMD is feasible, and will include RP2, RP5, HLP ponds, the TSF2 sumps, decant ponds and the equalisation pond. These ponds may be incorporated into the passive water treatment system or used as backup water storage in case treatment upset occurs.

2.6.6 Waste Water

Both active and passive approaches have been adopted for water treatment. The characteristics of these treatment systems are discussed below.

Active Water Treatment

The goals of active water treatment and sludge disposal are:

- year-round collection, containment and treatment of all AMD prior to effluent release;
- ensure that treated AMD complies with the WDL water quality standards;
- use neutralisation reagents and flocculants efficiently;
- minimise the volume and water content of sludge produced from water treatment;
- provide adequate long-term storage and containment of sludge in the on-site disposal facility; and
- promote rapid sludge consolidation.

Waste water from the pre-leach thickener overflow, tailings facility return ponds and equalisation pond will be treated in the new WTP. This will be initiated during the pre-production phase of the Project and will continue until AMD flow and water quality properties are conducive to treatment in passive / semi-passive water treatment systems.

During the pre-production phase, a lined equalisation pond will be constructed for mixing of AMD from various on-site sources prior to treatment and to temporarily store AMD in case of system upset. A lined sludge disposal cell will also be constructed for the permanent disposal of water treatment sludge.

Passive / Semi-Passive Water Treatment

The goals of the passive / semi-passive water treatment are:

- eliminate, or drastically curtail, the costs and continual inputs (e.g. reagents, power, staff) required to operate and maintain the new WTP;
- eliminate sludge disposal cell operations and maintenance;
- year-round collection, containment and treatment all AMD prior to effluent release; and
- ensure that treated AMD complies with the WDL water quality standards.

Passive and semi-passive water treatment systems typically include one or more of constructed anaerobic and aerobic wetlands, SAPS, toxic limestone drains, anaerobic limestone drains, sulfate-reducing bacteria bioreactors, aeration and settling basins, waterfalls, permeable reactive barriers as well as other passive treatment methods.

Passive and semi-passive water treatment systems are generally appropriate for AMD with a discharge of between approximately 24m^3/h and 48m^3/h and low levels of mineral acidity. Passive water treatment systems have successfully treated AMD flows of up to 120m^3/h. It is estimated that three passive treatment systems (most likely anaerobic wetlands or Successive Alkalinity Producing Systems) will be required covering a total area of around 10ha:

- during operations, AMD flows from TSF1 and HLP will be treated in Passive Treatment System 1;
- following closure, AMD flows from the WRD will be treated in Passive Treatment System 2; and
- post closure AMD flows from TSF2 will be treated in Passive Treatment System 3.

The location and final form of these systems is yet to be determined.

2.7 Decommissioning, Rehabilitation and Closure

The principal areas for rehabilitation include:

- HLP and moat;
- TSF1 and TSF2;
- process plant site;
- mine roads;
- WRD;
- LGO stockpile; and
- Batman Pit.

The following sections provide an overview of the proposed rehabilitation. A more detailed description is provided in Chapter 24.

2.7.1 Heap Leach Pad

The HLP covers an area of approximately 39ha and is 20 to 25m thick. Side slopes are as steep as 58 degrees (1 Horizontal: 1.6 Vertical) and are covered by a dense network of rills and gullies.

Testing of the HLP will be undertaken, however it is expected that the HLP will be NAF material as inferred from the acidic seepage stored in the HLP ponds. Leached ore in the HLP will be removed and processed during year 12 and 13 of production. Following this the HDPE liner and contaminated material below the liner will be removed and disposed in TSF2. The remaining approximate 156,000m^3 of material at the HLP will be graded to promote drainage and capped with a 0.8m layer of low permeability material (LPM) and NAF waste rock and a subsequent 0.2m layer of plant growth medium (PGM). The PGM layer will be sown with native seed and ultimately revegetated.

2.7.2 TSF1 and TSF2

TSF1 and TSF2 will have a final elevation of 34m and 60m respectively. The final planned TSF1 surface area at closure will be approximately 239ha (which includes an impounded surface area of 214ha and TSF dam surface area of 25ha). The final planned TSF2 surface area at closure will be approximately 301ha (which includes an impounded surface area of 179ha and dam surface area of 122ha).

To close the impounded surfaces of TSF1 and TSF2, a 1m thick cover composed of NAF waste rock will be installed to bridge thixotropic tailings. A 0.8m cover layer of LPM and NAF waste rock will then be applied. Finally, a 0.2m layer of PGM will be applied. The PGM layer will be sown with native seed and ultimately revegetated.

Modifications to TSF1 and TSF2 to control seepage will be made at closure, including the installation of seepage collection ditches and routing of water to the WTP or passive treatment system, depending on the year of mine operation. Closure of TSF2 will include removal of tailings delivery line spigot piping and on-site disposal. TSF2 will be rehabilitated progressively with the impoundment surface reclaimed in year 14, following completion of all processing activities.

2.7.3 Process Plant Site

Once processing ceases the process plant will be decommissioned, decontaminated, demolished and any reusable equipment and materials will be salvaged and resold. Concrete foundations, walls, bridges and other non-reactive, non-combustive, non-corrosive and non-hazardous demolition waste will be broken up and placed in the WRD and / or buried in-place or backfilled against cutbanks and highwalls throughout the Process Plant Site, as well as other areas that will be reclaimed at Mt Todd.

The site will be graded to blend into the surrounding topography and drain towards Batman Creek. The site will be covered with a 0.8m cover layer of LPM and NAF waste rock. A 0.2m layer of PGM will then be applied. The PGM layer will be sown with native seed and ultimately revegetated.

2.7.4 Mine Roads

Mine access roads will remain in place to provide post-mining access and mine haul roads will be closed by grading into surrounding topography, ripping subgrade materials, applying 0.2m of PGM and revegetating the areas.

2.7.5 Low Grade Ore Stockpiles

LGO1 will be eliminated by expansion of the Batman Pit. Closure of LGO2 will include removal of residual ore from the stockpile areas with a nominal quantity of 100,000m^3 remaining. LGO2 will be covered with a 0.8m cover layer of LPM and NAF waste rock. A 0.2m layer of PGM will then be applied. The PGM layer will be sown with native seed and ultimately revegetated.

Stormwater drainage, erosion and sediment controls will be designed and constructed to minimise erosion and channel scour.

2.7.6 Batman Pit

Conceptual water balance models indicated that the pit will act as a passive hydrologic sink post closure. Active dewatering and pit water treatment will therefore not be required post closure (Chapter 11).

A safety bund will be constructed around the entire perimeter of the Batman Pit to impede human access. The safety bund will be constructed with a 5m base and 2m height with a 10m offset from the potentially unstable pit edge zone.

2.7.7 Waste Rock Dump

The dump will be constructed in layers with each layer rehabilitated as the dump increases in size. The design and operations aim to promote clean water diversion and rapid surface water runoff, and erosion and seepage control measures.

Each lift will be constructed at 34 degrees with 8m wide benches at 30m vertical intervals on the face of the WRD. These benches will function as stormwater drainages and as access for rehabilitation activities and maintenance.

A 1m layer of NAF waste rock will be placed over the whole surface of the WRD. A cover layer, composed of a 0.3m bedding layer of crushed rock, a GCL and a further 0.3m layer of finely crushed rock, will accompany the closure of the WRD once final grades are attained. The GCL will assist in channelling seepage toward the outer edge of the WRD, toward the NAF material to prevent AMD.