Technical Report and Mineral Resource and Reserve Update for the Nzema Gold Mine, Ghana, West Africa

Report prepared for:

Endeavour Mining Corporation
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1 Summary

The Nzema Gold Mine (Nzema) is located in the Western Region of Ghana, approximately 280km west of the capital, Accra, and less than 20km from the coast at Essiama. The mine property is centred on latitude 5º00'N and longitude 2º14'W and is accessed from Accra by driving 225km on the main coast highway to Takoradi and from there on 79km of paved road to the village of Teleku Bokazo and then by a further 8km on the mine access road which is a well maintained all-weather dirt road to the mine offices.

This report was prepared for Endeavour Mining Corporation (Endeavour) by Nicolas Johnson (MPR, Perth), Quinton de Klerk (Cube Consulting, Perth), William Yeo (Endeavour, Geology Manager, Nzema Mine) and Adriaan Roux (Endeavour, Chief Operating Officer). Endeavour is listed on the TSX (stock symbol EDV) and the ASX (stock symbol EDR). The purpose of this report is to update the mineral resources, mineral reserves, production plan and other operational information for the Nzema Gold Mine as of December 31, 2012 and file the report on the SEDAR website.

1.1 Ownership

Adamus Resources Limited (Adamus), a wholly owned Ghanaian subsidiary of Endeavour, holds 4 mining licenses and 11 prospecting licenses covering a total area of 464km2 that constitutes the Nzema Property. Adamus has a 90% interest in the mining licenses and the Government of Ghana holds a 10% free carried interest under Section 8 of the Ghanaian Mining Act. The mining licenses are subject to a 3 to 5% sliding scale royalty on gold production payable to the Government of Ghana.

1.2 Geology

The mineralization at the Nzema Mine is within the Birimian Supergroup rocks (c. 2.1-2.2 Ga) with minor granitic intrusions, bounded by large granitoid bodies to the west and east. The Birimian Supergroup is divided into a series of narrow northeast striking, laterally extensive volcanic "belts" separated by broader sedimentary "basins". Regional northeast striking shear zones that parallel the belt appear to be fundamentally important in the development of the Birimian gold deposits for which Ghana is well known such as Ashanti, Prestea-Bogosu, Konongo, and Bibiani. The mineral deposits on the property include Salman Trend and Adamus[1] deposits and also several smaller deposits (Bokrobo, Akropon, Nfutu, Aliva and Avrebo). Salman Trend gold deposits are believed to be associated with the same belt-margin shear zones that host the other Ashanti Belt gold deposits and has many characteristics typical of these deposits.

The Salman Shear Zone has placed Birimian greywacke and phyllite packages in contact. The Salman Trend gold deposits occur along a 9km segment of the shear zone. While the Salman Shear Zone appears to be the main locus of gold mineralization, pockets of gold mineralization have been identified on or adjacent to other faults and structural features within the area.

The Adamus deposit is hosted by a northwest striking, northeast dipping package of greywacke (footwall) and interbedded greywacke-phyllite (hangingwall). In the western (footwall) part of the deposit, gold mineralization is also hosted by a steeply northeast dipping granite dyke that gradually converges on the hangingwall to the northwest. The few facing directions observed suggest the meta-sedimentary package is overturned.

[1] Previously referred to variously as the Anwia deposits or Ebi Teleku-Bokazo deposits.

Other satellite deposits near to Adamus and hosted in the same meta-sedimentary package include Bokrobo, Akropon, Nfutu, and Aliva. The Avrebo deposit is on the southeast portion of the property and is hosted by metabasalt.

1.3 Mineralization

Most of the gold lodes on the Salman Trend are within the immediate footwall of the shear zone within quartz-veined silica-sericite-carbonate altered greywacke and/or granite with disseminated arsenopyrite. Some narrow, shear zone parallel zones of gold mineralization are present in the hangingwall graphitic phyllite. Gold mineralization is associated with a complex array of deformed quartz veins and arsenopyrite disseminations in the silica-sericite-carbonate altered metasediments and granitoid. The fresh or "sulphide" mineralization is refractory but it is not included in mineral reserves or production schedules. A Preliminary Economic Assessment (PEA) of the sulphide mineralization was completed recently and is not the subject of this report.

At the Adamus deposit the gold mineralization is intimately associated with pyrite disseminated within and around a complex array of deformed pale grey to dark smokey grey quartz-carbonate-sericite±albite veins. A broad silica-sericite alteration zone about 200m thick and 450m long is developed in the footwall greywacke sequence and in some areas obliterates primary sedimentary structure. The silica-sericite alteration zone is more extensive than the gold-pyrite mineralization. There is no significant component of refractory gold in the sulphide zone at Adamus. The surface projection of identified mineralization trends northwest for approximately 900m and is up to 400m wide. Within this zone there are seven distinct domains of varying orientation and style that were used for the resource estimation.

The Bokrobo deposit comprises generally north-south trending, steeply west dipping auriferous quartz veins hosted by strongly silica and iron carbonate altered, medium to coarse grained, carbonaceous greywacke. A north-south trending dolerite dyke, dipping sub-vertically to the west cuts the depth extension of the main vein. In the southern portion of the deposit, a west-northwest to east-southeast trending, steeply south-southeast plunging 'dyke-like' granitic intrusion is cut by numerous auriferous quartz veins forming a sheeted vein system. In the north of the deposit, mineralization generally occurs in a single lode, but in the south, the mineralization occurs as two main lodes and a series of narrow stacked lodes around or in the outer margins of the granite intrusion.

Akropon mineralization occurs within a wide zone of silicification associated with pyrite and quartz veining with sericite as an accessory alteration mineral. The difference between the apparent dip of the mineralization and bedding suggests an en echelon vein array or possibly complex veining across a fold closure. Very little arsenopyrite has been identified at Akropon and the mineralization in other deposits in this area are non-refractory, but metallurgical testing is required.

At Nfutu mineralization occurs within quartz-pyrite veins and pyrite disseminations, typically around veins, in the host rocks with silica, iron carbonate and sericite as the major alteration minerals. Multiple flat-lying to shallowly east dipping and southeast plunging lodes occur as stacked lenses that appear to thicken with depth. Mineralization is more prominent at the graphitic phyllite-greywacke contact than in the competent greywacke. Only traces of arsenopyrite were identified in drill core, and preliminary metallurgy shows that mineralization is non-refractory.

At Aliva mineralization occurs as a series of stacked, shallowly east-dipping lenses subparallel to the east dipping contact between carbonaceous phyllite footwall and greywacke hangingwall. Mineralization appears to wrap around gentle to open folds and is associated with quartz veins with sericite alteration and pyrite disseminations in the veins and surrounding host rocks. No arsenopyrite has been identified at Aliva and the mineralization in other deposits in this area are non-refractory. Metallurgical testwork on 76 samples of all material types returned over 90% recovery.

At Avrebo the gold mineralization occurs in north-south to northeast-southwest trending, subvertical to steeply east-dipping, strongly sericite-iron carbonate altered lodes within metabasalt. Pyrite has been the only sulphide identified to date suggesting that the sulphide gold component may be non-refractory. Metallurgical tests have not yet been completed.

1.4 Exploration

Exploration activities completed by Endeavour (and previously as Adamus) and by other companies include:

- Soil sampling – 85% of the property is covered by 50m x 400m soil sampling with areas of infill
- Ground geophysics - Induced polarization (IP) over areas of interest for a total of 59 line km
- Airborne geophysics – 2,555km of heliborne electromagnetics (DIGHEM) in several surveys plus radiometrics over some areas
- Trenching – 16,676m in 253 trenches by various companies over key areas
- Pitting – 2,157m of sampling in 583 pits by various companies in key areas
- RC drilling and core drilling – 297,000m on mineral deposits plus 69,700m on targets and prospects on the property.

The 2012 exploration program included 58,400m of RC and core drilling mostly in the immediate mine areas, as well as auger, trench, and soil sampling programs to develop new targets. The exploration program objectives were to:

- Delineate and explore the oxides along the Salman Trend
- Drill the Salman Trend sulphides and conduct metallurgical testwork and engineering studies, with the goal of completing a resource update and a PEA[2]
- Drill at Aliva and Nfutu to delineate additional resources and convert resources to reserves
- Complete exploration drilling at Akropon, Avrebo, and Hotopo prospects.

Exploration highlights for the year ended December 31, 2012 include:

- Drilling across the site of the old Salman Village and surrounding areas encountered mineralized zones outside of existing planned pits
- Resource drilling and engineering studies at Nfutu and Aliva were completed
- Regional soil and auger sampling was completed with the aim of extending the reconnaissance level coverage over previously underexplored portions of the Nzema project area
- Completion of the Nzema Sulphide project and establishment of viable treatment route for the refractory sulphide portion of the Salmon deposits. The test work assessed the merits of producing a flotation concentrate followed by ultra-fine grinding, LeachOx, BIOX, or pressure oxidation. A sulphide resource estimate and preliminary economic assessment were prepared on the basis of the flotation followed by pressure oxidation process option which showed an overall recovery of 86%. The PEA indicates that additional sulphide resources need to be identified before proceeding with further studies.

[2] The Nzema Sulphide PEA was prepared as a separate document.

1.5 Mineral Resources

The mineral resource estimates have been determined and reported in accordance with the CIM Definition Standards – For Mineral Resources and Mineral Reserves, prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM council on November 27, 2010 as referred to in National Instrument (NI) 43-101.

Table 1.1 presents the Nzema Mineral Resource Estimate by deposit and Table 1.2 provides the Mineral Resources by material type (oxide, upper transition, lower transition, fresh). The estimates are reported at a 0.5g/t Au cut-off grade and constrained by a US$1,600/oz pit shell (effective date December 31, 2012 prepared by N. Johnson).

Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources will be converted into Mineral Reserves.

Table 1.1: Total Mineral Resource Estimates at Nzema at 0.50g/t cut-off grade by Deposit (December 31, 2012)

Nzema Totals	Measured			Indicated			Measured & Indicated			Inferred		
	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
Salman	18.6	1.2	745	8.0	1.2	309	26.6	1.2	1,053	5.5	1.3	234
Anwia	8.5	1.6	439	3.0	1.7	168	11.5	1.6	608	0.7	1.8	40
Bokrobo	1.0	2.4	75	1.0	2.0	63	1.9	2.2	138	2.3	1.1	81
Avrebo				1.1	0.9	33	1.1	0.9	33	0.1	1.0	4
Aliva	1.5	0.9	47	0.5	0.8	13	2.0	0.9	60	0.2	0.9	7
Nfutu	0.7	1.0	24	0.9	0.9	28	1.6	1.0	51	0.2	0.9	6
Akropon	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	1.4	1.1	49
Total	**30.3**	**1.4**	**1,330**	**14.5**	**1.3**	**614**	**44.8**	**1.3**	**1,943**	**10.5**	**1.2**	**421**

Table 1.2: Total Mineral Resource Estimates at Nzema at 0.50g/t cut-off grade by Material Type (December 31, 2012)

Nzema Totals	Measured			Indicated			Measured & Indicated			Inferred		
	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
Non-Refractory												
oxide	4.4	1.1	158	1.3	1.0	44	5.7	1.1	203	1.3	1.0	43
transition	2.5	1.4	111	0.8	1.3	33	3.3	1.4	144	0.7	1.2	27
sulphide	6.5	1.8	371	4.8	1.6	243	11.3	1.7	614	3.5	1.2	132
Refractory												
transition	3.1	1.2	118	0.3	0.9	9	3.4	1.1	127	0.1	1.0	2
sulphide	13.8	1.3	572	7.2	1.2	284	21.0	1.3	857	5.0	1.4	217
total	**30.3**	**1.4**	**1,330**	**14.5**	**1.3**	**614**	**44.8**	**1.3**	**1,943**	**10.5**	**1.2**	**421**

1. The Mineral Resources are defined within an optimal pit shell generated using an overall pit slope of 38 degrees, a commodity price of US$1,600/oz Au, average process recovery of 86%, a process cost of US$26.43/t and royalties, refinery and selling cost of US$80/oz of Au sold (5% of sell price).
2. Tonnages are rounded to the nearest 1,000 tonnes; gold grades are rounded to one decimal place and ounces are rounded to the nearest 1,000 ounces. Rounding may result in apparent summation differences between tonnes, grade and contained metal.
3. Tonnes and grade measurements are in metric units; contained gold is in troy ounces.

1.6 Mineral Reserves

Mineral Reserves are constrained within specific pit designs that are based on Measured and Indicated Mineral Resources only and take into consideration all appropriate modifying factors including metallurgical parameters, geotechnical parameters, infrastructure requirements and permitting requirements. The modifying factors used to determine the Mineral Reserves for the project are detailed in Section 15 of the technical report.

This Mineral Reserve estimate has been determined and reported in accordance with Canadian National Instrument 43-101, 'Standards of Disclosure for Mineral Projects' of June 2011 and the Definition Standards adopted by CIM Council in November 2010.

The Mineral Reserves were based on the various cut-offs derived from various gold recovery/process costs for the different material types and haulage distance from each specific deposit to the process plant.

Table 1.3 provides a summary of the Mineral Reserves, determined as of 31st December 2012.

Table 1.3: Nzema Gold Mine Mineral Reserves, as of December 31, 2012 using $1350/oz gold price

Deposit	Proved			Probable			Proved and Probable		
	'000t	Au g/t	Koz	'000t	Au g/t	Koz	'000t	Au g/t	Koz
Adamus (Anwia)	6,359	1.9	391.3	1,914	2.2	132.7	8,273	2.0	524.0
Salman	2,339	1.5	111.2	238	1.2	9.3	2,577	1.5	120.4
Bokrobo	580	3.3	61.4	252	4.6	37.2	832	3.7	98.6
Nfutu	321	1.4	13.9	312	1.2	12.4	633	1.3	26.4
Aliva	523	1.3	22.0	40	1.2	1.6	563	1.3	23.6
Total In-Situ Mineral Reserves	**10,122**	**1.8**	**599.8**	**2,756**	**2.2**	**193.2**	**12,878**	**1.9**	**793.0**

Stockpile	151	0.9	4.2	0	0.0	0.0	151	0.9	4.2
Total Mineral Reserves	**10,273**	**1.8**	**604.0**	**2,756**	**2.2**	**193.2**	**13,030**	**1.9**	**797.2**

The following notes should be read in conjunction with Table 1.3 above:

1. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
2. Tonnage of waste to be mined is 60.2Mt. This waste amount includes 506kt of Inferred Mineral resources at an average grade of 2.2g/t. The strip ratio over life of mine is 4.6 to 1.
3. The Lerchs-Grossmann pit shells on which the open pit designs are based, were defined using an overall pit slope of 37 to 45 degrees (depending on geotechnical settings of each of five deposits, details provided in Section 15 of the technical report), a commodity price of US$1,350/oz Au, process recovery based on mineralization type (details provided in Section 15) and selling cost of US$67.5/oz of Au sold.
4. Tonnages are rounded to the nearest 1,000 tonnes; gold grades are rounded to one decimal place; ounces are rounded to the nearest 100 ounces. Rounding may result in apparent summation differences between tonnes, grade and contained metal.
5. Tonnes and grade measurements are in metric units; contained gold is in troy ounces.

Table 1.4: Nzema Gold Mine Mineral Reserves by Material Type, as of December 31, 2012

Reserve Category	Deposit	Material Type	CoG Au g/t	Tonnes '000t	Grade Au g/t	Gold Koz
Proven	Adamus	ALL	0.7	6,359	1.9	391.3
	Salman	Oxides	0.6	1,267	1.2	50.3
		Upper transition	0.7	646	1.5	31.7
		Lower transition	1.1	362	2.0	23.2
		Fresh	1.8	64	2.9	5.9
	Bokrobo	ALL	0.8	580	3.3	61.4
	Nfutu	ALL	0.7	321	1.4	13.9
	Aliva	ALL	0.7	523	1.3	22.0
Sub-Total Proven				**10,122**	**1.8**	**599.8**
Probable	Adamus	ALL	0.7	1,914	2.2	132.7
	Salman	Oxides	0.6	205	1.2	7.7
		Upper transition	0.7	31	1.4	1.4
		Lower transition	1.1	2	2.2	0.2
		Fresh	1.8	-	0.0	0.0
	Bokrobo	ALL	0.8	252	4.6	37.2
	Nfutu	ALL	0.7	312	1.2	12.4
	Aliva	ALL	0.7	40	1.2	1.6
Sub-Total Probable				**2,756**	**2.2**	**193.2**
Proven and Probable	Adamus	ALL	0.7	8,273	2.0	524.0
	Salman	Oxides	0.6	1,472	1.2	58.0
		Upper transition	0.7	677	1.5	33.1
		Lower transition	1.1	365	2.0	23.4
		Fresh	1.8	64	2.9	5.9
	Bokrobo	ALL	0.8	832	3.7	98.6
	Nfutu	ALL	0.7	633	1.3	26.4
	Aliva	ALL	0.7	563	1.3	23.6
Sub-Total Proven and Probable				**12,878**	**1.9**	**793.0**
Stockpile				151	0.9	4.20
Total Mineral Reserves				**13,030**	**1.9**	**797.2**

The Salman and Adamus deposits account for 15% and 66% of the total reserves respectively.

1.7 Mining and Mine Plan

The mining method is conventional open pit mining including drilling, blasting, loading and hauling operations carried out by a contractor (African Mining Services Ghana Ltd – a subsidiary of AusDrill;

AMS). Mining is currently taking place in the Salman Trend on oxide and upper transition material and also at the Adamus pit.

Cumulative mining capacity of the fleet provided by AMS meets the earthmoving requirements of the mining schedule as generated by Nzema technical management and properly supports mining operations. The in-pit material excavation is largely conducted by two Liebherr 984C back-hoe excavators equipped with $7m^3$ buckets (main production units). Waste and near-pit ore haulage is mainly conducted by CAT 777 off-highway trucks; and material hauled out of smaller satellite pits utilizes articulated Volvo A35F trucks.

The ore control strategy targeting delineation of ore and waste uses RC holes piercing multiple benches. The geological and assay information, obtained by 18m holes, assayed every 1m, represents an input to the grade control block model used by geologists and surveyors for final ore/waste discrimination and in-pit mark-up.

Drilling and blasting is performed on 6 to 15m benches, depending on geological and geotechnical settings of a given deposit, with blasted material excavated in discrete 3m high flitches.

Production blasting is performed by MAXAM Ghana Ltd (MAXAM).

The explosives magazine on site consists of the ammonium nitrate mixing shed for the manufacturing of bulk explosives, four 20 footer containers for storing detonators, high explosives and other explosive accessories. The supply of detonators, boosters, bulk explosives, initiating systems and other explosives material into the magazines for storage and further use on the mine is the responsibility of MAXAM.

The waste rock dumps associated with mining operations are constructed to meet the requirements of the Ghana Mining Regulations and the EPA. The condemnation drilling covered the areas allocated for waste dumps and was completed during 2009 to 2010.

The current reserves supports another 7 years of mine life. The primary objective of the project production schedule has been to maximize the early cash flow from the operation by delaying the increased mining costs and bringing revenue forward as much as possible. This objective has been achieved within the following constraints:

- Ensuring continuous ore supply to the processing plant for the selected 2 Mtpa throughput rate
- Land access constraints
- Keeping the vertical mining advance rates generally below 9m (3 flitches) per month (except at the start and end of the pit stages depending on the bench quantities)
- Maintaining a supply of approximately four weeks of mill feed in the ROM stockpile at a reasonable grade
- Maintaining constant working strip ratios and consequently smooth mining rates for extended periods of time as much as possible.

Table 1.5 below represents the key parameters of the current mining schedule.

Table 1.5: Main Parameters of Nzema LOM Mine Schedule

Year	Mining	Waste	Total Processed		Au recovered
	t	t	t	Au g/t	Koz
2013	9,729,970	7,508,498	2,160,000	1.64	95,917
2014	11,147,094	9,028,826	1,826,350	1.77	92,840
2015	13,574,016	11,658,429	1,897,378	1.77	94,298
2016	13,284,352	11,510,580	1,859,540	1.78	96,253
2017	11,612,724	9,422,899	1,863,711	2.13	114,996
2018	8,766,875	7,387,408	1,718,110	2.35	116,084
2019	4,557,537	3,390,433	1,704,845	1.97	95,237
Total	**72,672,567**	**59,907,074**	**13,029,934**	**1.91**	**705,625**

1.8 Metallurgy and Process Plant

The Nzema process plant is a conventional gravity / CIL plant that produces gold doré bullion. The plant has been operating since February 2011 and achieved commercial production in April 2011. The design throughput treatment rate depends on the hardness of the ore with 2.1 Mtpa of softer oxide ore and 1.6 Mtpa of the harder transition ore. The average throughput rate is currently 2.1 Mtpa given the mix of ore feed.

The process plant facilities include a primary jaw crusher, a 3.5 MW SAG mill, a gravity concentrator in circuit with an Inline Leach Reactor (ILR), carbon-in-leach (CIL) circuit, cyanide destruction circuit, refinery to produce doré bullion; tailings discharge system and the necessary reagent, water and air supply systems.

Nzema has several types of mineralization: oxide, upper transition, lower transition and fresh ore with different recovery characteristics. All of the mineralization has good gold recoveries (i.e. 88 to 95%) with the exception of the Salman lower transition (55%) and fresh (or “primary”; 35%) mineralization. The Salman Trend lower transition and fresh mineralization is refractory due to the some of the gold being within fine grained arsenopyrite.

The production plan is based on mining and processing all mineralization types from Adamus, Bokrobo, Nfutu, Aliva but only the oxide and upper transition material from Salman Trend deposits. Plant feed is currently from the oxide and upper transition material in the Salman Trend and also from the Adamus oxide zone. The current transitional material from Salman is strategically blended with the oxide from Adamus and Salman in order to achieve the production targets for throughput and recoveries.

Oxide ore from both Salman and Adamus are mainly goethite, with free particulate gold derived from weathering of the fresh mineralization. Gold is free milling and amenable to high recoveries by a combination of gravity concentration and cyanide leaching - CIL.

Gold in Adamus sulphide zones is associated with pyrite whereas in the Salman Trend it is associated with pyrite and arsenopyrite. The gold in the Adamus sulphides is generally recoverable by conventional methods, while in the Salman sulphides would require fine grinding and an oxidation process (i.e. pressure oxidation, bioxidation etc.).

Deleterious elements are generally low in concentration in the mineralization that is included in the production schedule. Arsenic grades are low in the oxides and Adamus sulphides, but high at present in the Salman transition ore.

Dore alloy (87% Au average) produced by Nzema process plant is usually shipped to Rand Refinery (Johannesburg, South African Republic). Before the alloy leaves the site, a state customs representative inspects the weight and seals the container with a government customs seal, signifying that the government is fully aware of the gold content of Dore alloy leaving the country. A helicopter transports the Dore alloy (under appropriate security) to the Accra airport, and by the same day is shipped under supervision of a Ghanaian branch of an international security company.

1.9 Mine Infrastructure

The Nzema mine infrastructure includes:

- Access roads which meet public roads near Essiama and also near the administrative offices
- Mine haul roads connecting the Salman, Adamus and satellite deposits to the plant
- Administrative offices located next to the plant
- Warehouse and a spares yard located next to the plant
- Mine contractor maintenance shops
- Tailings storage facility
- Water storage impoundment
- Water supply - from the Ankobra River via an existing 9,000m raw water line fed from river water pumps
- Accommodations and cafeteria near the mine gate, close to Essiama.

1.10 Operating Costs

Mining costs calculations were based on current mining rates fixed in a contract between Nzema Gold Mine of Endeavour Mining Corporation and African Mining Services (AMS) as well as on 2012/2013 budgets. The cumulative mining cost of a single block in the resource model is based on three components- material type, blasting requirements and vertical component of the distance to the pit entrance. The average haul distances, considering plant and waste dump locations, were calculated separately for each pit, fixed in the current AMS contract and taken into account in optimization. During the mining of Oxide and Transition material drill and blast fragmentation is assumed to be required for rock with specific gravity greater than 2.1 t/m³. Fresh material is assumed to require blasting.

Table 1.6 1.6 represents an example of depth and material type dependent mining cost calculations for Adamus, which represents approximately 66% of Nzema mineral reserves.

Table 1.6: Mining Cost Components for the Adamus Pit

	Oxide/bcm		Transition/bcm		Fresh/bcm
Depth from Surface	Earthmoving	D&B	Earthmoving	D&B	
Surface +3m	2.41	1.40	3.02	1.93	4.95
Surface	2.42	1.40	3.03	1.93	4.96
Surface -3m	2.43	1.40	3.04	1.93	4.97
Surface -6m	2.44	1.40	3.05	1.93	4.98

Ore related mining and processing costs, metallurgical recoveries for the different material types, namely oxide (very weathered), upper transition (moderately weathered), lower transition (weakly weathered) and fresh, were obtained from the mine contract, processing plant management and relevant other parameters from the current production plan.

Table 1.7: Processing Costs for the Adamus Pit (Main and Satellite)

PARAMETER		Deposit			
		ADAMUS			
Description	Units	Oxide	Up-Trans	Low-Trans	Fresh
Ore mining & Processing					
Rehabilitation	$/t-m	0.15	0.15	0.15	0.15
Grade Control	$/t-ore	2.88	2.88	2.88	2.88
Ore Haulage	$/t-ore	2.91	2.91	2.91	2.91
Rehandle Cost	$/t-ore	0.33	0.33	0.33	0.33
Dewatering/Crusher/Supervision	$/t-ore	4.26	4.26	4.26	4.26
Processing Cost	$/t-ore	10.05	11.74	11.74	11.92
Site G&A Cost	$/t-ore	5.25	5.25	5.25	5.25
Total 'Process' Cost	**$/t-ore**	**25.68**	**27.37**	**27.37**	**27.55**

Table 1.8: Annual Operating Costs (US$ '000s)

	Units	Totals	2013	2014	2015	2016	2017	2018	2019
Total Waste Tonnes Mined	kt	59,907	7,508	9,029	11,658	11,511	9,423	7,387	3,390
Total Ore Tonnes Mined	kt	12,765	2,221	2,118	1,916	1,774	2,190	1,379	1,167
Mining Costs (incl rehandle)	US$ '000	235,109	37,220	42,481	41,551	31,684	30,598	33,104	18,471
Unit Mining Cost Per Total Tonne Mined	$/t mined	3.24	3.83	3.81	3.06	2.39	2.63	3.78	4.05
Tonnes Processed	kt	13,030	2,160	1,826	1,897	1,860	1,864	1,718	1,705
Processing Costs (incl maintenance)	US$ '000	157,993	34,769	21,184	21,101	21,508	20,382	20,996	18,053
Unit Processing Cost Per Tonne Milled	$/t processed	12.13	16.10	11.60	11.12	11.57	10.94	12.22	10.59
General and Administrative Costs	US$ '000	99,294	14,788	14,078	14,078	14,116	14,078	14,078	14,078
Unit Gen & Admin Cost Per Tonne Milled	$/t processed	7.62	6.85	7.71	7.42	7.59	7.55	8.19	8.26

1.11 Sustaining Capital Expenditures

For the Nzema Gold Mine, the majority of capital costs have already been spent during construction of the mine. The principal contractor was Lycopodium Limited, the Australian EPCM contractor, for process plant and related infrastructure construction.

The main projects requiring sustaining capital expenditures in 2013 are as follows:

- Purchase and installation of 6 MW diesel genset from SDMO of France. The contract sum is US$4M.

- Relocation and development of relocation site at the Adamus Pit is ongoing at a total cost to completion of US$27 million. FF Construction Ltd and other contractors have been engaged at the construction site.
- Tailings storage facility lift is underway and has been contracted to Naakyea Plant Pool Ltd with Knight Piesold providing the technical support.

As the earthmoving is carried out by mining contractor (AMS), no mining capital for mobile fleet replacements or additions was allocated or required.

Table 1.9 represents the annual CAPEX distribution over the Life-of-Mine period.

Table 1.9: CAPEX and Sustaining Capital, LoM

	Units	Totals	2013	2014	2015	2016	2017	2018	2019
Mine Development	US$ '000	39,322	28,820	4,870	5,633	-	-	-	-
Sustaining Capital	US$ '000	17,571	3,267	4,228	991	4,315	3,453	1,193	125
Total Capital	US$ '000	56,893	**32,087**	**9,097**	**6,624**	**4,315**	**3,453**	**1,193**	**125**

1.12 Environmental and Social Issues, Closure Plan

The Nzema Gold Operations has a corporate commitment towards sustainable development that focuses on achieving a high standard of environmental, economic and social performance in its operations.

Nzema maintains compliance with environmental and social regulatory requirements, as stated in the company social and environmental policy and follows through with the requirements of the AKOBEN programme as mandated by the Environmental Protection Agency (EPA). The environmental management of Nzema is defined under the schedule attached to the Environmental Permit EPA/EIA/278. The Environmental Permit3 for the Nzema mine was issued on December 12, 2008. Table 1.10 gives a summary of the environmental permits issued to the Nzema Gold Mine.

[3] Adamus Resources Limited Proposed Southern Ashanti Gold Project in the Nzema East and Jomoro Traditional Areas of the Nzema East Municipality and Ellembelle District in the Western Region; Environmental Permit No EPA/EIA/278 by the EPA (File No. CM:1064/02).

Table 1.10: Environmental Permits Issued to Nzema Gold Mine

Type of Permit	Agency	Date
Environmental Permit	Environmental Protection Agency	18th December 2008
Water Abstraction Permit	Environmental Protection Agency	8th October 2010
Modified TSF and By-pass Road	Environmental Protection Agency	20th December 2010
Water use permit	Water resources Commission	22nd October 2010
Mining Area Declaration	Minerals Commission	9th October 2010
Water Discharge Permit	Environmental Protection Agency	10th October, 2012

The environmental permit conditions refer to the following documents and plans to provide fundamental information on the pre-mine environment and guidelines for the post-mining rehabilitation of the site.

- Reclamation Plan (April 2010)
- Environmental Management Plan (August 2011).

Other commitments under the Schedule to the Nzema environmental permit and in the project EIS also include:

- Posting of a Reclamation Bond
- Compliance with Minerals and Mining Act, Act 703 (2006)
- Compliance with Mining Regulations LI665 (1970).

At the end of the Life-of-Mine, the mining project and infrastructure will be demobilized subject to the mine closure plan in compliance with the existing legal and statutory regulations. The closure plan will be subjected to the approval of the Mine Closure Plan by the Chief Inspector of Mines and EPA recommendations.

The objectives for the reclamation plan for the mine are as follows:

- Provide a final land-use that considers the needs of the stakeholders
- Create landforms that blend with the existing natural topography in the project area
- Leave the facilities physically and chemically stable including erosion control
- Reduce the aesthetic impact of the facilities
- Leave disturbed areas in a safe and stable condition
- Minimise the impact of the facilities on surface water drainage patterns and also on groundwater characteristics
- Minimise the impact of the facilities on contamination in general
- Restore as much of the mining area to a sustainable land-use capability as is practicable
- Minimise or eliminate any post-reclamation environmental impacts
- Provide rehabilitated areas that contribute to the long-term sustainability of the local economy
- Ensure that potential environmental liabilities associated with the closure of the site are minimized.

The closure plan considered open pits, partially filled pits, completely backfilled pits and waste dumps for rehabilitation. The mine closure costs are allocated in the Nzema business plan and reflected in operational cash flow model.

During 2011 and 2012 the Salman village was relocated 1.5km to the east of the previous site. Approximately 2,000 residents were moved to the new village which includes 711 structures. A resettlement due to the mining area of influence at the Adamus pit is currently underway. This will impact 1,200 to 1,500 residents and involve construction of approximately 540 structures.

1.13 Conclusions

Nzema is a successfully operating gold mine that started commercial production in April 2011 and is projected to continue until 2019 based on currently available mineral reserves.

The exploration database for the Youga project is reliable for the purpose of resource estimation. The mineral resources and mineral reserves have been updated to December 31, 2012. Adamus (Anwia) provides the majority of the reserves (66%) followed by Salman (15%), Bokrobo (12%) and the two additional deposits Nfutu (3%) and Aliva (3%). A total of 72.7 million tonnes will be mined (59.9 million tonnes waste) at an overall strip ratio of 4.6 to 1.

In 2012 the Nzema gravity/CIL processing facilities had a throughput of 2.144 million tonnes at an average grade of 1.85g/t Au to produce 109,447 ounces. The LOM production schedule has 12.9 million tonnes of ore at an average grade of 1.91g/t Au processed to produce a total of 705,625 ounces.

1.14 Recommendations

Nzema is an operating mine and requires ongoing monitoring of the impacts of changes in the gold price and the inflationary effects on power, fuels, labour and spare components must be monitored. Continued sustaining capital expenditures should be completed as described.

Additional metallurgical testwork is required for the fresh mineralization in the Akropon and Avrebo deposits.

The 2013 exploration program is $2.55M and will focus on identification of new resources close to existing deposits that can readily be converted to reserves. Table 1.11 summarizes the exploration program by metres of drilling and by costs. The following programs are planned:

- Reverse Circulation (RC) drilling at Adamus to convert Inferred mineral resources to Indicated mineral resources
- RC drilling between Salman North and Akango South deposits at Salman to target continuation of the known mineralised structures through low lying areas
- Reconnaissance RC (RRC) drilling along adjacent structures to the Salman Trend.

In addition to the near mine programs, the following will be completed:

- RRC drilling near the Avrebo deposit to identify additional mineral resources in that area.

Table 1.11: 2013 Nzema Planned Exploration Program

Item	metres	Cost US$
RRC Drilling	4,350	435,000
RC Drilling	6,000	320,000
Analysis		135,000
Consumables, Support, Land access and permitting		750,000
Labour		910,000
Total		**2,550,000**

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2 Introduction and Terms of Reference

2.1 Introduction

Endeavour Mining Corporation (Endeavour) owns a 90% interest in the Nzema Gold Mine located in southern Ghana, West Africa through its 100% owned Ghanaian subsidiary Adamus Resources Limited (Adamus).

This report was prepared for Endeavour by Nicolas Johnson (MPR, Perth), Quinton de Klerk (Cube Consulting, Perth), William Yeo (Endeavour, Geology Manager, Nzema Mine,) and Adriaan Roux (Endeavour, Chief Operating Officer, Accra). Endeavour is listed on the TSX (stock symbol EDV) and the ASX (stock symbol EDR). The purpose of this report is to update the mineral resources, mineral reserves, production plan and other operational information for the Nzema Gold Mine as of December 31, 2012 and file the report on the SEDAR website.

Mr. Johnson has completed resource estimates on the Nzema Gold Mine since 2010 and has conducted site visits on a regular basis with the most recent visit on 5th to 11th of December, 2012 (Table 2.1). Mr. de Klerk has worked on and reviewed mine plans, production schedules and mineral reserves for the Nzema Mine since 2012 and has visited site on 20th to 25th January, 2012 and 22nd to 26th November 2012. Dr. Yeo and Mr. Roux are directly involved with the management of the Nzema gold mine and are not independent of Endeavour. Dr. Yeo has worked as the Geology Manager since May 2011. Mr. Roux started as Nzema Process manager in 2010, moved to General Manager in 2011 and became COO for Endeavour based in Accra in late 2012.

This technical report was prepared to adhere to requirements of National Instrument 43-101, Companion Policy 43-101CP, and Form 43-101F1. The reporting of mineral resources and mineral reserves complies with the 'Definition Standards - For Mineral Resources and Mineral Reserves' Prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council on November 27, 2010 and is also consistent with the 'Australasian Code for Reporting of Mineral Resources and Ore Reserves' of September 2004 (the Code) as prepared by the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Mineral Council of Australia (JORC).

2.2 Terms of Reference

The authors are qualified persons (QP) by virtue of their experience, education and professional standing relative to the portions of the reports that they are responsible for. The QP professional designations and sections of the report that they are responsible for are listed in Table 2.1. The individual QP certificates are provided at the end of this report.

Table 2.1: List of Authors, Professional Designations and Report Sections

Author	Designation	Sections	Site Visits
Nic Johnson	MAIG	1-2, 6-12, 14, 23, 26, 27	Numerous visits during 2010 to 2012, most recently December 4 to 11, 2012
Quinton de Klerk	FAusIMM	1-3, 15, 16, 25-27	2012 (2); most recently Sept 23-26, 2012
William Yeo	MAIG	1-12, 27	Employed at Nzema Mine since May 2011
Adriaan Roux	Pr.Sci.Nat (SACNASP)	1-3, 13, 17-22, 24-27	Based on site in 2010 and 2011, Multiple visits in 2012, most recently in Dec 2012

The main sources of information are referenced in this report and are listed in Section 26.

A full listing of abbreviations used in this report is provided in Table 2.2 below.

Table 2.2: List of Abbreviations

Abbreviation	Description	Abbreviation	Description
$	US dollars	LOM	Life of Mine
A	Years	M	Metres
Au	Gold	MIK	Multiple indicator kriging
BCM	Bulk cubic meters	mm	Millimetre
CDN$	Canadian dollars	Moz	Million ounces
cm	Centimetre	Mt	Million tonnes
E (X)	Easting	N (Y)	Northing
G	Billion	OK	Ordinary Kriging
g	Gram	Oz	Troy ounce
g/t	Grams of gold per tonne	Ppb	Parts per billion
Gh$	Ghana Cedes	Ppm	Parts per million
ha	Hectare	QA	Quality Assurance
ID3	Inverse distance cubed	QC	Quality Control
JV	Joint venture	RAB	Rotary air blast
k	Thousand	RC	Reverse circulation
kg	Kilogram	RQD	Rock quality designation
km	Kilometre	SG	Specific gravity
km2	Square kilometre	t, T	Tonnes

The coordinate system used on most maps included in this report is Universal Transverse Mercator (“UTM”), WGS 84 datum in zone 30N.

3 Reliance on Other Experts

The authors of this report have relied on other experts for the information on legal title, permitting, geotechnical, environmental and social issues associated with the Nzema Gold Mine.

A summary of the legal title and permitting information was prepared by the Business Sustainability department of Adamus Resources Limited, the Ghanaian subsidiary of Endeavour. Copies of the mine permit documents are held in Endeavour's Accra office and at the Nzema Mine. The permits were issued by the Minerals Commission of Ghana. The authors of this report did not verify the legality of these permits or any underlying agreement(s) that may exist concerning the permits or other agreement(s) between third parties, but have relied on an opinion entitled "Report Relating to Certain Subsidiaries of Endeavour Mining Corporation and Certain Properties in Ghana in which Endeavour Mining Corporation or its Subsidiaries have an interest" dated August 2012 from Ampem Chambers, Barristers & Solicitors, located at 15 Kade Avenue, Kanda Estate, P. O. Box AN 10788, Accra, Ghana.

The geotechnical evaluations that were used in pit design and tailings management facility were furnished by Golder and Associates and the supporting reports are referenced in Sections 15 and 16 of this report. The geotechnical information has been summarized in this report but has not been independently verified by the authors.

The social and environmental impact assessment studies have been prepared by SGS, an international consultancy firm with offices in Ghana. SGS was responsible for both local studies and collection of baseline data and information. Relevant information from the environmental studies has been summarized in this report but has not been independently verified by the authors.

4 Property Description and Location

4.1 Property Location

The Nzema Gold Mine property is centred on Latitude 5º00’N and Longitude 2º14’W in the Western Region of Ghana, West Africa. The property is located in the south-west corner of the Western Region and is approximately 280km west of the capital, Accra, and less than 20km from the coast at Essiama (Figure 4.1).

Figure 4.1: Location Map of Nzema Gold Mine Property

The property is accessed from Accra via the main coast highway to Takoradi and from there by sealed road to the village of Teleku Bokazo and then by 10km of all-weather gravel road.

4.2 Mineral Tenure

Endeavour holds its 90% interest in the Nzema gold mine through ownership of the Ghanaian subsidiary, Adamus Resources Limited (Adamus), which owns the tenements comprising the Nzema Gold Mine Property by way of the company structure shown on Figure 4.2. The tenements comprising the mining permits are subject to a statutory 10% interest retained by the Government of Ghana.

Properties are obtained by submitting an application for an area with the Minerals Commission of Ghana. The boundaries of the license areas are located by description using latitudes and longitudes. There is no requirement to survey or establish the boundaries and/or corners of the mining or prospecting licenses in the field.

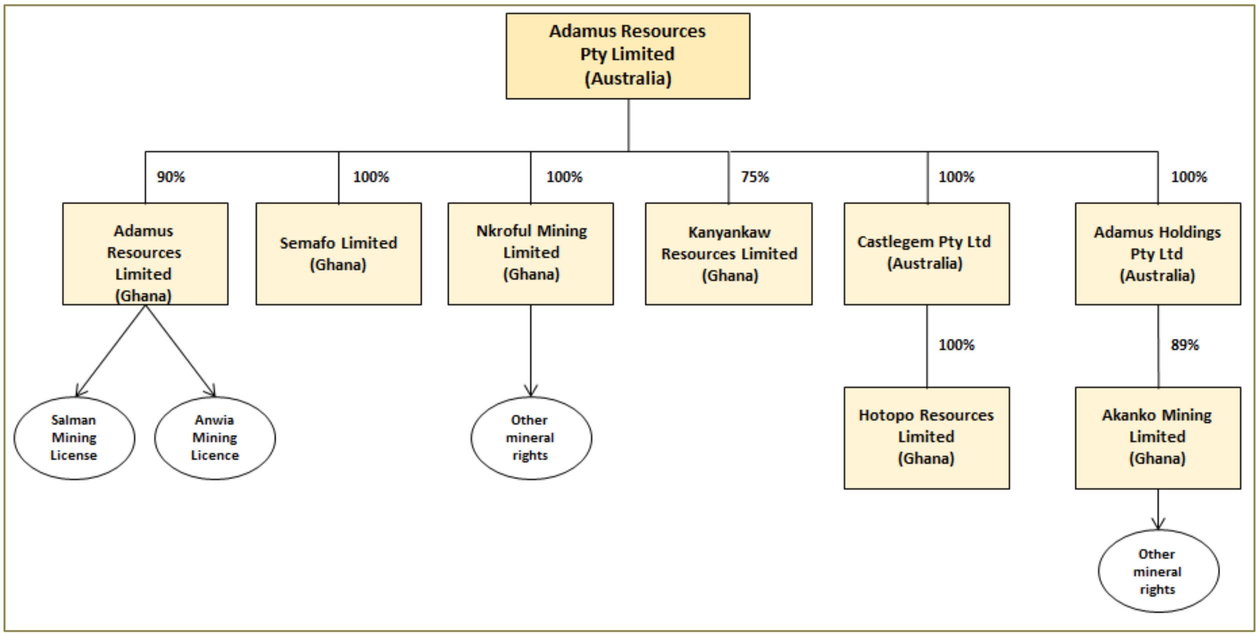


Figure 4.2: Organization of Ownership of Mineral Tenure

The mining leases and prospecting licenses cover a combined area of approximately 464km2 and are listed in Table 4.1.

Adamus holds four granted mining leases: Salman ML, Ebi-Teleku-Bokazo ML, Nkroful ML, and Akanko ML through subsidiaries. Salman ML is held by Adamus Resources (Ghana) Limited. Ebi-Teleku-Bokazo ML is held by Semafo (Ghana) Limited, a subsidiary controlled 100% by Adamus. Nkroful ML is held by Nkroful Mining Limited, a subsidiary controlled 100% by Adamus. Akanko ML is held by Akanko Mining Limited (Figure 4.2).

Adamus Resources (Ghana) Ltd. holds 100% interests in five granted prospecting licences (See Table 4.1) in the name of Salman PL, Ankobra PL, Ankobra River PL, Apa Tam PL, and Asanta PL. Ebi Teleku-Bokazo PL is held by Semafo (Ghana) Ltd, Mfuma is held by Nkroful Mining Limited, Akanko PL is held by Akanko Mining Limited, a 90% owned subsidiary of Adamus, and the remaining 10% is owned by a local company. Kanyankaw PL is held by Shankill Resources Limited and Hotopo PL and Banso PL are held by Hotopo Resources Limited, which is 100% owned by Castlegem Pty Limited. All these licenses are renewable annually or biennially depending on the extension application requested. All of the properties are subject to the right of the Ghanaian government to retain a 10% free-carried interest upon commencement of production.

The Adamus, Salman, Aliva, Nfutu, and Bokrobo gold deposits are located on the mining licenses in the central part of the project area (Figure 4.3). The Avrebo gold deposit is located on the eastern side of the property group on the Apa Tam PL. The Kayankaw PL, Hotopo PL and Banso PL are located 10 to 15km further east of the block of properties that constitute the Nzema Gold Mine property.

Table 4.1: Mineral Tenure Information as of December 2012

Property Name	Holder	Type	Number	Mincom File No.	Interest	Granted Date	Expiry Date	Renewal Fees	Comments
SALMAN	Adamus Ghana	PL	LVB 9317/05	PL.2/163	90%	30/06/05	15/12/12	$15,000	Extension application submitted
ANKOBRA	Adamus Ghana	PL	LVB 10160/94	PL.2/164	90%	14/10/94	18/11/12	$15,000	Extension application submitted
ANKOBRA RIVER	Adamus Ghana	PL	LVB 209/05	PL.2/364	90%	29/11/04	25/08/12	$15,000	Extension application submitted
APA TAM	Adamus Ghana	PL	LVB 854/05	PL.2/388	90%	10/01/05	9/10/12	$15,000	Extension application submitted
ASANTA	Adamus Ghana	PL	LVB 210/05	PL.2/387	90%	24/11/04	25/08/12	$15,000	Extension application submitted
EBI TELEKU-BOKAZO	Semafo Ghana	PL	LVB 1031/96	PL.2/192	90%	04/01/96	17/09/11	$15,000	Extension application submitted
AKANKO	Akanko Mining	PL	LVB 300/95	PL.2/57	80%	24/02/95	9/05/12	$15,000	Extension application submitted
MFUMA	Nkroful Mining	PL	LVB 9263/07	PL.2/50	90%	03/04/07	27/Aug/10[4]	$15,000	Extension application submitted
KANYANKAW	Shankill Resources Ltd	PL	LVB 2253/92	PL.2/131	90%	22/4/1992	13/03/12	$7,500	Extension application submitted
HOTOPO	Hotopo Resources Ltd	PL	LVB 9791/05	RL.2/96	90%	19/12/2006	31/01/12	$15,000	Extension application submitted
BANSO	Hotopo Resources Ltd	PL	LVD 14542/10	PL.2/98	90%	10/05/10	29/10/13	$7,500	All payments made, PL in good standing.
NKROFUL	Nkroful Mining	ML	LVB 6595/06		90%	29/03/06	28/03/16		All payments made, ML in good standing
SALMAN	Adamus Ghana	ML	LVB8552/08		90%	11/04/08	10/04/18		All payments made, ML in good standing
EBI TELEKU-BOKAZO	Adamus Ghana	ML	LVB8551/08		90%	11/04/08	10/04/18		All payments made, ML in good standing
AKANKO	Akanko Mining	ML	LVB8550/08		80%	11/04/08	10/04/18		All payments made, ML in good standing

[4] The new expiry date is based on the date at which the extension is granted.

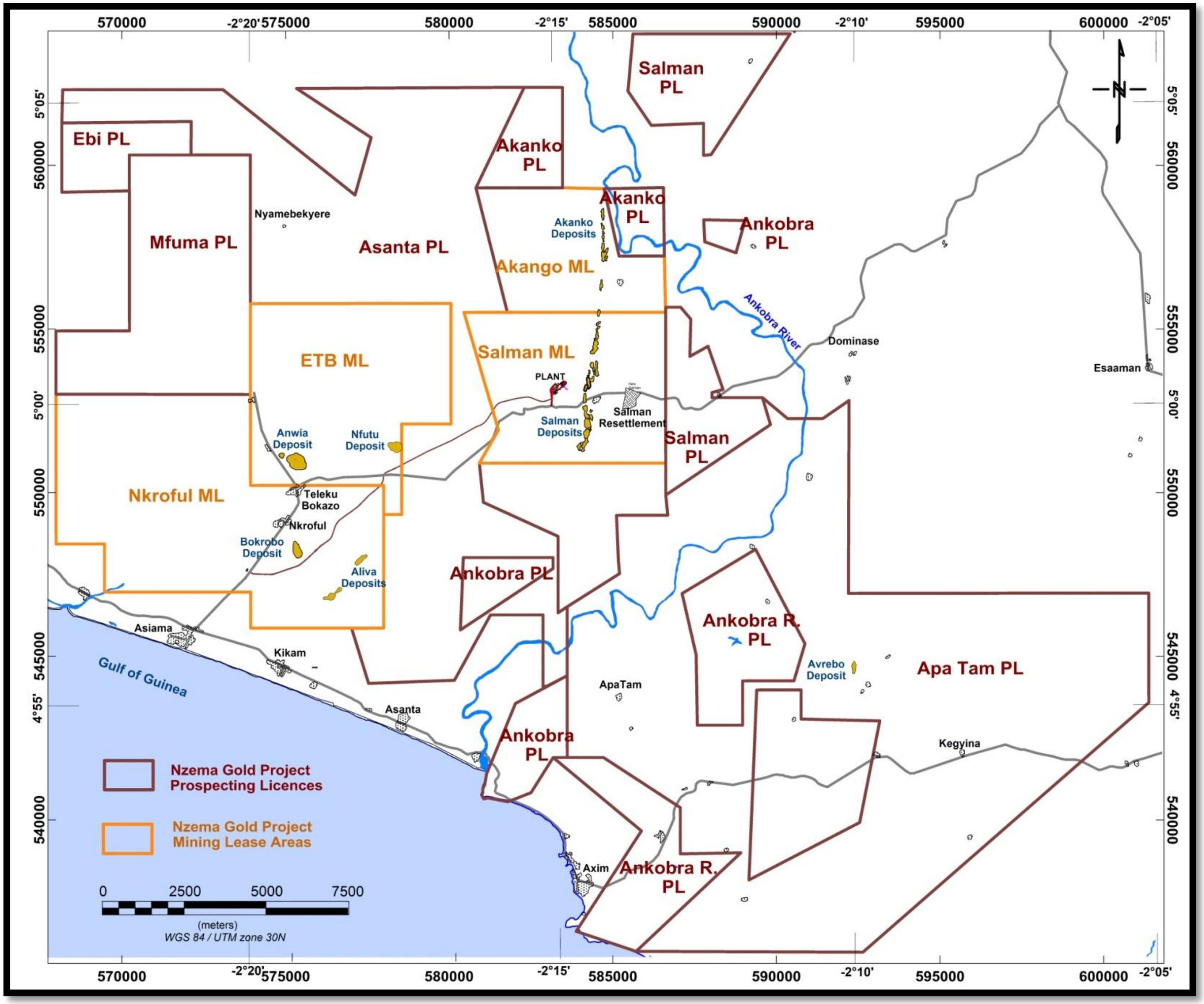


Figure 4.3: Mineral License Perimeters, Site Layout and Deposit Locations

4.3 Royalties and Other Agreements

Parts of the Ebi Teleku-Bokazo prospecting licence are subject to concessions in favour of a couple local companies to permit them to conduct the extraction of kaolin clays on a small-scale basis. To date ongoing small scale kaolin mining occurs on these concessions around the town of Aluku, and have not impinged on any area in use by, or proposed for the further development of, the Nzema mine or associated infrastructure.

Per an amendment to Mining Act 703 (March 17, 2010), mineral royalties increased from the 3-6% range to a fixed rate of 5% payable to the Ghanaian government. In addition, there is a 1 per cent royalty of gold recovered or 3 per cent of net profits, whichever is greater, (in each case, in relation to ore derived from the area of the original Teleku Bokazo prospecting licence) in favour of Super Paper Products, a local company that was the previous holder of the original prospecting licence.

The Ghanaian government has the right to retain 10 per cent free-carried interest in any or all tenements upon commencement of production.

4.4 Mining Rights in Ghana

All mineral rights are vested in the President in trust for the people of Ghana and the Minerals Commission has the sole responsibility of the administration of mineral rights in the country.

4.4.1 Prospecting License

The Minister, on application for a prospecting license and based on the recommendation of the Minerals Commission, grants a prospecting license for specific minerals and the license is not to exceed 3 years. Prospecting licenses can be extended and this may apply to the entire prospecting license area or to a reduced area depending on whether the prospecting license holder complies with the rights and obligations required by law. Upon submission of an application, the minerals commission reviews the completed work program and proposed work program and thereafter makes a recommendation to the Minister for approval.

4.4.2 Extension Application

In order to renew the granted prospecting licence an application, which includes a technical report on the work undertaken during the previous licence period, an application fee for renewal, advance payment of the annual rent for the licence area, and a program of exploration work for the extension period must be submitted.

Submitted applications are assessed by the Minerals Commission. In general, and provided the application is lodged with all required documentation, fees and other payments, the renewal is accepted and the formal notification to the applicant follows. Adamus has lodged the technical reports and application documentation in respect of those licences requiring renewals by the applicable due dates (see Table 4.1).

4.4.3 Grant of Mining License

The development of a mine requires the granting of one or more mining licenses. Application for a mining license in Ghana requires completion of a feasibility study to the satisfaction of the Ghanaian Minerals Commission.

In conjunction with the lodgement of the Nzema Mine feasibility study with the Minerals Commission, Adamus also lodged an Environmental Impact Statement (EIS) and Resettlement Action Plan (RAP) for the relocation of Salman Village, to the Ghanaian Environmental Protection Agency (EPA). EPA approval and issuance of an environmental permit is a mandatory requirement in addition to the granting of the mining license(s) by the Minerals Commission prior to commencement of mining operations. Adamus was awarded an Environmental Permit No EPA/EIA/278 on December 12, 2008 by the EPA (File No. CM:1064/02)[15].

The Salman, Akanko and Ebi Teleku-Bokazo Mining Licences were granted by the Minister of Lands, Forestry and Mines on April 11, 2008. Adamus has the exclusive rights to work, develop and produce within the Mining Licence areas for a renewable ten year term. In March 2009, Adamus announced that all approvals required to commence mining for the project had been received.

The granted mining licences cover sufficient area to host the ongoing mining operations. Figure 4.3 shows the current site layout for the Salman and Adamus mining operations, the processing facilities, other infrastructure and the mining lease boundaries.

The Salman ML, Ebi-Teleku-Bokazo ML, Nkroful ML, and Akanko ML permit documents are held in Endeavour's Accra office and at the Nzema Mine. The permits were issued by the Minerals Commission of Ghana by the Chief Inspector of Mines.

4.4.4 Project Stability Agreement

Adamus is awaiting final ministerial approval of a Project Stability Agreement with the country's Minister of Finance and Economic Planning which will set guidelines for royalties, tax rates, and duties etc., during the development and operational phases of the Project.

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The mine property is accessed from Accra by driving 225km on the main coast highway to Takoradi and then a further 79km on a paved road to the village of Teleku Bokazo. The entrance gate to the mine access road is located at Teleku Bokazo and from there it is a further 8 kilometres on a well maintained all-weather dirt road to the mine offices. Driving time from Accra is approximately 5 hours. Frequent daily flights are available to Takoradi (1 hour flight) and the drive from the Takoradi airport to the mine is approximately 1.5 hours.

The coastal highway links Ghana and Cote d'Ivoire and passes through the southern edge of the property. A series of sealed gravel roads link the coastal highway at Essiama with the regional mining centre Tarkwa, and pass through the centre of the Nzema Property. Numerous secondary gravel roads link villages throughout the project concessions. Access within more remote portions of the Project is restricted to footpaths and cut lines, and can become difficult during the peak of the rainy season (May to July and October).

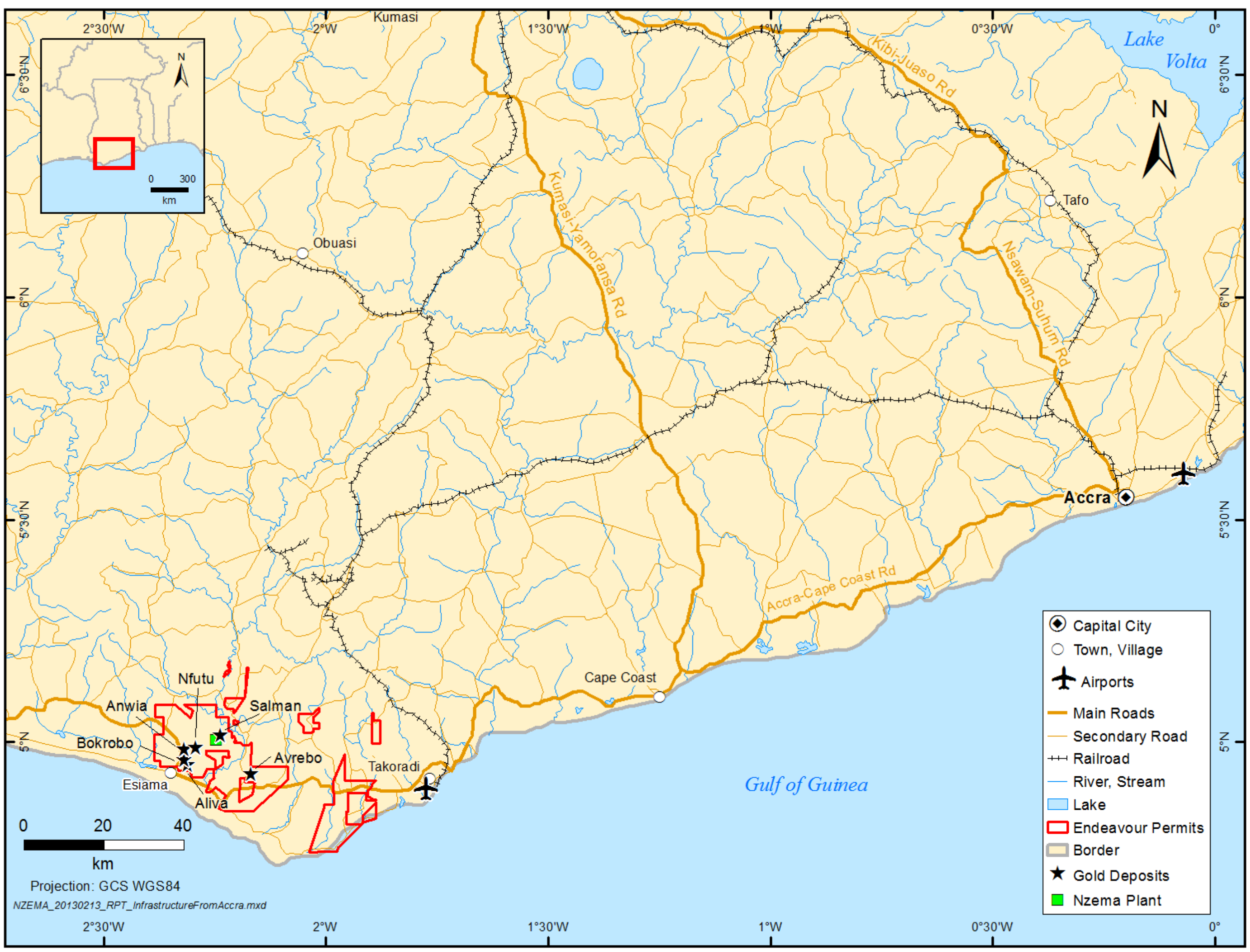


Figure 5.1: Regional Infrastructure and Access to the Nzema Gold Mine

5.2 Climate

Ghana lies just north of the equator and the climate is tropical, particularly in the southern half of the country. Seasonal temperature variations are minor. Daytime temperatures are high throughout the year, reaching about 30º C on most days. Diurnal variation is about 6 to 10º C in the humid southern part of the country.

In the mine area the climate is fairly typical of that for southwest Ghana, with wet seasons from March to July and also from September through October with a dry season between December and February. The mine property has an average annual rainfall of 2,023 mm with an average humidity of 80 per cent. Annual evaporation is approximately 2,850 mm.

5.3 Local Resources

Ecologically, the mine property is situated in the Wet Evergreen Forest Zone. Vegetation is dominantly secondary forest and fallow farming areas that rapidly return to scrub cover in the slash and burn farming cycle typically employed for subsistence crops. Dominant subsistence crops are cassava and maize, grown in small allotments with no formal boundaries. The dominant commercial crops are coconuts and oil palm and, to a lesser extent, cocoa is grown in isolated areas. Scattered rubber plantations also occur on the southern and western portions of the property.

The area around the mine has largely been disturbed and has experienced extensive degradation in recent years due a variety of activities. The main land uses include secondary forestry/logging, subsistence and cash crop farming, and artisanal mining.

There are several local villages near the mine site, the closest being the New Salman, Anwia and Akanko villages. The Salman village was relocated as of March 2012 to the site of the New Salman village about 2km east of the open pits on the southern end of the Salman Trend.

5.4 Infrastructure

Newly constructed gravel haul roads connect Adamus, Bokrobo, Aliva, Nfutu and Salman Trend to the ROM stockpile next to the processing plant. The mine infrastructure includes a haul road along the Salman Trend (a 9km long trend which contains the Salman and Akanko deposits) and a road extending 8km west to the Adamus deposit. The administrative and maintenance facilities are adjacent next to the plant site which is located at the southern end of the Salman Trend (Figure 4.3). Haul roads and access roads are well maintained. Several kilometres of bulldozed exploration tracks have been established to provide access to the remainder of the less advanced prospects (Figure 4.3).

Public roads run east-west connecting Teleku Bokazo to the Salman and Akanko villages and extending further east to connect with the sealed Agona-Tarkwa road. A gravel road links the New Salman and Akanko villages and runs parallel to, but on the east side of, the Salman Trend. The public roads are gravel roads that are periodically graded. Controlled crossings have been established where the mine haul and access roads cross the public roads.

The Adamus deposit is located approximately 500 metres north of the town of Teleku Bokazo and is within 1 kilometre of the public road connecting Teleku Bokazo to Essiama.

Ghana has two main ports which handle the majority of the shipping. The Takoradi port was used during construction and continues to be used as a port entry for some materials (Figure 5.1).

Nzema is connected to the national power grid with electricity supplied by GRIDCo. The power is supplied from a connection to a 161/34.5Kv, 25/33MVa step down substation located between the townships of Nkroful and Essiama, within 14km of the Salman Trend and 2.5km of the Adamus deposit.

Abundant processing water is available from both the Ankobra River and also from groundwater resources. A water storage dam is located immediately north of the process plant area and has a capacity of 600,000 m3. Currently the raw water requirements of the process plant are met by rainfall additions to the dam. Potable water from a water treatment plant that treats water sourced from a borehole near the process plant.

The tailings impoundment is located north of the plant and has a current capacity of 2.1Mt and is due for the next lift in January 2014 and this will provide an additional 1.9Mt capacity. Tailings dam raises are completed annually and are mostly carried out during the dry season (January to March).

The mine site has landline communications and cell network coverage.

5.5 Physiography

The property lies in the Nzema East District of the Western Region of Ghana. The physiography of the area is hilly terrain dissected by broad, flat drainages that typically form swamps in the wet season (Figure 5.2). Hill tops are generally at very similar elevations, reflecting the elevation of a previous erosional peneplane that is now extensively eroded. Drainages in the area are between 10 and 15 metres above sea level and primarily drain to the south. Maximum elevations are around 80 metres above sea level but the areas of the mine infrastructure are generally lie at less than 50 metres elevation. Despite the subdued topography, hill slopes are typically steep.

Figure 5.2: Typical Landscape in the Property Area

6 History

6.1 Artisanal (Galamsey) Workings

Small-scale colonial era and artisanal (galamsey) gold workings on several areas of the property, the most significant being at Akanko and along the Salman Trend, Adamus and Nkroful. There were also several gold dredging operations in the Ankobra River operated between 1900 and 1920, and reference is made to numerous small alluvial and hard rock gold workings in various Gold Coast Geological Survey annual reports between 1930 and 1940, and in Junner (1935). Sporadic hard rock mining commenced at Akanko in 1881, culminating with the efforts of Finsbury Pavement Financial Trust Ltd. in 1934 to 1935.

Several shafts were sunk into the crest of the low ridge northwest of Akanko village and at least three adits were driven from the foot of the Akanko ridge. Some of the shafts reached at least 56m depth and there was more than 250 m of underground development along the mineralized quartz reef (Tropical Exploration and Mining Co Ltd, 1997). Gold production at that location has been estimated at several thousand ounces although there is no official record (Tropical Exploration and Mining Co Ltd, 1997).

Artisanal alluvial and reef mining activity continues intermittently at various locations including Nkroful (hard rock), Bokrobo (hard rock) and the Salman area (alluvial) to the present day.

6.2 Exploration and Ownership History of the Salman Area

The Akanko area of the Salman deposit was held by Ghanorcan Resources Ltd from 1987 to 1989. Exploration activity included geophysics, soil and rock chip sampling, and trenching, but was limited to the immediate vicinity of the old Akanko mine (Tropical Exploration and Mining Co Ltd, 1997).

Tropical Exploration and Mining Company Limited (TEMCO) took up a prospecting licence, the Akanko PL, covering the old Akanko mine in 1995. Ghana Manganese Corporation ("GMC") held a concession over the area of the Salman deposit (the Salman-Aboaji PL) in the early 1990's and engaged TEMCO to explore the area for manganese and gold. Between 1992 and 1997 TEMCO completed an extensive soil sampling program (2,716 samples assayed for gold, arsenic, copper, antimony and manganese) and minor stream sediment and rock chip sampling over the Salman area, identifying a strong (>200 ppb Au, peaking at about 9g/t Au) north-northeast trending gold-arsenic anomalous zone extending over at least 8 kilometres and including scattered colonial and artisanal gold workings along, what is now referred to as, the Salman Trend. Three parallel but lower level and less continuous gold-arsenic anomalous zones were also recognized.

TEMCO excavated and sampled 97 trenches across the Salman soil anomaly and also across selected adjacent anomalies, intersecting numerous broad intervals of moderate grade gold mineralization (up to 86m at 5.60g/t Au) associated with quartz veins in saprolitic and lateritic regolith. Additional activities included pitting (51 pits), banka[5] drilling (14 holes) for alluvial gold, and pitting of the manganese deposits east of Salman.

BHP Minerals (BHP) acquired and joint ventured into a number of concessions in the area during the mid-1990s and undertook a variety of activities including soil sampling, acquisition and processing of Landsat imagery, and magnetic and GeoTEM surveying focusing on the previously identified Salman Trend and parallel features. The tenor of mineralization at surface encountered by TEMCO along the

[5] Manual rotary drill system that penetrates less than a few metres into unconsolidated ground or decomposed rock.

Salman Trend was confirmed, as were some further lower level anomalies identified along strike to the north of the Ankobra River and on parallel features.

BHP then completed 75 drill holes, including 4 HQ diameter diamond drill core holes for 571m and 71 reverse circulation (RC) holes for 6,964 m, on 12 northwest trending traverses across the Salman Trend. The drill traverses were spaced between 200 and 500 metres apart over a total strike length of about 4 kilometres. Almost all drill holes were oriented at -45° towards 300°.

Significant mineralization was encountered on all but two of the traverses and confirmed the presence of significant gold mineralization (such as 34m at 3.50g/t Au from 2m in SRCH018, and 25m at 4.52g/t Au from 34m in SRCH082) to a vertical depth of at least 80 metres along the Salman Trend. A multi-lode system was implied and in some places appeared to dip west, almost parallel to the orientation of the drill holes, making sectional interpretation difficult. BHP interpreted a series of narrow, near-vertical primary lodes which mushroomed out in the oxide zone, and estimated a resource of 1.1 Moz (Bolton and Amegashi, 1996).

This historic resource estimate was made prior to the implementation of NI 43-101. The estimate does not conform to NI 43-101 reporting standards and should not be interpreted as such. The estimate is presented here for information purposes only.

The Salman prospect was acquired from BHP by African Gold Resources Limited (AGR) in 1999. AGR completed a validation of the BHP database, undertook additional soil sampling, trenching and ground-based magnetic surveying, and carried out a program of mobile metal ion (MMI) soil sampling. Hightime Investments Pty Ltd joint ventured into TEMCO's Akanko prospecting licence in 2002 and followed up some of the previously identified soil gold anomalies with more detailed soil sampling and channel sampling of bulldozer traverses. Hightime Investments assigned its interest in the joint venture to Adamus Holdings in 2003. Adamus Holdings was acquired by Adamus Resources Ltd (Adamus) in 2004.

6.3 Exploration and Ownership History of Adamus and Nfutu Areas

The Teleku Bokazo and Ebi Prospecting Licences were explored between 1995 and 1998 by SEMAFO Inc., the Ghanaian subsidiary of SEMAFO (Semafo). During this period the company completed a systematic soil sampling survey over the entire concession area. The majority of the survey was conducted on a 30m by 120m pattern, and four prominent gold anomalies (including Adamus and Nfutu) were identified for infill sampling, down to a 15m by 60m grid spacing in the case of the Adamus deposit. A small trenching program was carried out, mainly over the area of the Adamus deposit where seven trenches were completed in October 1995. All trenches returned some intercepts over 1g/t Au. Semafo went on to drill a total of 350 RC holes (24,951 m) and 75 diamond drill holes (12,911.5 m) at the Adamus deposit. Results were very encouraging but the deposit was difficult to interpret. A high density of drilling in four main orientations was applied in an attempt to clarify the apparent poor continuity within and between mineralized zones. The poor continuity was determined to be largely a reflection of a poor understanding of the controls on mineralization.

SAMAX Gold Inc. (Samax) entered into a joint venture arrangement with Semafo on the Ebi – Teleku Bokazo property in 1998, with management of the project passing to Samax. Immediately following the establishment of the Anwia joint venture, Samax was acquired by Ashanti Goldfields Company Limited (AGC) and the joint venture continued to operate under the Samax name as a wholly owned subsidiary of AGC. Two vertical RC drilling campaigns were undertaken by Samax at Adamus (Anwia) to validate proposed interpretations, refine the geometry and limits to mineralization, and provide data for preparation of resource estimates. A total of 150 RC holes (8,913 m) were drilled, of which two were completed with PQ-diameter diamond drill core tails of 29.3m and 48.5m length, respectively. One further diamond hole was drilled from surface with PQ core (70 m) to provide oriented geotechnical data and representative samples for metallurgical testwork.

Semafo (Ghana), Samax and AGC made several resource estimates for Adamus, ranging from 3.6 Mt at 1.29g/t for 147,000 oz Au (Semafo, 1997) to 2.94 Mt at 3.09g/t for 292,000 oz Au. None of these estimates complied with either the JORC Code or NI 43-101 requirements.

This historic resource estimate was made prior to the implementation of NI 43-101. The estimate does not conform to NI 43-101 reporting standards and should not be interpreted as such. The estimate is presented here for information purposes only.

Samax withdrew from the joint venture in 2000 and Adamus acquired Semafo (Ghana) in 2004.

In 1997, SAMAX drilled 87 holes for 5,717m over Nfutu and the area between Nfutu and Adamus (formerly the Mark and Peter prospects). When Samax was acquired by AGC, the work was concentrated on Adamus and there is no evidence of further work at Nfutu prior to the SAMAX/AGC withdrawal from the joint venture in 2000. Adamus acquired Semafo in 2004 and began further work on Nfutu including RC drilling.

6.4 Exploration and Ownership History of Bokrobo-Aliva Areas

Hardrock mining of quartz vein materials, as well as alluvial workings, occurred at Bokrobo and Abosso between 1898 and 1901 (Griffis et al., 2002). Additional vein mineralization is documented for Aliva and Atome in the 1900s (Junner 1935). In 1992 Union Mining and Dr Alex Barko, a Ghanaian National, set up the Nkroful Mining Company who took over the Nkroful area including the Bokrobo and Aliva deposits. In 1993 Nkroful Mining conducted a feasibility study (not NI43-101 compliant) that estimated hard rock resources of 1.36 Mt at 5.8g/t and an alluvial resource of 440,000 m^3 at 0.5 g Au/m^3, installed a bulk sampling plant and treated 300 tonnes material from Bokrobo (ACA Howe, 2003).

Between 1995 and 1998 Nkroful Mining entered into a joint venture with SAMAX. SAMAX conducted soil sampling programs over Bokrobo, Abosso, Atome and Aliva areas (with the same soil grid spacings described for Adamus). Pitting and trenching were conducted in 1996 with 3 trenches (292m total length) over the 3km long Aliva soil anomaly and four trenches (60m total length) at Bokrobo. In 1997 to 1999 SAMAX drilled 46 RC holes for 3,293m and 9 RCD holes for 2,059m (754m RC and 1,306m DD) over the Bokrobo area (including Abosso and Atome) and 31 RC holes for 1,813m over the Aliva area. The Aliva RC holes could not be verified and were not used in preparation of the current resource estimate.

In 1999 SAMAX was taken over by AGC and the joint venture was terminated so the property reverted to Nkroful Mining. Nkroful Mining was acquired by Adamus in 2006, at which time further work was conducted.

In 2003 ACA Howe (2003) published a noncompliant resource report for Bokrobo comprising 720,500 tonnes at 5.23g/t for 121,000 oz Au classified as Indicated Resource and 198,000 tonnes at 4.65g/t for 29,000 oz Au classified as Inferred Resource. No historic resource estimate for Aliva is available.

This resource estimate does not conform to NI 43-101 reporting standards and should not be interpreted as such. The estimate is presented here for information purposes only.

6.5 Exploration and Ownership History of Other Satellite Areas

6.5.1 Avrebo

The Avrebo deposit (formerly Afrebo) is located on the Apa Tam PL. The Apa Tam PL was originally controlled by EQ Resources (EQ). EQ conducted a soil sampling program over the area on a 100m by 20m grid spacing. EQ also drilled 12 RC holes for 1,040m in 1996.

6.5.2 Akropon

The Akropon deposit is located on the Asanta PL, formerly the Enyinase PL and was part of the Semafo concessions. The full exploration history of the Asanta PL is not known, but the area was covered by stream sediment sampling and a regular soil sampling survey in areas of higher elevation (above streams and swamps). The soil survey was conducted in 1996 on a 50m by 200m pattern and was infilled in 2003 on a 25m by 100m pattern by Hightime Ghana Pty Ltd (Hightime) (Ravensgate, 2003, 2004). No details are available regarding the association between Semafo and Hightime. Three core holes for 937m were drilled in 1997 by Semafo, likely more for stratigraphic information than mineralization as the geology of the area is poorly understood, but these holes were centred on the initial gold soil anomaly.

In 2004 Adamus acquired Semafo and Hightime.

6.6 Exploration by Adamus Resources Limited

Adamus progressively acquired the tenements between 2002 and 2006 pursuant to the acquisitions and joint ventures described. The property ownership by Endeavour/Adamus and by subsidiary companies is shown in Table 4.1 of Section 4.2.

Adamus initially focused its attention on delineating and quantifying near-surface mineralization along the Salman Trend and adjacent structures. At the Adamus deposit the work was focused on verifying and improving drill hole surveying, geological logging and drill testing down plunge extensions to the known mineralization.

Adamus’ activities on all tenements from 2002 includes geological mapping, soil and auger sampling (15,900 samples), pitting, trenching and channel sampling of bulldozer traverses (11,200m combined), heliborne radiometric, magnetic and electromagnetic surveying (ca. 340km^2), and several exploration and resource delineation drilling campaigns (~297,000m combined RC and core drilling).

Adamus commenced detailed exploration of the satellite deposits (Bokrobo, Nfutu, Aliva, Avrebo) in 2006. At the time of the feasibility study, insufficient data was available for incorporation of these satellite deposits into resource categories.

The feasibility study was completed in December 2007. The mineral resource and reserve estimates from the feasibility study were included in the Revised Technical Report of August 2008. The resources for the satellite deposits were incorporated into the Technical Report of August 2008 but were not listed separately in the report, but lumped together as “satellite deposits”.

Mining commenced on the Salman Trend in October 2010 and the first gold was poured in January 2011. Mining commenced on the Adamus deposit in December 2012.

6.7 Historical Mineral Resource and Mineral Reserve Estimates

In addition to the resource estimates by previous property owners, Adamus commissioned several previous resource estimates for the deposits, especially Adamus and Salman. These are summarized below and defined in more detail in Heeks (2009).

In August 2004 Ravensgate Pty Ltd undertook estimates using ordinary kriging into blocks measuring 4mE x 10mN x 4mRL (Adamus) or 5mE x 5mN x 2.5mRL (Salman) constrained by mineralization wireframes interpreted at approximately 0.5g/t Au cut-off grade (Ravensgate, 2004). In February 2005 SRK Consulting undertook an update of Adamus and Salman resource estimates using the Uniform Conditioning method to estimate recoverable resources (SRK Consulting, 2005).

Table 6.1: Nzema Previous Mineral Resource Estimates by Ravensgate and SRK at 1.0g/t cut-off

	Measured			Indicated			Inferred		
Ravensgate	Tonnage (Mt)	Au g/t	k oz Au	Tonnage (Mt)	Au g/t	k oz Au	Tonnage (Mt)	Au g/t	k oz Au
Salman				5.1	2.20	358	0.8	1.94	48
Adamus (Anwia)				2.4	2.22	168	1.8	2.43	143
SRK									
Salman	2.8	2.19	194	6.8	1.90	419	2.2	1.72	122
Adamus (Anwia)	3.0	2.39	234	2.5	2.20	176	0.8		

Between 2006 and 2011 Hellman and Schofield (H&S) produced a number of resource updates, using multiple indicator kriging (MIK) to estimate recoverable resources, including resources for the four satellite deposits – Bokrobo, Aliva, Avrebo and Nfutu. The various H&S estimates are listed in Table 6.2.

Table 6.2: Nzema Mineral Resource Estimates by Hellman and Schofield at 1.0g/t cut-off

	Measured			Indicated			Inferred		
Salman	Tonnage (Mt)	Au g/t	k oz Au	Tonnage (Mt)	Au g/t	k oz Au	Tonnage (Mt)	Au g/t	k oz Au
2007	9.1	1.90	555	4.4	1.62	229	5.2	1.64	274
2008	11.4	1.73	636	5.6	1.54	276	2.5	1.50	120
2009	13.0	1.71	717	5.7	1.55	284	2.5	1.54	121
2011	14.0	1.60	720	5.2	1.40	234	4.6	1.52	225
Adamus (Anwia)									
2007	5.51	2.19	387.9	2.43	1.69	132.0	2.75	1.83	161.8
2008	6.17	2.01	398.5	2.75	2.00	177.5	2.66	1.69	144.7
Bokrobo									
2008	0.58	2.83	52.7	0.64	1.97	40.5	0.54	1.93	33.6
2009	0.67	3.18	68.9	0.56	3.03	54.6	1.14	1.57	57.4
Aliva									
2008	0.47	1.21	18.2	0.29	1.24	11.6	0.19	1.27	7.6
Avrebo									
2008				0.54	1.28	22.4	0.05	1.63	2.8
Nfutu									
2008							0.54	1.82	31.4

The mineral resource estimates described in Tables 6.1 and 6.2 are provided as background information only and while they are not historic, they are not the current mineral estimates for the Nzema Mine. They are presented here for information purposes only.

7 Geological Setting and Mineralization

7.1 Regional Geology

Major gold deposits in Ghana are hosted by proterozoic rocks of the West African Craton, including the Birimian Supergroup, a series of metavolcanic and metasedimentary rocks, the Tarkwaian Group, comprising fluvial metasedimentary rocks, and various gabbroic to granitic intrusives (Figure 7.1). Gold mineralization within the Birimian Supergroup is structurally controlled and associated with mesothermal quartz veins and sulphide concentrations, while both mesothermal shear-hosted and palaeoplacer gold deposits occur in the Tarkwaian Group. The Nzema Project is within the Birimian Supergroup rocks with minor granitic intrusions, bounded by large granitoid bodies to the west and east, and is devoid of Tarkwaian Group rocks.

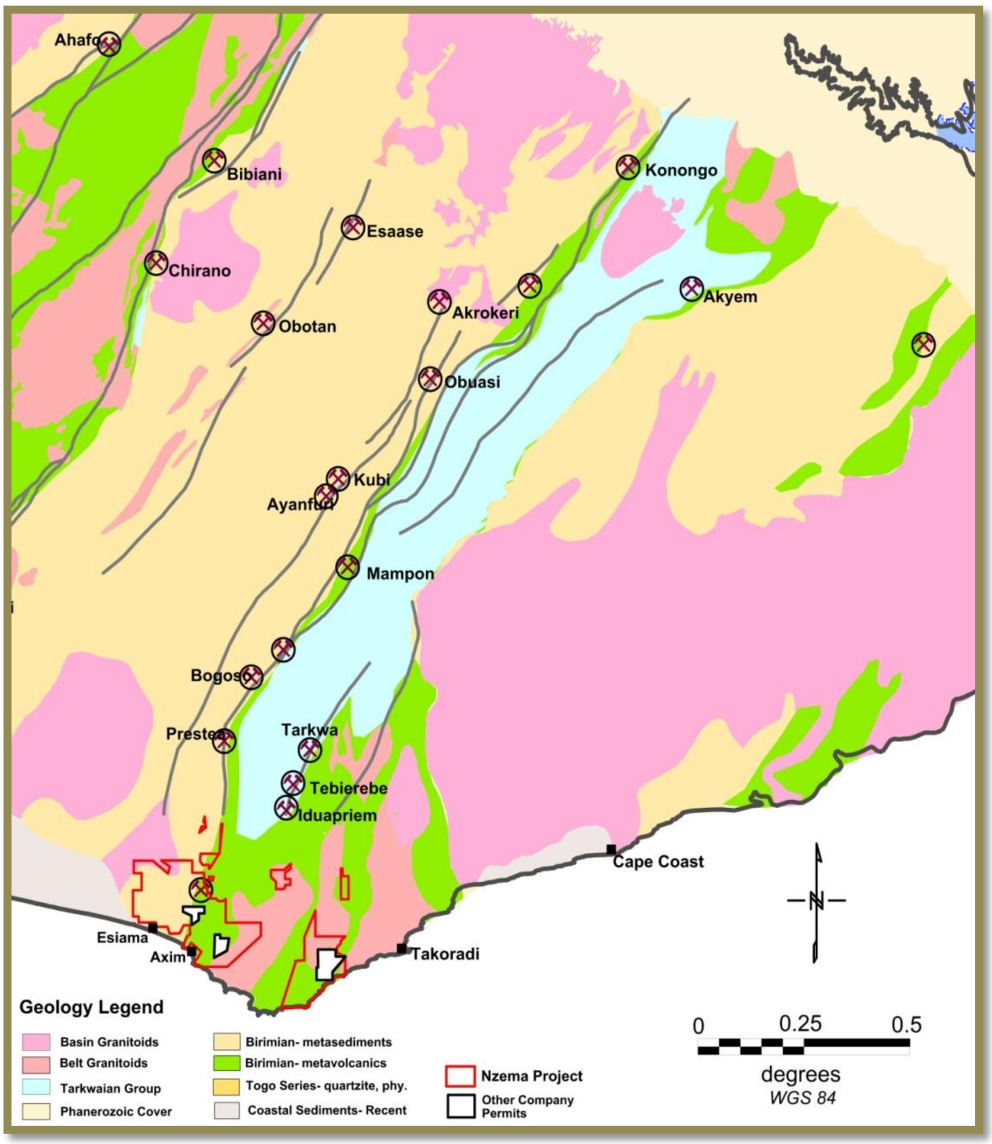


Figure 7.1: Regional Geology Setting

The Birimian Supergroup (c. 2.1-2.2 Ga) is divided into a series of narrow (typically 20-60 kilometres wide), northeast striking, laterally extensive volcanic “belts” separated by broader sedimentary “basins” (formerly termed the Upper and Lower Birimian; Griffis et al. 2002). The volcanic belts are dominated by massive andesitic to basaltic (tholeiitic) flows, coarse andesitic to dacitic volcaniclastics, and locally abundant pillow lavas. Phyllite and greywacke dominate the basins, and generally exhibit primary sedimentary structures indicative of deposition by subaqueous sediment gravity flows. Redeposited tuffs of andesitic to dacitic composition are a feature of the basin margins, forming packages a few metres to hundreds of metres thick intercalated with the epiclastic greywackes and phyllites. Thin packages of chert, graphitic phyllite and fine-grained manganese-rich sediments often mark the transitional zone between the Birimian belt and basin.

Two main granitoid suites are recognized in Ghana, Dixcove-type and Cape Coast-type. The Dixcove suite is generally confined to the volcanic belts and includes a range of small plutons to large batholiths of mafic to intermediate composition. Hornblende is the dominant mafic phase and many bodies are not foliated. U-Pb zircon dating of Dixcove granitoids indicates crystallization between c. 2,135 and 2,185 Ma (Hirdes et al., 1992, Boher et al., 1992, Oberthür et al., 1998). The larger Cape Coast bodies are typically foliated (often gneissic) biotite granitioids, commonly with migmatitic margins and prominent contact metamorphic aureoles. Cape Coast type granitoids are most widespread in the sedimentary basins and U-Pb zircon dating indicates they are younger than the Dixcove suite, crystallization occurring between c. 2,116 and 2,088 Ma (Hirdes et al., 1992, Boher et al., 1992, Davis et al., 1994, Oberthür et al., 1998).

The deformation and metamorphism of the entire Birimian Supergroup and Tarkwaian Group and intrusion of the Cape Coast granitoid suite occurred between c. 2,116 and 2,088 Ma is widely referred to as the Eburnian Orogeny (e.g. Griffis et al., 2002), or more specifically, the Eburnian II Orogeny (Allibone et al., 2002a).

Compositionally, the Birimian sedimentary rocks were most likely derived from Birimian volcanic belts and the presence of redeposited tuffs within the basin margins indicate active intermediate to felsic volcanism during deposition. The youngest detrital zircons indicate Birimian metasediments were still being deposited at least 55 Ma after eruption of some of the Birimian metabasalts (before 2,185 Ma, above), and the basalts could represent the older parts of the volcanic chains which subsequently erupted more felsic volcaniclastic material into the adjacent basins. With an age range of 2,135-2,185 Ma the Dixcove granitoid suite could represent the metamorphosed and eroded roots of these andesite-dacite volcanoes. However, the quartz-rich composition and presence of foliated clasts of Birimian sedimentary rocks within “contemporaneous” Tarkwaian conglomerates (Milési et al., 1991) indicates that many aspects of Birimian and Tarkwaian tectonic development have yet to be satisfactorily resolved.

Metamorphic grade of the Birimian rocks is greenschist facies, with local amphibolite facies aureoles around granitoid plutons. Recent work in the southern Ashanti region (John et al., 1999) suggests that the greenschist facies is widely retrograde after amphibolite facies conditions. Both belt and basin packages are highly deformed with widespread isoclinal folding and regional bedding-parallel cleavage attributed to regional northwest–southeast compression during the peak of the Eburnian Orogeny c. 2,100 Ma.

Regional northeast striking shear zones parallel to the belt margins are also assumed to have developed during peak Eburnian orogeny and appear to be fundamentally important in the development of the Birimian gold deposits for which Ghana is well known such as Ashanti, Prestea-Bogosu, Konongo, and Bibiani.

The Nzema Project covers the south-western margin of the famous Ashanti Belt (Figure 7.1). The Salman Trend of gold deposits is believed to be associated with the same belt-margin shear zones that host the Prestea, Bogosu, and Obuasi-Ashanti gold deposits (Figure 7.1) and has many characteristics typical of these deposits. The Adamus Deposit is located within the adjacent Birimian basin rocks (Anwia Domain), several kilometres west of the belt margin fault zone, and has a contrasting mineralization style. The Avrebo Deposit is located within the Birimian belt rocks (Avrebo Domain), a few kilometres east of the belt margin fault, possibly along a subparallel structure and also has a contrasting mineralization style.

7.2 Property Geology

7.2.1 General

Basement exposure is generally poor within the Nzema Project area and largely restricted to road cuttings, a few stream beds, prospecting pits, trenches, and cleared drill pads. Laterite and mottled clay zones are locally developed on ridges, and saprolite typically extends to 10 to 30 metres beneath surface and locally as much as 100 metres. The eastern part of the property is largely underlain by Birimian volcanic and volcaniclastic rocks assigned to the Ashanti Belt (Avrebo Domain), the western part mainly by Birimian metasedimentary rocks of basin and basin margin affinity in the south-eastern corner of the Kumasi Basin (Anwia Domain) (Figure 7.2). The Salman Trend is situated in the centre of a thrust complex (Salman Domain) which separates the basin (Anwia Domain) from the belt (Avrebo Domain) rocks (Figure 7.2).

The Birimian volcanics are thought to be faulted against the Tarkwaian Group immediately northeast of the Nzema property, and a small area of quartz-rich fluvial rocks immediately east of Axim may also belong to the Tarkwaian (see also Loh and Hirdes, 1996, Griffis et al., 2002). A large biotite granite body is exposed in the western part of the project area and probably belongs to the Cape Coast intrusive suite (Figure 7.2).

Two large, magnetically zoned probably Dixcove-type granitoid batholiths intrude the volcanics at the eastern edge of the project, and curved magnetic ridges adjacent to these intrusives could represent contact aureoles (Figure 7.2). Several narrow granitoid dykes and fault slivers up to 13 kilometres long and 700 metres thick of uncertain affinity are scattered through the project area, and some near-circular geophysical features (electromagnetic resistors with weakly magnetic edges) between 1.5 and 2 kilometres diameter northeast of Adamus may represent subsurface plutons. Two north-striking dolerite dykes are known from geophysics and drilling in the Nkroful-Adamus area.

There is no formal subdivision of the Birimian Supergroup in the southern Ashanti area but several lithologically and geophysically distinct units can be identified and three litho-structural domains are recognized and noted on Figure 7.2 as the Avrebo, Salman and Anwia Domains from east to west.

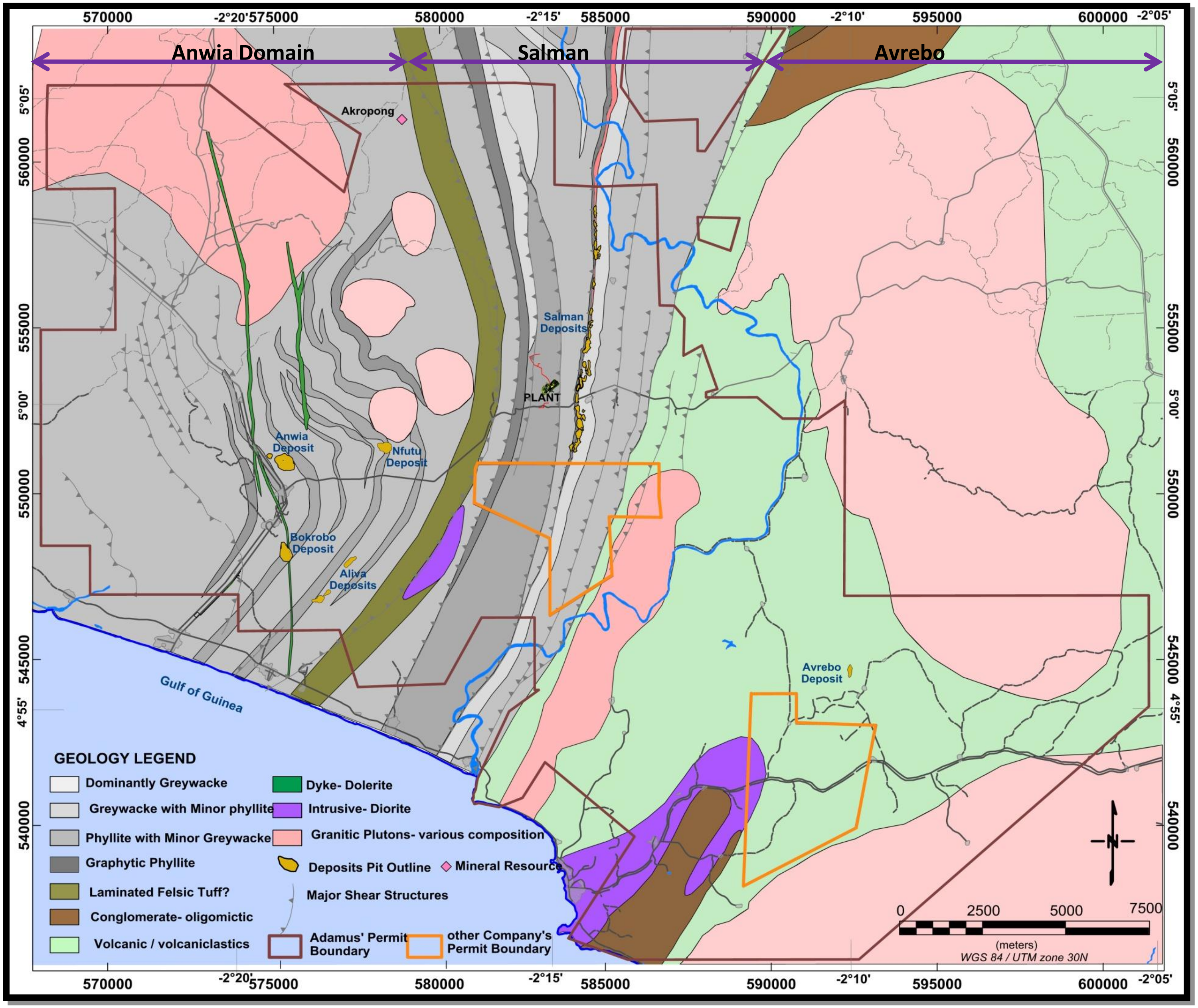


Figure 7.2: Property Geology

The Avrebo Domain encompasses the eastern part of the project area underlain by Birimian volcanic and volcaniclastic rocks, minor Birimian greywacke and phyllite packages, and Dixcove-type intrusive bodies. Primary layering is generally steep and strikes north-northeast to northeast. Cleavages are not particularly well developed in the volcanic lithologies (cf. phyllite and greywacke packages) but at least two or three weak foliations are evident in most exposures and are of similar orientation to those of the Salman Domain (described below). Scattered lenses of greywacke and phyllite within the volcanic rocks are probably fault bounded, and a large north to northeast striking shear zone is identified within the volcanics in the Avrebo area. The Avrebo Domain covers the south-western edge of the Ashanti Belt, and the volcanics appear to be faulted against a package of basin margin metasediments to the west (Salman Domain). The eastern margin of the Avrebo Domain is not defined.

The Salman Domain comprises a zone 4 to 5 kilometres wide and immediately west the Ashanti volcanic belt (Avrebo Domain) comprising isoclinally folded north to northeast striking metasedimentary units separated by a series of similarly oriented mylonitic shear zones informally termed the Ankobra Fault Zone. Greywacke and phyllite packages dominate the Salman Domain, minor lithologies include redeposited andesitic to dacitic crystal-lithic tuffs, pebbly volcanogenic greywackes and conglomerates, and rare andesitic dykes or flows. The Adamanso Shear Zone separates the Salman Domain from the Avrebo Domain (belt volcanics) to the east. The Aluku Shear Zone separates the Salman Domain from metasedimentary rocks of the Anwia Domain (basin) to the west. The mineralized Salman Shear Zone is situated within the Salman Domain and between these bounding shears.

The Salman Shear Zone, host to the Salman Trend gold deposits, is the best known and explored fault within the Ankobra Fault Zone (Figure 7.2). While the Salman Shear Zone appears to be the main locus of gold mineralization, pockets of gold mineralization have been identified on or adjacent to other faults within the Ankobra Fault Zone, including the Mamposo and Adamanso shear zones. The Salman and Mamposo shear zones are defined by both geological mapping and geophysics, while the other members of the Ankobra fault set, including the Adamanso and Aluku shear zones, are based on bedding discontinuities defined by geophysics. Detailed mapping and geophysical interpretation shows that Salman Shear Zone extends from the Gulf of Guinea coast between Asanta and Sawoma villages for at least 20 kilometres through Salman and Akanko and north of the Ankobra River to the Banso area. It is then interpreted to continue for a further 30 kilometres north, along with several of the other Ankobra faults, to merge with the Central Fault Zone of Allibone et al. (2002b) at Prestea-Bogosu: fabrics and lithologies within the Salman Shear and Central Fault Zone are comparable.

Exposures of the Salman and Mamposo shear zones are characterized by the presence of tightly folded and boudinaged greywacke beds and quartz veins within a highly deformed zone of graphitic mylonite and phyllite up to about 125 metres thick. The mylonitic fabric indicates the Ankobra Fault Zone developed associated with regional isoclinal folding during west-northwest – east-southeast compression. Outcrop observations indicate sinistral reactivation of the Salman Shear shortly after formation and finally dextral reactivation; however, the bulk of the strain appears to be associated with the initial compressional event. Several slices of altered, foliated biotite-ilmenite granitoid, termed the Akanko Granitoid, are included within the Salman Shear: all observed contacts are foliated and the bodies were either structurally modified after intrusion within the shear zone or structurally emplaced.

The Anwia Domain is characterized by modest dipping bedding over large areas and large-scale open folding. Porphyroblastic greywackes, phyllite, and kaolinitic (ex-vitric?) redeposited tuff are the dominant lithologies. The thick kaolinitic tuff packages, widespread porphyroblasts, and generally low graphite content distinguish the Anwia Domain lithologically from the adjacent Salman Domain.

Geophysical interpretation (especially EM) supported by a few field observations suggests a kilometre-scale dome and basin geometry within the Anwia Domain (Figure 7.2): open, metre-scale dome and basin folding produced by F2-F3 interference was observed in outcrop at the Adamus Deposit. The few facing directions observed suggest the sedimentary sequence is overturned.

The western margin of the Anwia Domain is not defined; the eastern margin with the Salman Domain is placed along the geophysically inferred Aluku Shear Zone. By analogy with thin-skinned fold-thrust belts the Aluku Shear Zone could represent the oldest, basin-ward thrust in an imbricate fault zone, and the Mamposo, Salman and Adamanso shear zones represent progressively younger thrusts formed as the Birimian basin (Anwia Domain and west) was pushed eastwards over the Birimian volcanic belt during regional compression. Similar cleavage characteristics in both Salman and Anwia domains suggests a common deformational history, comprising sinistral (D2) then dextral (D3) modification and reactivation of the original (D1) isoclinal folding and thin-skin thrusting architecture, all followed by post-orogenic relaxation (D4). The same sequence of compression with isoclinal folding and thrust fault development, followed by sinistral then late dextral wrenching has been proposed for the Obuasi-Ashanti area some 150 kilometres along strike to the north-northeast (Allibone et al. 2002a).

8 Deposit Types

8.1 Salman Deposit Type and Mineralization

The Salman Trend is defined by a semi-continuous +200ppb gold in soil anomaly extending for at least 9 kilometres along the Salman Shear Zone (Figure 9.1). Approximately 8.5 kilometres of strike extent has been drill tested to date with several discrete, multi-lode gold deposits identified along the shear zone (Figures 10.1 to 10.3). Significant oxide gold deposits within the Salman Trend include, from south to north, Salman South, Salman Central, Nugget Hill, Teberu, Salman North, North Hill, Akanko South, Akanko Central, and Akanko North. Salman Central, Nugget Hill and Salman North deposits are located on the shear zone at conspicuous north to north-northwest bends (left-hand flexures) within the overall north-northeast strike of the shear zone.

The Salman Shear Zone is made up of a western hangingwall comprised of 10-125 metres thick deformed phyllite and thin bedded greywacke with S-C bands and graphitic mylonite zones, and an eastern footwall of thick bedded greywacke with minor sheared phyllite zones up to a few metres thick. Boudinaged S_0-parallel quartz veins and greywacke beds are a characteristic feature of the hangingwall zone. Numerous metre-scale open to tight F2 folds are locally evident in both the hangingwall and footwall, and quartz veins in a variety of orientations are locally noted. The shear zone dips moderately to steeply west over much of the 8.5 kilometres drilled extent. Narrow slivers of altered biotite granitoid are locally occur within the shear zone south of Salman North: the granitoid body becomes continuous north of the Teberu zone (Figure 10.2).

At Salman South, Central and Nugget Hill gold mineralization occurs in west dipping lodes approximately parallel to and splaying out along the main Salman Shear. Most of the gold lodes are within the immediate footwall within quartz-veined silica-sericite-carbonate altered greywacke and/or granite with disseminated arsenopyrite. Some narrow, shear zone parallel zones of gold mineralization are present in the hangingwall graphitic phyllite. The mineralized zone at Salman Central gradually transgresses the shear zone from mostly footwall-hosted at the southern end to mainly hangingwall-hosted at the northern end.

At Nugget Hill and Teberu, and to the north, the main gold lodes are within the footwall greywacke, approximately 50-300 metres east of the footwall–hangingwall contact, and presumably are associated with moderately west dipping subsidiary shears. Both west and east dipping lodes are defined at Salman North: west-dipping along the main shear zone on the western granite margin (hangingwall shear zone); east-dipping parallel to footwall shears along and adjacent to the eastern granitoid margin. The highly fractured granitoid beneath the intersection of west and east dipping shears is extensively mineralized resembling a stockwork. Similar west and east dipping lodes are also present adjacent to and within the granitoid body at Akanko.

Gold mineralization is associated with a complex array of deformed quartz veins and arsenopyrite disseminations in silica-sericite-carbonate altered metasediments and granitoid. Petrography, metallurgical work and field observations suggest there are three principal styles of gold mineralization, as follows:

- Nuggety free gold within quartz±carbonate veins;
- Gold associated with fine acicular arsenopyrite disseminated (typically <5 per cent) in silica-sericite-carbonate altered wallrocks adjacent to mineralized quartz veins, and;

- Free particulate gold within the oxide zone, derived from the weathering of the former two primary mineralization types.

Most quartz veins are small (<2m thick and <10m long), and locally constitute up to 20 per cent of the rocks. At least five types of quartz vein sets are identified, all to some degree mineralized. Gold mineralization does not appear restricted to a particular vein set or sets, and there are zones where some vein types appear barren; the same vein types being mineralized elsewhere.

The relative timing of a gold mineralization event or events has not been satisfactorily established on the Salman Trend but a relatively late (syn-D3 dextral shearing) origin is currently preferred. Allibone et al. (2002b) proposed that mineralization at Bogosu (50-70 kilometres along strike to the north-northeast of Salman Trend) occurred during sinistral wrenching (equivalent to Salman D2 deformation), with gold mineralization concentrated principally in steeply plunging lodes in dilational left-hand jogs and to lesser extent shallow dipping lodes in right-hand restraining bends within the Central Fault Zone. The occurrence of the major Salman Central and North deposits on lefthand flexures agrees, at first glance, with the D2 sinistral wrench mineralization model. However, the shallow dipping footwall shears and lodes at Salman Central and Salman North are more geometrically compatible with mineralization on restraining-bend thrusts. The left-hand bends along the Salman Shear would have been restraining during dextral wrenching and mineralization may have occurred during D3 reactivation.

8.2 Adamus Deposit Type and Mineralization

The Adamus gold deposit, approximately 9km west of the Salman Trend, is hosted by a northwest striking, northeast dipping package of greywacke (footwall) and interbedded greywacke-phyllite (hangingwall). In the western (footwall) part of the deposit, gold mineralization is also hosted by a steeply northeast dipping granite dyke that gradually converges on the hangingwall to the northwest (Figure 10.4). Three cleavages are present: north-northeast striking S2, east striking S3, and locally a sub-horizontal S4. Gentle to open, metre-scale F2 folds are widespread, and small-scale open dome and basin F2-F3 interference patterns were locally observed in outcrop. The few facing directions observed suggest the meta-sedimentary package is overturned.

Gold mineralization is intimately associated with pyrite disseminated within and around a complex array of deformed pale grey to dark smokey grey quartz-carbonate-sericite±albite veins. A broad silica-sericite alteration zone about 200 metres thick and 450 metres long is developed in the footwall greywacke sequence and in some areas obliterates primary sedimentary structure. The silica-sericite alteration zone is more extensive than the gold-pyrite mineralization. Unlike the Salman Shear Zone, there is no significant component of refractory gold in the sulphide zone at Adamus. The surface projection of identified mineralization trends northwest for approximately 900 metres and is up to 400 metres wide (Figure 10.4). Within this zone seven distinct domains of varying orientation and style were used for the resource estimation.

Most of the gold mineralization is located in the south-eastern part of the deposit where a very broad, modestly north-west plunging (35°) zone transgresses the hangingwall greywacke-phyllite sequence into the intensely silica-sericite altered footwall greywacke unit. This broad zone passes upwards into an extensive horizontal mineralization zone around 50 metres beneath surface in the weathered zones. Mineralization becomes sporadic along trend to the northwest until the northern end of the granite intrusive is encountered. Limited drilling along the granite intrusive also indicates the presence of northeast dipping lodes parallel to the granite margins (Figure 10.4).

8.3 Bokrobo Deposit Type and Mineralization

The Bokrobo deposit is situated on the Nkroful mining license, 3.2 kilometres south-southeast of Adamus (Figure 7.2) and comprises generally north-south trending, steeply west dipping auriferous quartz veins hosted by strongly silica and iron carbonate altered, medium to coarse grained, carbonaceous greywacke. A north-south trending dolerite dyke, dipping sub-vertically to the west cuts the depth extension of the main vein. In the southern portion of the deposit, a west-northwest to east-southeast trending, steeply south-southeast plunging 'dyke-like' granitic intrusion is cut by numerous auriferous quartz veins forming a sheeted vein system. In the north of the deposit, mineralization generally occurs in a single lode, but in the south, the mineralization occurs as two main lodes and a series of narrow stacked lodes around or in the outer margins of the granite intrusion. Current interpretation has the main mineralization event occurring post-granite intrusion and prior to intrusion of the dolerite. Some remobilization occurred in favourable structural sites probably syn-dolerite intrusion.

8.4 Satellite Deposit Types and Mineralization

8.4.1 Nfutu

At Nfutu, 2.7 kilometres east of Adamus (Figure 7.2), the gold mineralization is in a similar structural setting as Adamus on the limbs of an F2 fold and in the core of an F3 fold. Mineralization occurs in shallowly east dipping greywacke sandwiched between two graphitic phyllite layers; the phyllite layers are thought to be a single folded bed. The layers change strike from northeast trending in the northwest part of the deposit to north-south in the southeast portion of the deposit. Local granitoids have been inferred from geophysical evidence, especially to the northeast of the deposit and albite alteration was intersected in some deep diamond drill holes.

The gold mineralization occurs within quartz-pyrite veins and pyrite disseminations, typically around veins, in the host rocks with silica, iron carbonate and sericite as the major alteration minerals. Multiple flat-lying to shallowly east dipping and southeast plunging lodes occur as stacked lenses that appear to thicken with depth. Mineralization is more prominent at the graphitic phyllite-greywacke contact than in the competent greywacke. Only traces of arsenopyrite were identified in drill core, and preliminary metallurgy shows that mineralization is non-refractory.

8.4.2 Aliva

At Aliva, 1.6 kilometres southeast of Bokrobo (Figure 7.2), the gold mineralization occurs as a series of stacked, shallowly east-dipping lenses subparallel to the east dipping contact between carbonaceous phyllite footwall and greywacke hangingwall. Mineralization appears to wrap around gentle to open F3 folds and is associated with quartz veins with sericite alteration and pyrite disseminations in the veins and surrounding host rocks. No arsenopyrite has been identified at Aliva and the mineralization in other deposits in this area are non-refractory. Metallurgical testwork on 76 samples returned over 90% recovery.

8.4.3 Akropon

Akropon is located 9 kilometres northwest of the processing plant and 10.5 kilometres northeast of Adamus deposit on the eastern edge of the Anwia Domain (Figure 7.2). Mineralization appears to dip moderately east within greywacke in an interbedded sequence of greywacke and andesitic volcanics (possibly reworked tuffs). The dip of the surrounding host rocks has not been determined, but preliminary indications suggest a moderate west dip. Mineralization occurs within a wide zone of silicification associated with pyrite and quartz veining with sericite as an accessory alteration mineral. The difference between the apparent dip of the mineralization and bedding suggests an en echelon vein array or possibly complex veining across a fold closure. Very little arsenopyrite has been identified at Akropon and the mineralization in other deposits in this area are non-refractory, but metallurgical testing is required.

8.4.4 Avrebo

At Avrebo, 12 kilometres southeast of the Salman deposit (Figure 7.2), the gold mineralization occurs in north-south to northeast-southwest trending, subvertical to steeply east-dipping, strongly sericite-iron carbonate altered lodes within metabasalt. The central high grade zone is situated on a north-south trending silicified structure, which is much more extensive in size than the gold-bearing zone. The silicified structure is cut by quartz vein arrays trending N30°E. Pyrite has been the only sulphide identified to date suggesting the sulphide gold component may be non-refractory. Metallurgical tests have not yet been completed.

9 Exploration

The main exploration activities completed by Endeavour (and previously as Adamus) and by other companies include:

- Soil sampling
- Ground geophysics
- Airborne geophysics
- Trenching
- Pitting
- RC drilling
- Core drilling.

The results of these activities are described in the following sections.

9.1 Soil Sampling

Approximately 85% of all permits comprising the Nzema property have been covered by 50m x 400m grid soil sampling with infill soil sampling (generally on 25m x 200m grid - slightly different sample spacings were used by various companies) around areas of interest (Figure 9.1). Those areas not covered by soil sampling include low lying swampy and riverine areas. Gold in soils over 200ppb has been the single most important exploration tool for locating areas with the potential to host significant mineralization.

The soil geochemistry has highlighted the Salman trend and several parallel trends that are along thrusts and shear zones in the Salman area; the Adamus deposit; the Aliva-Nfutu trend; and the Avrebo deposit and trend. Current exploration activities continue to investigate the geochemical anomalies on the property.

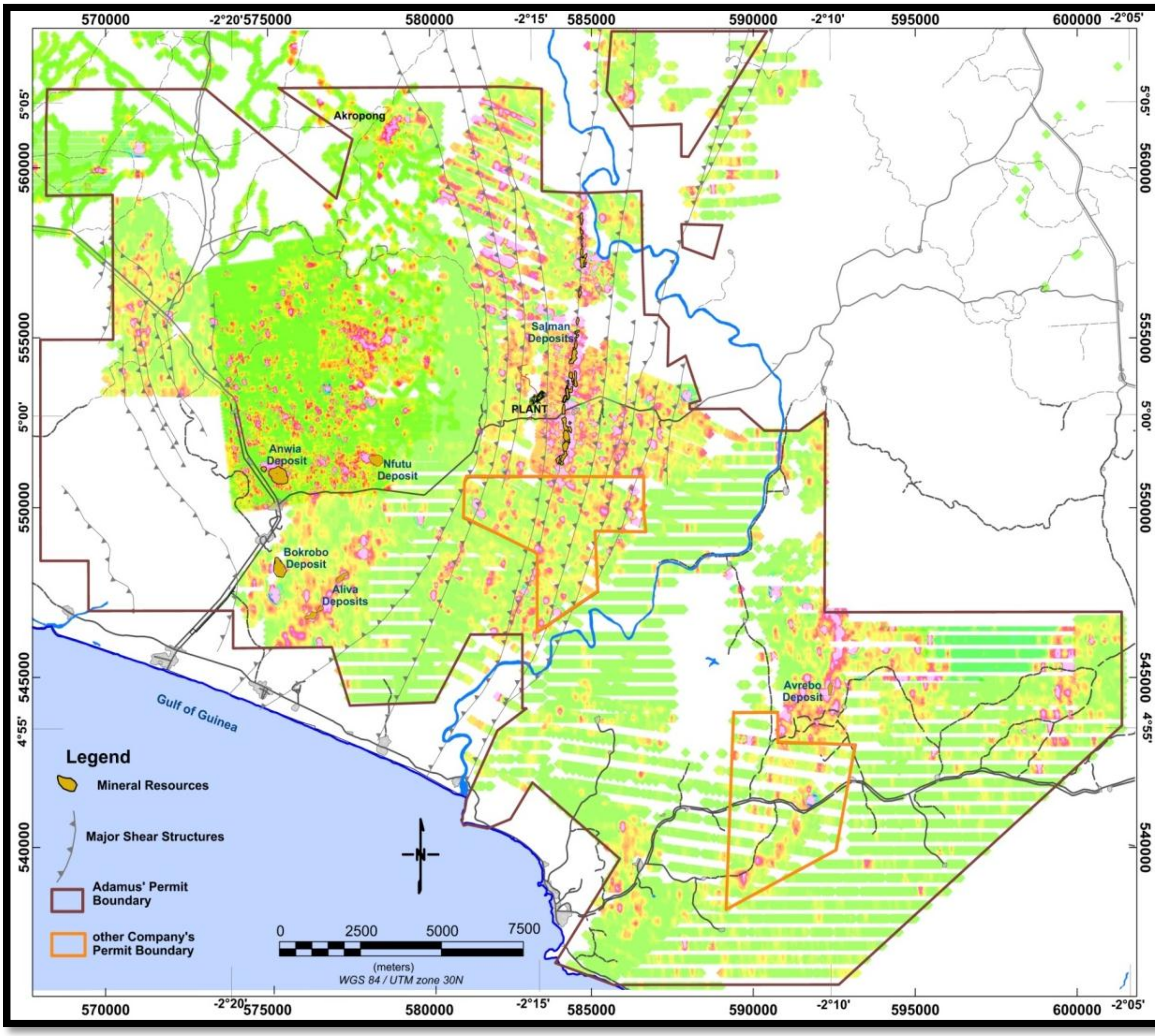


Figure 9.1: Distribution of Gold in Soil Samples

9.2 Ground Geophysics

The only ground geophysical surveys over the property were Induced Polarization (IP) surveys over prospects of interest(contracted by Adamus). The IP surveys were conducted over:

- Adamus and Nfutu in 2005 by Resource Potentials (13.2 line-km over Adamus and 13.2 line-km over Nfutu; Whitford, 2005)
- Salman South-Salman Central and Bokrobo in 2008 by Geophysics GPR (Botswana) Ltd. (12 line-km over Salman and 10 line-km over Bokrobo)
- Avrebo in 2009 conducted by Terranet Ltd. (11 line-km)

All IP surveys have been reprocessed into vertical pseudosections to aid drill targeting at each of the deposits/prospects.

9.3 Airborne Geophysics

Airborne geophysics over the property included helicopter electromagnetic surveys (DIGHEM) flown by Fugro Airborne Surveys Corp at the following times and areas:

- March 2004 Fugro flew 292.7 line-km over Salman Trend and Adamus (090 azimuth; line separation 150m; EM sensor at 30m above ground level) (Prichard, 2004)
- November 2004 Fugro flew 1,362.9 line-km over portions of the Ankobra PL and Apa Tam PL (including the area around Avrebo) and infilling the Salman Trend to Adamus area not covered by the survey mentioned above (090 azimuth; line separation 150m; EM sensor at 30m above ground level) (Prichard, 2005)
- 2006 Fugro flew 899 line-km over the Nkroful ML (covering Bokrobo and Aliva), Nkroful ML area and Mfuma PL (090 azimuth; line separation 100m; EM sensor at 30m above ground level).

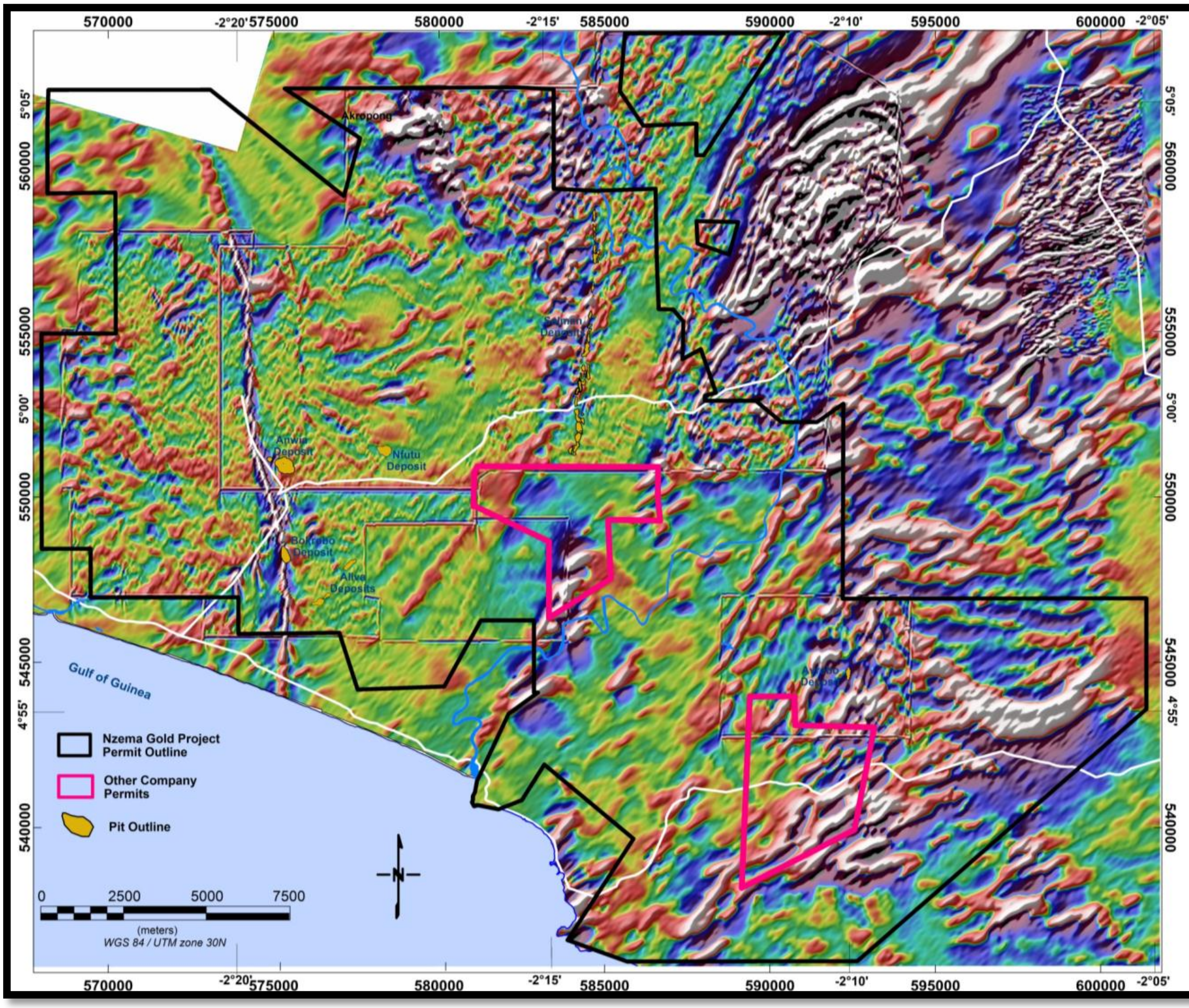


Figure 9.2: Airborne Geophysics - Total Magnetic Intensity, reduced to pole first vertical derivative

In 2004 Fugro also flew a helicopter borne magnetic horizontal gradient (Midas) and radiometric survey over Adamus properties (at the time) in the Nzema area north of 550,000N (WGS84, 30N coordinates). A total of 2,480 line-kms were flown, but no details were available on line spacing.

In 2011 Southern Geosciences reprocessed all airborne geophysics into single set of integrated maps (see Figure 9.2), including Ghana regional surveys (government data) for those parts of the permits not already covered. In that same year Southern Geoscience reprocessed the IP surveys creating 3D psuedosections and better defining anomalous areas of interest within the specific prospects.

The airborne geophysical surveys highlight several of the key features such as faults, shear zones, certain rock packages, intrusives and dykes.

9.4 Trenching and Pitting

Approximately 16,676m of trenching was undertaken in several campaigns by TEMCO, BHP, AGR, EQ Resources and Adamus (Table 9.1) to delineate the surface expression of mineralized zones. The breakdown by company is approximately 4,882m of TEMCO trenches (Salman Trend), 237m of BHP trenches (Salman Trend), 1,111m of AGR trenches (Salman Trend), 660m of EQ Resources trenches (Avrebo) and the remainder was Adamus trenches in all areas.

Table 9.1: Trenches Included in Exploration Database for Nzema Property

Company	Prospect	Number of Trenches	Total (metres)
TEMCO, BHP, AGR, Adamus	Akanko North	9	967.5
	Akanko Central	32	1,774.6
	Akanko South	3	213.6
	North Hill	2	113.2
	Salman North	27	1,616.8
	Teberu	10	495
	Nugget Hill	17	972
	Salman Central	38	2,671.8
	Salman South	33	2,463.7
	Salman Trend Total	171	11,288.2
Adamus	Akropon	19	689.7
	Aliva	37	1,809.4
	Adamus (Anwia)	3	278.4
EQ Resources	Avrebo	17	2,259.4
Adamus	Bokrobo	3	59.7
	Nfutu	3	292
	Total	253	16,676.80
Table includes horizontal channel sampling of large artisanal pits (>10m)			

Aliva trench sampling includes horizontal channel sampling throughout and vertical channel samples every 10m (45 vertical channel samples collected) in select trenches. All other trenches were sampled horizontally using 2m or 4m sample intervals.

Most of the trenches were excavated manually to depths of 2 to 3 metres, generally reaching the mottled clays around the base of the laterite gravel and, particularly along the ridges at Salman Central and North, the top of the saprolite. BHP and AGR deepened and re-sampled some of the original TEMCO trenches, returning results of similar magnitude and confirming the validity of the TEMCO work.

Adamus also channel sampled 23 selected bulldozed drill lines for 1,288m at Salman Central, Salman North and Akanko where saprolitic and mottled clay zone materials were exposed. The channel lines at Salman Central and Akanko trend UTM east-west; those at Salman North were oriented approximately northwest (300° azimuth).

A recommendation arising from the February 2006 Salman resource estimate was to obtain vertical channel samples to better define gold grades in the near-surface, deflated laterite profile and the uppermost saprolite. Pits were manually excavated to depths of 3 to 4m on nominal 25mEast x 50mNorth spacing over prospects of interest (Table 9.2). All pits were sampled with vertical channel samples with lengths of individual samples between 0.5 and 1.5m, the majority being 1m. In addition, 66 of the Aliva pits were sample horizontally in the saprolite near the base of the pit using 1m sample lengths.

Table 9.2: Pit Sampling Over Prospects

Prospect	Number of Pits	Total metres sampled
North Hill	49	188.1
Salman North	61	226.0
Salman Central	128	457.4
Salman South	119	444.8
Salman Trend Total	357	1,316.6
Akropon	30	94.3
Aliva	196	726.7
Total	583	2,137.3

9.5 Drilling Methods

The current mineral resource estimate is based on a combined total of approximately 297,000 metres of reverse circulation percussion ("RC") and core drilling. A breakdown of the various drilling completed on the each deposit is given in Table 10.1 and described in Sections 10.1 to 10.5. An additional approximately 69,700m of all types of drilling occur on less advanced prospects on the Nzema property.

First pass drilling in a new area or on an extension along known structural trends usually consists of reconnaissance RC holes, drilled heal-to-toe to 30m depth at -45° to -50° dip and oriented close to perpendicular to anticipated strike (especially for known mineralization from trenches or historic drilling nearby). Reconnaissance RC drilling is generally followed by deeper RC drilling to follow-up significant intersections, and if deep mineralization is encountered then RC precollars followed by core drilling (DD tails) is completed. Diamond drilling (DD) is employed later, as necessary, to confirm RC intersections of significance, provide structural information, geotechnical evaluation and to provide materials for metallurgical studies.

Drill spacing over each resource area varies from 50m x 25m to 25m x 25m, with areas contributing the bulk of resource ounces drilled at the closer spacing for Indicated resource classification. In the central portions of some deposits the drill hole spacing is tighter due to drill programs being conducted at different bearings. The drilling and the associated surveying methods used in the deposit areas are detailed in Section 10 below.

10 Drilling

10.1 Introduction

Table 10.1 summarizes drilling conducted on all of the deposits reporting resources in this Technical Report. Approximately 297,000m of RC and core drilling was completed on the Nzema property.

All Adamus RC drilling was done by designated RC rigs or as RC pre-collars using multipurpose RC-DD rigs using a face-sampling hammer and button bits of 5.25” or 5.75” diameter. The RC and RCD drill holes were typically collared with PVC pipe down to 6 or 12 metres. All RC holes were logged on a one metre basis for lithology, mineralization, alteration, weathering and oxidation, and qualitative moisture content (dry, moist or wet) was recorded. RC samples were weighed on a campaign basis to qualitatively check sample recoveries.

The diamond drill holes were variously drilled from surface or from RC pre-collars up to a nominal depth of 80 to 100 metres. Diamond drilling from surface was collared in HQ3 through the saprolite and reduced to HQ at a nominal depth of 30m and occasionally to NQ for holes below about 70m to 100m. Diamond drill core was typically extracted in 3 metre runs and fresh core was oriented using a spear, Craelius device, or EziMark device at 6 metre intervals. The core was placed in core trays by the drilling crew, with annotated core blocks inserted between core runs and at the end of the hole. Recovery was measured on site. Fresh core was marked with the intervals and a bottom-of-hole line (based on orientation marks).

The core trays were then moved to the Nzema core yard for geological logging, sampling (described in section 11) and storage. Structural orientations were then measured relative to the bottom-of-hole line. Logged core recoveries within the primary profile were consistently high, typically 95-100 per cent; and variable within the oxide zone, generally over 70 per cent. Minor intervals within the transition zone, especially within the highly deformed sequences, had poor recoveries in the 30-50 per cent range.

10.2 Salman Trend Drilling

BHP (1994-1995) completed 71 RC drill holes for 6,964m and 4 diamond drill core holes for 571m on 12 traverses spread over 4 kilometres of strike along the Salman Trend (Table 10.1). The diamond drilling was conducted by Stanley Drilling Services using a truck mounted LM55 electric hydraulic diamond drill rig. Ausdrill carried out the RC drilling using UDR650 and Drilteck D25K rigs with 4.5” drill pipe and 5” RC46 face sampling hammer with 5.25” bit. Most holes were oriented inclined at -45° towards 300° magnetic azimuth (Salman local grid west). All holes were geologically logged on a one metre basis. Diamond drill core was not oriented for the collection of structural information.

Niagara drilling on the Akanko deposits was done in 2006 immediately prior to Adamus acquiring the prospects (Table 10.1). Details of the drill program have been lost, but the collars, azimuth, logs and assays were incorporated into the Adamus database and subsequently verified by Adamus drilling over the same areas.

Adamus completed the bulk of the drilling on the Salman Trend. The typical RC drilling and logging and drill core logging and handling procedures practiced by Adamus are described in the introduction (section 10.1) of this chapter. Figures 10.1 to 10.3 show drill plans for the Salman Trend.

Table 10.1: Drilling by Campaign for All Deposits with Resources

Salman	Diamond Drilling (DD)				RC-DD Drilling						Reverse Circulation (RC) Drilling			
Year	**Company**	**Contractor**	**Holes**	**(m)**	**Company**	**Contractor**	**Holes**	**RC (m)**	**DD (m)**	**Total (m)**	**Company**	**Contractor**	**Holes**	**(m)**
1994-95	BHP	Stanley	4	571.3							BHP	Ausdrill	71	6,964.0
2002-03											Adamus	St Lambert	60	5,776.0
2003	Adamus	Minerex	1	156.0	Adamus	Minerex	6	392.0	1,037.9	1,429.9	Adamus	Minerex	64	4,978.0
2004-05	Adamus	Minerex	6	481.2	Adamus	Minerex	11	766.0	1,280.3	2,046.3	Adamus	Minerex	447	34,366.0
2006	Adamus	Minerex	6	679.3	Adamus	AMS	1	69.8	182.8	252.6	Adamus	Minerex	143	8,255.0
2006											Adamus	AMS	218	14,432.0
2006											Niagara	BLY	38	3,201.0
2007											Adamus	AMS	89	5,530.0
2008	Adamus	AMS	2	292.3	Adamus	AMS	22	2,001.0	2,017.6	4,018.6	Adamus	AMS	58	5,126.0
2008											Adamus	Unknown	34	2,934.0
2010	Adamus	AMS	6	737.8	Adamus	AMS	25	3,063.0	1,584.0	4,647.0	Adamus	AMS	97	7,217.0
2011	Adamus	AMS	10	2,094.6	Adamus	AMS	15	1,245.7	1,548.4	2,794.1	Adamus	AMS	296	17,572.0
2012	Endeavour	various	80	12,170.7	Endeavour	various	27	1,792.9	2,924.6	4,717.5	Endeavour	AMS	92	6,044.0
2012											Endeavour	Atlantic	295	9,721.0
			115	17,183.2			107	9,330.4	10,575.6	19,906.0			2,002	132,116.0
Anwia[6]	**Diamond Drilling (DD)**				**RC-DD Drilling**						**Reverse Circulation (RC) Drilling**			
Year	**Company**	**Contractor**	**Holes**	**(m)**	**Company**	**Contractor**	**Holes**	**RC (m)**	**DD (m)**	**Total (m)**	**Company**	**Contractor**	**Holes**	**(m)**
1995-98	Semafo	St Lambert	75	12,911.5							Semafo	St Lambert	350	24,951.0
1998-											Samax	Unknown	150	8,913.0
2003											Adamus	Unknown	3	330.0
2004-05	Adamus	Minerex	3	490.6	Adamus	Minerex	17	1,162.0	2,843.9	4,005.9	Adamus	Minerex	10	768.0
2006	Adamus	Minerex	5	717.8	Adamus	Minerex	2	156.0	129.9	285.9	Adamus	AMS	9	482.0
2006					Adamus	AMS	20	2,264.0	2,712.8	4,976.8	Adamus	Minerex	34	2,541.0
2007					Adamus	Geodrill	10	729.8	2,573.3	3,303.1	Adamus	Geodrill	7	403.0
2011	Endeavour	AMS	2	320.9	Adamus	AMS	5	566.0	132.1	698.1	Endeavour	Atlantic	1	126.5
2011-12	Endeavour	AMS	1	213.4							Endeavour	AMS	12	1,563.0
			86	14,654.2			54	4,877.8	8,392.0	13,269.8			576	40,077.5

[6] Now referred to as Adamus.

Bokrobo	Diamond Drilling (DD)				RC-DD Drilling						Reverse Circulation (RC) Drilling			
Year	Company	Contractor	Holes	(m)	Company	Contractor	Holes	RC (m)	DD (m)	Total (m)	Company	Contractor	Holes	(m)
1996-98	Samax	Unknown	5	402.9	Samax	Unknown	9	753.9	1,305.5	2,059.4	Samax	Unknown	46	3,293.9
2006	Adamus	Minerex	4	343.7	Adamus	Minerex	18	386.9	1,337.3	1,724.2	Adamus	Minerex	1	26.0
2007					Adamus	Geodrill	17	952.2	1,818.8	2,771.0	Adamus	AMS	5	327.0
2007					Adamus	AMS	1	81.0	87.3	168.3	Adamus	Geodrill	2	103.0
2008	Adamus	Unknown	14	1,716.8	Adamus	Unknown	5	125.0	1,191.5	1,316.5	Adamus	Unknown	4	203.0
			18	2,060.5			41	1,545.1	4,434.9	5,980.0			12	659.0
Aliva	**Diamond Drilling (DD)**				**RC-DD Drilling**						**Reverse Circulation (RC) Drilling**			
Year	**Company**	**Contractor**	**Holes**	**(m)**	**Company**	**Contractor**	**Holes**	**RC (m)**	**DD (m)**	**Total (m)**	**Company**	**Contractor**	**Holes**	**(m)**
1996-98											Semafo	unknown	31	1,813.0
2007											Adamus	AMS	88	4,778.0
2011	Adamus	AMS	4	454.7							Adamus	AMS	20	1,379.0
2012											Endeavour	Atlantic	115	4748.0
			4	454.7			0	0.0	0.0	0.0			194	9,117.0
Nfutu	**Diamond Drilling (DD)**				**RC-DD Drilling**						**Reverse Circulation (RC) Drilling**			
Year	**Company**	**Contractor**	**Holes**	**(m)**	**Company**	**Contractor**	**Holes**	**RC (m)**	**DD (m)**	**Total (m)**	**Company**	**Contractor**	**Holes**	**(m)**
1997											Semafo	Unknown	87	5,717.0
2004-05	Adamus	Minerex	3	419.7	Adamus	Minerex	2	132.0	246.8	378.8	Adamus	Minerex	38	3,301.0
2011-12	Adamus	various	16	2,159.3							Adamus/ED	AMS	96	8,648.0
			19	2,579.0			2	132.0	246.8	378.8			221	17,666.0
Avrebo	**Diamond Drilling (DD)**				**RC-DD Drilling**						**Reverse Circulation (RC) Drilling**			
Year	**Company**	**Contractor**	**Holes**	**(m)**	**Company**	**Contractor**	**Holes**	**RC (m)**	**DD (m)**	**Total (m)**	**Company**	**Contractor**	**Holes**	**(m)**
1996											EQ	BLY	12	1,040.0
2005					Adamus	Unknown	4	215.0	390.2	605.2	Adamus	Minerex	18	1,309.0
2007					Adamus	AMS	15	711.1	1,692.3	2,403.4	Adamus	AMS	47	3,735.5
2012											Endeavour	Atlantic	305	7,641.0
			0	0.0			19	926.1	2,082.5	3,008.6			382	13,725.5
Akropon	**Diamond Drilling (DD)**				**RC-DD Drilling**						**Reverse Circulation (RC) Drilling**			
Year	**Company**	**Contractor**	**Holes**	**(m)**	**Company**	**Contractor**	**Holes**	**RC (m)**	**DD (m)**	**Total (m)**	**Company**	**Contractor**	**Holes**	**(m)**
1997	Semafo		3	937.5										
2007											Adamus	AMS	23	1,811.0
2012											Endeavour	AMS	14	1,436.0
			3	937.5			0	0.0	0.0	0.0			37	3,247.0

The Salman Trend drilling program that was included in the last resource estimate (2008) concluded in September of 2008. There was a hiatus in drilling during 2009 and early 2010 for mine construction and project commissioning. The current drill programs, conducted between 2010 to 2012, aimed to extend the depth of known mineralization below the existing resource and infill and extend mineralization in oxide pits. At the completion of this current program a total of 16,612m of diamond drill core drilling, 9,330m of RC pre-collar drilling, 10,576m of DD tails and 121,951m of RC drilling had been completed on the Salman Trend deposits for inclusion in the current resource estimates.

Almost all of Adamus' drilling within the Salman Trend has been conducted on east-west (UTM Zone 30N, WGS84) lines which are approximately perpendicular to the trend of the gold mineralization. The exception is at Salman North where the initial Adamus drilling is parallel to that of BHP (i.e. bearing 120 - 300°); the Salman North drilling was changed to east-west lines during 2010. Most holes were drilled at an inclination of -45° to -55° and towards either east or west as appropriate for the dip of the targeted lode. A few holes were drilled with inclinations between -60° to -90°, and a series of 6 RC holes were drilled approximately parallel to strike (c. north-south) at Salman Central and Nugget Hill to test for mineralization continuity within lodes.

Adamus also undertook the additional drilling of:

- 3,370m of RC drilling in 50 holes for metallurgical testwork samples
- 572m of PQ core drilling in 8 holes for samples for comminution and metallurgical testwork samples
- 1,121m of HQ core drilling in 9 geotechnical holes
- 800m of RC and open hole drilling for17 trial dewatering bores and observation wells.

Eight RC holes at Salman South, Salman Central, Nugget Hill, Teberu and Salman North were twinned with HQ diamond drill core holes to confirm the integrity of the RC drilling.

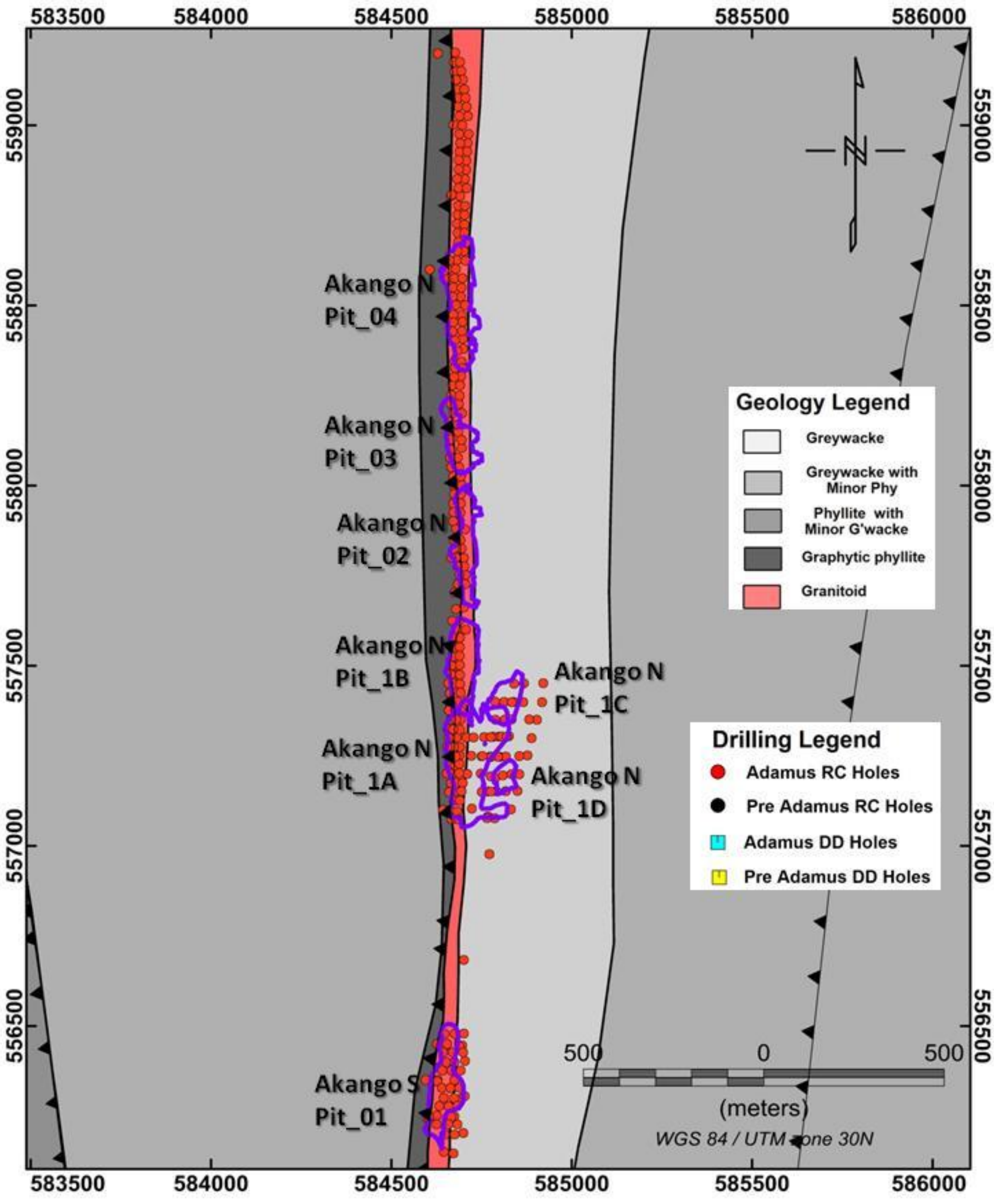


Figure 10.1: Drill Plan for Akanko North, Akanko Central and Akanko South on the Salman Trend

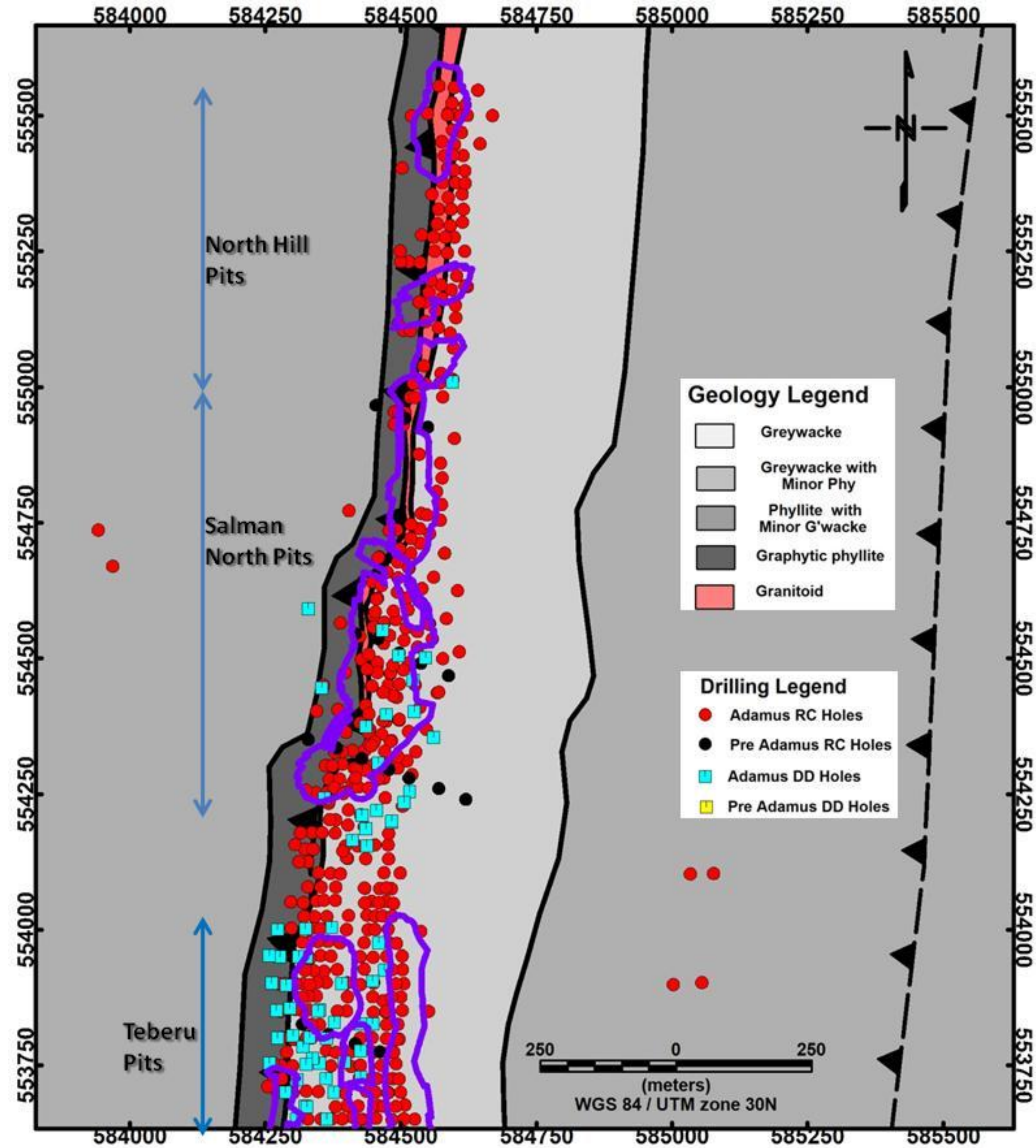


Figure 10.2: Drill plan for North Hill, Salman North and Teberu along the Salman Trend

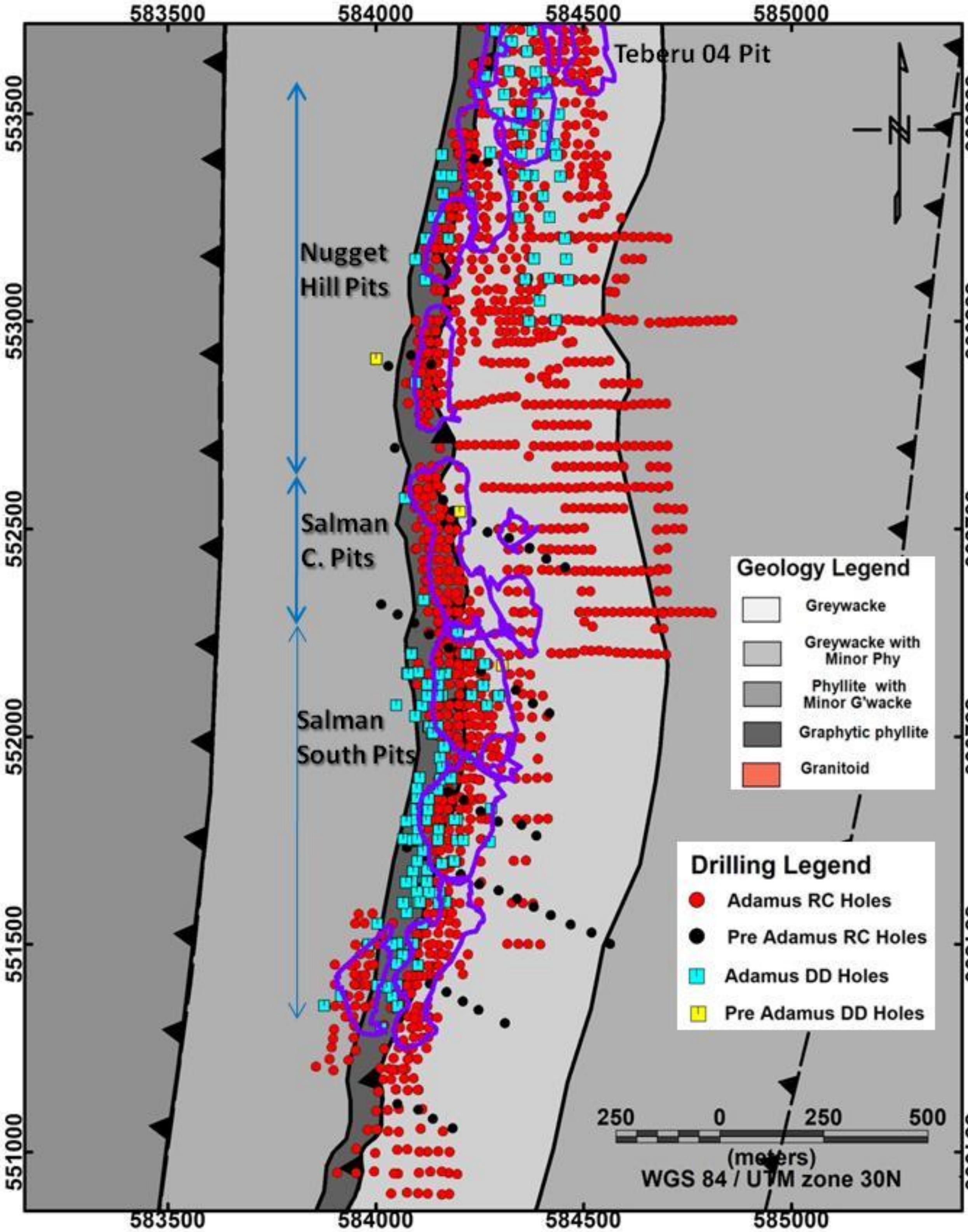


Figure 10.3: Drill Plan for Nugget Hill, Salman Central and Salman South along the Salman Trend

10.3 Adamus Deposit Drilling

The bulk of the drilling at Adamus[7] was conducted by Semafo/Samax, with additional drilling by Adamus to confirm the earlier results and expand the resource. A plan map is provided in Figure 10.4.

Semafo drilled a total of 350 RC holes for 24,951m and 75 diamond drill core holes for 12,912m at the Adamus deposit between 1995 and 1998. Most of the drilling was done by St Lambert Drilling Ltd (Quebec, Canada). All Semafo RC and diamond drill holes were geologically logged, although much data was subsequently lost when Samax later rationalized the lithological codes. Most holes were declined between 50° and 70° and four major azimuths were drilled; UTM northeast, northwest, southeast, and southwest using Semafo's Adamus local grid. Semafo diamond drill core was not oriented for structural measurements.

Two campaigns of RC drilling were undertaken by Samax at Adamus during the 1998-2000 period for a combined 8,913m in 150 holes. The holes were on approximately 15 metre centres and all were vertical in the central portion of the deposit. Two PQ diamond drill core tails were drilled from RC pre-collars and one PQ hole from surface, for a total of 148 m. The PQ drill core was used for geotechnical and metallurgical work (and therefore is not included in Table 10.1). Detailed geological and geotechnical logs were compiled; a photographic record of the core (core blocks, orientation marks and bulk density determination intervals) was prepared and magnetic susceptibility measurements were recorded.

The typical RC drilling and logging and drill core logging and handling procedures practiced by Adamus at Adamus are as described in the introduction (section 10.1) of this chapter. Figure 10.4 shows the drill plan for the Adamus deposit.

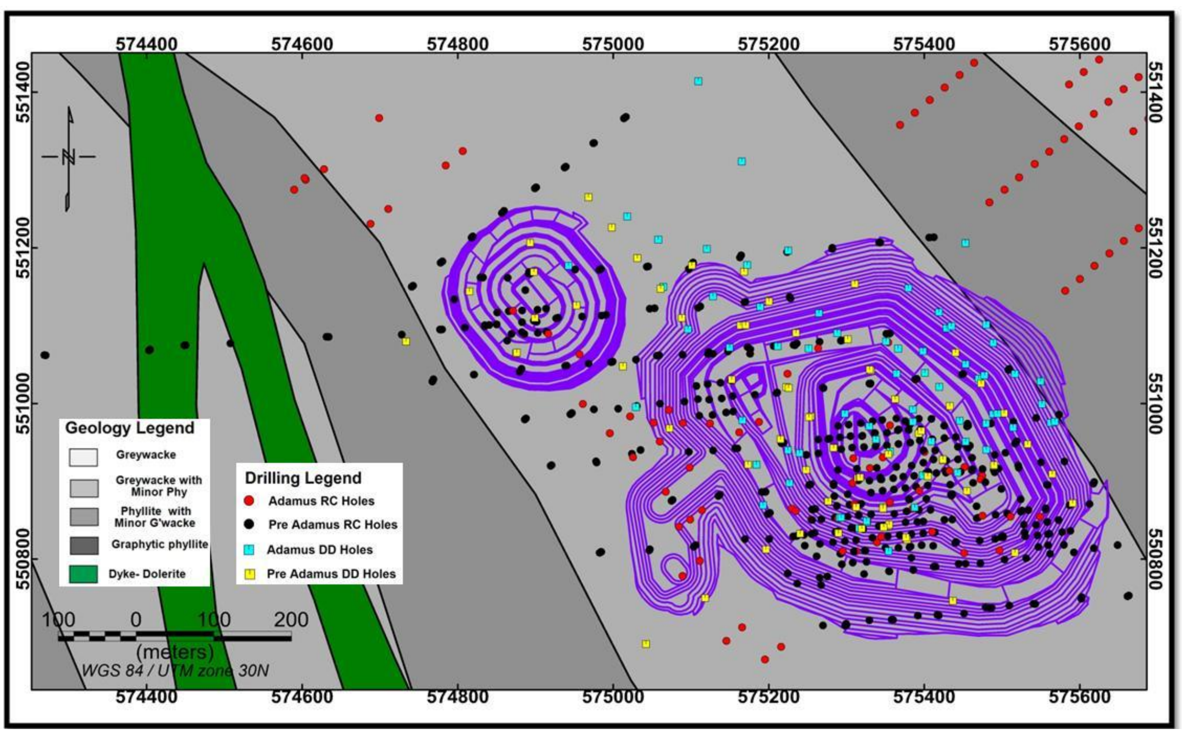


Figure 10.4: Drill Plan for Adamus Deposit

[7] Anwia and Teleku-Bokazu is collectively referred to as Adamus.

The majority of the Adamus drill holes were inclined toward the southwest, parallel to the Semafo grid, and declinations range from -50° to -90° (dominantly -60°) designed to provide an optimal intersection through the mineralized zones. A few of the Adamus holes were drilled to the northeast and southeast, again parallel to the Semafo grid. Endeavour/Adamus contributed 1,725m DD, 4,878m RC pre-collars, 8,392m DD tails and 15,127m RC drilling to the database being used for resource estimation.

Additional Adamus drilling by Endeavour/Adamus includes:

- 552m of RC drilling in 7 holes and 364m of PQ diamond drill coring in 5 holes that were drilled to gain samples for metallurgical testwork
- 902m (including 156m in 2 RC pre-collars) of HQ diamond drill coring was completed in 6 holes for geotechnical logging in 2006-2007 and two HQ diamond drill holes for 321m were drilled in 2012 for geotechnical logging and pit slope stability
- 270m of RC and open hole drilling in 5 trial dewatering bores and observation wells.

10.4 Bokrobo Deposit Drilling

Samax conducted the initial drilling over Bokrobo in 1996-1997. Samax drilled 9 RC holes for 680m on 090° bearing and then drilled 17 RC and 5 DD holes on a 030° bearing for 1,145m RC and 403m DD. The third drilling campaign in 1998 was conducted on the 090° bearing with 20 RC holes for 1,529m and 9 RCD holes for 1,305.5m RC and 753.9m DD. Drilling methods and protocols are the same as those described for Semafo/Samax drilling at Adamus in Section 10.3.

At the Bokrobo Deposit, all drilling done by Adamus occurred between 2006 and 2008 and was included in the database used for the 2008 resource estimate; no additional drilling has taken place. Drilling at Bokrobo by Adamus totalled 2,061m of DD, 1,545m RC pre-collars, 4,435m DD tails and 659m of RC. The typical RC drilling and logging and drill core logging and handling procedures practiced by Adamus at Bokrobo are as described in the introduction (section 10.1) of this chapter. The drill holes at the Bokrobo Deposit are shown in Figure 10.5.

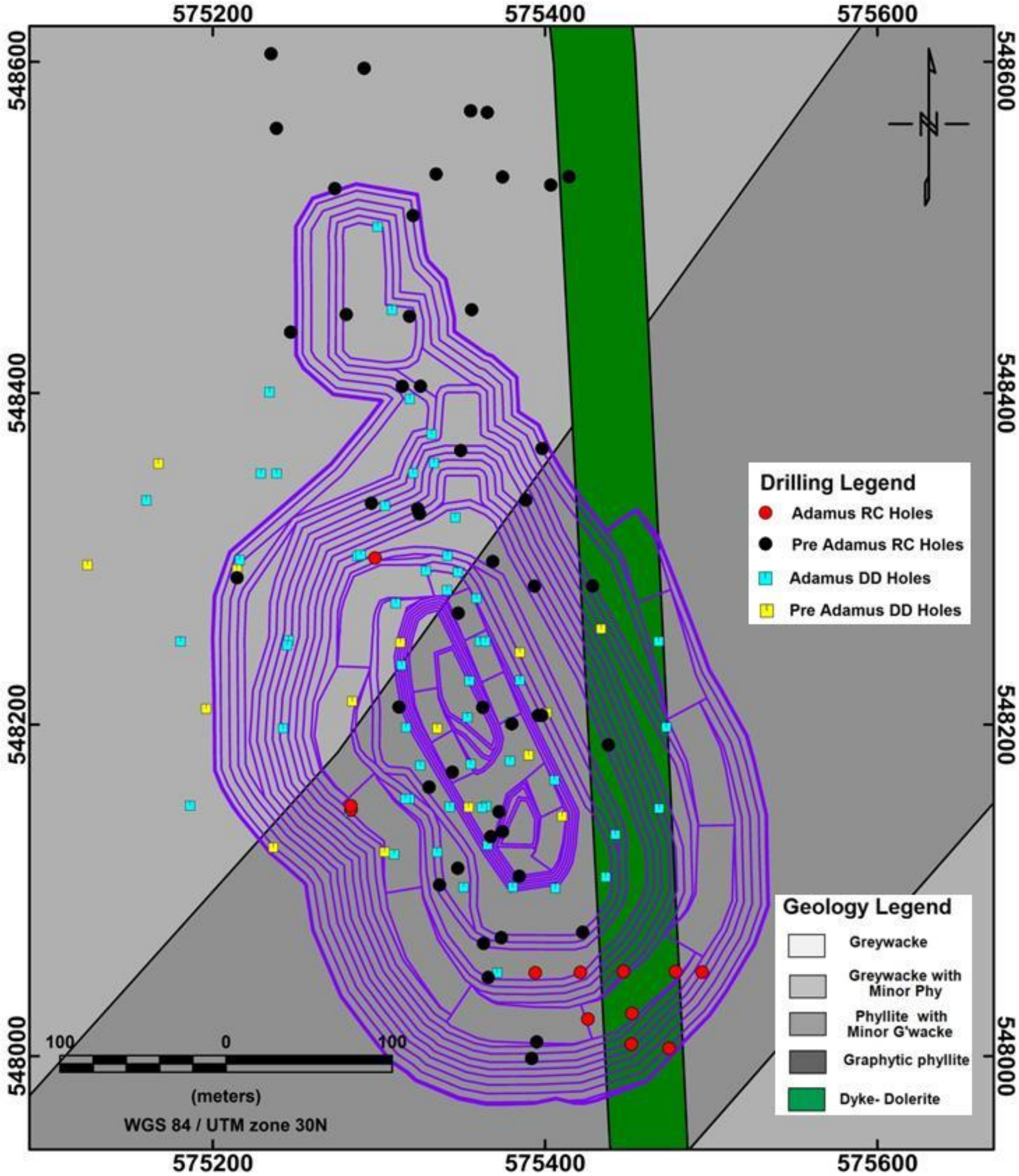


Figure 10.5: Drill plan for Bokrobo Deposit

10.5 Satellite Deposit Drilling

All Adamus diamond and RC drill holes on the satellite deposits were conducted according to Adamus' standard RC and diamond drill hole procedures as described in Section 10.1.

At the Aliva Deposit the initial drilling was done by Semafo/Samax between 1996-1998. A total of 31 RC holes for 1,813m were drilled on 50m and 100m lines over most of the 2.5km long +200ppb soil anomaly on an azimuth of 315°. Drilling methods and protocols are the same as those described for Semafo/Samax drilling at Adamus in Section 10.3. Much of the data for these drill programs has been lost and the holes were not included in the database used for resource estimation because they could not be verified.

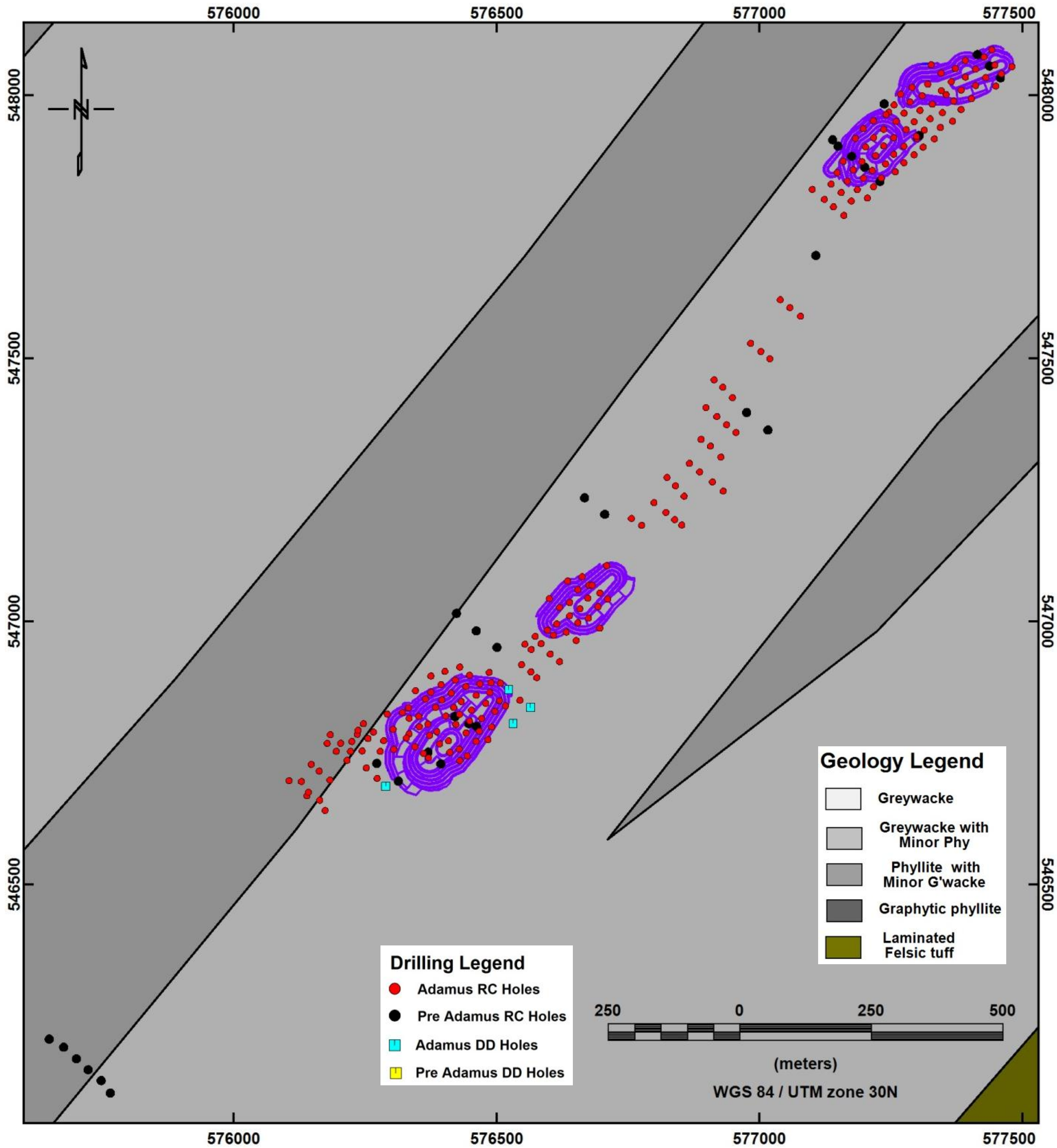


Figure 10.6: Drill plan for Aliva

Adamus drilled the Aliva deposit in 2007 and 2012 to confirm previous results and then late 2012 to complete infill drilling on a 25m by 25m grid for resource estimation. Adamus drilling included 455m DD and 9,117m RC drilling in all campaigns. Additional drilling by Adamus included 2 HQ holes for 180m drilled for geotechnical and pit slope stability studies. The drill plan of Aliva is given in Figure 10.6.

Nfutu was initially drilled by Semafo in 1997 with 87 RC holes for 5,717m. Drilling methods and protocols are the same as those described for Semafo/Samax drilling at Adamus in Section 10.3. The Semafo drilling was followed by Adamus drilling in 2004-05 and 2011-12 consisting of 19 DD holes for 2,579m to confirm deeper mineralization, 2 RCD holes for 132m RC and 247m DD and 134 RC holes for 11,949m. All drilling was done on a 045° azimuth, -45° to -50° dip. The DD holes were mainly used for twinning RC holes or to intersect the same mineralization intersected by nearby RC holes for confirmation. The drill plan for Nfutu is given in Figure 10.7.

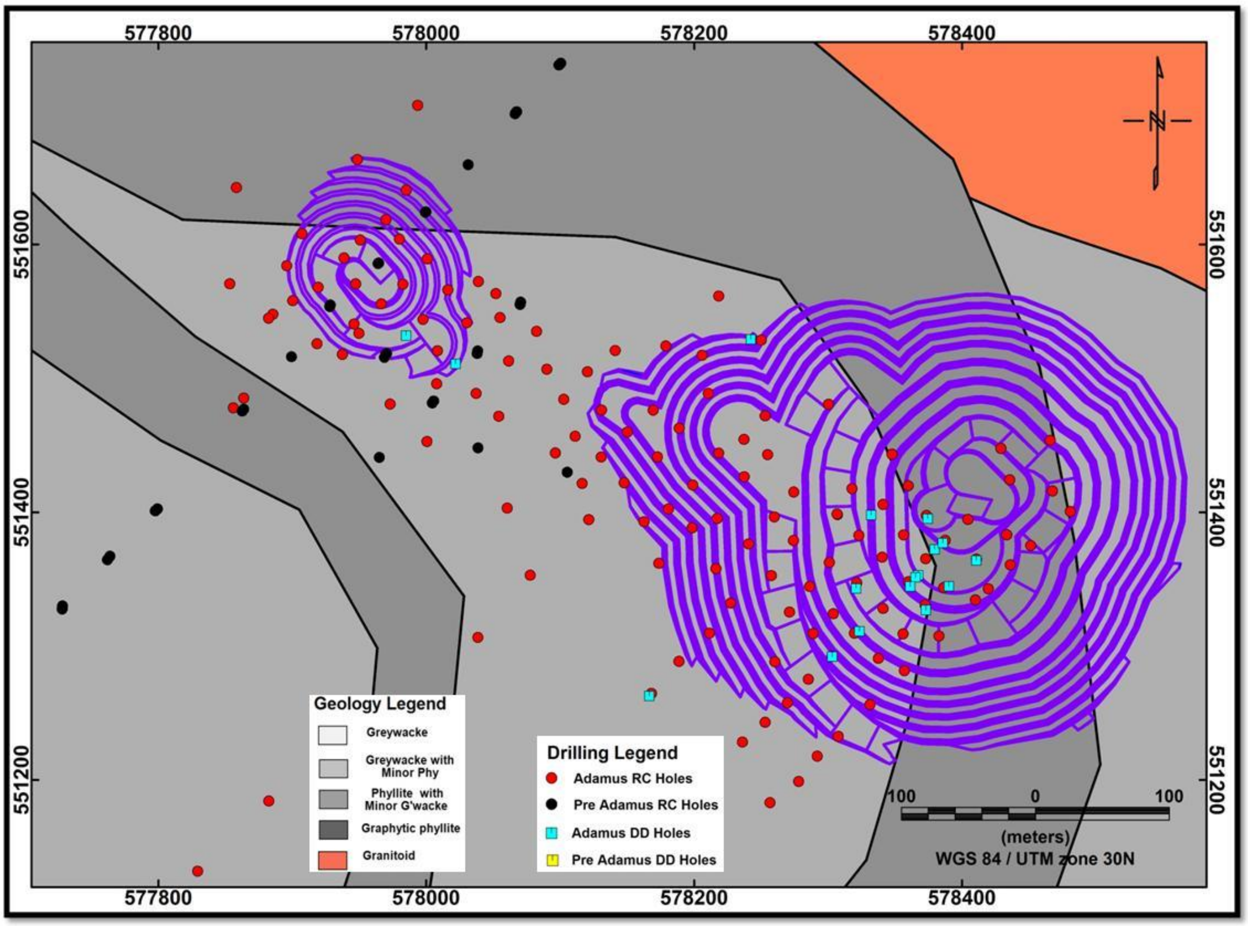


Figure 10.7: Drill Plan for Nfutu Deposit[8]

The initial drilling at Avrebo consists of 12 RC holes for 1,040m drilled by EQ Resources in 1997 as reconnaissance drilling. These holes do not have systematic spacing or azimuths (7 drilled at 104°, 3 at 354°, 1 at 284° and 1 at 315°). The details for this drilling was not available, but a database of hole collars, azimuth, logs and assays was available and was later confirmed by Adamus drilling.

Adamus drilled two campaigns of RC holes in 2005 with the first campaign consisting of 7 holes for 631m drilled on 100° azimuth on 50m spaced lines and the second campaign of 11 holes for 678m drilled on

[8] Additional holes drilled in the Nfutu area are not shown on this figure.

315°azimuth on 20m spaced lines. All holes were drilled with -45° to -50° dips. All further drilling at Avrebo deposit was conducted on the 315° azimuth and consisted of 47 RC holes for 3,735m and 19 RCD holes for 926m RC and 2,083m DD. The drill plan for Avrebo is given in Figure 10.8.

In 2012 Endeavour/Adamus drilled shallow reconnaissance RC holes (30m deep on -45°dip) on 200m line spacings along the 2km of +200ppb soil anomaly north of the current Avrebo resource. This drill campaign consisted of 305 holes for 7,641m over 10 lines (some lines could not be drilled or could not be completely drilled due to low-lying swampy ground or rubber plantations).

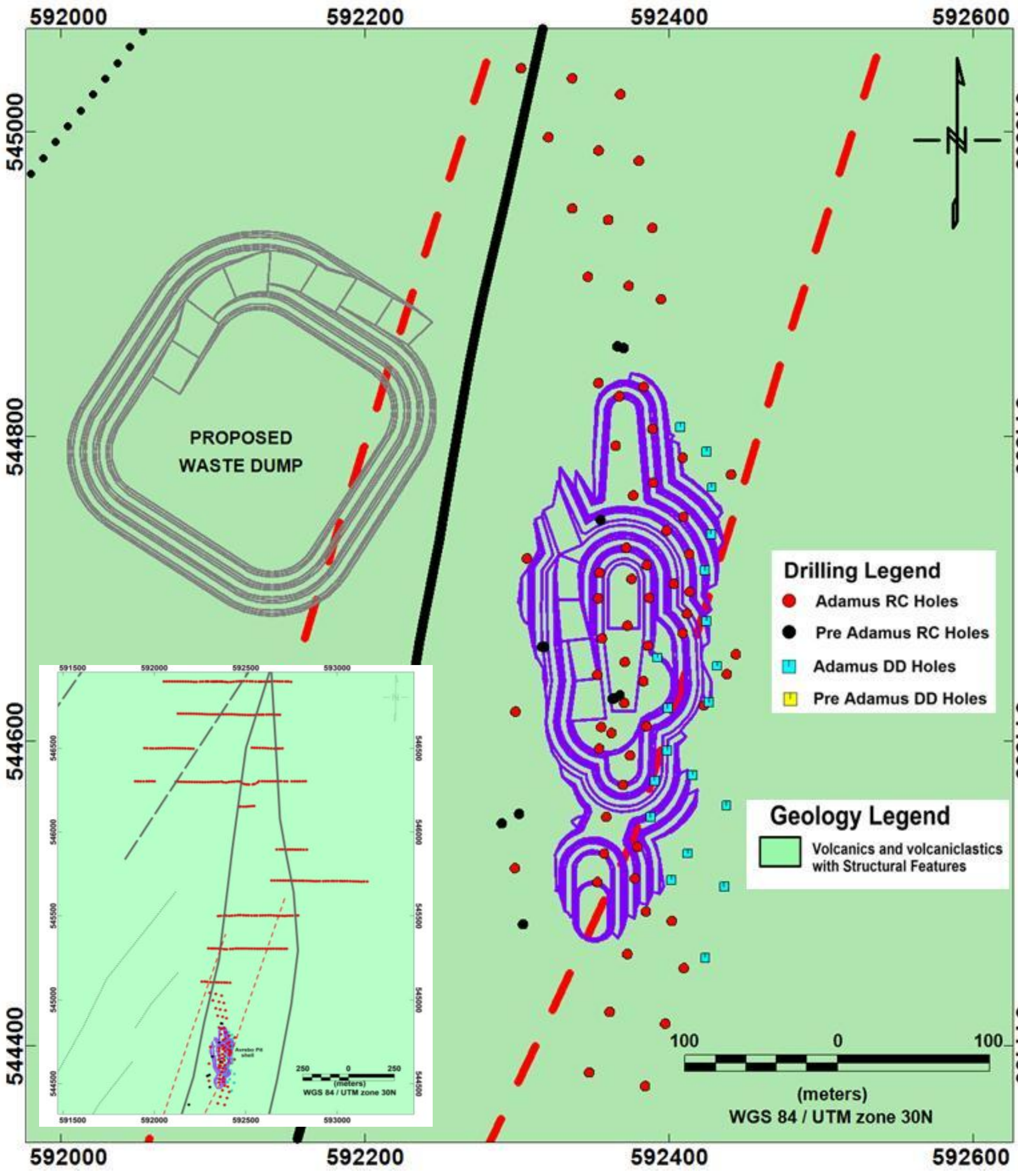


Figure 10.8: Drill Plan for Avrebo Deposit and Surrounding Areas (inset map) on the Avrebo Trend

The initial drilling at Akropon was 3 DD holes for 937.5m drilled by Semafo and the drilling follows the same Semafo procedures outlined for Adamus drilling (Section 10.3). These holes were mainly stratigraphic holes as they intersected limited mineralization below 50m and were drilled at 090° (one hole) or 270° (2 holes) at -50°. Endeavour/Adamus drilled 37 RC holes for 3,247m to intersect mineralization below trench mineralization in two different campaigns in 2007 and 2012. The Adamus holes are all drilled at 090° azimuth with dips of -45° or -50° on 50m to 100m line spacings as shown in the drill plan for Akropon (Figure 10.9).

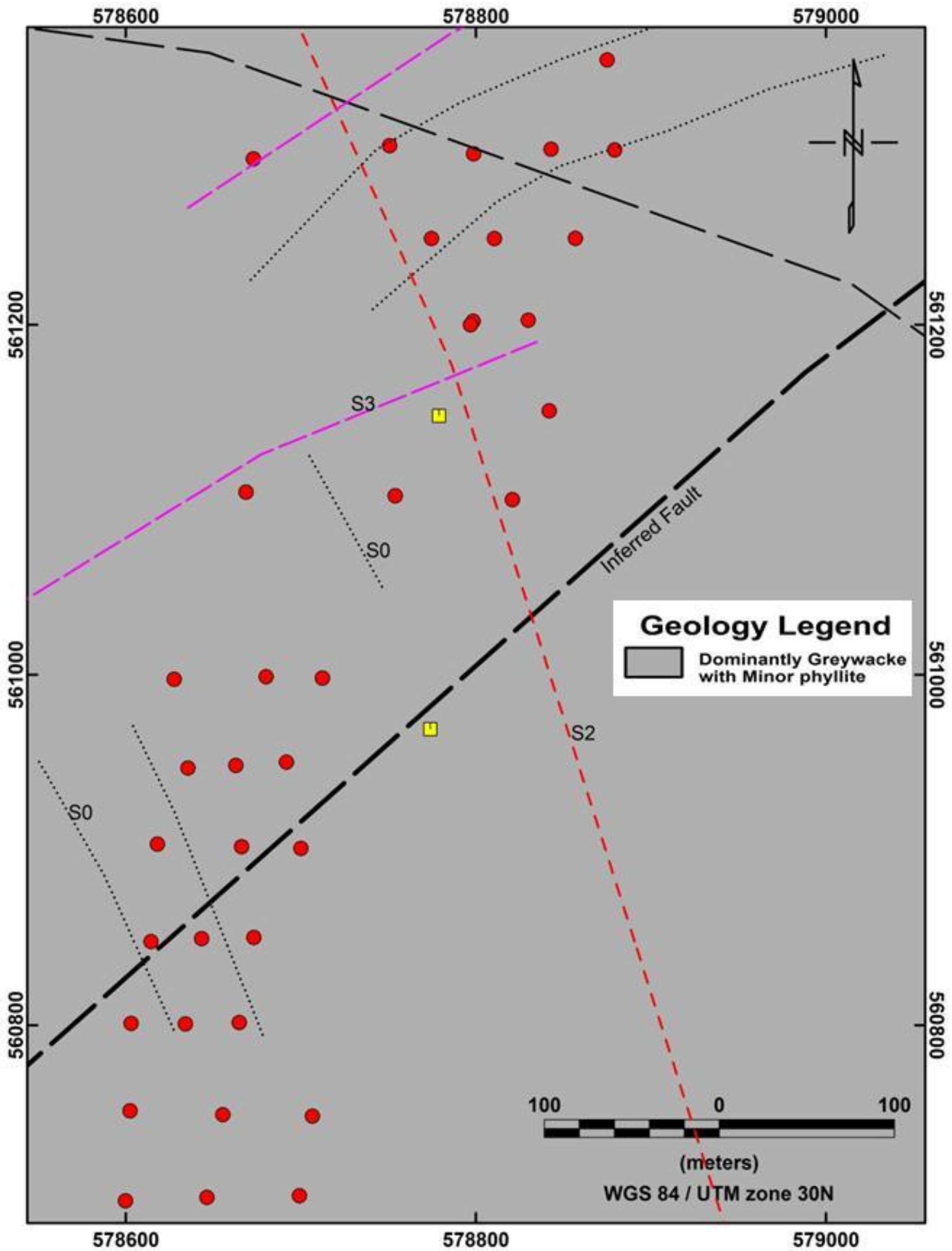


Figure 10.9: Drill Plan for Akropon Deposit

10.6 Collar and Hole Surveying

There is little information about survey methods employed by the various companies that drilled the deposits prior to the work of Endeavour/Adamus.

10.6.1 Borehole Collar Surveys and Topographical Surveys

Adamus completed field checks of all previous drilling upon acquisition of each permit or prospect and found drill collar pipes were still readily visible and clearly labelled for the most part. A resurveying program was carried out by using both total station and Differential GPS equipment in UTM Zone 30N WGS84 coordinates by Adamus personnel. Accuracy by both methods is nominally centimetre to decimetre in the easting and northing, sub-decimetre for the RL by total station and sub-metre by Promark 2 DGPS. All holes that could not be verified were not used in the resource estimation.

As part of the resurveying programs, an area approximately 1km^2 centred on each deposit was topographically surveyed by Promark 2 DGPS to establish base stations and surveyed using Sokkia total station equipment along cut lines. A strip approximately 8 kilometres long and up to 1 kilometre covering the Salman Trend has been topographically surveyed using concrete pillars established by Promark 2 DGPS and Sokkia total station equipment along cut lines. Over 17,000 spot heights on 10m x 50m centres were used to construct a digital terrain model suitable for resource modelling for all prospects.

All Adamus drill hole collars, on all drill programs, have been surveyed in UTM Zone 30N WGS84 coordinates with centimetre accuracy using Sokkia total station equipment tied to a series of concrete control pillars established by Promark2 DGPS.

10.6.2 Down-hole Surveys

The Semafo, Samax and Ashanti diamond drill holes were sporadically surveyed down-hole during drilling by acid etch tube and the results were of doubtful quality. Resource Services Group (RSG) was contracted by Semafo in 1997 to conduct down-hole surveys for a selection of drill holes. Some 24 diamond drill holes and 19 RC holes were down-hole surveyed by RSG using a Reflex electronic survey instrument in the open hole. The selected diamond drill holes were generally successfully surveyed, but many of the holes had collapsed and could not be surveyed much beyond 20-40 metres down hole.

All Adamus diamond drill holes and RC holes deeper than 30m were down-hole surveyed by the drilling contractor, while drilling or immediately at the completion of each hole, using Flexit Multismart or Reflex electronic survey tools or an Eastman single shot camera.

To address concerns about significant deviation in the historic bore holes at Adamus, Adamus employed Minerex drilling contractors to re-enter and down-hole survey 22 of the 75 diamond drill holes completed by Semafo. Both azimuth and declination data were collected as per Adamus' standard diamond drill hole surveying procedure. The holes selected for resurvey included those with relatively high metal content and/or important geometrical implications. Digital Surveying was also contracted by Adamus to check some of the historic drill holes using the Flexit Multismart electronic tool. Some 33 holes were resurveyed representing all of the previous drilling programs. Results from the open hole resurveying program were very consistent with the Minerex re-entry program but hampered by a high frequency of collapsed holes.

None of the BHP drill holes on the Salman Trend were down-hole surveyed. At the time of the feasibility study, approximately 83 per cent of Adamus diamond drill holes and 49 per cent of the RC holes had been down hole surveyed with a range of equipment including Tropari, single shot down hole cameras and electronic multishot tools.

The breakdown by equipment is:

- 13 RC holes surveyed to bottom of hole for both dip and azimuth using Tropari inside stainless steel starter rods;
- 10 RC holes surveyed to bottom of hole for both dip and azimuth using an electronic multishot tool inside stainless steel starter rods;
- 176 RC holes surveyed to bottom of hole for dip only by digital tool inside rods;
- 199 RC holes surveyed to bottom of hole for dip only by single shot Eastman camera inside rods;
- 8 diamond drill core holes surveyed to bottom of hole for dip and azimuth by hanging digital survey tool out end of drill rods;
- 8 diamond drill core holes surveyed to bottom of hole for dip and azimuth by hanging single shot Eastman camera out end of drill rods;
- 99 RC and diamond drill core holes partially to completely surveyed with Flexit Multismart tool in the open hole after drilling.

The Flexit Multismart tool was operated by Digital Surveying; all other equipment by the drilling contractor during drilling. Open hole surveys using the Flexit Multismart tool were hampered by widespread collapse of holes shortly after drilling. The majority of RC holes at Salman are less than 100 metres long and the average length is about 80 metres. The down hole surveying results show a mean deviation of 3° in dip (n=138) and less than 2° in azimuth (n=27).

All DD, RCD and RC holes drilled by Adamus subsequent to the initial feasibility study have been surveyed at 6m or 12m depth (to check the rig setup), at 30m depth and at every multiple of 30m depth throughout the remainder of the hole.

11 Sample Preparation, Analyses, and Security

Sample procedures and QA/QC for all drilling prior to January 2009 were reported by Heeks (2009). The current authors have been involved in the Nzema project since 2011, and therefore have relied on the previously reported procedures and data quality as stated in Heeks (2009). Additional steps taken to verify the quality of that data are outlined below with all activities from 2009 onward presented in this chapter.

11.1 Sampling and Logging Procedures

11.1.1 Reverse Circulation Drilling

All RC samples were collected from the drill rig cyclone on a one metre basis into large plastic bags then riffle split to collect sub-samples for assay. BHP, Semafo and Samax typically submitted one metre sub-samples directly for assay. Adamus either directly submitted one metre sub-samples or composited the sub-samples, generally into 4m composites, for assay according to prospectivity and laboratory assay production rates (turn-around times).

Semafo RC samples were passed through a 75:25 riffle splitter to produce a 3-4kg sub-sample from each metre for submission to the assay laboratory. One sample in fifteen had a blind field duplicate prepared and submitted. Splitters were routinely cleaned with high pressure air. For the later part of the Semafo drilling program a wet splitter was used as required. The wet sample was collected in a 30 litre tub and allowed to settle before the excess water was decanted off. The sample was then passed through a wet splitter. Semafo had concerns that gold was lost during the decanting process and a flocculent was added prior to decanting.

The Samax RC drill samples were riffle split on a one metre basis to provide approximately 4kg from each metre of sample for assay. It is not known how wet samples were dealt with by Samax. Blanks, standards and field duplicates were inserted into the sampling sequence at a rates ranging from 1:10 to 1:50 samples.

The BHP RC samples were riffle split to 2kg on a one metre basis. It is not known how wet samples were dealt with by BHP. BHP used a computer generated random numbering system to label subsamples sent to the assay laboratory. Two standards were randomly included for every 20 samples. The standards, Sal1 and Sal2, were prepared by homogenizing crushed rock from a road cutting through the main mineralized zone at Salman, and assayed values ranged from 0.018 to 4.66 ppm and 0.01 to 0.29 ppm Au respectively. A blank was made from beach sand collected near Essiama and assayed less than 0.02 ppm. Both of these materials (the standards and the blank material) are now considered unsuitable for assay quality control purposes by the current authors.

All Adamus RC cuttings were collected from the drill rig cyclone at one metre intervals into large plastic bags before splitting. The sampling cyclone was cleaned at the end of each rod using high pressure air from the rig compressor, a scraper, and a rubber mallet to avoid progressive sample accumulation. The bags were clearly marked with the appropriate hole number and interval using a permanent marking pen. The plastic bags of RC drill cuttings were weighed on bench scales and laid out sequentially in rows of 10 or 20 on the drill pad during drilling. Prior to sub-sampling for assay, each single metre field sample was rolled in the bag or tipped into a large clean plastic bucket and mixed to reduce sample stratification.

For the initial Adamus drill programs the one metre samples were put through a three tier 87:13 riffle splitter and the final sample split into two small sub-samples of about 2kg each using a 50:50 riffle splitter; one sub-sample was combined into 4 metre composites for assay and the second sub-sample was reserved for follow-up assay of the 1m sample should the composite return grades >0.3g/t. For later programs the RC drill cuttings were subsampled and submitted for assay as one metre intervals from the outset (i.e. no 4 metre composites).

Wet samples were not immediately split, but instead tube or grab sampled to produce the 4 metre composite sample then the mineralized one metre bulk samples were air dried before being weighed and split for one metre assays.

In all cases the assay samples were placed into calico bags labelled with unique sample numbers. Standards and field duplicates were inserted into the sampling sequence at a rate of 1:20 (5 per cent) in accordance with standard RSG Global quality control protocols (RSG Global, 2002). Blanks were inserted at the rate of 2 per 100 samples (2%).

Laboratory submission sheets were then completed and samples dispatched by the company or laboratory courtesy vehicle for assay. Upon receipt of primary assays the pulps of selected mineralized samples were also periodically dispatched to Genalysis Laboratories, Australia (ISO/IEC 17025: Accreditation No. 3244) for confirmatory analysis.

11.1.2 Core Drilling

The Semafo and BHP diamond drill core was mostly sampled in one metre intervals with the remaining core (generally ½ core) returned to the trays for storage. The three Samax PQ diamond drill core holes were sampled and assayed on a lithological basis.

Most of the Adamus oxide and transition zone core was wrapped with plastic film immediately after drilling for bulk density determinations which were performed on site (see below) prior to sampling. All Adamus diamond drill core sampling was completed at the Salman exploration camp. The drill core was sampled in 1 or 2 metre intervals according to prospectivity. Single metre samples of ¼ core were collected through zones considered prospective by the supervising geologist, owing to them containing visible gold or any mineral assemblage known from previous work to have potential to host gold, quartz, quartz veining, fresh or oxidized sulphides, alteration and/or being within structurally complex zones or packages. Two metre ¼ core samples were collected through zones considered to be waste owing to the absence of any of the above markers of prospective mineralization.

After 2010, when the mineralization was adequately delineated, core sampling was reduced to 1m samples of ¼ core in areas of recognizable mineralization and bracket sampling was completed for at least 5m beyond areas of visible mineralization, both above and below. Non-mineralized materials between areas of interest were not sampled unless bracket samples returned assays over 0.5g/t.

Competent (fresh and some transition) core was cut using a core saw; soft oxide and transition material was sampled with a knife or spatula. The samples were placed into calico or plastic bags labelled with a unique sample number. The remaining core was returned to the trays for storage. Quality control reference standards and blanks were inserted into the sampling sequence at a rate of 1:20 (5 per cent) in accordance with RSG Global quality control protocols (RSG Global, 2002).

Laboratory submission sheets were then completed and samples dispatched by company or laboratory courtesy vehicle for assay. Upon receipt of primary assays the pulps of selected mineralized samples were also periodically dispatched to SGS Analabs (ISO/IEC 17025: Accreditation No. 1936) and Genalysis Laboratories, Perth, Australia for confirmatory analysis.

11.1.3 Trench and Pit Sampling

All trenches (TEMCO, AGR and Adamus) were geologically logged and sampling intervals of 1, 2 or 3 metres as appropriate were marked with coloured flagging tape and/or aluminum permatags along the wall of the trench that was sampled. Samples were collected as a continuous channel running along the base of one wall or floor of the trench or bulldozer line as appropriate. Samples were placed in calico bags, given a unique sample number and submitted for assay. Quality control samples, including standards and field duplicates, were inserted into the Adamus sampling sequence at a rate of 1:20; blanks were inserted at a rate of 1:50 samples.

Vertical channel samples were also conducted in many trenches in the same manner as described above for the horizontal channel samples. These vertical samples were generally equal to or greater than 1m length and samples were terminated at regolith boundaries.

Manually dug pits on the Salman Trend were sampled in vertical channels with individual sample intervals ranging from 0.5 metres to 1.5 metres length to assess the gold content of the regolith.

11.2 Sample Storage and Security

RC samples were prepared and labelled at the rig and then collected from the drill rig to the core yard at the Salman exploration camp on a daily basis. Similarly, the diamond drill core boxes were transferred to the core yard at the Salman exploration camp on a daily basis for geological logging and sampling prior to submission. Sample batches were periodically delivered to Transworld and SGS Laboratories in Tarkwa for analysis by company vehicle or laboratory courtesy vehicle.

All Adamus drill core, BHP drill core, BHP and Adamus assay pulps, BHP RC chip-boards, Adamus RC chip trays and significantly mineralized RC bulk residues from Adamus historic programs are stored at the Salman exploration camp. Semafo drill core from Adamus is stored under cover at the old Semafo core yard in Nkroful. Semafo and Samax RC bulk residues and drill core from the three Samax diamond drill holes are no longer available.

From mid-2004 to mid-2005, sample handling was monitored by RSG Global personnel to ensure adequate sample quality and security. After establishment by Adamus of standard operating procedures, all subsequent sample handling and monitoring of QAQC has been by Adamus personnel.

11.3 Sample Preparation and Analyses by Independent Laboratories

No employee, officer, director or associate of Adamus was involved in any aspect of the laboratory sample preparation or analysis of samples from the exploration and resource delineation activities on the Nzema property.

11.3.1 TEMCO Program

The TEMCO trench samples were sent to SGS Laboratory, Accra where they were pulverized and assayed for Au by aqua regia digestion and then presumably with an AAS finish. Most samples were also analyzed for As, Sb, Cu and/or Mn. Assay certificates are not available but TEMCO exploration reports with a complete printout of trench sample descriptions with assays are held by Adamus (Tropical Exploration and Mining Co Ltd, 1992, Tropical Exploration and Mining Co Ltd, 1993).

11.3.2 Semafo Program

Semafo diamond drill core and RC samples were submitted to SGS Laboratories, Tarkwa for assay of gold by 50g charge fire assay. Assay certificates are not available to Endeavour.

11.3.3 Samax Program

Samax RC and diamond drill core samples of approximately 4kg each were submitted to SGS Laboratories, Tarkwa, pulped and assayed for gold by 2kg agitated cyanide leach (bottled roll) with AAS finish. Assay certificates are held by Endeavour.

11.3.4 BHP Program

BHP diamond drill core and RC samples were sent to SGS Laboratories in Accra where they were assayed for gold by 50g charge fire assay with AAS finish. Lower limit of detection was 0.01 ppm. A second 50g pulp sample was taken from each pulverized diamond drill core bulk residue at the laboratory for aqua regia digestion followed by assay of As, Cu and Sb by AAS. A batch of 149 duplicate samples from RC holes with significant mineralization was analyzed by CHEMEX laboratories in Canada; the CHEMEX and SGS assays compared well (e.g. Bolton & Amegashi, 1996). A selection of assay certificates and complete printout of digital BHP drill hole logs with assays is held by Endeavour.

11.3.5 Niagara Program

Niagara completed 50g fire assay of samples. No other information is available on the sample preparation and method of analysis used by this company.

11.3.6 EQ Resources Program

EQ Resources completed 50g fire assay of samples. No other information is available on the sample preparation and method of analysis used by this company.

11.3.7 Adamus Program

Adamus trench, RC and diamond drill core samples were submitted to Transworld Laboratories, now Intertek Minerals Ltd Ghana since Oct 2008, and/or SGS Laboratories both in Tarkwa. The samples were assayed by 50g charge fire assay for gold with AAS finish and were reported as having 0.01 ppm lower limit of detection.

Approximately 1,800 samples were pulped at SGS Tarkwa and 120 samples at Transworld then air-freighted to Genalysis, Perth (ISO/IEC17025: NASA Accreditation No. 3244) for check assaying by 50g charge fire assay for gold with AAS finish (0.01 ppm lower limit of detection). An approximate breakdown of the samples sent to each lab is 90% by Transworld/Intertek, 7% by SGS Tarkwa, and 3 % pulped by SGS Tarkwa and Transworld/Intertek and then assayed by Genalysis. During 2005, field duplicates and pulps of selected mineralized samples from Transworld and SGS Tarkwa were periodically air-freighted to SGS Analabs and Genalysis Laboratories, Perth for check assaying.

Approximately 5,900 samples were also assayed for gold by 1kg agitated cyanide leach (bottle roll) with Leachwell and tail fire assay at Transworld and SGS in Tarkwa. Approximately 200 samples were assayed by 200 or 400g cyanide bottle roll with Leachwell and tail fire assay at Genalysis, Perth.

Standard sample preparation and fire assay procedure at all laboratories involved oven drying of samples upon arrival, followed by jaw crushing to -2 mm, followed by complete pulverization[9] to P90% -75µm in LM2 or LM5 disk mills, followed by homogenization. Sub-sampling was then conducted to obtain a 150-200g pulp, with 50g sub-sampled from the pulp for fire assay and AAS finish for Au.

[9] The procedure was changed sometime in 2010 from 500g subsample being pulverised to complete pulverization of the sample.

Remaining pulps were returned to Adamus for storage or re-assay as appropriate. All assay results were supplied to Adamus in electronic form and as hardcopy assay certificates.

From mid-2004 to mid- 2005, quality control data were periodically reviewed by RSG Global and appropriate recommendations were made regarding resampling or reassay of sample batches. Subsequent quality control monitoring has been done by Endeavour/Adamus.

11.4 Specific Gravity Data

Previous bulk density determinations were reported by Heeks (2009) and are given in Table 11.1.

Additional bulk density determinations were carried out on Aliva, Nfutu and Salman Trend since 2009 and results are given in Table 11.2. The Salman Trend data includes all deposits along the trend with diamond drilling (in both Tables 11.1 and 11.2) and was not separated into the individual deposits since the geology is similar throughout.

All bulk density determinations were conducted by Adamus using air-dried HQ core and the weight-in-air, weight-in-water method (Archimedes Principle or Water Displacement method). Measurement for Adamus and Bokrobo were made between 2004-2006, and were reported in the 2009 Technical Report (Heeks, 2009). Measurement for Salman Trend include 2,736 measurements made between 2004-2006 and reported in the 2009 Technical report (Heeks, 2009) plus an additional 443 measurements conducted in 2012 on core from the sulphide drilling program. Measurements for Aliva and Nfutu were collected between 2010-2012. Logging of weathering zones has been updated since the pre-2009 surfaces were determined, so some samples previously classified in one weathering zone have been moved to another.

Table 11.1: Bulk Density Determinations Pre-2009 (Heeks, 2009)

Prospect	Weathering	Number of Analyses	Bulk Density (g/cm^3)		
			min	max	mean
Salman Trend (All data)	Very Weathered	250	1.22	2.67	1.81
	Moderately Weathered	101	1.55	2.68	2.17
	Weakly Weathered	109	2.20	2.76	2.56
	Fresh Rock	1,021	2.14	5.74	2.76
Adamus (Anwia)	Very Weathered	89	1.59	2.54	1.87
	Moderately Weathered	127	1.71	2.85	2.15
	Weakly Weathered	92	1.99	2.77	2.44
	Fresh Rock	1,085	1.50	4.75	2.77
Bokrobo	Very Weathered	23	1.51	1.97	1.74
	Moderately Weathered	19	1.76	2.74	2.31
	Weakly Weathered	106	2.54	2.90	2.76
	Fresh Rock	2,538	2.33	3.15	2.77

As observed when comparing the two tables, there is considerable difference between the bulk density determinations collected prior to 2009 from those collected from 2009 onward. This is particularly highlighted by the comparison in Table 11.2 for all Salman Trend data (including the pre-2009 and 2009 onward data) and the 2012 Salman Trend data.

Table 11.2: Bulk Density Determination for Deposits by Weathering Zones

Prospect	Weathering	Number of Analyses	Bulk Density (g/cm^3)		
			min	max	mean±std
Aliva	Very Weathered	8	1.48	1.82	1.60±0.115
	Moderately Weathered	0	NA	NA	NA
	Weakly Weathered	5	2.10	2.58	2.28±0.202
	Fresh Rock	28	2.46	2.81	2.67±0.087
Nfutu	Very Weathered	2	1.53	1.64	1.58±0.078
	Moderately Weathered	8	1.69	2.36	2.04±0.213
	Weakly Weathered	23	2.06	2.62	2.27±0.186
	Fresh Rock	32	2.22	2.83	2.67±0.114
Salman Trend (All data)	Very Weathered	285	1.20	2.50	1.78±0.222
	Moderately Weathered	46	1.52	2.56	2.08±0.294
	Weakly Weathered	41	1.72	2.57	2.27±0.209
	Fresh Rock	2364	1.99	3.11	2.68±0.129
Salman Trend 2012 Measurements only	Very Weathered	37	1.20	2.35	1.63±0.279
	Moderately Weathered	31	1.50	2.56	2.03±0.351
	Weakly Weathered	21	1.72	2.57	2.40±0.186
	Fresh Rock	354	2.33	2.94	2.72±0.077

During the mining of the Salman oxide resource (Oct 2010- Dec 2012) monthly reconciliation between the mined physicals (based on truck counts and assigned bulk densities) and crushed ore tonnes, from plant weightometer, surveyed pit and stockpile volumes indicates that actual bulk densities were lower than the previously determined values. Consequently for very weathered and moderately weathered oxide material bulk densities were reduced by 15% from the values used in the resource estimates prior to 2011. (Table 11.3).

Table 11.3: Bulk Density Values Used in Resource Models

Weathering Zone	Bulk Density (g/cm^3)
Very Weathered	1.55
Moderately Weathered	1.80
Weakly Weathered	2.50
Fresh Rock	2.80

11.5 Sampling Preparation and Assay Quality

Adequacy of Sample Preparation, Security and Analytical Procedures, in the author's opinion, conforms to those described elsewhere as "industry standards". The Sample Preparation, Security and Analytical Procedures are those instituted and revised by RSG Global in 2004-2005. All monitoring subsequent to 2005 has been undertaken by Endeavour/Adamus.

12 Data Verification

12.1 Quality Assurance and Quality Control Programs

Endeavour/Adamus had standard Quality Assurance and Quality Control (QAQC) programs in place during each of its exploration campaigns including regular insertion of certified reference materials, blanks, duplicates and check assays completed at an umpire laboratory. Quality control materials are assessed on each batch of assays returned and statistics are compiled on a monthly basis for internal review. Table 12.1 summarizes the analytical quality control data produced for the Nzema Property.

Table 12.1: Summary of Analytical Quality Control Data Produced By Nzema Project

Sampling Program	2009 to 2012	%	Comment
Sample Count	91,921		
Field Blanks	2,606	2.84	
QC samples			
G306-1	*218*		
G905-5	*46*		
G901-7	*241*		
G901-1	*101*		
G905-10	*249*		
G908-8	*272*		
	1,127	1.23	Geostats
OxD87	*613*		
OxG84	*393*		
OxG99	*31*		
OxI96	*165*		
OxI81	*605*		
OxJ95	*96*		
OxK79	*363*		
	2,266	2.46	RockLabs
Assay Pills	584	0.64	Unknown
Field Duplicate	3,316	3.61	
Total QC Samples	13,292	14.46	
check Assay to Umpire Laboratory	2,455		

Sample batches with failed QAQC samples are reviewed and are re-assayed or partially re-assayed where appropriate. Multiple QAQC samples are inserted in each batch so that batch QAQC did not rely on a single sample result. If one QAQC sampled failed and the remainder were within limits then no action would be taken. If more than one sample failed then initially a number of samples in sequence before and after failed QAQC samples would be re-assayed. If the majority of QAQC samples failed the entire batch would be re-assayed.

Pre-2010 drilling, assays and quality control of assay results were covered by Heeks (2009). The following assessment only covers drilling, assays and quality control from 2009 to the present.

12.1.1 Field Duplicates

Blind field duplicates are collected for all RC and trench sampling programs with one duplicate collected every 20th sample. In all cases the final bulk sample split (approximately 5kg) is split into two subsamples using a 50:50 riffle splitter, one submitted as original and the other as a field duplicate. Field duplicates are assigned the next sample number and assayed sequentially with the original sample in the same batch.

A total of 3,316 blind field duplicates were assayed between July 2009 and Sept 2012[10]. Of these, 425 (12.8% of field duplicates and 0.56% of samples assayed) have at least one result greater than 0.25g/t Au (25 times the lower detection limit) for the duplicate pair. Seventy five percent of all duplicate results are within ±40% relative percent difference. Seventy five percent of duplicates with at least one result greater than 0.25g/t are within ±44% relative percent difference.

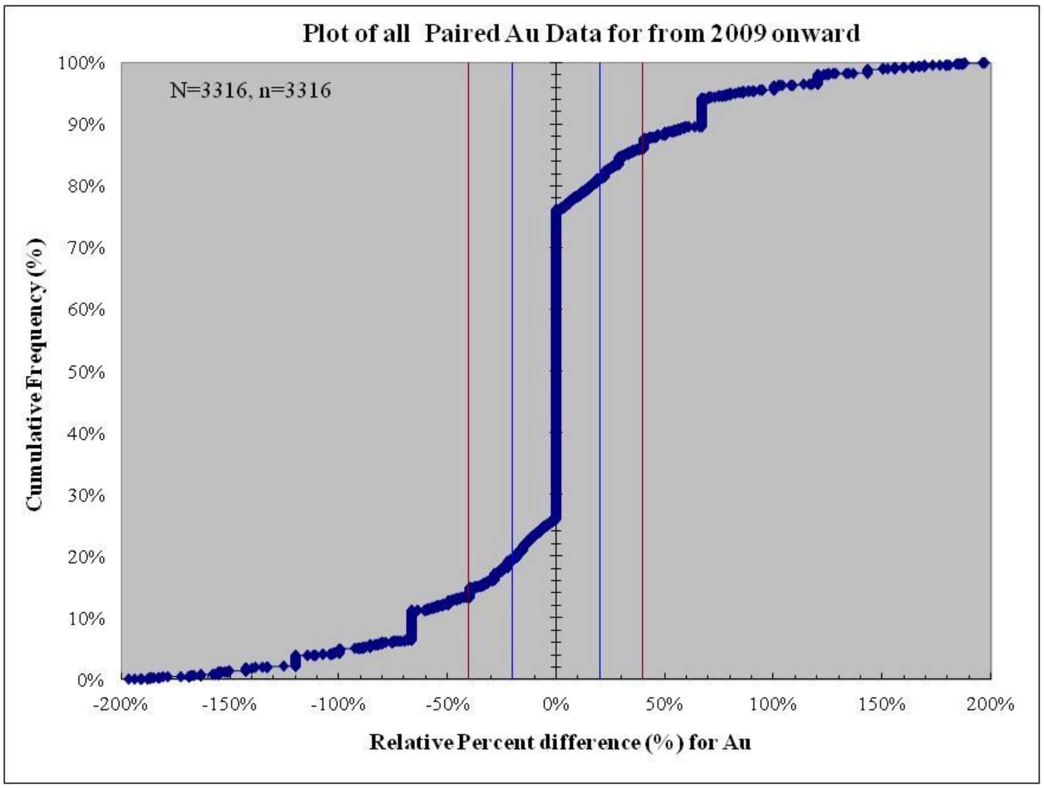


Figure 12.1: Cumulative Frequency Plot of All Duplicate Paired Results from 2009 Onward

Assays for these duplicate pairs range from 0.005g/t to 36.63g/t and 80 results (2.4% of all duplicate pairs) are outliers due to the extreme high variance between the paired results. The outliers are reduced to 53 results when considering pairs with one assay reporting >0.25g/t (1.6% of all duplicate pairs). The duplicate samples have a positive bias of 4.98% before the removal of outliers which rises to

[10] Treatment and statistics for field duplicates prior to 2009 are described in Heeks (2009).

5.85% after the outliers are removed. In general the paired samples reproduce one another sufficiently for use in resource estimation.

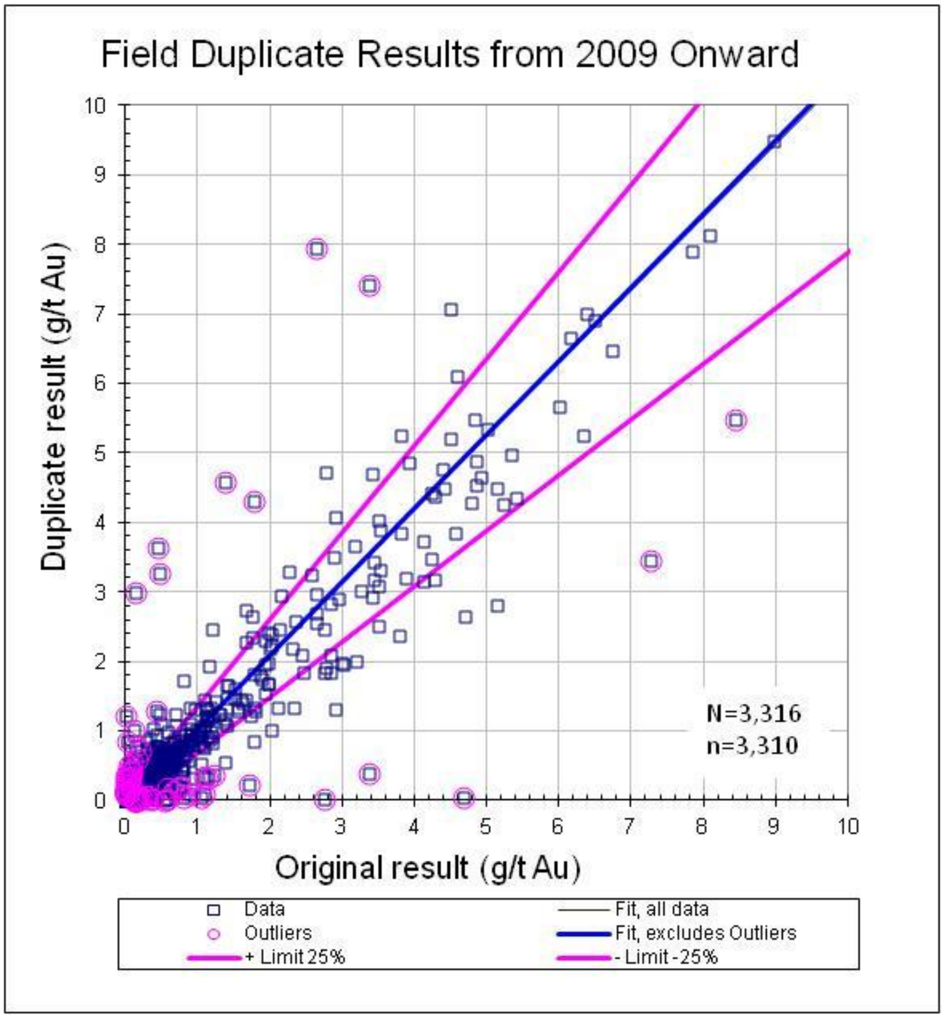


Figure 12.2: Plot of Field Duplicate Pairs from 2009 Onward with Outliers Identified

Six samples with higher grades are not shown on Figure 12.2.

12.1.2 Certified Reference Materials

Certified reference materials were inserted into all drilling and trench sampling sequences approximately once per every 20 samples. Pre-2009 insertion of standards is covered by Heeks (2009) and this section discusses the insertion and quality control of standards from 2009 onward.

Prior to 2009 most of the "standards" used by Adamus were assay pills – a pressed powdered pill of known gold content inserted into 1kg of barren material to yield the desired assay grade. Some of these pill standards remained after 2009 and were used in the mid 2010 to early 2011 drill programs. For the remainder of the drill and trench sampling programs Certified Reference Materials (CRMs) were purchased either from Geostats (G-series numbers; Western Australia) or RockLabs (Ox-series numbers; Auckland, New Zealand) and inserted. Table 12.2 shows the performance of the CRM inserts post 2009 and Table 12.3 shows the performance of all pill inserts post 2009.

Since about November 2010 the assay pills were phased out in favour of CRMs. CRMs were purchased in 2.5kg tubs and loaded into individual sachets of 50 or 100gm for insertion with sample series. A total of 3,393 "samples" of reference materials were inserted between November 2010 and September 2012. An additional 584 assay pills were used from August 2010 to February 2011. The total number of CRMs and pill standards is 3,977 "samples".

Table 12.2: CRMs Used for Post 2009 QAQC Program

CRM name	Dates Used	Accepted Value (g/t)	Accepted stdev (g/t)	No results	min	max	mean	% bias	% >2 stdev	% >3 stdev
G306-1	Dec 2010-Aug 2011	0.410	0.030	218	0.35	0.48	0.40	-1.94%	0.46%	0.00%
OxD87	Nov 2011-Jul 2012	0.417	0.013	613	0.38	0.44	0.41	-0.61%	1.47%	0.00%
G905-5	Nov 2010-Jan 2011	0.520	0.030	46	0.46	0.54	0.50	-3.76%	0.00%	0.00%
OxG84	Dec 2011-Aug 2012	0.922	0.033	393	0.84	1.00	0.94	2.29%	0.51%	0.00%
OxG99	Sept 2012-present	0.932	0.034	31	0.92	1.01	0.96	3.52%	3.23%	0.00%
G901-7	Nov 2010-Jul 2011	1.520	0.060	241	1.35	1.60	1.50	-1.24%	0.41%	0.00%
OxI96	Jul 2012-present	1.802	0.064	165	1.67	2.00	1.81	0.68%	4.85%	0.61%
OxI81	Nov 2011-Aug 2012	1.807	0.033	605	1.73	1.86	1.80	-0.35%	0.33%	0.00%
OxJ95	Aug 2012-present	2.337	0.086	96	2.13	2.69	2.37	1.53%	3.13%	1.04%
G901-1	Nov 2010-Jan 2011	2.580	0.130	101	2.36	2.89	2.59	0.23%	2.97%	0.00%
OxK79	Dec 2011-Aug 2012	3.532	0.078	363	3.50	3.82	3.61	2.12%	4.96%	0.28%
G905-10	Nov 2010-Nov 2011	6.750	0.250	249	5.84	7.23	6.86	1.62%	0.00%	0.40%
G908-8	Jan 2011-Nov 2011	9.650	0.390	272	8.20	10.50	9.66	0.13%	1.10%	0.37%
			Total	**3,393**						

% bias calculated as (mean-accepted value)/accepted value

Table 12.2 shows the accepted value and standard deviation on the accepted value for the various RockLab and Geostat standards employed. RockLabs generally has a very tight standard deviation (1.5% to 3.5% of the accepted value) compared to Geostats (3% to 7%). For example, G306-1 has a standard deviation 2.5 times higher than OxD87 despite the Reference Materials having essentially the same grade. Under these conditions all batches with a statistically significant population of results behaved acceptably.

Assay pills are fraught with additional issues as sampling bias often precludes acceptable results; thus this method of quality control was phased out. Table 12.3 gives performance of the assay pills used during these campaigns.

Table 12.3: Pill Assay Standards Used for All Post 2009 Sampling

Pill Standard Name	Dates Used	Accepted Value (g/t)	Stdev (g/t)	No results	min	max	mean	% bias	% >2 stdev	% >3 stdev
STD5C	May 2010-Jan 2011	0.520	0.026	43	0.46	0.56	0.52	-0.36%	4.65%	0.00%
STD9B	Dec 2010-Jan 2011	1.330	0.067	4	1.20	1.46	1.39	4.14%	0.00%	0.00%
STD4C	Sep 2010-Feb 2011	1.460	0.073	204	1.06	1.58	1.45	-0.35%	0.49%	0.98%
STD4B	Aug-Dec 2010	1.480	0.074	70	1.36	1.56	1.46	-1.62%	0.00%	0.00%
STD7B	Aug-Nov 2010	2.060	0.103	28	1.91	2.20	2.07	0.62%	0.00%	0.00%
STD8B	Sep 2010-Jan 2011	2.360	0.118	147	2.20	2.61	2.41	2.30%	3.40%	0.00%
STD C	Nov 2010-Feb 2011	4.400	0.330	19	3.64	5.56	4.25	-3.30%	21.05%	5.26%
STD B	Oct 2010-Feb 2011	7.850	0.393	21	5.64	8.84	7.71	-1.83%	4.76%	4.76%
STD6B	Oct-Nov 2010	9.700	0.485	46	8.92	10.08	9.53	-1.75%	0.00%	0.00%
STD13	Nov 2010	13.640	0.682	2	13.00	13.10	13.05	-4.33%	0.00%	0.00%
			Total	**584**						

% bias calculated as (mean-accepted value)/accepted value

12.1.3 Blanks

Blanks were inserted roughly 3 times every 100 samples in all drilling and trench sampling programs. Results for the pre-2009 blank samples are discussed by Heeks (2009) and this summary covers blanks analyzed after 2009.

The total number of blanks analyzed for all resource drilling and trenching at Nzema is 6,152 (or 2.63% of samples assayed). Since 2009 the total number of blank inserts into drilling and trench sampling is 2,606 (3.41% of samples assayed). Figure 12.3 is a quality control chart for all post 2009 blanks using sequential run number (on the horizontal axis as proxy for date analyzed) representing assay results returned between April 2010 to August 2012. For all blanks analyzed during this period only 9 (0.35%) reported values beyond 0.05g/t Au (5 times lower detection limit) and 4 (0.15%) reported values beyond 0.10g/t (10 times lower detection limit). Since 2008, increased vigilance and monitoring of assay results on a batch by batch basis has significantly reduced the number of errant blanks.

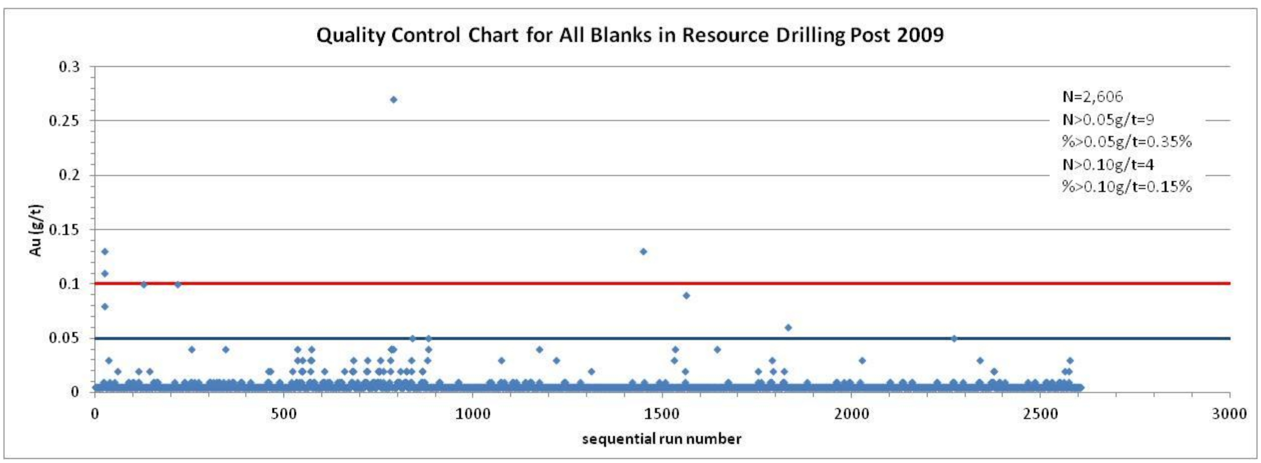


Figure 12.3: Control Chart for Post 2009 Blanks Plotted by Sequential Run Number

12.1.4 Umpire Laboratory Results

Umpire lab check results were obtained for both cyanide leach and 50g fire assay on original assay results for holes drilled between December 2002 and September 2004. Only the fire assay results are presented here as they are used for resource estimation.

A total of 1,479 samples from the Salman Trend drilling were originally analyzed by either SGS (284 of the samples) or the Transworld lab (1195 of the samples), and were then submitted to Genalysis for umpire fire assays. A smaller set of 244 samples from the Salman drilling were originally analyzed by SGS, and were then submitted to Transworld, SGS and Genalysis for umpire fire assays. Another set of 244 samples from Adamus RCD holes drilled in 2004 was initially analyzed by 50g FA-AAS at the SGS laboratory and then the pulps were analyzed by Genalysis as umpire assays using the same technique.

Table 12.4 give precision results for each of these sets of umpire samples compared to the original assays. In all cases the umpire results from Genalysis had a positive bias (Genalysis produce higher results than Transworld and SGS) and SGS had a slight negative (lower than the original SGS results) bias.

Table 12.4: Results of Umpire Samples

Prospect	Original Lab	Umpire Lab	Type of Assay	No Results	min (g/t)	max (g/t)	Precision (RPD within)			% outliers
							±20%	±40%	%bias	
Salman	mixed	Genalysis	50g FA	1479	0.005	48.33	63.1%	79.3%	1.69	3.1
Salman	SGS	Genalysis	50g FA	284	0.005	48.33	47.9%	63.0%	0.00	8.8
Salman	TWL	Genalysis	50g FA	1195	0.02	32.25	66.8%	83.2%	2.18	2.3
Salman	SGS	Genalysis	50g FA	244	0.005	22.55	50.8%	65.2%	0.00	6.1
Salman	SGS	SGS	50g FA	244	0.01	19.9	50.0%	64.7%	0.00	7.4
Salman	SGS	Transworld	50g FA	244	0.005	24.62	42.6%	59.4%	15.3	7.4
Adamus	SGS	Genalysis	50g FA	244	0.01	74.74	41.0%	59.4%	0.00	3.7

Prospect	Original Lab	Umpire Lab	Type of Assay	no >0.25g/t	max (g/t)	Precision for >0.25g/t		
						±20%	±40%	%bias
Salman	mixed	Genalysis	50g FA	1343	48.33	65.0%	80.9%	2.82
Salman	SGS	Genalysis	50g FA	158	48.33	53.2%	64.6%	6.9
Salman	TWL	Genalysis	50g FA	1185	32.25	66.6%	83.0%	2.18
Salman	SGS	Genalysis	50g FA	118	22.55	61.0%	69.5%	7.13
Salman	SGS	SGS	50g FA	124	19.9	59.7%	66.1%	-0.3
Salman	SGS	Transworld	50g FA	126	24.62	50.0%	62.7%	11.6
Adamus	SGS	Genalysis	50g FA	93	74.74	49.5%	72.0%	8.46

12.1.5 Twinned Drill Holes

Eight RC holes on the Salman Trend, mainly in Salman South, were twinned with DD holes (Table 12.5). A total of 24 mineralized intervals were compared. In some cases the DD hole is not an exact twin as the later drilling was collared in pits, but twin holes followed the initial RC hole path from the new surface and intersected the same zone (e.g. SNDD1513 was collared in the pit, but twinned the main intersection in SNRC080). Most twins targeted oxide or transition materials, with only two holes twinning sulphide intersections.

Most DD holes confirmed mineralization from the RC holes adequately. For example SNDD1513 (collared in pit) twinned an intercept in SNRC080 (collared from surface) at Salman South with SNDD1513 yielding 21m of 4.81g/t from 6.5m and SNRC080 yielding 21m of 2.77g/t from 51m (elevation difference due to collar in pit for SNDD1513; see Figure 12.4). SNDD213 yielded 10m of 1.03g/t from 0m and 16m of 1.92g/t from 23m and SNRC098 yielded 3m at 1.01g/t at 1m (0-1m NSAMP) and 17m at 5.12g/t from 20m (Figure 12.4). These two examples illustrate where RC produced better results than DD and also where DD produced better results than RC. The principal difference between the different holes is attributed to nugget effect and not likely to be an issue with the RC drilling. For example, the SNRC098 intercept at 17m included 2m at 10.53g/t while SNDD213 intercept at 23m only included 1m at 8.75g/t, thus accounting for the overall difference in grade between the two composites (Figure 12.4).

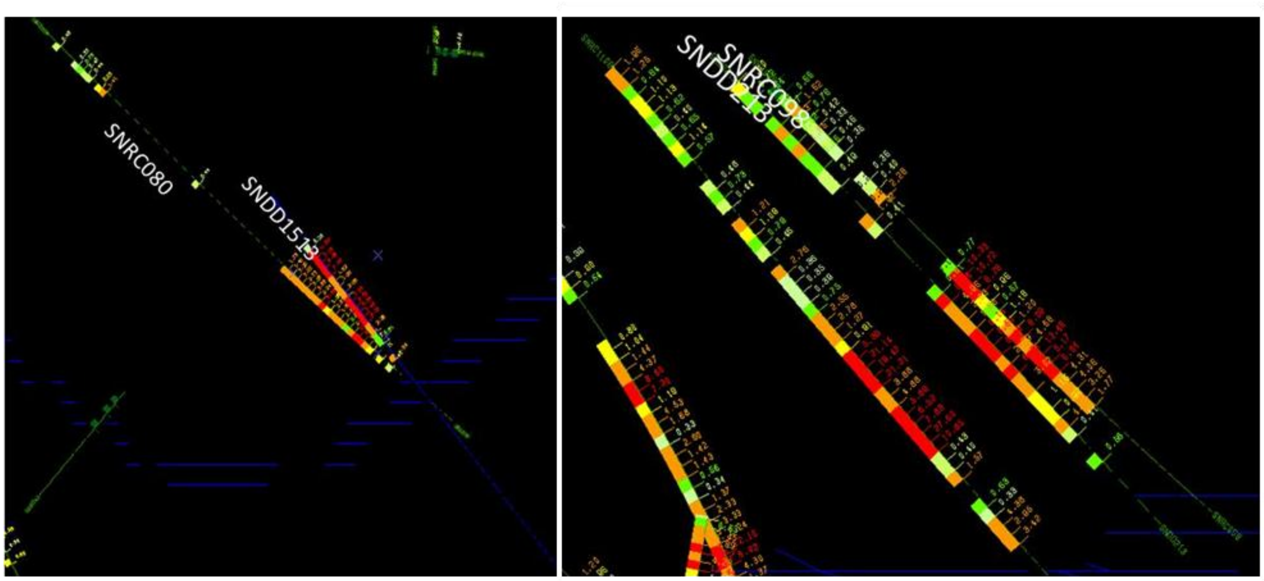


Figure 12.4: Example of Diamond Drill Hole Twins of RC Holes

Left image is SNDD1513 (collared in pit) twinning SNRC080 (collared from surface) at Salman South. Right image is SNDD213 twinning SNRC098 (both from surface) on Salman South.

A hole twinning program was completed during drilling of the Nfutu deposit in 2012. The diamond drill holes showed some instances where the RC drill holes may have been influenced by drilling below the water table. The suspect RC holes were removed from the database prior to resource estimation.

Table 12.5: Comparison of Intersects Between RC and DD Twin Holes

RC Hole ID	Weather zone	From (m)	To (m)	Interval (m)	comp grade g/t	Distance between holes (m)	DD Hole ID	Weather zone	From (m)	To (m)	Interval (m)	comp grade g/t
SNRC025	mw-ww	2	16	14	2.51	2.75	SNDD236	vw-mw	0	17	17	1.74
including	mw	12	13	1	6.41	2.75	including	mw	16	17	1	10.7
including	ww	14	15	1	5.5							
SNRC025	ww	36	44	8	4.18	2.75	SNDD236	ww	43	47	4	2.77
							including	ww	43	44	1	8.4
SNRC095	vw-mw	1	8	7	0.82	1.12	SNDD217	vw	1	7	6	0.86
SNRC095	ww	16	29	13	6.69	1.52	SNDD217	vw-mw	17	28	11	4.01
including	ww	16	17	1	13.86		including	vw-mw	23	25	2	9.14
including	ww	24	29	5	12.05						0	
SNRC095	ww	39	44	5	7.22	2.2	SNDD217	mw	39	44	5	6.16
including	ww	41	42	1	13.09						0	
SNRC098	vw-mw	1	4	3	1.01	2.05	SNDD213	mw	0	10	10	1.03
						2.05	including	mw	5	6	1	3.23
SNRC098	mw	12	13	1	2.28	2.05	SNDD213	mw	15	16	1	1.92
SNRC098	ww	20	37	17	5.12	2.45	SNDD213	mw	23	39	16	3.56
including	ww	21	23	2	10.53	2.45	including	mw	32	33	1	8.75
including	ww	30	31	1	13.48	2.45						
SNRC1285	ww	5	6	1	1.4	1.46	SNDD1486	vw	2	3	1	0.68
SNRC1285	ww	9	13	4	2.06	2.36	SNDD1486	ww	7.1	10	2.9	2.6
							including	ww	8.1	9	0.9	5.38
SNRC1285	ww	31	32	1	1.25	4.41	SNDD1486	fr	29	30	1	0.77
SNRC1285	fr	74	75	1	0.96	8.89	SNDD1486	fr	76	77	1	0.52
SNRC1285	fr	87	97	10	3.36	10.36	SNDD1486	fr	84	100	16	4.95
including	fr	96	97	1	9.48	10.36	including	fr	96	99	3	13.39
SNRC289	fr	68	74	6	1.72	4.41	SNDD1093	fr	67	74	7	2.55
including	fr	70	71	1	4.09	4.41	including	fr	71	72	1	7.97
SNRC289	fr	78	81	3	1.3	4.41		fr				
SNRC289	fr	84	89	5	2.65	4.41	SNDD1093	fr	86	90	4	2.1
SNRC870	ww	40	42	2	3.64		SNDD1520	vw	6.7	8.5	1.8	1
including	ww	41	42	1	6.22							
SNRC870	ww	59	68	9	5.37		SNDD1520	vw	22.5	31.5	9	2.75
including	ww	64	67	3	8.78		including	vw	28.5	29.5	1	8.92
SNRC870	fr	97	101	4	0.98		SNDD1520	fr	57	59	2	1.42
SNRC870	fr	114	116	2	1.05		SNDD1520					
SNRC080	ww	51	72	21	2.77		SNDD1513	vw-mw	6.5	27.5	21	4.81
including	ww	66	68	2	8.11		including	vw	6.5	11.5	5	8.85
							including	mw	17.5	20.5	3	8.34
SNRC085	ww	18	23	5	1.42	0.5	SNDD850	mw	20.4	23.4	3	2.29
SNRC085	ww-fr	43	45	2	2.79	1.09	SNDD850	fr	43.5	47.4	3.9	6
							including	fr	43.5	44.4	0.9	9.38
SNRC085	fr	49	51	2	0.73	1.26	SNDD850	fr	51	53	2	0.69

13 Mineral Processing and Metallurgical Testing

13.1 Metallurgical Testing

13.1.1 Testwork History

Metallurgical testing commenced in 2005 and the programme covered comminution, gravity, leaching and detoxification in support of the 2007 Nzema feasibility study. Optimum conditions were selected based on testing master composites. Variability testing was then done on variability composite samples.

A further round of testing was undertaken for the 2008 feasibility study update. This round covered, further gravity/leach variability testing for Adamus ores, and cyanide detox/arsenic precipitation on annual blend composite samples. Some amenability testing for heap leach and bacterial oxidation was also undertaken.

The overall test programme design was sound and logical, and carried out at reputable laboratories (AMMTEC). The test work covered all of the major testing criteria required for process design and economic evaluation. The sample selection included all the major ore zones.

The objectives of test work programs were to:

1. Establish process route
2. Determine optimum plant operating parameters for the ores to be processed
3. Evaluate the variability in metallurgical performance for the different (various) deposits
4. Define the required parameters for the engineering design of the plant.

The complete test work comprises the following;

- Unconfined compressive strength determinants (UCS)
- SMC drop weight test work
- J .K drop weight test for SAG mill amenability
- Bond abrasion index
- Bond ball work index
- Mineralogical test works
- Head assay analysis
- Cyanidation and optimization
- Carbon adsorption test work
- Cyanide destruction test
- Thickening and viscosity test
- Thickening and viscosity test
- Arsenic precipitation
- Tailings consolidation and geochemistry

A comprehensive description of the testwork results are provided in Heeks (2009).

The results of this work were used for the design of the current 1.6 Mtpa (harder fresh material) / 2.1 Mtpa (softer oxide material) design capacity process plant which uses gravity/CIL to producing doré bullion. This plant achieved commercial production in April 2011.

More recent testwork was completed on samples from the Nfutu and Aliva deposits.

13.1.2 Comminution Testwork

The 2007 feasibility study describes a comminution testing program aimed at a Crush / SAG mill / Ball mill circuit. The crushing work index was generally low, but with significant variability. Oxides were considered very soft and did not warrant testing. Transition ore samples showed very low average crushing work index (<10 kWh/t) and a few moderately higher values. Adamus sulphides averaged 20.1 kWh/t and had a maximum result of 32.4 kWh/t.

Unconfined compressive strength tests (UCS) also showed wide variability. As would be expected, the sulphide samples showed higher competence, but were reasonable for SAG milling. In terms of impact breakage, all of the composites were classified as either soft or very soft by the J.K. Drop Weight test. SAG Mill Comminution (SMC) test results gave further evidence of suitability for SAG milling. Bond ball mill testing gave results ranging from 6.8 to 14.2 kWh/t. The abrasive index is also generally low.

In summary, the ore is not difficult to grind, although based on the testwork it was expected that the wide variability might create some challenges in mill circuit control.

The key process design parameters derived from the testwork are provided Table 13.1. Plant design has been based on maximum recoveries for each of the ore types.

Table 13.1: Key Process Design Parameters

Mill Circuit Design			
	Parameter	Units	Value
Comminution Testwork:			
	UCS	MPa	<180
	Bond Rod Mill Work Index	kWh/t	14.7
	Bond Ball Mill Work Index	kWh/t	13
	Optimum Mill Product Size, P_{80}	microns	106
Leach Feed Thickening:			
	Settling Rate	$t/m^2/h$	1.00
	Flocculent Consumption	g/t ore	20.0
	Underflow Density	% solids	50
Leach/CIP Design:			
	Residence Time	hours	30
	Pulp Density (feed)	% solids	50
	Cyanide Addition Rate	kg/t	2.0
	pH	adjusted with lime	10 - 10.5
	Lime Requirement (>90% CaO)	kg/t	2.0

13.1.3 Gold Recovery

The recoveries for each of the material types for each of the deposits is provided in Table 13.2.

Table 13.2: Gold Recoveries

Deposit	Ore Types	Recoveries %
Adamus	Oxide	95.8
	Transitional	93.3
	Primary	91.8
Salman	Oxide	91.0
	Upper Transitional	83.0
	Lower Transitional	55.0
	Primary	35.0
Aliva	Oxide	94.0
	Transitional	92.9
	Primary	87.0
Nfutu	Oxide	85.8

Additional testwork was completed on the Nfutu deposit in mid-2012 by SGS metallurgical testing laboratory. The objective was to confirm the recoveries of Nfutu ore and ensure that it is amenable to processing in the existing process plant. Additional quantitative mineralogy work has been done to support the metallurgical testwork. The recovery trend revealed that the ore has good recoveries and similar characteristics to Adamus mineralization (Table 13.2).

13.1.4 Multi-Element Analyses

Multi-element analyses completed on oxide, upper transition, and lower transition ore from the Salman Trend show higher arsenic levels in some samples and occasional low levels of copper. Iron and zinc are also slightly higher in the lower transition ore type.

Table 13.3: Multi-Element Analyses for Salman Ore Types

Element	Units	Salman Oxide Ore	Salman Upper	Salman Lower
Ag	ppm	0.39	< 0.02	< 0.02
Al	ppm	0.93	0.7	1.27
As	ppm	0.4	34	3.87
Ba	ppm	< 0.05	< 0.05	< 0.05
Bi	ppm	< 0.10	< 0.10	< 0.10
Ca	ppm	25	34.6	25.4
Cd	ppm	< 0.05	< 0.05	< 0.05
Co	ppm	0.41	0.96	0.88
Cr	ppm	< 0.10	< 0.10	< 0.10
Cu	ppm	< 0.02	8.82	18.1
Fe	ppm	0.15	0.32	1.17
Hg	ppb	< 5	< 5	N/A
K	ppm	31	37	36
Li	ppm	< 0.05	< 0.05	< 0.05
Mg	ppm	1.55	2.32	4
Mn	ppm	< 0.05	< 0.05	< 0.05
Mo	ppm	0.17	0.12	0.22
Na	ppm	360	406	390
Ni	ppm	< 0.05	< 0.05	< 0.05
P	ppm	< 1.0	1	< 1.0
Pb	ppm	< 0.05	< 0.05	0.18
Sb	ppm	< 0.05	< 0.05	N/A
Se	ppm	< 0.5	< 0.05	N/A
Sr	ppm	0.17	0.09	0.18
Ti	ppm	< 0.10	< 0.10	< 0.10
V	ppm	< 0.02	0.03	< 0.02
Y	ppm	< 0.01	< 0.01	< 0.01
Zn	ppm	0.16	0.45	1.08
Zr	ppm	< 0.05	< 0.05	< 0.05

13.2 Current Metallurgical Testwork

Currently all metallurgical testwork in the process plant is directed towards plant optimization and this includes:

- Cyanide leach amenability
- Carbon adsorption tests
- Extended leach testwork
- Recovery optimization
- Size analysis
- Grind sensitivity analysis- relationship between grind and recovery
- Carbon attrition testwork.

This testwork is carried out by the process plant metallurgical lab and the gold analysis/determinations are conducted by SGS Laboratories. Most of the testwork has been conducted on the Salman ore because it comprises the majority of the ore feed in 2012 and is currently being processed through the plant.

Cyanide testwork generally showed a fast recovery with moderate cyanide consumption. Ongoing tests show that the Salman ore is not sensitive to grind.

13.3 Mineral Processing

The mineral processing design was based on the testwork results for the various ore types of the Salman and Adamus deposits (Figure 13.1). The plant is designed to treat oxide, transition and primary ores (except from Salman) from the various pits. The initial feed was oxide material and at a rate of 2.1 Mtpa. The ore is currently being blended from Salman oxide and upper transition ores and Adamus oxide ores.

The Nzema treatment plant flowsheet (Figure 13.1) is based on single stage crushing, single stage SAG milling, gravity recovery of free gold from a portion of the cyclone underflow using Falcon 5200 followed by Intensive cyanidation reactor to treat the gravity concentrate and a six-stage CIL circuit to treat cyclone overflow as leach feed. The treatment circuit also includes a Counter Current Decantation Plant (CCD) for the recovery of cyanide from the tails slurry via thickening and decants return dilution to achieve less than 50 ppm of free cyanide to tails. The stripping plant includes a six tonne Zadra elution circuit with electrowinning, removal of the gold deposition from the stainless cathodes with high pressure water sprays and smelting of the product.

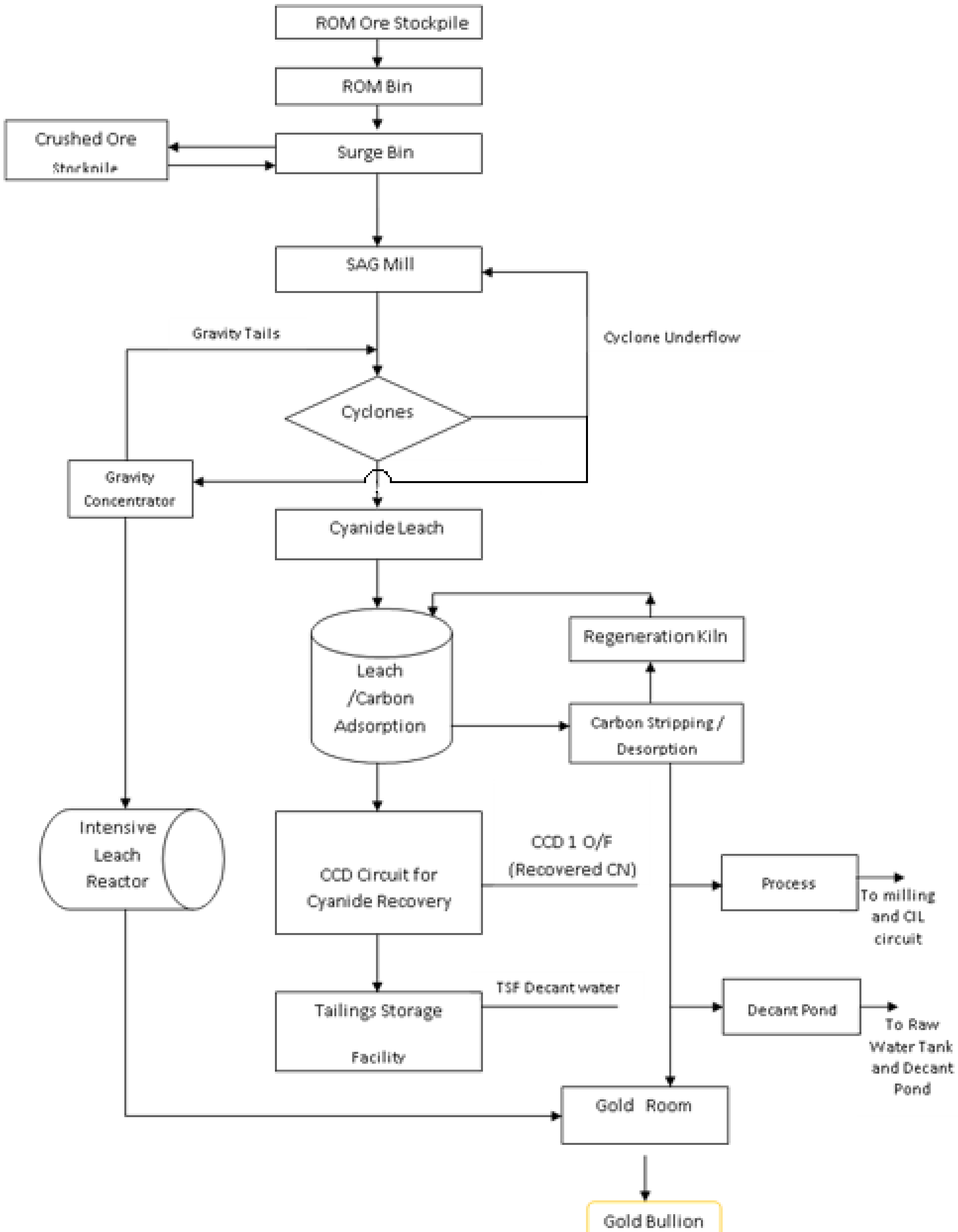


Figure 13.1: Nzema Treatment Plant Flowsheet Design

13.4 Tailings Testwork

As part of the testwork for the feasibility Study for the Project, Knight Piésold undertook testing of the tailings derived from the different ore types. The ore types tested include 'Adamus Oxide', 'Adamus Transition', 'Adamus Sulphide', 'Salman Oxide' and 'Salman Transition'.

The five samples were produced by AMMTEC laboratories and delivered to the KP tailings testing laboratory in Perth, Western Australia. The samples consisted of feed material ground to approximately P80 of 75 microns and adjusted to a pH of 8.5 with the addition of lime. No leaching of any of the samples occurred prior to testing.

All of the samples were tested in the 'as received' condition and the following tests were carried out:

1. Classification tests to determine:
    - Particle size distribution of the tailings
    - Supernatant liquor density
    - Liquid and plastic limits of the tailings solids
    - Tailings solids particle density
2. Undrained and drained sedimentation tests
3. Air drying tests
4. Permeability tests
5. Consolidation tests

Classification testing was completed by Western Geotechnics laboratory, in Perth and was conducted in accordance with relevant Australian Standards. The particle size analysis was completed in accordance with Australian Standard AS1289 3.6.3 – 2003.

14 Mineral Resource Estimates

14.1 Introduction

Mineral Resource estimates have been completed for seven separate deposits that so far comprise the Nzema Gold Project. These deposits are:

1. Salman
2. Adamus
3. Bokrobo
4. Nfutu
5. Aliva
6. Avrebo
7. Akropon

In 2012 MPR Geological Consultants Pty Ltd (MPR) were retained by Endeavour Mining Corporation (Endeavour) to estimate Mineral Resources for the Salman, Nfutu, Aliva and Akropon deposits. Mineral Resource estimates for Adamus, Bokrobo and Avrebo were not updated in 2012 and are unchanged from earlier work.

The work completed by MPR in 2012 follows on from previous estimates undertaken by Hellman and Schofield Pty Ltd (H&S) which were carried out in 2008 and reported in March 2009 ("the 2009 H&S estimate") within the Technical Report entitled "Southern Ashanti Gold Project, Ghana, West Africa" (Heeks, 2009).

The information presented below is a summary of the work completed for the current resource models in 2012 and previously in 2008 as appropriate for each deposit. More detailed reports exist for each deposit (Hellman & Schofield Pty Limited., 2008a, 2008b, 2009; MPR Geological Consultants Pty Ltd., 2012a, 2012b, 2013a, 2013b).

14.2 Resource Estimation Procedures

Mineral Resources at Nzema have been estimated using the method of Multiple Indicator Kriging (MIK) with block support adjustment. Geological and oxidation domains were imposed to define domains of similar grade tenor and directional trends. The models estimate resources into blocks with dimensions appropriate to the average drill hole spacing for each deposit. Continuity of gold grades was characterised by indicator variograms at 14 indicator thresholds. A block support adjustment, incorporating an allowance for the Information Effect, was used to estimate the gold resources for a selective mining unit of 3mE x 8mN x 3mRL and grade control sampling at 5mE x 8mN x 1.5mRL spacing.

The Mineral Resource estimates within each block have been classified according to the distribution of sampling in the kriging neighbourhood. This classification scheme takes into account the uncertainty in the estimates related to the proximity and spatial distribution of the informing sample composites.

Data viewing, compositing and wire-framing at Nzema have been performed using Micromine software. Exploratory data analysis, variogram calculation and modelling, and resource estimation have been performed using FSSI Consultant (Australia) Pty Ltd GS3M software.

14.3 Modelling Domains

14.3.1 Domain Strategy

Geological/mineralisation and oxidation domains were imposed to define primary domains of similar grade tenor and directional trends. Drill holes were viewed in cross-section and mineralised envelopes were defined at low grade, nominally 0.2g/t Au, and interpreted as cross-section outlines snapped to drill-hole traces in three dimensions. The cross-section outlines were then formed into 3D wire-frames and the wire-frames used to allocate primary (mineralisation) domain codes. At Salman a separate primary domain is formed for the near surface zone of complete weathering/scree material by creating a solids wire-frame by using the topography and "very weathered" surface DTM's as the top and bottom, respectively, of a closed volume. All remaining composites left un-assigned to primary domains are flagged to a bulk, mostly barren waste or peripheral domain.

Secondary model sub-domains are based on logged weathering or oxidation, where the latter is used to define the transition from oxide material to fresh or sulphide material (Figure 14.1) at Salman. This is critical at Salman as the metallurgical recovery drops from approximately 90% in the oxide sub-domain to as low as 35% in fresh or "sulphide" sub-domain. At other deposits which do not have refractory ore the sub-domains are selected based on the weathering transitions.

For most deposits three weathering surfaces have been created based on the logging contained in the geological data base:

- VW completely weathered (near surface)
- MW moderately weathered/oxidised (base of oxide)
- WW weakly weathered/oxidised (base of transitional, top of sulphide).

Composites are numerically coded according to the follow scheme:

1. Completely Weathered
2. Oxide
3. Transition
4. Fresh rock

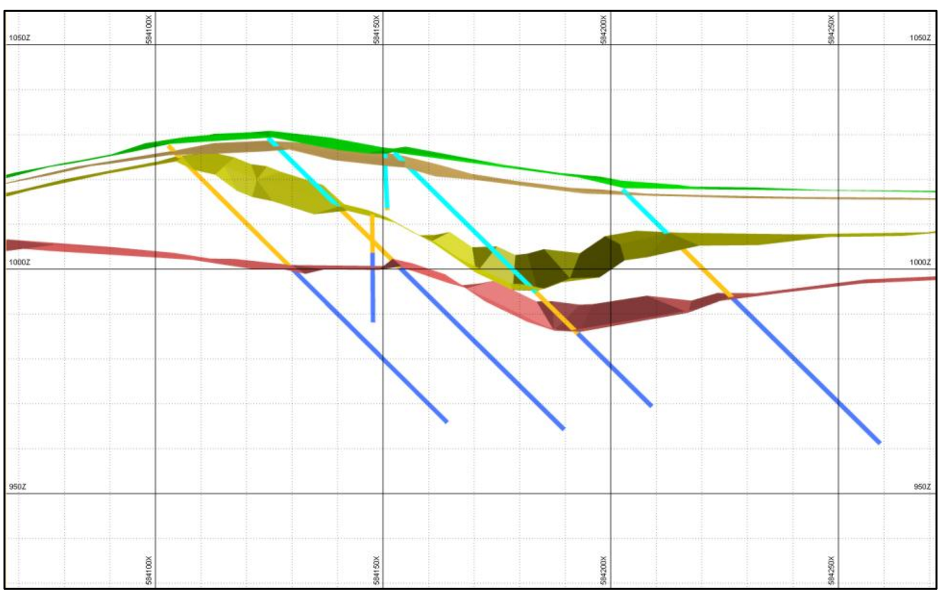


Figure 14.1: Secondary Domain Surfaces at Salman (yellow=oxide/transition; red=transition/fresh)

14.3.2 Adamus Primary Domains

Although structural controls on gold mineralisation at Adamus are not well understood, drilling in the central part of the deposit is sufficiently close spaced that the orientations of mineralised zones are appropriate. The present interpretation favours mineralization occurring in stacked primary lode structures and this is supported by exposures that were exploited by small-scale miners in the area.

Domains used in the current study simply groups the resource data into two primary mineralised domains and are shown in Figure 14.2 and described in Table 14.1.

Depth to fresh rock at Adamus varies between 25 and 50 metres over the resource area.

Table 14.1: Adamus Resource Modelling Domains

Domain	Description
0	Peripheral, essentially barren, undefined mineralisation
1	Main Zone – series of stacked primary lode structures
2	Granite hosted gold mineralisation

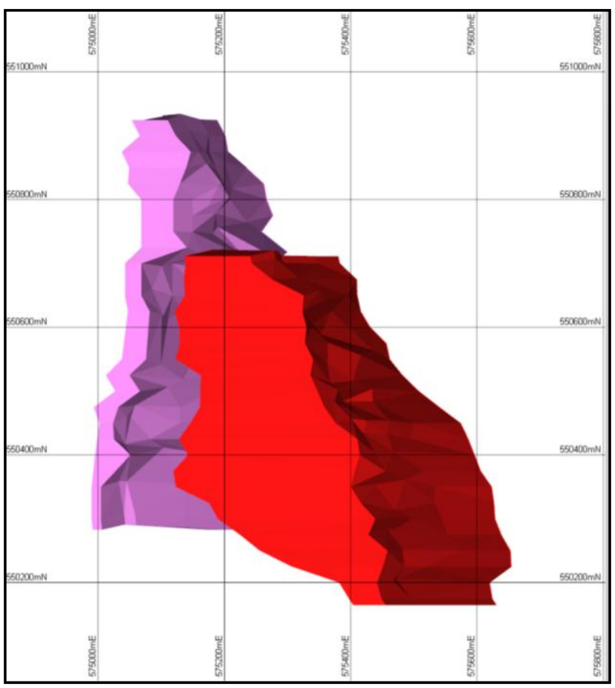


Figure 14.2: Adamus Model Primary Domains

14.3.3 Salman Trend Primary Domains

The primary domain wire-frames in the current study are the outcome of a completely new sectional interpretation for the Salman Trend and in some areas differ significantly from those used in earlier studies. The new interpretation not only had the additional infill exploration drilling to base the interpretation on but also the extensive close spaced grade control drilling. The close spaced drilling allowed the resolution of previously interpreted single zones (based on broad drilling) into multiple zones resulting in a larger number of domains identified in the current study.

For modelling purposes the Salman resource is split into four areas; Salman South, Teberu-Nugget Hill, Salman North and Akango. In each area Domain 1 is all material above the very weathered (VW) surface and Domain 2 is unconstrained peripheral waste material. In addition to Domains 1 and 2, ten mineralised domains were created at Salman South, eight at Nugget Hill - Teberu, three at Salman North and six at Akango (Figure 14.3 to Figure 14.6).

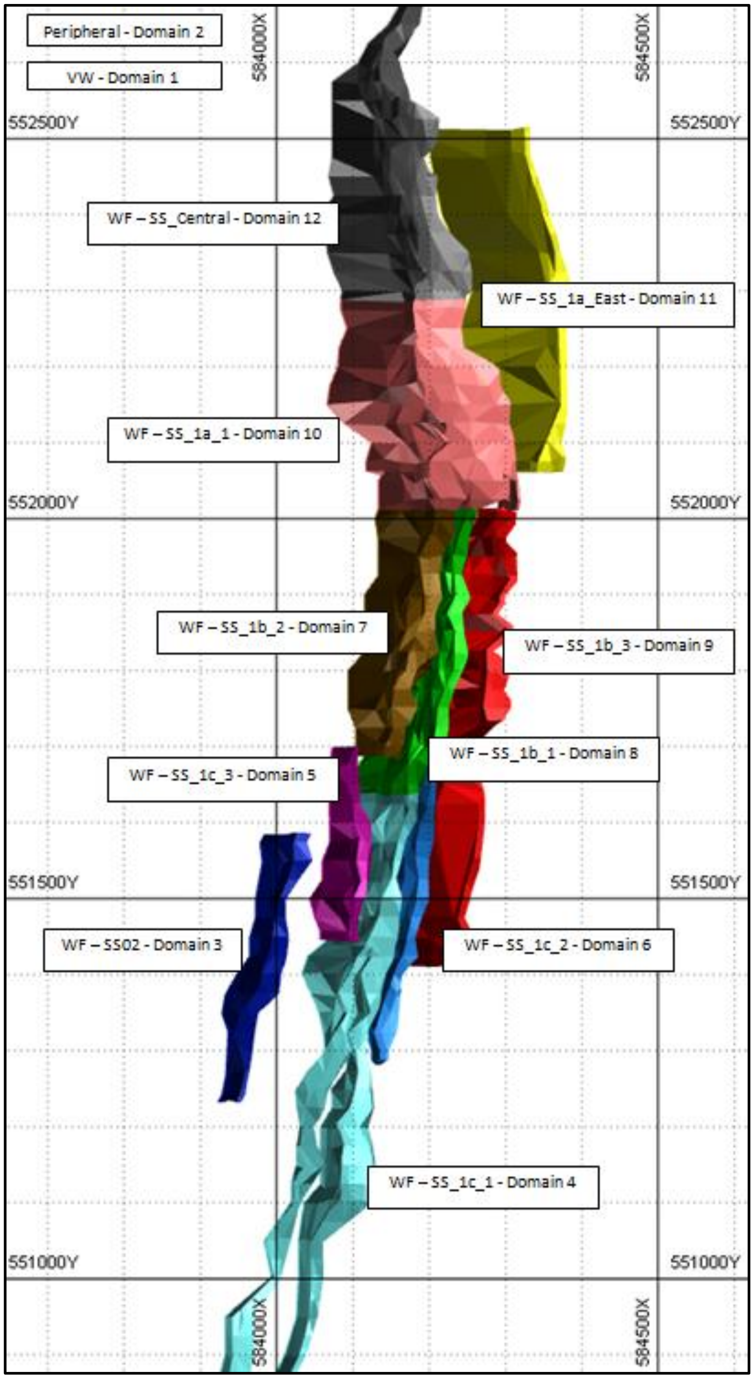


Figure 14.3: Salman Model Primary Domains at Salman South

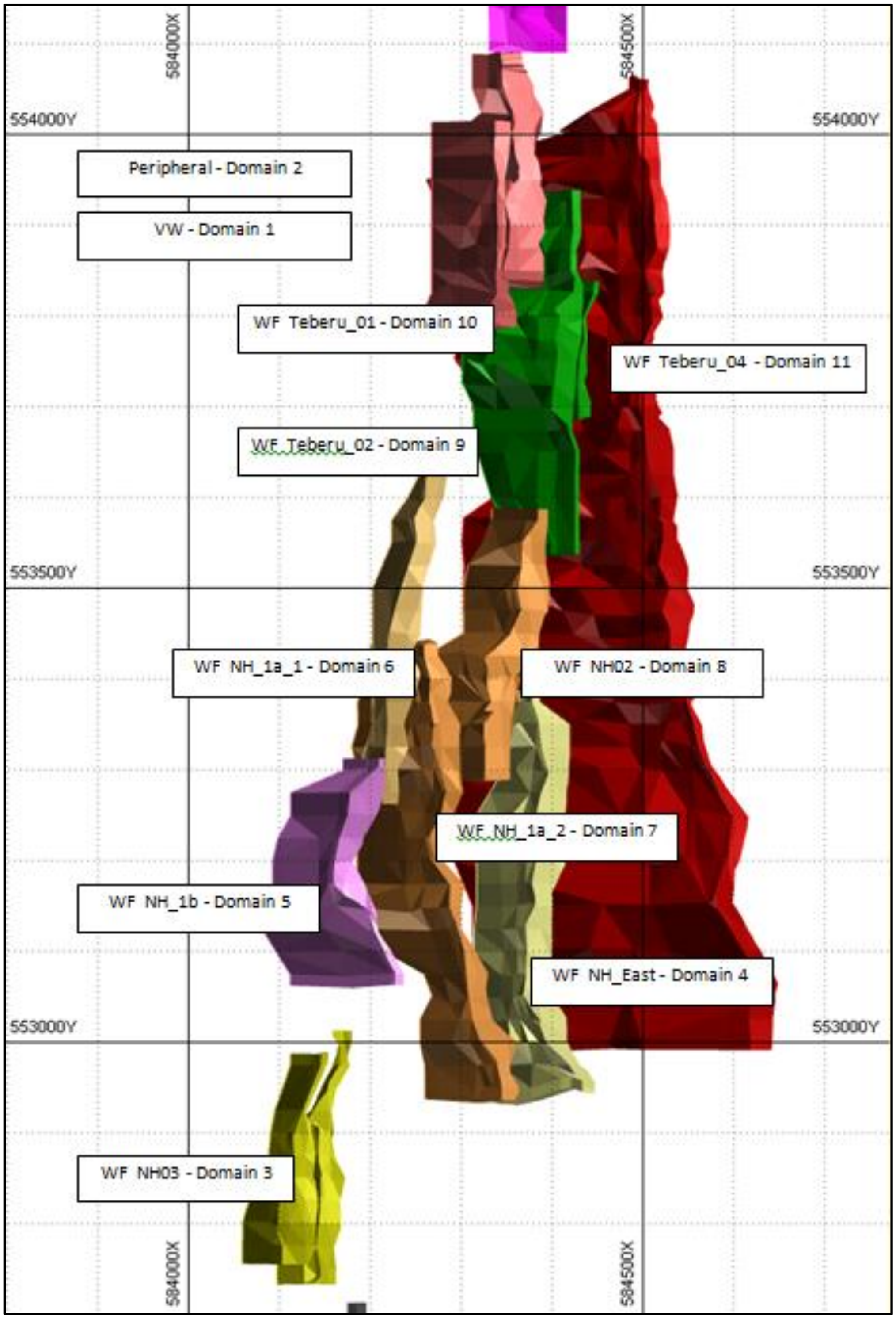


Figure 14.4: Salman Model Primary Domains at Nugget Hill - Teberu

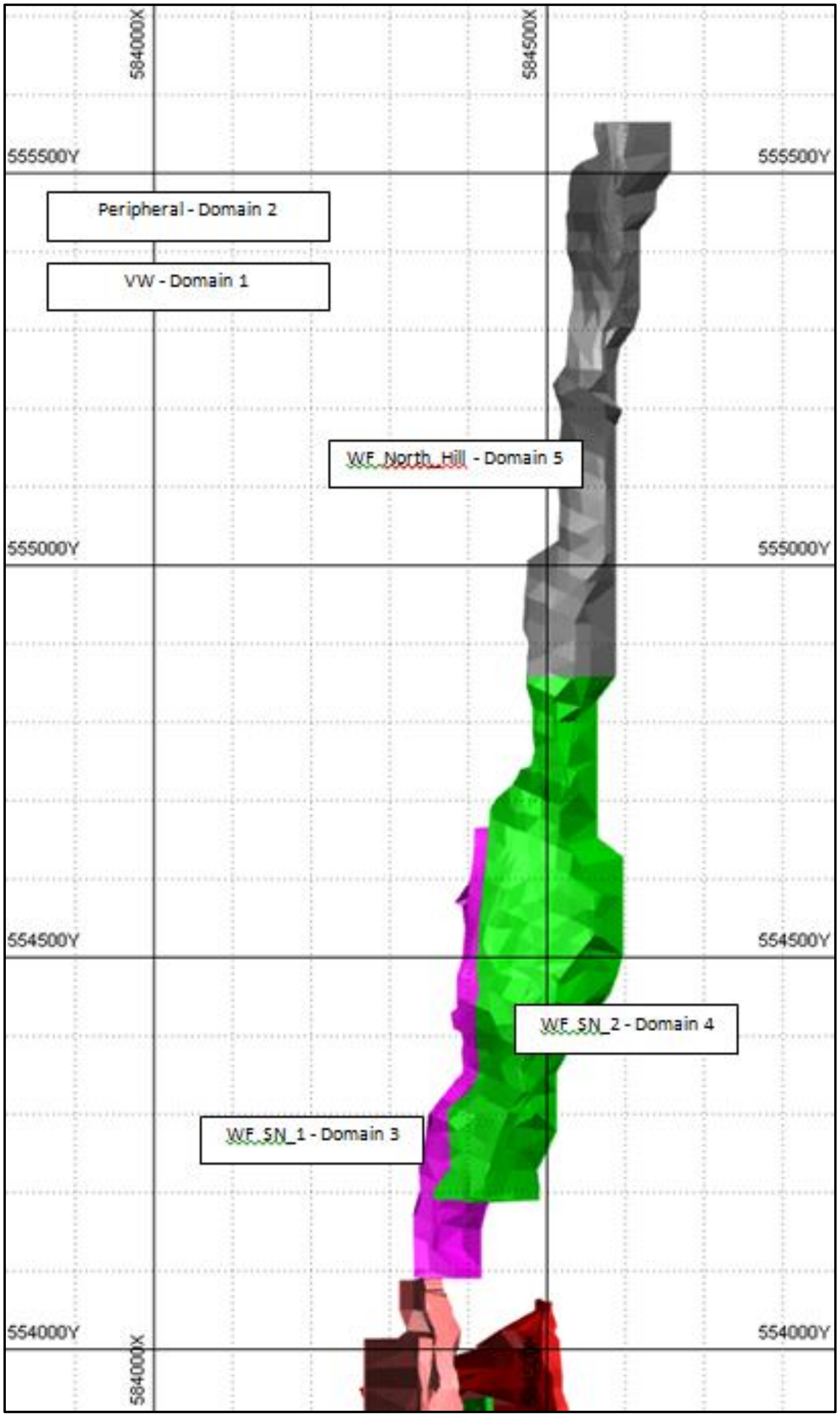


Figure 14.5: Salman Model Primary Domains at Salman North

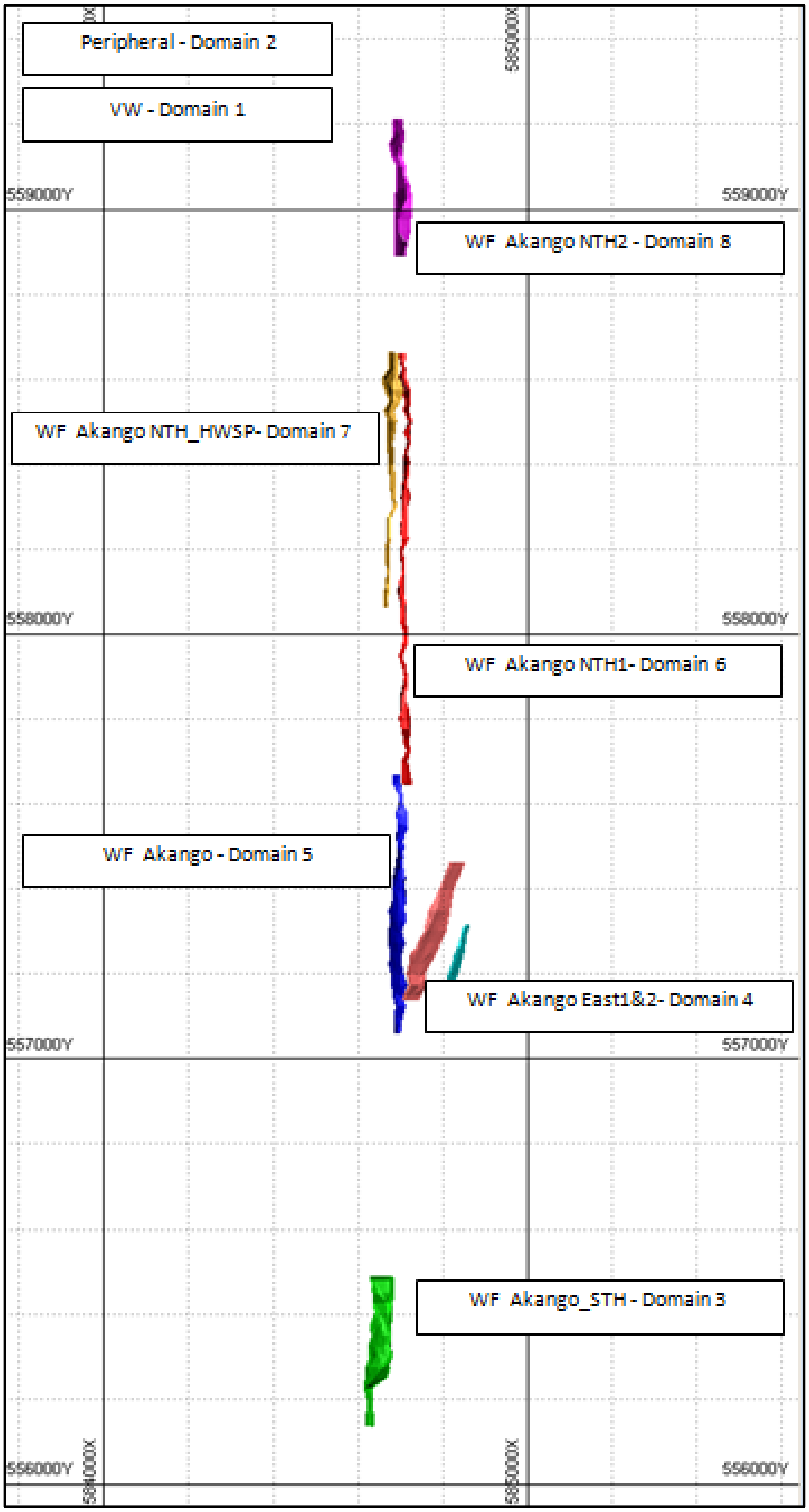


Figure 14.6: Salman Model Primary Domains at Akango

14.3.4 Bokrobo Domains

The main mineralised zone at Bokrobo dips steeply to the west and strikes in a northerly direction. Two relatively shallow west-dipping zones, "the hangingwalls" confine another mineralised trend. An east dipping barren dyke stopes out the main zone on some levels (Figure 14.7 and Table 14.2). The gold mineralisation at Bokrobo has been defined over a strike of some 350 metres and up to approximately 200 metres vertically.

Table 14.2: Bokrobo Resource Modelling Domains

Domain	Description
0	Peripheral (Essentially Barren)
1	Main Mineralised Zone-Strikes North and dips steeply West (red)
2	Hanging Wall Zone, shallow westerly dip. (pink)
3	Deep granite (yellow)
4	Barren N-S striking dyke (green)

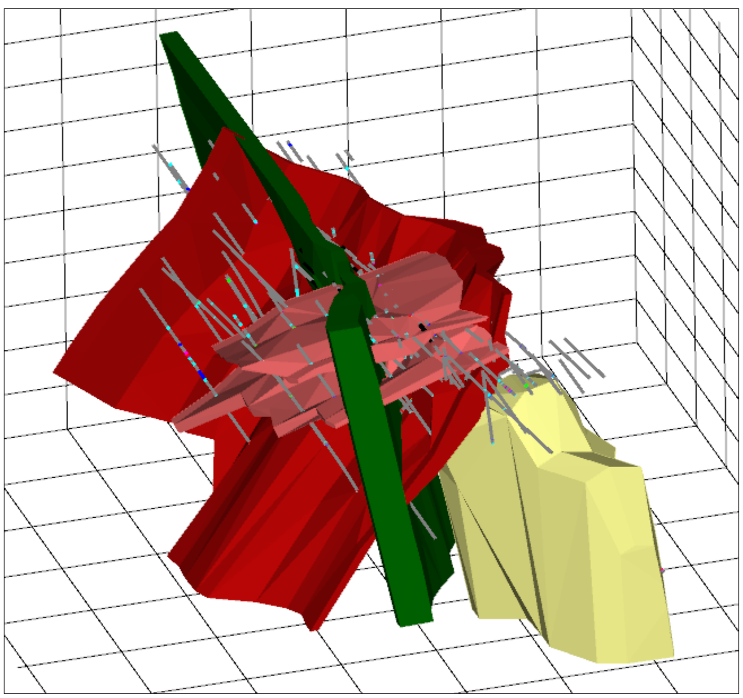


Figure 14.7: Bokrobo Model Primary Domains

14.3.5 Nfutu Domains

A single mineralised envelope is used in the MIK estimate at Nfutu (Figure 14.8). All resource composites unassigned to a mineralised domain are included in the resource model as an unbounded domain (Domain 1).

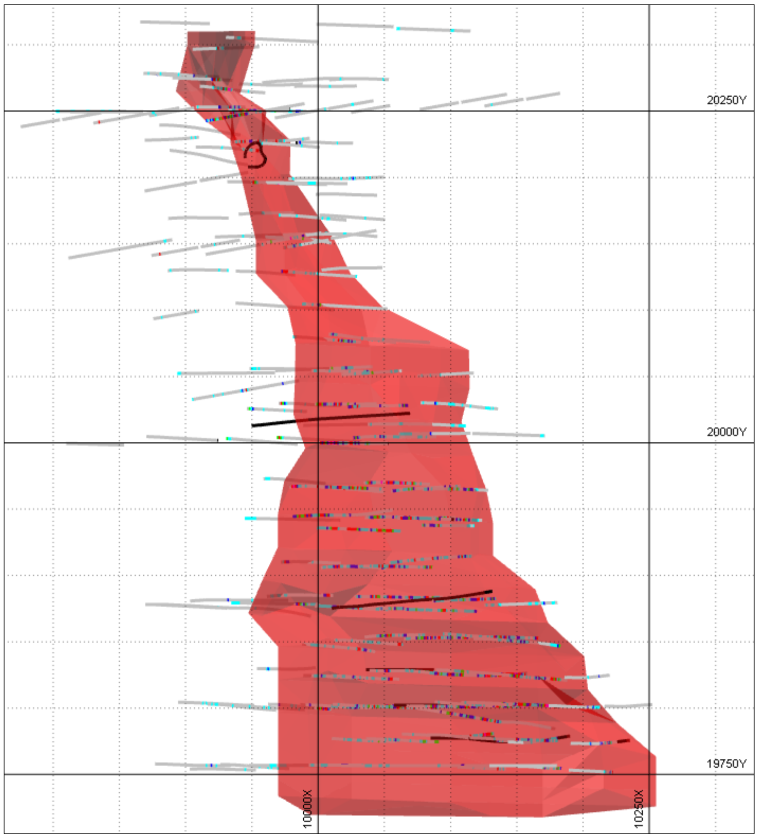


Figure 14.8: Nfutu Model Primary Domain

14.3.6 Aliva Domains

Four mineralised envelopes are used in the MIK estimate at Aliva. In the southern end of the study area, model Domain 2 consists of a series (stacked) moderately (45°) east dipping zones of gold mineralisation. Domains 3, 4 and 5 extend through the remainder of the study area and typically capture narrow east steeper (60°) dipping mineralised structures (Figure 14.9). All resource composites unassigned to a mineralised domain are included in the resource model as an unbounded domain (Domain 1).

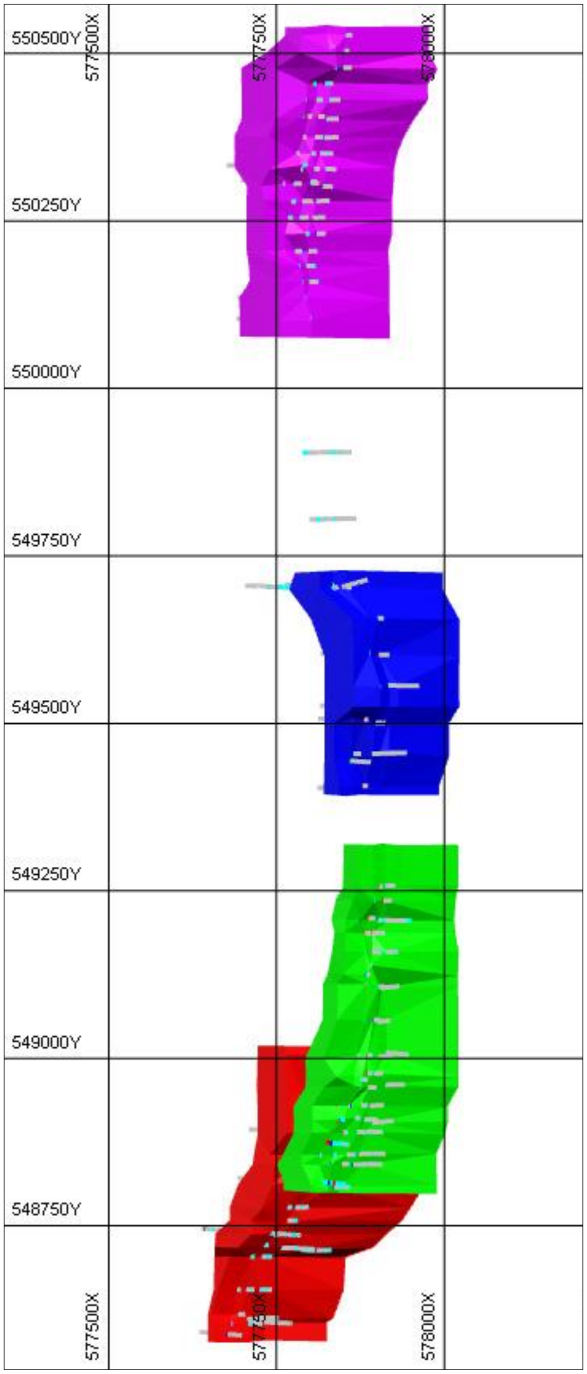


Figure 14.9: Aliva Model Primary Domains

14.3.7 Avrebo Domains

The gold mineralisation at Avrebo has been defined over a strike of some 670 metres and up to approximately 170 metres vertically. A single mineralised envelope was used in the MIK estimate at Avrebo (Figure 14.10). This domain was interpreted from logged geology based on alteration.

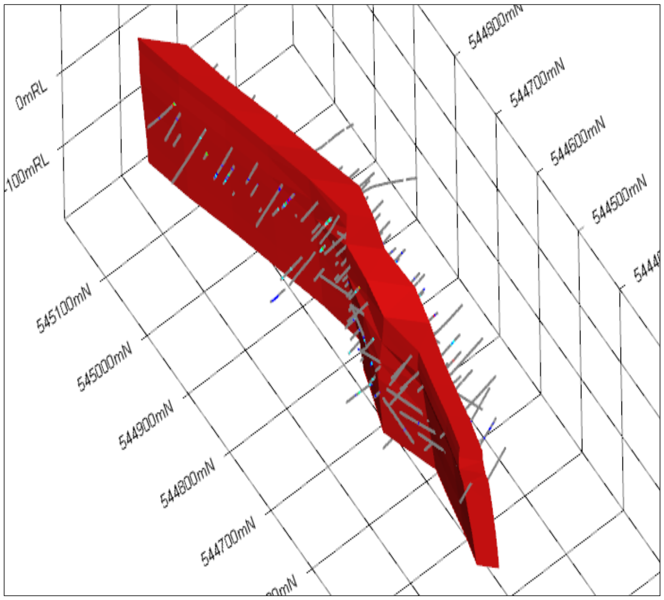


Figure 14.10: Avrebo Model Primary Domain

14.3.8 Akropon Domains

A single mineralised envelope was used in the MIK estimate at Akropon (Figure 14.11). All resource composites unassigned to a mineralised domain are included in the resource model as an unbounded domain (Domain 1).

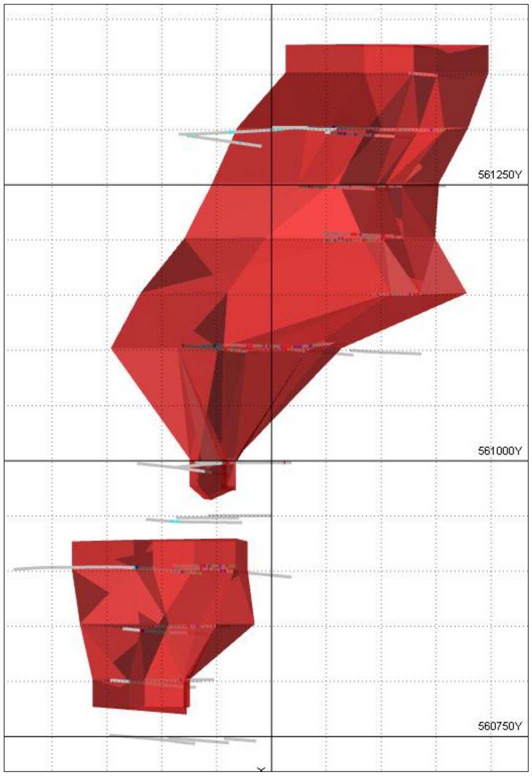


Figure 14.11: Akropon Model Primary Domains

14.4 Composite and Statistical Analysis

In all cases drill hole data was composited into equal 2m lengths prior to domain coding and statistical analysis. Un-sampled barren intervals have been assigned zero grade prior to compositing.

14.4.1 Reconciliation of Pre-2011 and 2012 Resource Composites for Salman

New sampling available in 2011-2012 has contributed a total of 30,592 additional composites (mineralised and non-mineralised) to the Salman resource data. In the following comparisons between the pre-2011 and 2012 data only the mineralised composites captured within the primary domain wire-frames (excluding surface scree material) are used, i.e. Domain 3 and higher in each model region. The pre-2011 and 2012 mineralised composites number 17,190 and 9,780, respectively (excluding Akango). The 2012 composites comprise 36 per cent of the total mineralised composites.

Table 14.3 presents summary univariate statistics for the pre-2011 and 2012 mineralised composites shown separately for each modeling region. No significant differences in the average statistics (mean, variance, coefficient of variation) or location statistics (minimum, maximum, quartiles) are seen between the two generations of composites, suggesting the pre-2011 and 2012 composite grades are compatible and sampling similar mineralisation i.e. mostly infill drilling. No new data is available for Akanko but has been included for completeness.

Table 14.3: Salman South Univariate Statistics of Resource Composites

	Salman South		Nugget Hill		Salman North		Akango	
	pre-2011	2012	pre-2011	2012	pre-2011	2012	pre-2011	2012
Number	8,261	3,358	2,584	4,698	6,345	1,724	2,554	-
Mean	1.01	0.95	0.84	0.72	0.61	0.51	0.84	-
Variance	6.43	5.59	3.57	2.91	4.58	2.87	9.41	-
CV	2.5	2.5	2.25	2.38	3.53	3.3	3.66	-
Minimum	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-
1st Quartile	0.07	0.03	0.06	0.03	0.05	0.01	0.07	-
Median	0.24	0.17	0.18	0.15	0.13	0.07	0.22	-
3rd Quartile	0.95	0.77	0.69	0.62	0.45	0.33	0.63	-
Maximum	96.34	45.69	31.18	41.23	75.1	37.06	97.26	-

14.4.2 Adamus and Bokrobo Composites

At Adamus and Bokrobo some sub-domains only contain low numbers of samples within particular weathering horizons, rendering it necessary to combine the samples prior to calculation of indicator statistics (and indicator variogram modelling) for resource estimation. Considering that there are no observed differences in the tenor of gold mineralisation across weathering boundaries, such as may be caused by supergene gold enrichment, the combining of the sub-domains is considered reasonable.

At Adamus the primary mineralised domains show coefficients of variation (CV) ranging from 3.0 to 5.0, which are high but typical for gold deposits with mineralisation similar to that seen in this deposit. CV at these levels indicates that reliable estimation of gold grades using a linear estimator would be problematic (Table 14.4). Similarly at Bokrobo, Domains 1 and 4 have high CV values, up to around 8.0.

Table 14.4: Adamus and Bokrobo Univariate Statistics of Resource Composites

	Adamus			Bokrobo				
	Domain 0	Domain 1	Domain 2	Domain 0	Domain 1	Domain 2	Domain 3	Domain 4
Number	10,955	16,409	2491	9,467	1,212	890	1051	922
Mean	0.046	0.804	0.487	0.087	2.74	0.419	0.597	0.116
Variance	0.042	17.478	1.302	0.209	473.978	0.899	1.469	0.976
CV	4.448	5.203	2.342	5.241	7.946	2.264	2.03	8.497
Minimum	0	0	0	0	0.01	0.01	0.01	0.01
1st Quartile	0.01	0.02	0.05	0.01	0.06	0.04	0.07	0.01
Median	0.02	0.08	0.14	0.02	0.26	0.14	0.22	0.01
3rd Quartile	0.04	0.35	0.44	0.05	1.08	0.4	0.58	0.02
Maximum	8.96	254	21.46	18.83	658.33	12.45	17.89	23.47

14.4.3 Aliva, Nfutu, Avrebo and Akropon Composites

Univariate statistics for the primary modelling domains for Aliva, Nfutu, Avrebo and Akropon are shown in Table 14.5 and Table 14.6 below.

Table 14.5: Aliva and Nfutu Univariate Statistics of Resource Composites

	Aliva					Nfutu	
	Domain1	Domain2	Domain3	Domain4	Domain5	Domain1	Domain2
Number No.	3,491	1,064	592	318	916	3,789	3,180
Mean	0.053	0.32	0.675	0.416	0.525	0.037	0.357
Variance	0.021	0.218	0.749	0.315	2.259	0.007	1.157
CV	2.718	1.463	1.283	1.348	2.864	2.301	3.011
Minimum	0	0.01	0	0.01	0	0.01	0.01
1st Quartile	0.01	0.08	0.12	0.1	0.07	0.01	0.03
Median	0.02	0.15	0.35	0.19	0.16	0.02	0.08
3rd Quartile	0.06	0.36	0.87	0.52	0.41	0.04	0.25
Maximum	4.35	4.48	6.61	4.09	29.81	2.82	26.05

Table 14.6: Avrebo and Akropon Univariate Statistics of Resource Composites

	Avrebo		Akropon	
	Domain 0	Domain 1	Domain1	Domain2
Number	1,989	2,428	1,114	844
Mean	0.095	0.384	0.038	0.484
Variance	0.027	1.031	0.002	4.213
CV	1.726	2.644	1.388	4.243
Minimum	0	0.01	0	0
1st Quartile	0.02	0.03	0.01	0.04
Median	0.05	0.1	0.02	0.13
3rd Quartile	0.1	0.34	0.05	0.29
Maximum	2.08	24.91	1.03	4.48

14.5 Bulk Densities

The bulk density (BD) information used in the Nzema resource estimates were revised from those used in 2009 estimate for oxide ore at Salman, based on observations and reconciliation with reported plant process tonnes and stockpile surveys. Bulk densities used at Adamus and Bokrobo are unchanged from previous estimates as there is no evidence to suggest a change is necessary and also the oxide proportion of these resources is proportionally much less significant compared to Salman. Smaller satellite resources have used bulk density values similar to Salman (Table 14.7).

Table 14.7: Nzema Resource Bulk Densities

Sub-Domain	Salman	Adamus	Bokrobo	Aliva	Nfutu	Avrebo	Akropon
1	1.55	1.8	1.8	1.55	1.55	1.8	1.8
2	1.8	2.1	2.1	1.8	2	2.1	1.8
3	2.5	2.5	2.5	2.5	2	2.5	2.5
4	2.8	2.8	2.8	2.8	2.9	2.8	2.8

14.6 Spatial Continuity Analysis

14.6.1 Indicator Thresholds and Class Grades

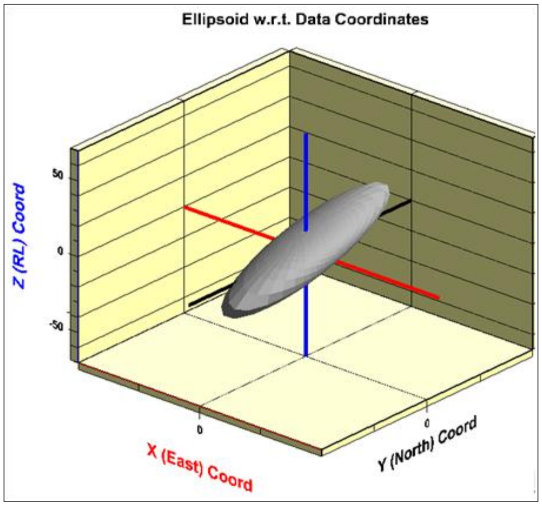
Composited drill samples were flagged as lying within or outside the domain wire-frames and in surface/oxide/transition or fresh (sulphide) zones. Conditional statistics were calculated for each data subset at 14 probability thresholds of 0.1, 0.2, 0.3, 0.4, 0.6, 0.7, 0.75 0.8, 0.85, 0.9, 0.95, 0.97 and 0.99.

The upper class average grades can be derived from either the mean or median of the upper bin and in some cases upper cuts to the highest grades in the domain composites can also be applied prior to calculating the domain conditional statistics. The selection of the average grade of the highest bin was made on a case by case basis and was influenced by a combination of observed skewness of the bin data (comparing the median and mean) and, where data is available at Salman, reconciliations with the grade control results.

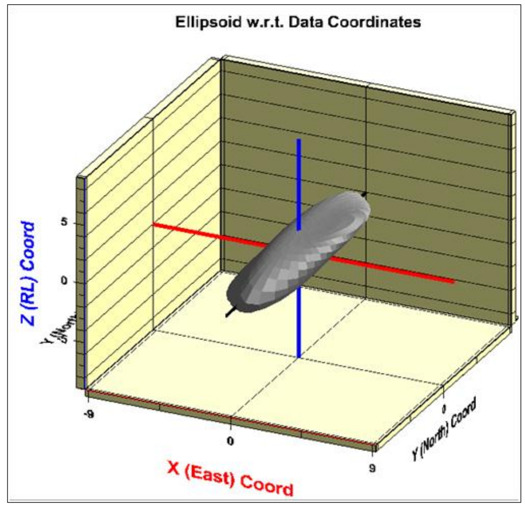
14.6.2 Variogram Models

Indicator and gold variograms were modelled from the respective domain composites (or in some cases a combined data set of similar oriented mineralised domains). Although grade continuity within the mineralised domains is not strongly structured, the available data generally show strongest grade continuity for all deposits to be within dipping planes oriented to local strike and dip to the gold mineralisation and is consistent with trends shown in the raw data.

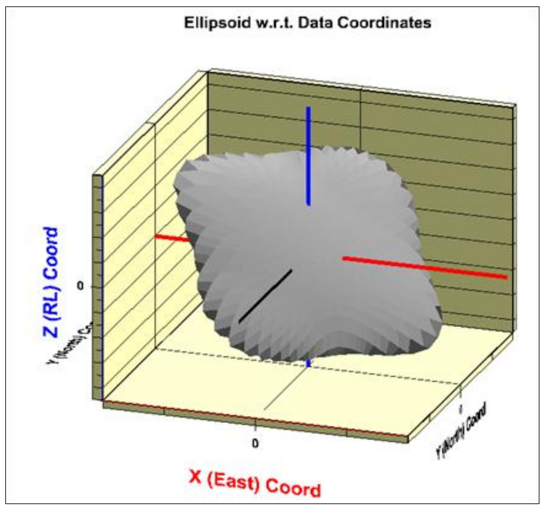
The variogram models developed for the different estimates are too numerous across all deposits, modelling areas, primary and secondary domains to show in full, as each sub-domain (of which there are over 200) each require a set of 14 indicator variograms and a gold variogram. Example variogram models of the median indicator of important primary domains for each deposit are presented as Figure 14.12 to Figure 14.14. The plots show the 3D-variogram surface maps for the median indicator variogram used for modeling the gold. The viewing angle is generally looking north and down.



Salman (South), Domain 10

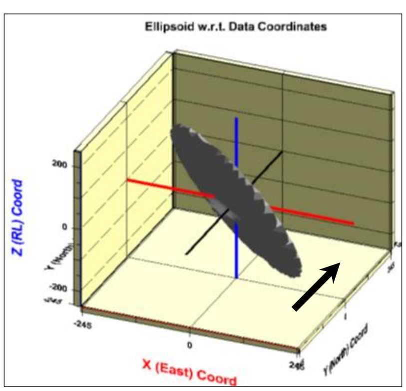


Salman (Teberu), Domain 11

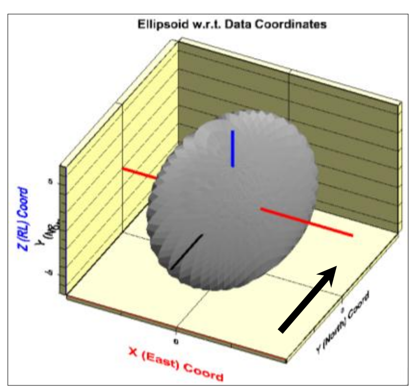


Salman (North), Domain 4

Figure 14.12: 3D Variogram Map, Median Indicator, Salman Domains

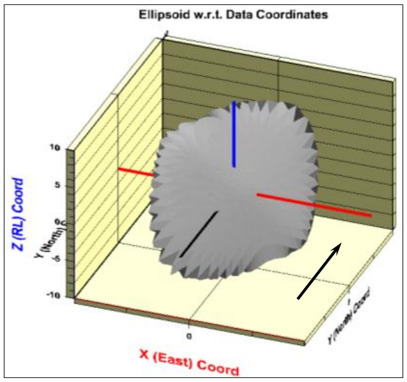


Domain 1

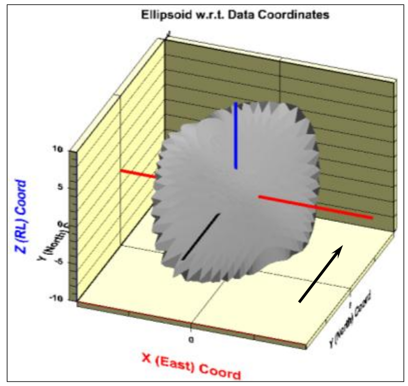


Domain 2

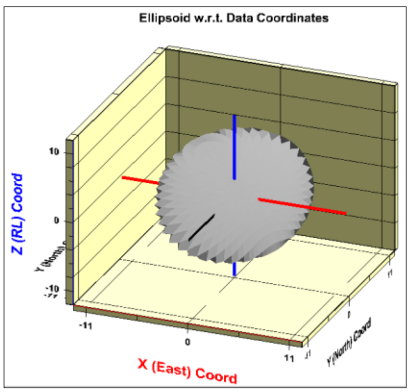
Figure 14.13: 3D Variogram Map, Median Indicator, Adamus Domains



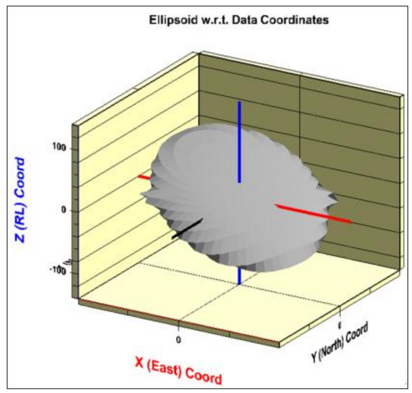
Bokrobo, Domain 1



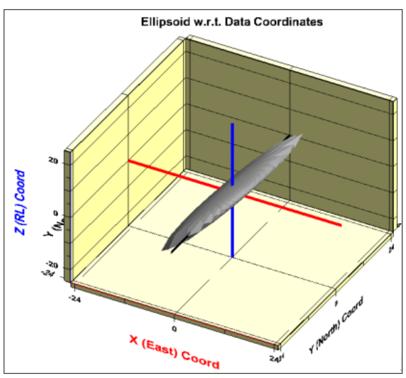
Avrebo, all Domains



Aliva, Domains 2-4



Nfutu, Domain 1



Akropon, Domain 2

Figure 14.14: 3D Variogram Map, Median Indicator, Bokrobo, Avrebo, Aliva, Nfutu and Akropon

14.7 Multiple Indicator Kriging Parameters

Tables 14.8 to Table 14.11 show the dimensions and block sizes of the various block models used at Nzema. The plan view block dimensions were selected on the basis of sample spacing in the more closely drilled shallow portions of the deposits.

Table 14.8: Salman and Adamus Model and Kriging Parameters

	Adamus			Salman		
Model Parameters	*East*	*North*	*Elevation*	*East*	*North*	*Elevation*
Block origin (centroid)	574850	550045.5	701.5	583847.5	550912.5	800.5
Block Dimensions	20	25	3	15	25	3
GC SMU size	5	8	3	3	8	3

Kriging Parameters	*Measured*	*Indicated*	*Inferred*	*Measured*	*Indicated*	*Inferred*
Min. no. of data	16	16	8	16	16	8
Max. no. of data per octant	6	6	6	6	6	6
Min. no. of octants with data	4	4	2	4	4	2
X (east) search radius (m)	25	32.5	32.5	15	22.5	22.5
Y (north) search radius (m)	30	39	39	25	37.5	37.5
Z (rl) search radius (m)	10	13	13	20	30	30

rotations	
Salman South	Y 30
Nugget Hill-Teberu	Y 30
Salman North	Z -10, Y -30
Akango	No rotation

Table 14.9: Bokrobo and Avrebo Model and Kriging Parameters

	Bokrobo			Avrebo		
Model Parameters	*East*	*North*	*Elevation*	*East*	*North*	*Elevation*
Block origin (centroid)	575110	547962.5	712.5	592250	544412.5	878.5
Block Dimensions	20	25	3	20	25	3
GC SMU size	3	5	3	4	8	3

Kriging Parameters	*Measured*	*Indicated*	*Inferred*	*Measured*	*Indicated*	*Inferred*
Min. no. of data	16	16	8		16	8
Max. no. of data per octant	6	6	6		6	6
Min. no. of octants with data	4	4	2		4	2
X (east) search radius (m)	25	37.5	37.5		30	30
Y (north) search radius (m)	30	60	60		37.5	37.5
Z (rl) search radius (m)	10	15	15		15	15

Table 14.10: Aliva and Nfutu Model and Kriging Parameters

	Aliva			Nfutu		
Model Parameters	*East*	*North*	*Elevation*	*East*	*North*	*elev*
Block origin (centroid)	577607.5	548587.5	932.5	9727.5	19750	890.5
Block Dimensions	15	25	3	15	25	3
GC SMU size	4	8	3	3	5	3

Kriging Parameters	*Measured*	*Indicated*	*Inferred*	*Measured*	*Indicated*	*Inferred*
Min. no. of data	16	16	8	16	16	8
Max. no. of data per octant	6	6	6	6	6	6
Min. no. of octants with data	4	4	2	4	4	2
X (east) search radius (m)	25	37.5	37.5	20	30	30
Y (north) search radius (m)	35	52.5	52.5	25	37.5	37.5
Z (rl) search radius (m)	10	15	15	10	15	15

Table 14.11: Akropon Model and Kriging Parameters

	Akropon		
Model Parameters	*East*	*North*	*Elevation*
Block origin (centroid)	578520	560625	953.5
Block Dimensions	20	25	3
GC SMU size	4	8	3

Kriging Parameters	*Measured*	*Indicated*	*Inferred*
Min. no. of data			8
Max. no. of data per octant			6
Min. no. of octants with data			2
X (east) search radius (m)			37.5
Y (north) search radius (m)			75
Z (rl) search radius (m)			15

Variance adjustment ratios applied in estimating the Nzema gold resources are listed in Tables 14.12 and Table 14.13. These ratios have been applied using the Direct Lognormal Correction method (Journel & Huijbregts, 1978, page 481). Selective mining dimensions of 3mE x 8mN x 3mRL and grade control sample spacing of 5mE x 8mN x 1.5mRL have been assumed.

Table 14.12: Salman Model Block Variance Corrections

	Salman South	Nugget Hill-Teberu	Salman North	Akango
Domain 1	0.045	0.013	0.193	0.078
Domain 2	0.123	0.129	0.033	0.079
Domain 3	0.020	0.129	0.033	0.079
Domain 4	0.020	0.129	0.163	0.167
Domain 5	0.078	0.129	0.025	0.074
Domain 6	0.078	0.129		0.080
Domain 7	0.082	0.129		0.080
Domain 8	0.076	0.129		0.080
Domain 9	0.038	0.300		
Domain 10	0.100	0.300		
Domain 11	0.038	0.197		
Domain 12	0.250			

Table 14.13: Block Variance Corrections Used for Each Deposit

	Adamus	Bokrobo	Avrebo	Aliva	Nfutu	Akropon
Domain 0	0.029	0.195	0.082	0.218	0.011	0.097
Domain 1	0.029	0.195	0.082	0.218	0.011	0.097
Domain 2	0.088	0.136		0.218		
Domain 3		0.195		0.218		
Domain 4		0.195		0.009		

14.8 Mineral Resource Classification

Blocks in the resource models have been allocated confidence categories on the basis of search passes as shown in Tables 14.8 to Table 14.11. The approach is based on the principle that larger numbers of samples, which are more evenly distributed throughout the search neighbourhood, will provide a more reliable estimate.

At Nzema, the majority of blocks in areas drilled at 25m x 25m spacing or closer report to measured category, most blocks in areas consistently drilled at 50m x 50m spacing or less report to indicated category and blocks in peripheral areas and at depth with less consistent drill coverage report to inferred category.

14.9 Model Validation

Model validation is based primarily on visual inspection of the resource outcomes compared to data composites on a section by section basis. At Salman reconciliation with grade control results can also be used to validate the model.

Figure 14.15 to Figure 14.23 show example cross sections through the various resource models. On each figure two plots are shown. The upper plot show the MIK model blocks scaled and coloured by the estimated material above 0.60g/t cut-off. The lower plot shows block confidence categories with blocks plotted at their full dimension.

In viewing the plots showing the estimated proportion there are situations where the blocks appear to be un-correlated to the mineralised envelopes and the mineralised intercepts in the neighbouring drill holes. This is occurring because of the way the resource blocks have been presented. The blocks plotted are only those that contain a resource above 0.60g/t Au Cut-off and the proportion of ore has been used to scale the east dimension of the block for presentation purposes. The scaling occurs about the block centroid co-ordinate, therefore introduces the apparent miss-match between data and the resource blocks.

Polylines shown on the plots are slices through the model domain wire-frames and weathering/oxidation DTM's. The as-mined topographical surface as at June 2012 is the black polyline on each section. (Note that the estimates are prepared with an effective date of December 31, 2012.)

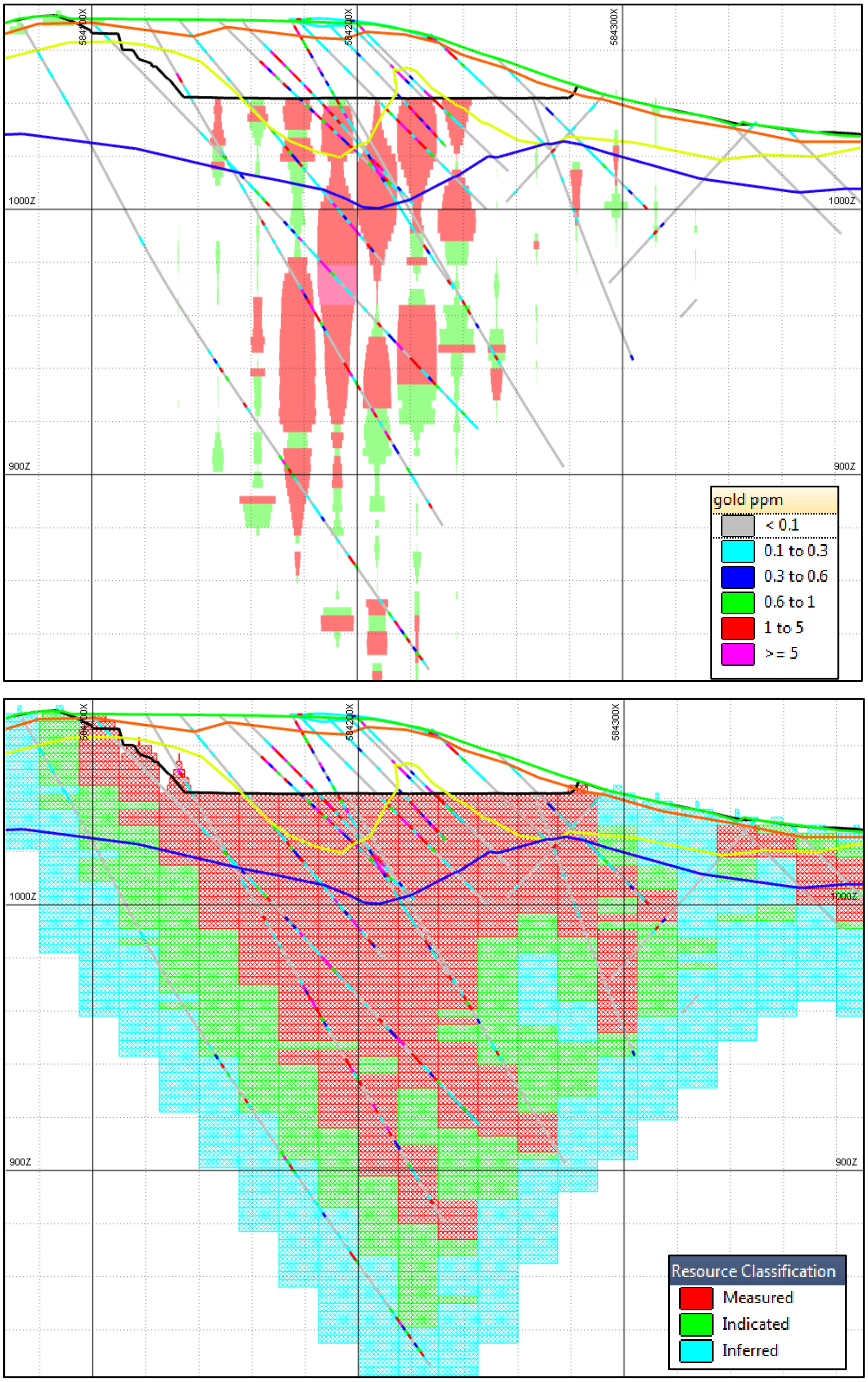


Figure 14.15: Salman Model Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 551,800mN

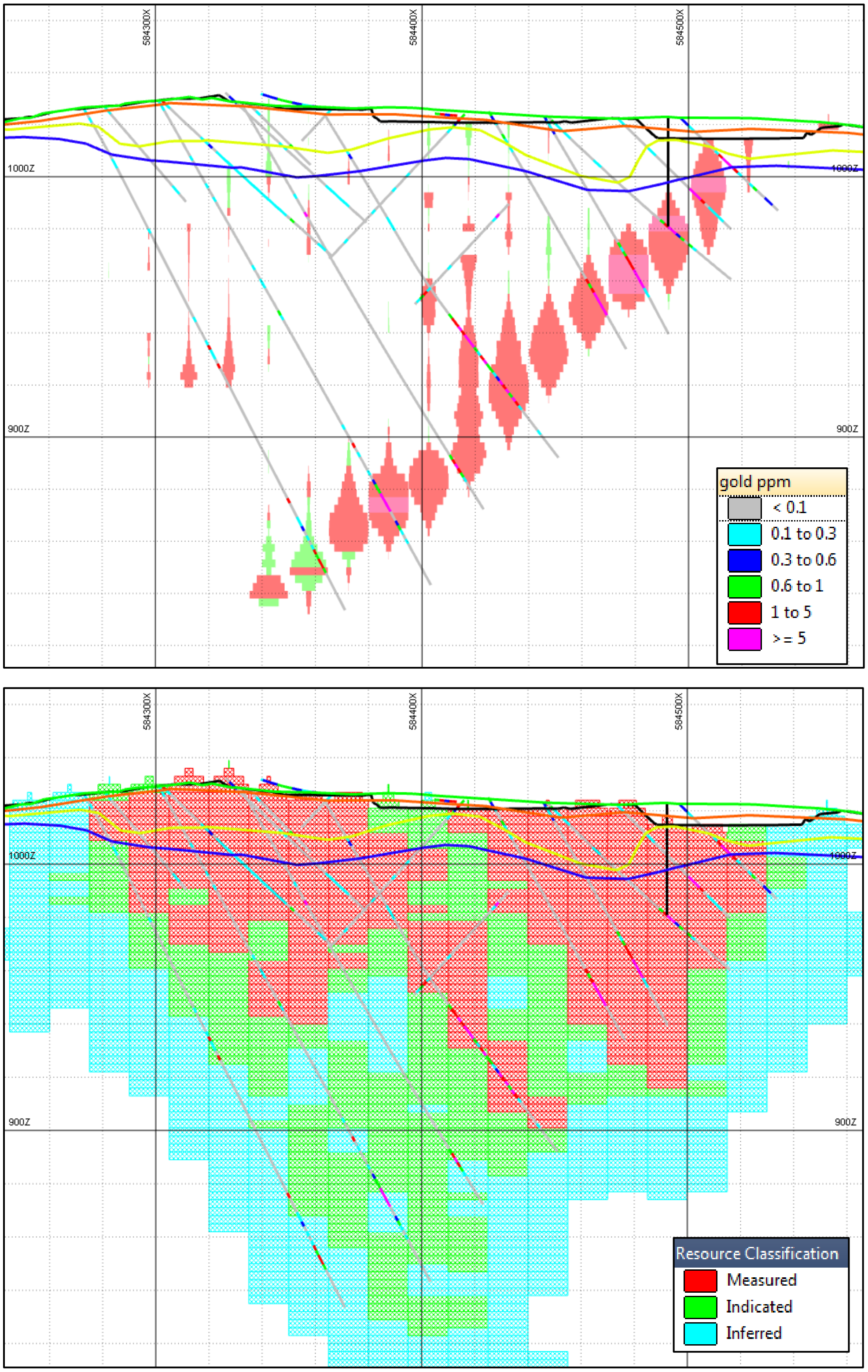


Figure 14.16: Salman Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 553,800mN

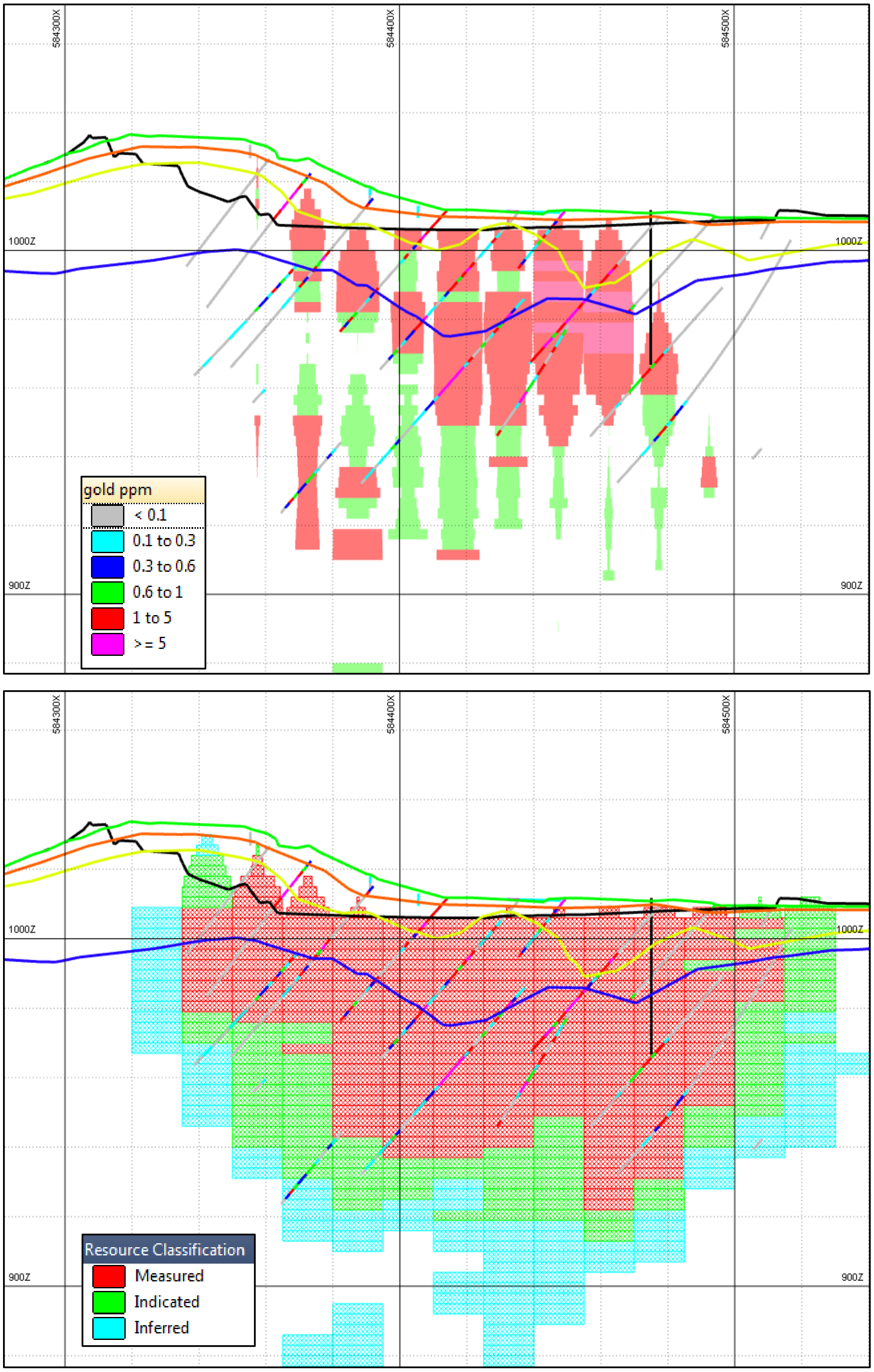


Figure 14.17: Salman Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 554,300mN

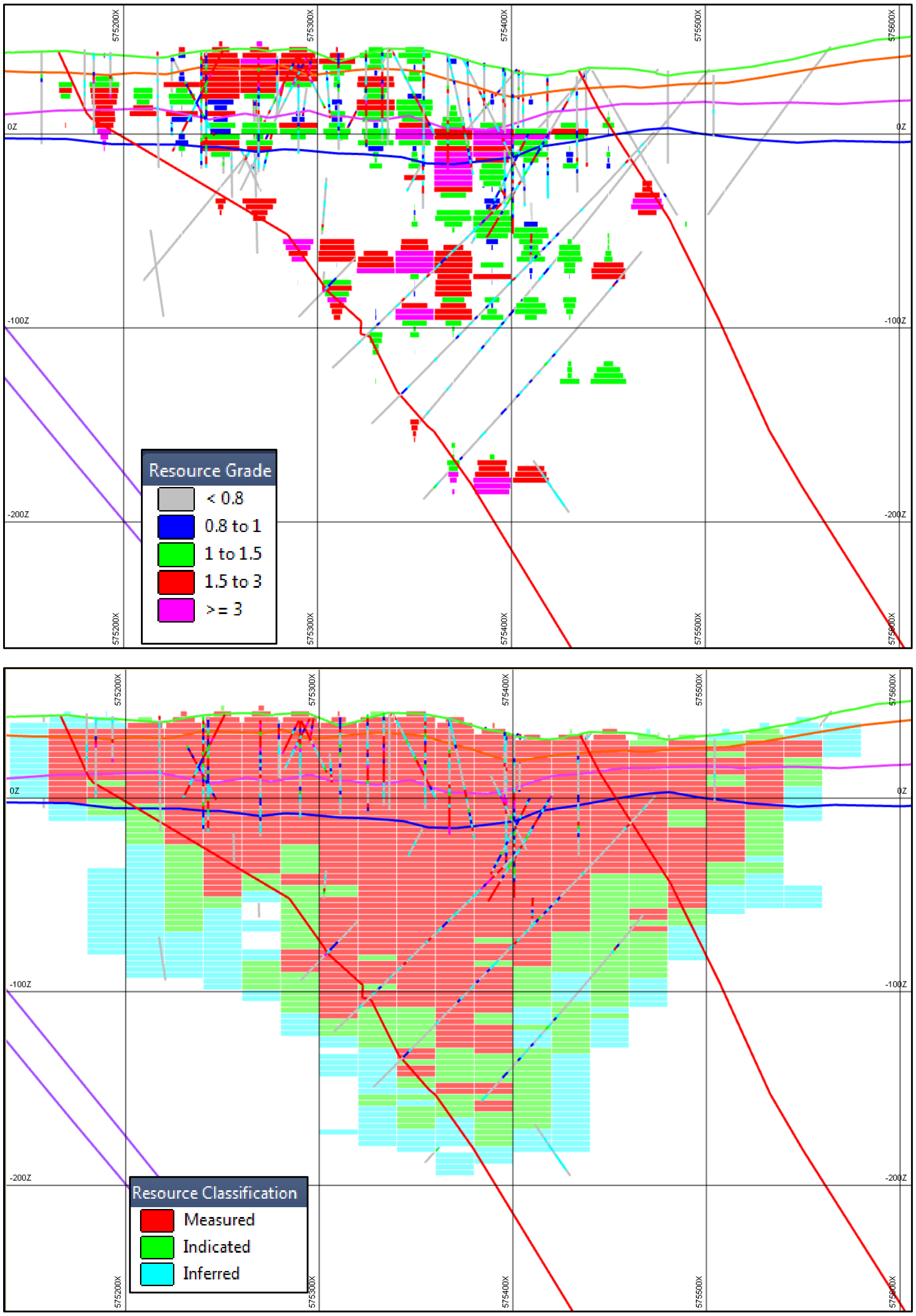


Figure 14.18: Adamus Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 550,345.50 mN (Model Grid)

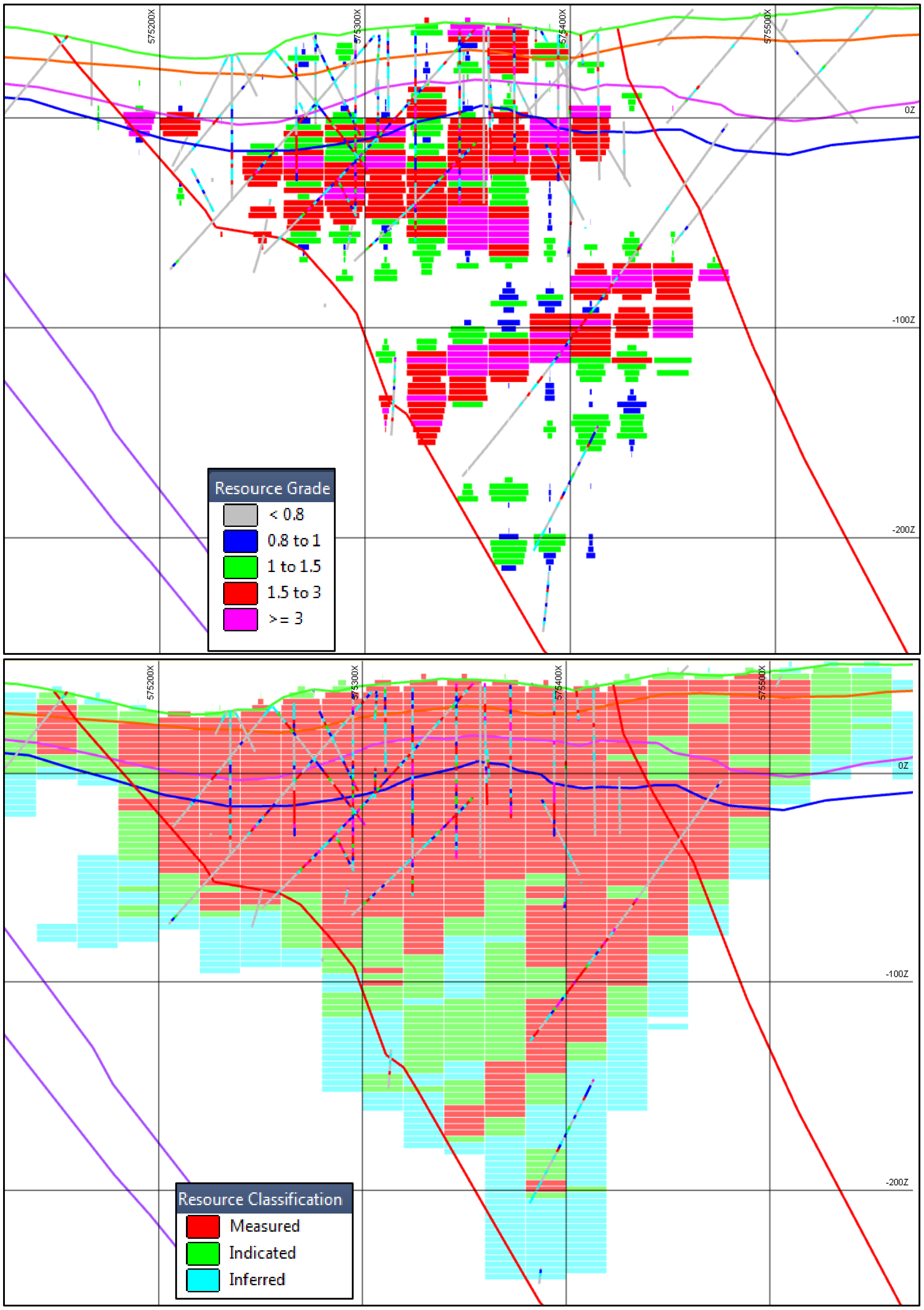


Figure 14.19: Adamus Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 550,420.50 mN (Model Grid)

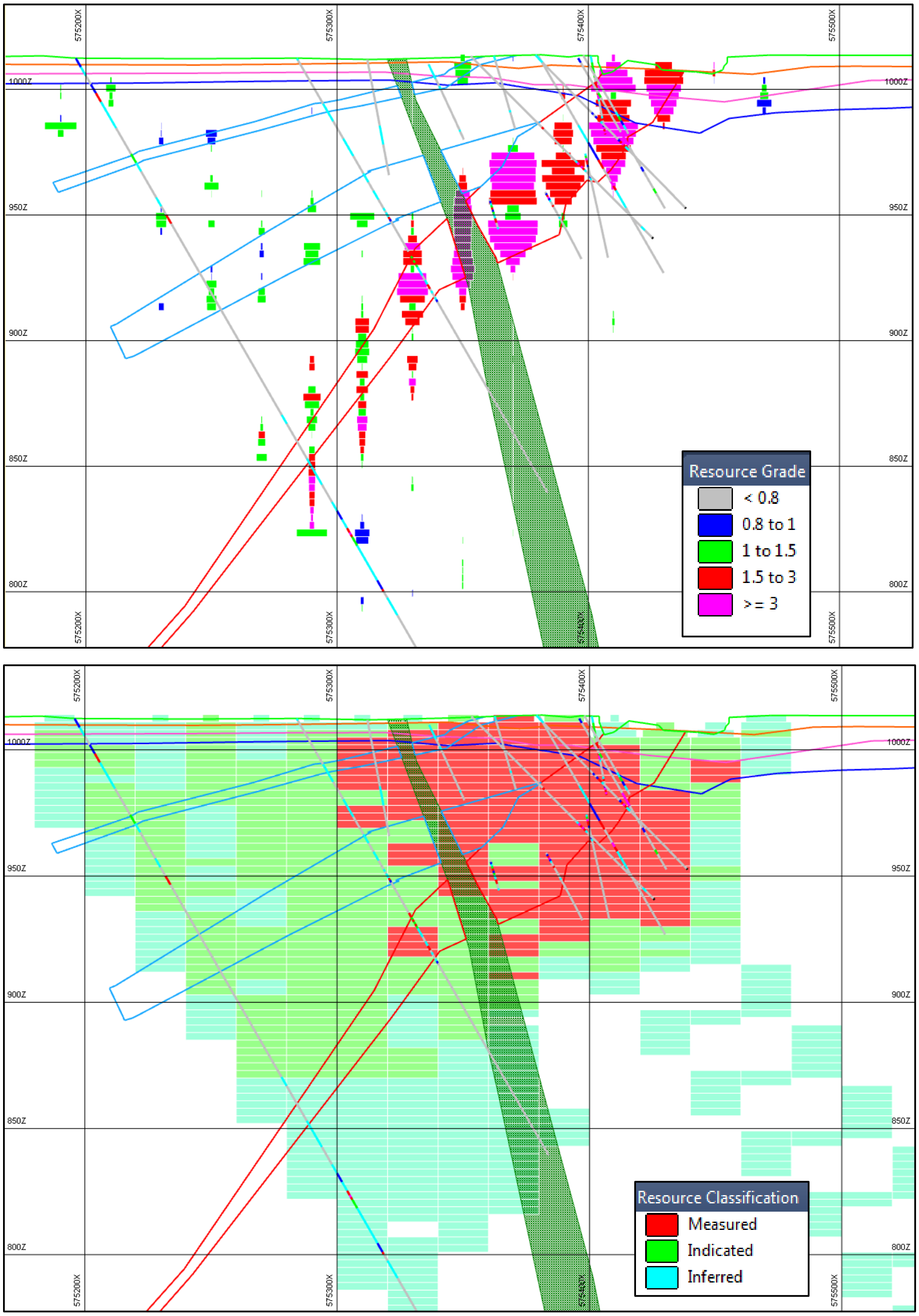


Figure 14.20: Bokrobo Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 548,212.50 mN

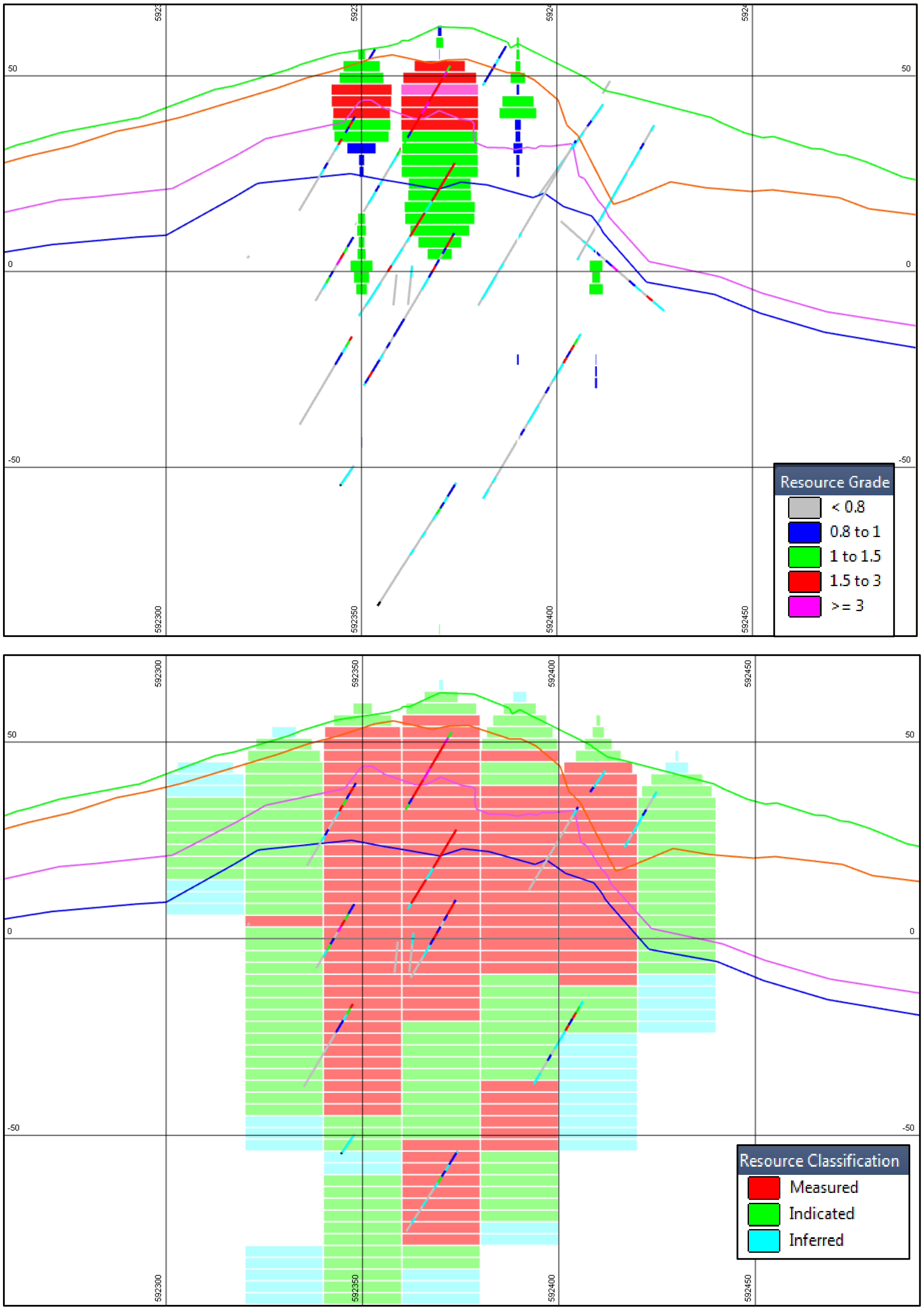


Figure 14.21: Avrebo Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 544,687.50 mN (Model Grid)

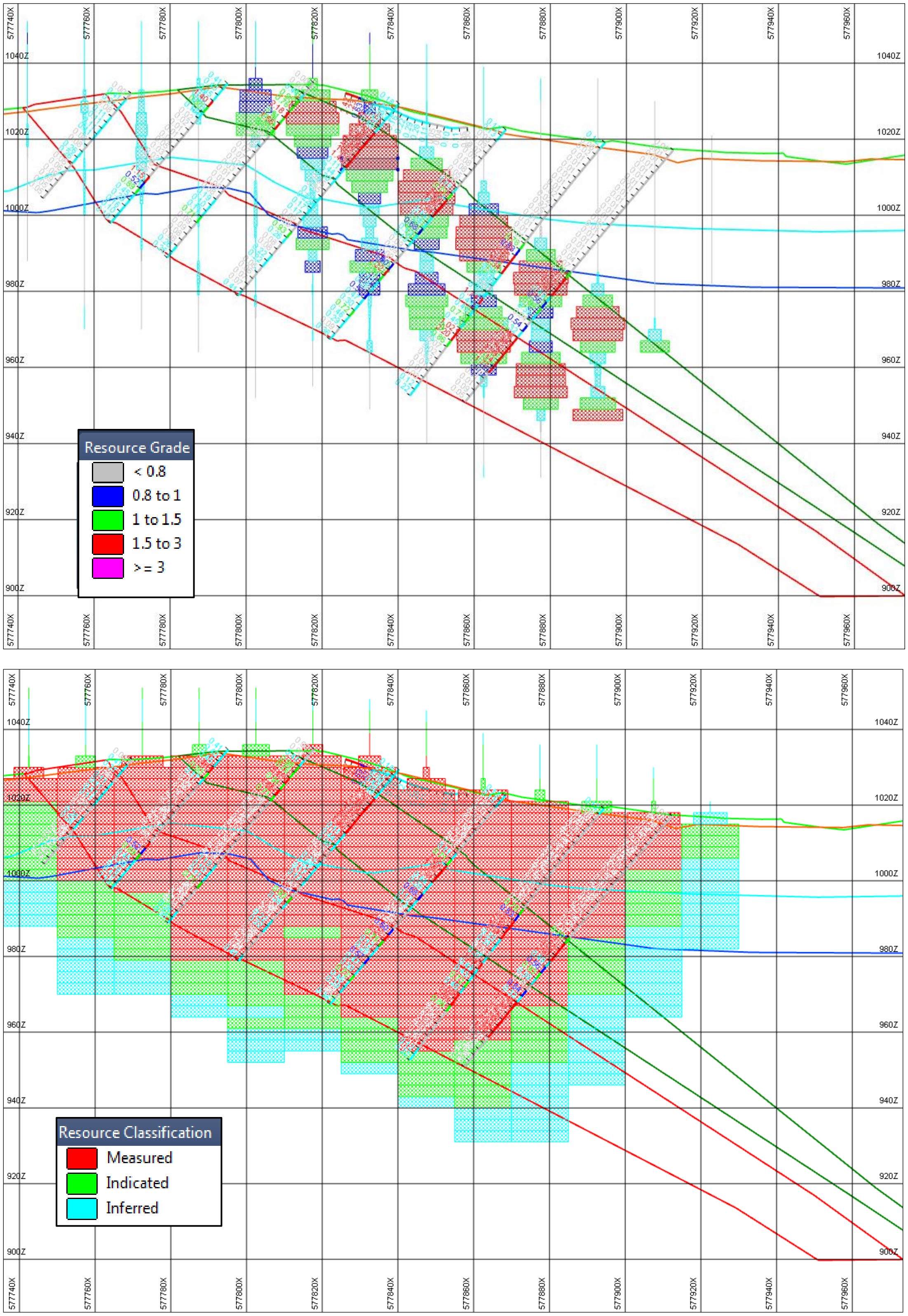


Figure 14.22: Aliva Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 550,400mN

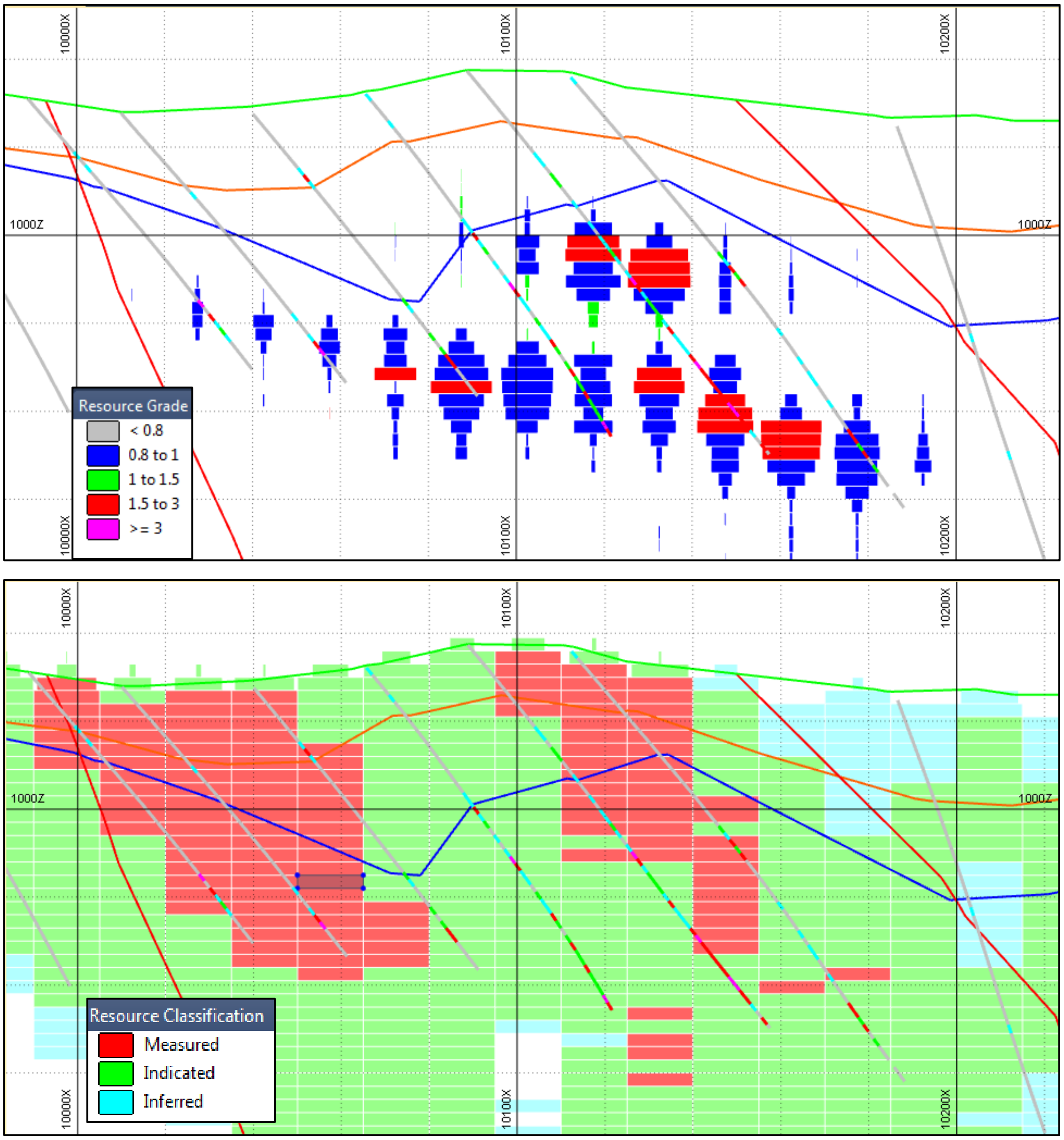


Figure 14.23: Nfutu Block Proportions at 0.60g/t cut-off and Model Confidence Categories, Section 19,825 mN (Model Grid)

14.9.1 Comparison Between MIK Resource to Grade Control

The most rigorous test for the robustness and quality of a resource model is to compare the predicted resources to actual mined tonnes and grade. Most commonly this is undertaken by mine sites as part of the reconciliation studies and involves comparing the resource model's predicted resource estimates to grade control (GC)/milling results. This can be done over a given volume, normally between two mined surfaces (i.e. representing a time period) or completed mine benches. In the current study the resources predicted by the MIK model are compared on a pit by pit basis and globally to the tonnes and grade defined by the mine GC, as reported from the GC block model.

Tables 14.14 to Table 14.16 show the comparison of the MIK model and GC model resource estimates for all areas mined at Salman since the commencement of mining to the end of June 2012, a period of 18 months. Cut-off grades 0.6 and 0.9g/t Au are shown in the tables. The figures indicate that globally the MIK estimate is a good predictor of the GC defined resource. Table 14.16 also shows that although the variance between resource predicted and GC outcome are variable on a pit by pit basis, globally and for the reported cut-off grades, the MIK and GC figures are within ±10%, an acceptable level of accuracy for a comparison of a resource estimate to an open pit mine GC result.

Table 14.14: MIK Resource Estimates within Mined Pits

	0.6g/t Au cut-off			0.9g/t Au cut-off		
Pit Area	Tonnes	Au	Oz	Tonnes	Au	Oz
SS	1,856,230	1.75	104,627	1,437,349	2.05	94,574
NH	305,816	1.24	12,202	178,186	1.60	9,191
SN	838,153	1.44	38,794	562,252	1.78	32,244
Total	3,000,199	1.61	155,623	2,177,787	1.94	136,009

Table 14.15: Grade Control Model Estimates within Mined Pits

	0.6g/t Au cut-off			0.9g/t Au cut-off		
Pit Area	Tonnes	Au	Oz	Tonnes	Au	Oz
SS	1,608,123	2.02	104,359	1,286,984	2.34	96,897
NH	326,647	1.42	14,939	243,587	1.66	13,012
SN	996,932	1.33	42,485	821,153	1.47	38,768
Total	2,931,702	1.72	161,783	2,351,724	1.97	148,677

Table 14.16: Differences Between MIK and GC Estimates within Mined Pits

	0.6g/t Au cut-off			0.9g/t Au cut-off		
Pit Area	Tonnes	Au	Oz	Tonnes	Au	Oz
SS	-13%	15%	0%	-10%	14%	2%
NH	7%	15%	22%	37%	4%	42%
SN	19%	-8%	10%	46%	-18%	20%
Total	-2%	6%	4%	8%	1%	9%

Table 14.17 shows the mine to mill grade reconciliation for the full 2012 year. During this time the process plant produced about 2% more gold than predicted by the mine. Shown in Table 14.18 is the overall material balance between mine stockpiles, plant production (crushed ore) based on weightometers showing the true reconciled mine production for 2012 whilst Table 14.19 shows the reconciliation between reconciled mine production (Table 14.18) and the MIK for 2012 mined volumes.

These tables confirm the previous data that shows the MIK models are within ±10% of the actual mined production.

Table 14.17: Grade Reconciliation Between Plant and Mine

Source	tonnes	grade	ozs
Plant Reconciled	2,105,252	1.67	113,332
Mine Stockpiles:			
ROM (0.9 - 1.0g/t cog)	*1,845,921*	*1.76*	*104,610*
LOW (0.6g/t cog)	*259,331*	*0.75*	*6,253*
Mine Claimed	**2,105,252**	**1.64**	110,863
Variances		**2.2%**	**2.2%**

Table 14.18: Calculation of Plant Reconciled Mining Total for 2012

Material	tonnes	grade	ozs
opening stocks	271,893	1.71	14,913
crushed ore	2,105,252	1.67	113,332
closing stocks	151,246	0.86	4,195
Reconciled Mine Production	**1,984,605**	**1.61**	**102,614**

Table 14.19: Reconciliation the Reconciled Mine Production and MIK Model for 2012

MIK	Measured & Indicated			Inferred		
COG	Tonnes	Grade	Ozs	Tonnes	Grade	Ozs
0.6 - 0.9	666,243	0.74	15,890	40,165	0.73	946
>0.9	1,571,315	1.79	90,534	35,135	1.55	1,752
>0.6	**2,237,558**	**1.48**	**106,425**	**75,300**	**1.11**	**2,698**
Reconciled Mined	**1,984,605**	**1.61**	**102,614**			
Variances (>0.6g/t)	**-11%**	**9%**	**-4%**			

14.10 Mineral Resource Statement

Resources at Salman and Adamus are constrained with a conceptual pit optimisation shell using assumptions shown in Table 14.20 and Table 14.21 below.

Table 14.20: Assumptions Considered for Constraining Open Pit Optimization at Salman

Parameter	Value	Unit
Gold Price	$1600	US$ per ounce
Processing	26.43	US$ per tonne of feed
Overall Pit Slope	38	degrees
Gold Process Recovery	86	percent

Table 14.21: Assumptions Considered for Constraining Open Pit Optimization at Adamus

Parameter	Value	Unit
Gold Price	$1600	US$ per ounce
Processing	26.43	US$ per tonne of feed
Overall Pit Slope	38	degrees
Gold Process Recovery	86	percent

Estimated Mineral Resources for each deposit are listed in Tables 14.22 to Table 14.28 and total Nzema Mineral Resources are shown in Table 14.29 and 14.30. The Mineral Resources are reported below the topographic surfaces, which for Salman and Adamus incorporates end of year (December 31, 2012) pit surveys of the mining surface.

Mineral Resource estimates for the smaller deposits are not constrained by conceptual pits as they are significantly shallower than mineral resources at both the Salman and Adamus.

Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources will be converted into Mineral Reserves. All figures are rounded to reflect the relative accuracy of the estimate.

Table 14.22: Mineral Resource Estimates, Salman

Salman	Measured			Indicated			Measured & Indicated			Inferred		
cog	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
0.5	18.6	1.2	745	8.0	1.2	309	26.6	1.2	1,053	5.5	1.3	234
0.6	16.1	1.4	702	6.9	1.3	288	23.0	1.3	990	4.8	1.4	221
0.7	14.0	1.5	658	5.9	1.4	267	19.9	1.4	925	4.2	1.6	208
0.8	12.2	1.6	613	5.0	1.5	247	17.2	1.6	860	3.7	1.7	196
0.9	10.6	1.7	569	4.3	1.6	228	14.9	1.7	797	3.2	1.8	184
1.0	9.2	1.8	526	3.7	1.7	209	12.9	1.8	736	2.9	1.9	173
1.2	6.9	2.0	447	2.8	2.0	175	9.7	2.0	622	2.2	2.1	150
1.5	4.6	2.4	347	1.8	2.3	132	6.3	2.3	479	1.5	2.5	120

Table 14.23: Mineral Resource Estimates, Adamus

Anwia	Measured			Indicated			Measured & Indicated			Inferred		
cog	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
0.5	8.5	1.6	439	3.0	1.7	168	11.5	1.6	608	0.7	1.8	40
0.6	7.5	1.7	422	2.7	1.9	162	10.2	1.8	584	0.6	2.0	39
0.7	6.7	1.9	404	2.4	2.1	156	9.0	1.9	560	0.5	2.2	38
0.8	5.9	2.0	387	2.1	2.2	150	8.0	2.1	537	0.5	2.3	36
0.9	5.3	2.2	369	1.9	2.3	145	7.2	2.2	514	0.4	2.5	35
1.0	4.7	2.3	353	1.7	2.5	139	6.5	2.4	492	0.4	2.6	34
1.2	3.9	2.6	322	1.5	2.8	129	5.3	2.6	451	0.3	2.8	32
1.5	2.9	3.0	281	1.1	3.1	116	4.1	3.0	397	0.3	3.2	29

Table 14.24: Mineral Resource Estimates, Bokrobo

Bokrobo	Measured			Indicated			Measured & Indicated			Inferred		
cog	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
0.5	1.0	2.4	75	1.0	2.0	63	1.9	2.2	138	2.3	1.1	81
0.6	0.9	2.7	73	0.8	2.4	60	1.6	2.5	133	1.8	1.3	72
0.7	0.8	2.9	71	0.7	2.7	57	1.4	2.8	128	1.4	1.4	64
0.8	0.7	3.2	69	0.6	3.0	55	1.2	3.1	124	1.1	1.6	57
0.9	0.6	3.4	67	0.5	3.4	52	1.1	3.4	120	0.9	1.7	52
1.0	0.6	3.7	66	0.4	3.7	51	1.0	3.7	116	0.8	1.9	47
1.2	0.5	4.1	63	0.3	4.4	47	0.8	4.2	110	0.5	2.3	38
1.5	0.4	4.7	59	0.3	5.4	44	0.6	5.0	103	0.3	2.8	30

Table 14.25: Mineral Resource Estimates, Avrebo

Avrebo	Measured			Indicated			Measured & Indicated			Inferred		
cog	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
0.5				1.1	0.9	33	1.1	0.9	33	0.1	1.0	4
0.6				0.9	1.0	28	0.9	1.0	28	0.1	1.2	4
0.7				0.7	1.2	24	0.7	1.2	24	0.1	1.5	3
0.8				0.5	1.3	21	0.5	1.3	21	0.1	1.6	3
0.9				0.4	1.4	18	0.4	1.4	18	0.0	1.8	3
1.0				0.3	1.5	15	0.3	1.5	15	0.0	1.9	2
1.2				0.2	1.7	11	0.2	1.7	11	0.0	2.1	2
1.5				0.1	2.0	7	0.1	2.0	7	0.0	2.3	2

Table 14.26: Mineral Resource Estimates, Aliva

Aliva	Measured			Indicated			Measured & Indicated			Inferred		
cog	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
0.5	1.5	0.9	47	0.5	0.8	13	2.0	0.9	60	0.2	0.9	7
0.6	1.2	1.1	41	0.4	0.9	11	1.5	1.0	51	0.2	1.0	6
0.7	0.9	1.2	35	0.3	1.1	9	1.2	1.2	44	0.1	1.1	5
0.8	0.7	1.3	31	0.2	1.2	7	0.9	1.3	38	0.1	1.3	4
0.9	0.6	1.4	27	0.1	1.3	6	0.7	1.4	32	0.1	1.4	4
1.0	0.5	1.5	23	0.1	1.4	5	0.6	1.5	28	0.1	1.5	3
1.2	0.3	0.0	18	0.1	0.0	3	0.4	1.7	21	0.0	1.7	2
1.5	0.2	0.0	12	0.0	0.0	2	0.2	2.0	13	0.0	1.8	1

Table 14.27: Mineral Resource Estimates, Nfutu

Nfutu	Measured			Indicated			Measured & Indicated			Inferred		
cog	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
0.5	0.7	1.0	24	0.9	0.9	28	1.6	1.0	51	0.2	0.9	6
0.6	0.5	1.2	21	0.7	1.1	24	1.2	1.1	45	0.2	1.1	6
0.7	0.4	1.3	19	0.5	1.2	21	1.0	1.2	39	0.1	1.2	5
0.8	0.4	1.4	17	0.4	1.3	18	0.8	1.4	34	0.1	1.3	4
0.9	0.3	1.6	15	0.3	1.4	15	0.6	1.5	30	0.1	1.4	4
1.0	0.2	1.7	13	0.3	1.6	13	0.5	1.6	27	0.1	1.5	3
1.2	0.2	1.9	11	0.2	1.8	10	0.4	1.9	21	0.0	1.7	2
1.5	0.1	2.3	8	0.1	2.1	7	0.2	2.2	15	0.0	2.1	2

Table 14.28: Mineral Resource Estimates, Akropon

Akropon	Measured			Indicated			Measured & Indicated			Inferred		
cog	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
0.5										1.4	1.1	49
0.6										1.1	1.2	44
0.7										0.9	1.3	39
0.8										0.7	1.5	35
0.9										0.6	1.6	31
1.0										0.5	1.7	28
1.2										0.4	2.0	23
1.5										0.2	2.4	17

Table 14.29: Total Mineral Resource Estimates at Nzema at 0.50g/t cut-off Grade by Deposit

Nzema	Measured			Indicated			Measured & Indicated			Inferred		
Totals	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
Salman	18.6	1.2	745	8.0	1.2	309	26.6	1.2	1,053	5.5	1.3	234
Anwia	8.5	1.6	439	3.0	1.7	168	11.5	1.6	608	0.7	1.8	40
Bokrobo	1.0	2.4	75	1.0	2.0	63	1.9	2.2	138	2.3	1.1	81
Avrebo				1.1	0.9	33	1.1	0.9	33	0.1	1.0	4
Aliva	1.5	0.9	47	0.5	0.8	13	2.0	0.9	60	0.2	0.9	7
Nfutu	0.7	1.0	24	0.9	0.9	28	1.6	1.0	51	0.2	0.9	6
Akropon	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	1.4	1.1	49
Total	**30.3**	**1.4**	**1,330**	**14.5**	**1.3**	**614**	**44.8**	**1.3**	**1,943**	**10.5**	**1.2**	**421**

Table 14.30: Total Mineral Resource Estimates at Nzema at 0.50g/t cut-off Grade by Material Type

Nzema	Measured			Indicated			Measured & Indicated			Inferred		
Totals	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs	MTonnes	Grade	KOzs
Non-Refractory												
oxide	4.4	1.1	158	1.3	1.0	44	5.7	1.1	203	1.3	1.0	43
transition	2.5	1.4	111	0.8	1.3	33	3.3	1.4	144	0.7	1.2	27
sulphide	6.5	1.8	371	4.8	1.6	243	11.3	1.7	614	3.5	1.2	132
Refractory												
transition	3.1	1.2	118	0.3	0.9	9	3.4	1.1	127	0.1	1.0	2
sulphide	13.8	1.3	572	7.2	1.2	284	21.0	1.3	857	5.0	1.4	217
total	**30.3**	**1.4**	**1,330**	**14.5**	**1.3**	**614**	**44.8**	**1.3**	**1,943**	**10.5**	**1.2**	**421**

1. The Mineral Resources are defined within an optimal pit shell generated using an overall pit slope of 38 degrees, a commodity price of US$1,600/oz Au, average process recovery of 86%, a process cost of US$26.43/t and royalties, refinery and selling cost of US$80/oz of Au sold (5% of sell price).
2. Tonnages are rounded to the nearest 1,000 tonnes; gold grades are rounded to one decimal place and ounces are rounded to the nearest 1,000 ounces. Rounding may result in apparent summation differences between tonnes, grade and contained metal.
3. Tonnes and grade measurements are in metric units; contained gold is in troy ounces.

15 Mineral Reserve Estimates

15.1 Mining and Mineral Reserves Estimation Approach

The mining components of the study are based on the geological block models generated by MPR Geological Consultants Pty Ltd. This section of the report includes discussion on the open pit optimization, practical pit design, scheduling process, options investigated and the reasons behind selections made. The mineral reserves and the results of the mine design process are presented.

The existing Salman Processing Plant has an approximate throughput of 2 million tons per annum (Mtpa) (dependent on material type) for the Adamus, Bokrobo, Nfutu and Aliva ore bodies and Oxide/Upper Transition (non-refractory) portion of Salman South, Salman Central, Nugget Hill, Teberu, Salman North and Akango ore bodies. Conventional open pit shovel and truck methods are currently in use at Nzema. Mining by contractor has been selected by Endeavour for the mining operations. The current reserve estimate supports another 7 years of Life of Mine (LOM).

Mineral Reserves have been modified from Mineral Resources by taking into account geologic, mining, processing, economic parameters and permitting requirements and therefore are classified in accordance with the CIM Definition Standards for Mineral Resources and Mineral Reserves.

The design methodology involved two processes: (1) Whittle-4X was used to identify the optimum pit shell in terms of value and tonnage; and (2) using agreed mining parameters, a number of practical pits have been designed to determine general mining requirements such as dumping capacity, equipment requirements, operating costs and a mineable tonnage profile that can be considered as a mineral reserve.

15.2 Key Assumptions/Basis of Estimate

Mineral Reserves for Salman, Adamus, Bokrobo, Nfutu and Aliva are supported by a LOM plan, which was developed using the following key parameters.

15.2.1 Geotechnical Considerations

Introduction

The Nzema project comprises Adamus, Salman, Bokrobo, Nfutu and Aliva mineral deposits. Salman deposit is subdivided to Salman South, Salman Central, Salman North, Nugget Hill, Teberu, Akanko South and Akanko North deposits.

Overall slope angles (OSA) for all mentioned deposits for mineralized and waste materials were defined by Golder Associates and summarized in the June 2012 reports titled “Design recommendations for Anwia and Salman pits. Pit slope design for Anwia and Salman pits of Nzema Mine”, “Design recommendations for Nfutu pits. Pit slope design for Nfutu pits of Nzema Mine” and “Design recommendations for Aliva pits. Pit slope design for Adamus and Salman pits of Nzema Mine”. Bokrobo was not part of the assessment in the June 2012 report, however, Endeavour considered that it is reasonable to apply to this area the same parameters as for the Adamus mineral deposit.

Adamus Deposit

The slope recommendations for the Adamus Highly Weathered Zones were based on the following operational assumptions:

- Vertical bench separation is assumed to be 10 m. In cases, where the ‘relict’ structures within the saprolite show the potential for planar failure, then the vertical bench separation could be limited to 5m high.
- The bench face angle(s) will be cut as steeply as possible to maximize water run-off and reduce the potential for erosion. In addition, wide berms would be used to retain any possible failure debris from the bench faces (or batters). The Nzema mine is located in an area of heavy seasonal rainfall and, consequently high water run-off and the potential for erosion is an important consideration for slope stability in the Highly Weathered Zone.
- For the slope stability analysis, a factor of safety of 1.3 was considered for dry conditions and 1.1 for partially saturated conditions.
- Excavation will be primarily mechanical with the use of dozers or backhoes.

To 'optimize' the bench design for the highly weathered zones of the Adamus pit, the strength parameters of cohesion and friction angle parameters were varied within a reasonable range. This range was considered adequate for the bench scale analysis, was established from previous reports, and assessments based on estimated field parameters and rock mass classification.

Taking the above into consideration, it is recommended that within the Highly Weathered Zone the bench face (or batter) angles can be cut between 60° and 65°, with a 6m bench width. The 60° bench face limit is for sectors in which there are kinematic controls (discontinuities identified in the moderately weathered and fresh rock and assumed to possibly occur in the weathered material).

Field assessment of rock strength and point load test results were used to design the pit slopes in slightly weathered to fresh rock units. Structural data collected from the geotechnical boreholes were also used to assess the structural fabric of rock mass domains. Based on stereonets generated for each structural domain (two such domains were identified), kinematic analyses were conducted for investigating structurally controlled failure in rock slopes, i.e., planar, wedge and toppling failures. Limit-equilibrium stability of overall slopes was also considered. The analysis led to the bench and slope configurations provided in Table 15.1 which presents the detailed parameters and resulting OSA used in Adamus pit optimization analysis, inclusive of ramps.

Table 15.1: Recommended Slope Configurations for Rock Mass Domains for Adamus

Geological Unit	Bench Face Angle	Bench Height (m)	Berm Width (m)	Inter-ramp Angle
ADAMUS DOMAIN I				
Highly Weathered Zone	60° - 65°	10	6	40.3° - 43.2°
Moderately Weathered Greywacke	70°	15	10	44.1°
Fresh Greywacke	75°	15	10	46.9°
Overall slope angle ≅ 40° - 42° (inclusive of ramps)				
ADAMUS DOMAIN II				
Highly Weathered Zone	60° - 65°	10	6	40.3° - 43.2°
Moderately Weathered Greywacke	70°	15	10	44.1°
Moderately Weathered Greywacke with Phyllite Interbeds	70°	15	10	44.1°
Fresh Greywacke	80°	15	10	49.9°
Fresh Greywacke with Phyllite Interbeds	80°	15	10	49.9°
Overall slope angle ≅ 42° - 44° (inclusive of ramps)				

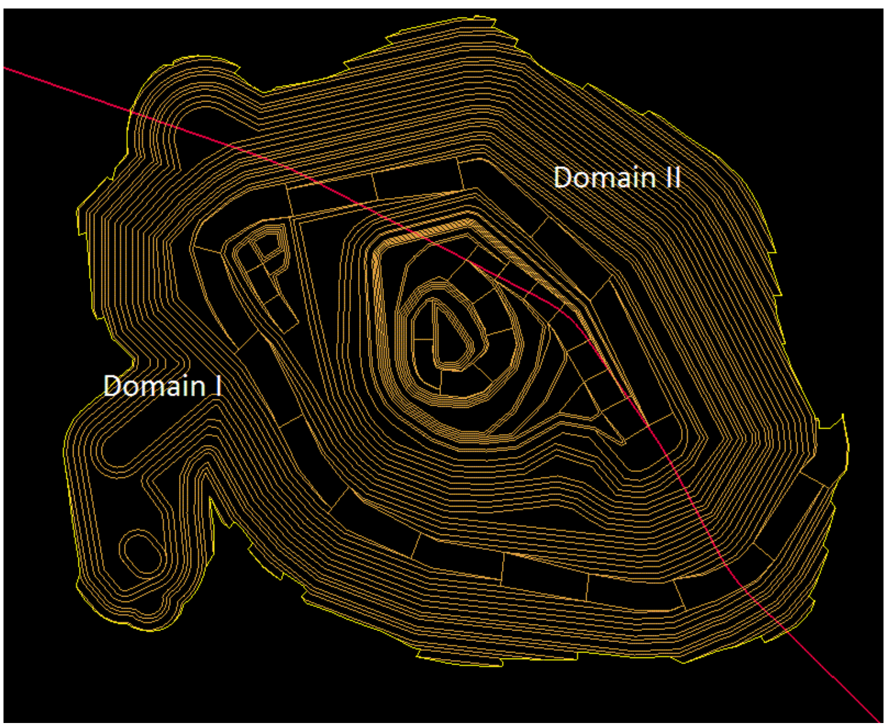


Figure 15.1: Adamus Deposit Geotechnical Domains, Adamus Main Pit

Salman Deposit

The slope recommendations for the Salman Highly Weathered Zones were based on the operational assumptions similar to those used for Adamus except for that the vertical bench separation is assumed to be 6m.

It is recommended that within the Highly Weathered Zone of the Salman pits, the bench face (or batter) angles be cut at 60°, with a 6m bench width.

Similar to the procedures for the Adamus pit design, field assessment of rock strength, point load test results, and structural data were used to design the pit slopes in slightly weathered to fresh rock units. Structural data collected from the geotechnical boreholes were also used to assess the structural fabric of rock mass domains. Based on stereonets generated for each structural domain (two such domains were identified), kinematic analyses were conducted for investigating structurally controlled failure in rock slopes, i.e., planar, wedge and toppling failures. Limit-equilibrium stability of overall slopes was also considered. The analysis led to the bench and slope configurations provided in the table below.

Table 15.2 presents the detailed parameters and resulting OSA used in the Salman pit optimization analysis, inclusive of ramps.

Table 15.2: Recommended Slope Configurations for Rock Mass Domains for Salman

Geological Unit	Bench Face Angle	Bench Height (m)	Berm Width (m)	Inter-ramp Angle
SALMAN HANGINGWALL (WEST, NORTH & SOUTH WALLS) DOMAIN				
Highly Weathered Zone	60°	6	5	35.3°
Moderately Weathered Phyllite	70°	6	5	39.9°
Moderately Weathered Greywacke with Phyllite Interbeds	70°	6	5	39.9°
Fresh Phyllite	70°	6	5	39.9°
Fresh Greywacke with Phyllite Interbeds	70°	6	5	39.9°
Overall slope angle ≅ 36° - 37° (inclusive of geotechnical berm)				
SALMAN FOOTWALL (EAST WALL) DOMAIN				
Highly Weathered Zone	65°	6	5	37.6°
Moderately Weathered Greywacke	80°	6	5	44.7°
Fresh Greywacke	80°	12	6-7.5	51.3° - 55.9°
Overall slope angle ≅ 45° - 47° (inclusive of ramps)				

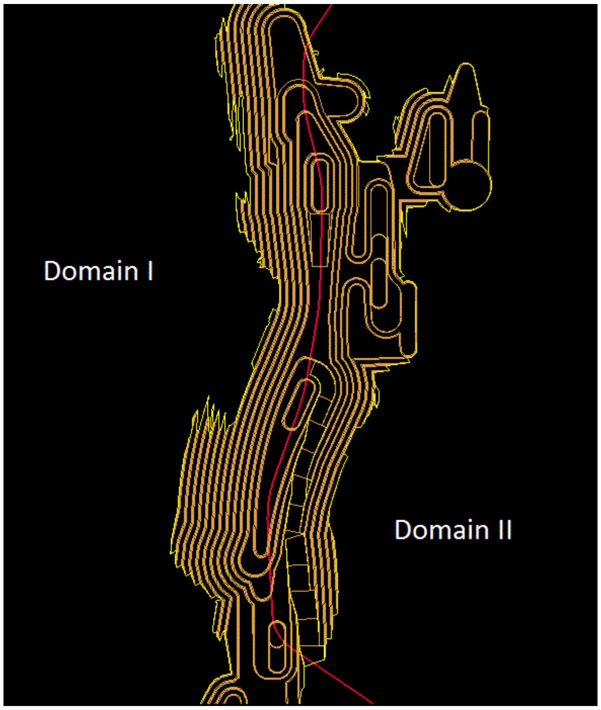


Figure 15.2: Salman Deposit Geotechnical Domains, Salman South pit

Nfutu Deposit

Table 15.3 presents the detailed parameters and resulting OSA used in the Nfutu pit optimization analysis, inclusive of ramps.

Table 15.3: Recommended Slope Configurations for Rock Mass Domains for Nfutu

Geological Unit	Bench Face Angle	Bench Height (m)	Berm Width (m)	Inter-ramp Angle
DACITE				
Highly Weathered Zone	60° - 65°	10	6	40.3° - 43.2°
Moderately Weathered Dacite	70°	15	10	44.1°
Fresh Dacite	80°	15	10	46.9°
Overall slope angle ≅ 41° - 43° (inclusive of ramps)				
GREYWACKE				
Highly Weathered Zone	60° - 65°	10	6	40.3° - 43.2°
Moderately Weathered Greywacke	70°	15	10	44.1°
Fresh Greywacke	80°	15	10	49.9°
Overall slope angle ≅ 41° - 43° (inclusive of ramps)				
PHYLLITE				
Highly Weathered Zone	55° - 60°	10	6	37.6° - 40.3°
Moderately Weathered Phyllite	70°	15	10	44.1°
Moderately Weathered Phyllite (Pit Wall Dip Direction from 70° - 110°)	60°	15	10	38.8°
Fresh Phyllite	80°	15	10	49.9°
Fresh Greywacke with Phyllite Interbeds	60°	15	10	38.8°
Overall slope angle ≅ 35° - 43° (inclusive of geotechnical berm)				

Aliva Deposit

Table 15.4 presents the detailed parameters and resulting OSA used in the Aliva pit optimization analysis, inclusive of ramps.

Table 15.4: Recommended Slope Configurations for Rock Mass Domains for Aliva

Geological Unit	Bench Face Angle	Bench Height (m)	Berm Width (m)	Inter-ramp Angle
Greywacke, Greywacke with Phyllite Intercalation, some Phyllite				
Highly Weathered Zone	60° - 65°	10	6	40.3° - 43.2°
Slightly Weathered to Fresh Rock	80°	15	10	49.9°
Overall slope angle ≅ 49.6° (inclusive of ramps)				

All relevant geotechnical reports are referenced in Section 27.

During the design process, different bench face angles and berm widths for different domains within one bench were achieved by adding slope parameter values to description fields of boundary strings.

After completion of design works the pit plans were reviewed by a Golder Associates geotechnical professional and were approved for execution.

15.2.2 Economic Input

Introduction

Whittle requires revenue, mining and processing costs for the open pit optimization analysis to be specified. These parameters are used to determine the economic final pit.

During 2012 all optimization input parameters were re-calculated internally by Nzema Gold Mine senior technical personnel and audited by external mining consultancies such as Cube Consulting, Perth WA. Obtained values take into account experience gained during the 3 previous years of operation and based on relevant chapters of the current business plan, actual process plant parameters and mining rates fixed in the contract with African Mining Services (AMS). The input parameters cover wide range of disciplines and as a result a number of specialists were involved in their estimation and validation.

A long term, flat gold price of US$1350/oz was assumed as the base case price for the open pit optimization and subsequent financial analysis. Additionally, 5% of total gold revenue was assumed for royalties, refining, sales and transport costs.

Mining Costs

Mining costs calculations were based on current mining rates fixed in a contract between Nzema Gold Mine of Endeavour Mining Corporation and AMS as well as in 2012/2013 budgets. The cumulative mining cost of a single block in the resource model is based on three components: material type, blasting requirement and vertical component of the distance to the pit entrance. The average haul distances, considering plant and waste dump locations, were calculated separately for each pit, fixed in the current AMS contract and taken into account in optimization. During the mining of oxide and transition material the drill and blast fragmentation is assumed to be required for rock with specific gravity greater than 2.1t/m³. Fresh material is assumed to require blasting independently of the average SG. The mining costs for each block were calculated in Surpac and loaded into the Whittle model as a mining cost adjustment factor (mcaf attribute).

Table 1.6 presents an example of depth and material type dependent mining cost calculations for Adamus.

Table 15.5: Mining Cost Components for Adamus

	Oxide/bcm		Transition/bcm		Primary/bcm
Depth from Surface	Earthmoving	D&B	Earthmoving	D&B	
Surface +3m (i.e. Above ground)	2.41	1.40	3.02	1.93	4.95
Surface	2.42	1.40	3.03	1.93	4.96
Surface -3m (i.e. Below ground)	2.43	1.40	3.04	1.93	4.97
-6m	2.44	1.40	3.05	1.93	4.98

Processing Costs and Cut-off Grade Estimation

In addition to the mining related costs (rehabilitation, grade control, haulage, rehandle, dewatering), the processing costs, metallurgical recoveries for the different material types, namely oxide (very weathered), upper transition (moderately weathered), lower transition (weakly weathered) and fresh were developed by the plant management. General and administrative costs were estimated by site personnel on the basis of recent actual costs.

Neither mining dilution nor mining ore recovery was specified for the open pit optimization analysis, as it is inherent in the block gold grade estimation of the resource MIK model. The assumed Single Mining Unit (SMU) is some 120m^3 (8*5*3m). That is 12.5 SMUs per mineral resource block (20*25*3m).

Process recovery of the Adamus, Bokrobo, Aliva and Nfutu ores is fairly consistent and does not depend on the material type (

Table 1.7 to 15.10). Fresh and Lower Transition mineralized materials of Salman deposit are refractory and have significantly lower recovery comparatively to Oxide and Upper Transition ore (Table 15.7). All mentioned recovery factors have been taken into account in the course of optimization and Cut-off Grade estimation. The processing and ore-related mining and haulage costs breakdown for all deposits comprising the current Mineral Reserves are presented in the tables below.

Table 15.6: Processing Costs, Ore Recovery Parameters and CoG, Adamus Deposit

PARAMETER		Deposit			
Description	Units	ADAMUS (AW)			
		Oxide	Up-Trans	Lo-Trans	Fresh
Mining & Processing					
Rehabilitation	$/t-m	0.15	0.15	0.15	0.15
Grade Control	$/t-ore	2.88	2.88	2.88	2.88
Ore Haulage	$/t-ore	2.91	2.91	2.91	2.91
Rehandle Cost	$/t-ore	0.33	0.33	0.33	0.33
Dewatering/crusher/supervision	$/t-ore	4.26	4.26	4.26	4.26
Processing Cost	$/t-ore	10.05	11.74	11.74	11.92
Site G&A Cost	$/t-ore	5.25	5.25	5.25	5.25
Total 'Process' Cost	**$/t-ore**	**25.68**	**27.37**	**27.37**	**27.55**
Revenue Factors					
Process Recovery	%	91%	91%	91%	90%
Gold Price	**$/oz**	**1,350**	**1,350**	**1,350**	**1,350**
Royalty	%	5.0%	5.0%	5.0%	5.0%
Effective Revenue Price	$/oz	1,283	1,283	1,283	1,283
Effective Revenue Price	$/g	41.23	41.23	41.23	41.23
Cut-off Grade	**g/t**	**0.68**	**0.73**	**0.73**	**0.74**

Table 15.7: Processing Costs, Ore Recovery Parameters and CoG, Salman Deposit

PARAMETER		Deposit			
Description	Units	SALMAN			
		Oxide	Up-Trans	Lo-Trans	**Fresh**
Mining & Processing					
Rehabilitation	$/t-m	0.15	0.15	0.15	0.15
Grade Control	$/t-ore	2.88	2.88	2.88	2.88
Ore Haulage	$/t-ore	0.99	0.99	0.99	0.99
Rehandle Cost	$/t-ore	0.00	0.00	0.00	0.00
Dewatering/crusher/supervision	$/t-ore	4.26	4.26	4.26	4.26
Processing Cost	$/t-ore	10.05	11.74	11.74	11.92
Site G&A Cost	$/t-ore	5.25	5.25	5.25	5.25
Total 'Process' Cost	**$/t-ore**	**23.43**	**25.12**	**25.12**	**25.30**
Revenue Factors					
Process Recovery	%	91%	83%	55%	35%
Gold Price	**$/oz**	**1,350**	**1,350**	**1,350**	**1,350**
Royalty	%	5.0%	5.0%	5.0%	5.0%
Effective Revenue Price	$/oz	1,283	1,283	1,283	1,283
Effective Revenue Price	$/g	41.23	41.23	41.23	41.23
Cut-off Grade	**g/t**	**0.62**	**0.73**	**1.10**	**1.74**

Table 15.8: Processing Costs, Ore Recovery Parameters and CoG, Bokrobo Deposit

PARAMETER		Deposit			
Description	Units	BOKROBO			
		Oxide	Up-Trans	Lo-Trans	Fresh
Mining & Processing					
Rehabilitation	$/t-m	0.15	0.15	0.15	0.15
Grade Control	$/t-ore	2.88	2.88	2.88	2.88
Ore Haulage	$/t-ore	3.27	3.27	3.27	3.27
Rehandle Cost	$/t-ore	0.33	0.33	0.33	0.33
Dewatering/crusher/supervision	$/t-ore	4.26	4.26	4.26	4.26
Processing Cost	$/t-ore	10.05	11.74	11.74	11.92
Site G&A Cost	$/t-ore	5.25	5.25	5.25	5.25
Total 'Process' Cost	**$/t-ore**	26.04	27.73	27.73	27.91
Revenue Factors					
Process Recovery	%	91%	91%	91%	90%
Gold Price	**$/oz**	1,350	1,350	1,350	1,350
Royalty	%	5.0%	5.0%	5.0%	5.0%
Effective Revenue Price	$/oz	1,283	1,283	1,283	1,283
Effective Revenue Price	$/g	41.23	41.23	41.23	41.23
Cut-off Grade	**g/t**	**0.69**	**0.74**	**0.74**	**0.75**

Table 15.9: Processing Costs, Ore Recovery Parameters and CoG, Nfutu Deposit

PARAMETER		Deposit			
Description	Units	NFUTU			
		Oxide	Up-Trans	Lo-Trans	Fresh
Mining & Processing					
Rehabilitation	$/t-m	0.15	0.15	0.15	0.15
Grade Control	$/t-ore	2.88	2.88	2.88	2.88
Ore Haulage	$/t-ore	1.89	1.89	1.89	1.89
Rehandle Cost	$/t-ore	0.33	0.33	0.33	0.33
Dewatering/crusher/supervision	$/t-ore	4.26	4.26	4.26	4.26
Processing Cost	$/t-ore	10.05	11.74	11.74	11.92
Site G&A Cost	$/t-ore	5.25	5.25	5.25	5.25
Total 'Process' Cost	**$/t-ore**	24.66	26.35	26.35	26.53
Revenue Factors					
Process Recovery	%	86%	86%	86%	86%
Gold Price	**$/oz**	1,350	1,350	1,350	1,350
Royalty	%	5.0%	5.0%	5.0%	5.0%
Effective Revenue Price	$/oz	1,283	1,283	1,283	1,283
Effective Revenue Price	$/g	41.23	41.23	41.23	41.23
Cut-off Grade	**g/t**	**0.69**	**0.74**	**0.74**	**0.74**

Table 15.10: Processing Costs, Ore Recovery Parameters and CoG, Aliva Deposit

PARAMETER		Deposit			
Description	Units	ALIVA			
		Oxide	Up-Trans	Lo-Trans	Fresh
Mining & Processing					
Rehabilitation	$/t-m	0.15	0.15	0.15	0.15
Grade Control	$/t-ore	2.88	2.88	2.88	2.88
Ore Haulage	$/t-ore	3.45	3.45	3.45	3.45
Rehandle Cost	$/t-ore	0.33	0.33	0.33	0.33
Dewatering/crusher/supervision	$/t-ore	4.26	4.26	4.26	4.26
Processing Cost	$/t-ore	10.05	11.74	11.74	11.92
Site G&A Cost	$/t-ore	5.25	5.25	5.25	5.25
Total 'Process' Cost	**$/t-ore**	26.22	27.91	27.91	28.09
Revenue Factors					
Process Recovery	%	91%	91%	91%	90%
Gold Price	**$/oz**	1,350	1,350	1,350	1,350
Royalty	%	5.0%	5.0%	5.0%	5.0%
Effective Revenue Price	$/oz	1,283	1,283	1,283	1,283
Effective Revenue Price	$/g	41.23	41.23	41.23	41.23
Cut-off Grade	**g/t**	**0.69**	**0.74**	**0.74**	**0.75**

15.3 Pit Optimization and Pit Phase Design

The open pit optimization analysis was carried out for a wide range of gold prices, from a low of US$ 400/oz to a maximum of US$ 2700/oz in increments of 0.1 of base case (revenue factor 1, steps of US$135/oz). Such variance allows the determination of the starter pit shell for further NPV adjustment (when necessary and applicable).

The open pit optimization financial analysis was performed based on assuming the total mill capacity to be 2Mtpa for Oxide/Transitional/Fresh blend and 1.7Mpta for Fresh material. Therefore, in the course of optimization, for every single optimized deposit, the upper limit of mill feed production was set to 1.0 Mtpa, based on the assumption of having two independent working areas available at any given time to provide the necessary plant ore feed. The optimization also assumed that sufficient waste is removed each period to enable the required processing rate to be maintained, therefore, the operation is mill limited. A discount rate of 10% was used.

The resource models were exported from Surpac to Whittle/Gemcom Four-X where the open pit optimization calculations were performed. Only Measured and Indicated mineral resources were taken into consideration. The *Inferred* mineralized material has not been used as a revenue source in the optimization.

The Whittle/Gemcom Four-X Analyzer software provides guidance to the potential economic final pit geometries. Whittle 4X compares the estimated value of individual mining blocks at the pit boundary versus the cost for waste stripping. It establishes the pit walls where the ore revenue and waste stripping cost balance for maximum net revenue. The sequence of the pit shell increments is sorted from the economically best (the inner smallest shell viable for the lowest commodity price) to the economically worst (the outer largest pit shell available for the highest commodity price). Whittle Four-X provides indicative cash flows for three mining sequences called “best case”, “worst case” and “specified case” scenarios, using time discounting of cash flows. In the best case, the optimum pit shells are mined bench by bench in increments from inner to the outer shell, resulting in a higher discounted cash flow (DCF) due to lower stripping ratios and/or higher grades in the early years of mine life. The worst case scenario is based on mining the whole pit outline bench by bench as a single pit, hence resulting in a lower DCF as a result of usually high stripping requirements in the early years of the operation. In the “specified case” scenario the user is able to set up the mining sequence, practical from a minimal mining width point of view, which often delivers outcomes similar or just slightly below of “best case” scenario. Ordinarily, after the selection of the ultimate pit, several practical mining stages are designed and sequenced when developing a final production schedule. The average discounted cash flows are calculated for each pit shell (mean of the worst and best cases) in order to emulate a practical mining sequence. The selected optimum pit shell is then engineered to generate practical pit designs that incorporate the design slope angles, access ramps and haul roads for operating open pits. The ore and waste tonnages in the practical pits are then estimated and scheduled to determine the ore production and resulting waste stripping requirements.

15.3.1 Open Pit Optimization Analysis, Adamus deposit

Introduction

The following addresses the optimization process and results for the Adamus deposit, which represents approximately 66% of the total Nzema Mineral Reserves. The same approach was used in optimization, practical mine design and reserve calculation for rest of the Nzema mineral deposits[11]. Due to the significant size of the deposit and relatively long LoM, the Adamus pit is an only one where the mining will be conducted in two stages, or push backs (Adamus Starter- Adamus Final pit). The individual Life of Mine span for the Salman, Bokrobo, Nfutu and Aliva pits varies from 1.2 to 0.5 years. All pits were designed following a single stage strategy, i.e. without intermediate pits. The optimal pit shell selection for those deposits was based on the highest undiscounted cash flow.

Resource Block Model

The block model estimated by MIK (Multiple Indicator Kriging) prepared by MPR Geological Consultants Pty Ltd was used as the basic resource model for the pit optimization study. This resource model was exported from Surpac to Whittle (using built-in MIK block model's export algorithm), where optimization analysis was performed. The resulting pit shells were imported back to Surpac, where the majority of the mine design was completed. Only mineralized material in the Measured and Indicated categories was taken into account. Table 15.11 shows the Mineral Resource that has been used for the optimization process of the Adamus deposit.

Table 15.11: Adamus Deposit: Summary of Measured and Indicated Resources Imported to Whittle*

CoG g/t	Oxides kt	Upper Transition kt	Lower Transition kt	Fresh kt	Au Koz	Au g/t
0.5	761	1,411	1,990	8,814	654	1.57
0.6	641	1,184	1,748	7,737	624	1.72
0.7	555	994	1,541	6,827	595	1.87
0.8	484	838	1,364	6,064	567	2.02
0.9	424	711	1,211	5,419	540	2.16
1.0	373	607	1,079	4,871	515	2.31
1.1	329	520	963	4,404	491	2.45

*Unconstrained resource model

Whittle Cut-off Grade Calculation

The mining Cut-off Grade ("COG") was derived by calculating the overall cost of mining and processing one tonne of ore divided by the recovered value of the gold contained therein [(process cost + ore mining cost)/(Process Recovery * (Price – Royalty))] . This was calculated within the Whittle algorithm and determined to be 0.62g/t for Oxides, 0.66g/t for Upper/Lower Transition and 0.67g/t for Fresh ore. As the Mineral Reserves of Adamus mainly consist of Fresh material and the MIK resource model has a 0.1g/t cut-off grade interval, 0.7g/t Au was set as the general Cut-off Grade for Mineral Reserves calculation at Adamus.

Optimal Pit Selection

The results of the Adamus open pit optimization are shown in Figure 15.3 and Table 15.12.

[11] The open pit optimization procedure used for Adamus is provided here as an example of the methodlogy used for the other deposits rather than providing a full description of each of the other deposits.

Table 15.12: Whittle Optimization Results, Adamus Deposit

Whittle Pit Number	Revenue factor	RoM		Au in-situ	Waste	Total	Strip ratio	Undicount CashFlow	Au output	Discount Cash flow
		kt	Au g/t	Koz	kt	kt		M$	Koz	M$
1	0.3	2,159	2.23	155	3,752	5,910	1.7	128	140	115
2	0.4	5,210	2.07	347	13,792	19,002	2.7	264	314	214
3	0.5	7,058	2.01	457	22,675	29,733	3.2	332	413	251
4	0.6	7,776	2.01	502	28,263	36,039	3.6	358	453	262
5	0.7	7,991	2.00	514	30,268	38,259	3.8	363	464	265
6	0.8	8,108	1.99	519	31,190	39,298	3.9	364	469	265
7	0.9	8,397	1.96	530	32,982	41,379	3.9	367	479	265
8	1	8,673	1.95	544	38,114	46,787	4.4	367	492	263
9	1.1	8,884	1.93	552	40,430	49,313	4.6	366	499	260
10	1.2	8,934	1.93	554	41,199	50,133	4.6	366	500	259
11	1.3	9,013	1.92	557	42,497	51,510	4.7	365	503	258
12	1.4	9,102	1.92	561	44,436	53,538	4.9	363	506	256
13	1.5	9,249	1.90	566	48,159	57,408	5.2	359	511	252
14	1.6	9,276	1.90	567	48,881	58,157	5.3	358	512	251
15	1.7	9,290	1.90	568	49,270	58,560	5.3	358	513	250
16	1.8	9,589	1.88	580	60,431	70,020	6.3	344	524	237
17	1.9	9,598	1.88	581	60,751	70,349	6.3	344	524	236
18	2	9,665	1.88	585	64,901	74,567	6.7	338	528	231

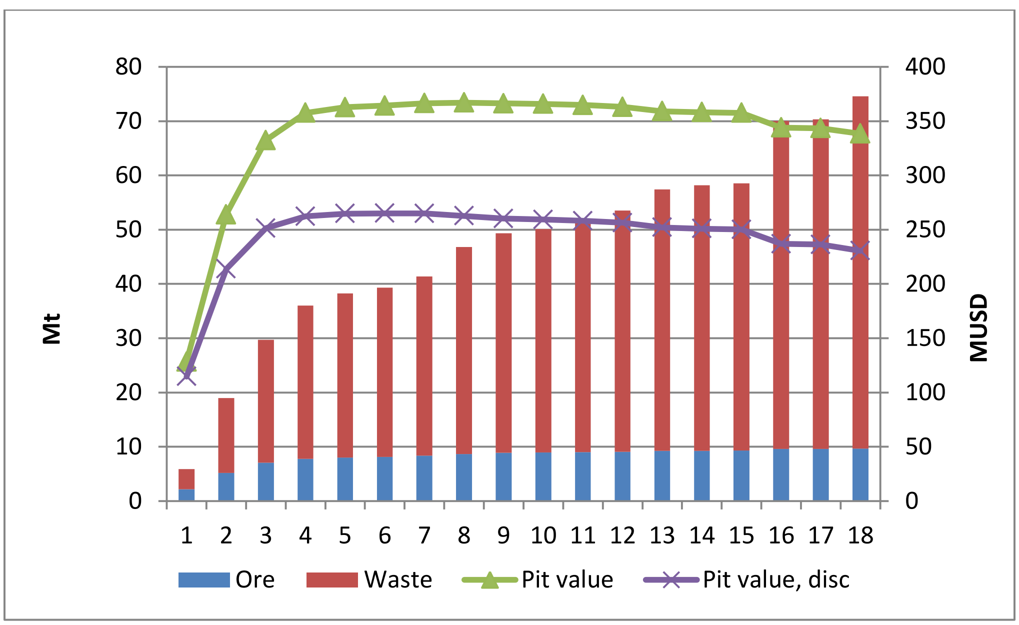


Figure 15.3: Whittle Pit by Pit Graph Optimization Results

The results of NPV calculation presented in this graph represent the “specified case” scenario based on a schedule with one pushback (an intermediate pit exploiting the upper part of the Adamus ore body), fixed lead of 20 benches per period (vertical advance of 60m per year) and automatic selection of an intermediate pit shell. The undiscounted pit cash flow is the same for all three options.

Taking into account the flat shape of the Undiscounted/Discounted Cash Flow graph and its low sensitivity to pit size in the range between Pit 4 and Pit 14, Pit shell #8, which generates the highest undiscounted cash flow and provides good resource recovery, was selected to be used as a template for the practical pit design, as shown in Figure 15.3. The maximum undiscounted cash flow was used as the indicator for the optimum pit also because discounted cash flow (NPV) essentially penalizes higher grade blocks which are scheduled to be mined towards the end of the mine life. Depending on the discount rate used, the first three years of the mining schedule have the greatest influence when NPV is used as an indicator for the selection of the optimum pit shell. Generally optimum shells selected by discounted cash flow are smaller than those selected by undiscounted cash flow.

The amount of ore inside the optimum shell is approximately 8.7Mt at a grade of 2g/t. The total material moved is 46.8Mt giving a stripping ratio of 4.4. This includes the Adamus Main and Adamus North-West ore bodies.

After the optimal pit shell was identified, a set of scheduling optimizations were conducted aiming at defining the mining sequence that delivers the highest NPV. Using Whittle pit shell #8 as a final pit and #2 as an intermediate pit shell, optimized with a constraint of 20 benches per period by the Whittle “Milawa Balanced” algorithm, delivered the best outcome. The practical mine design, mining schedule and year-by-year cash flow analysis were based on this proposed mining sequence.

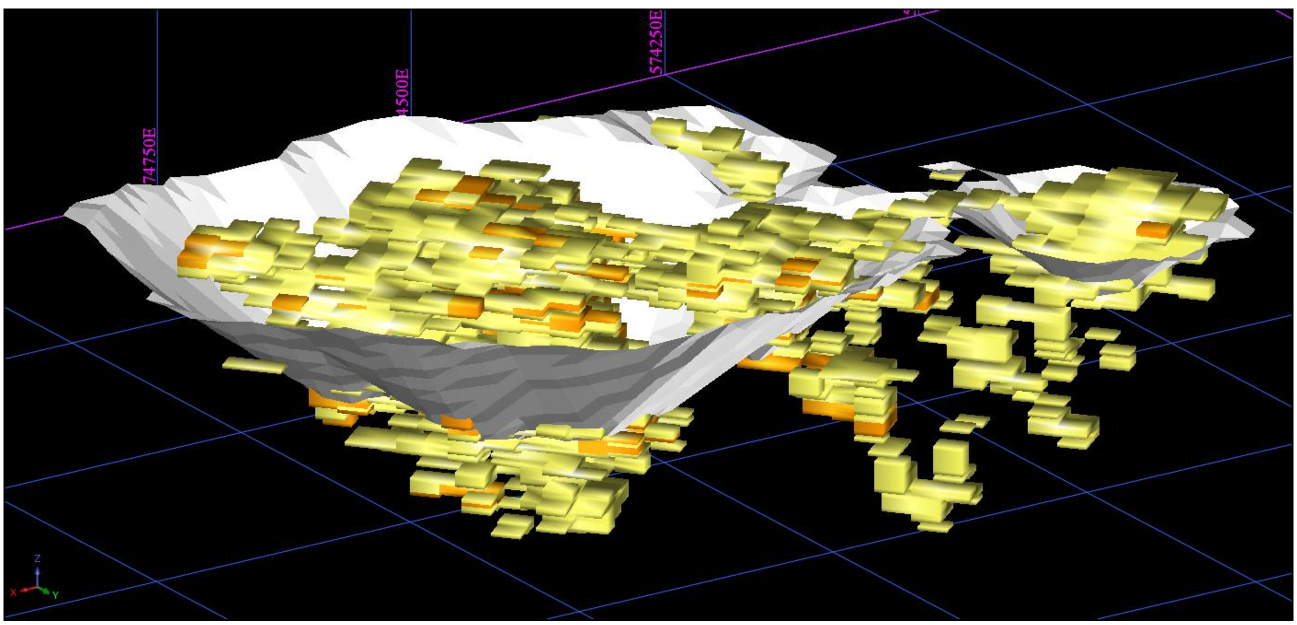


Figure 15.4: Pit Shell #8[12] Selected for Pit Design and Ore Blocks (CoG 0.7g/t) of Adamus Resource Model

[12] Only Measured and Indicated Resource block are shown.

Sensitivity Analysis

A sensitivity analysis has been prepared by varying the unit mining cost, process costs, recovery and the gold price by ±10%. These sensitivities were carried out using the Whittle Four X undiscounted cash flow. Figure 15.5 below shows the results of this analysis.

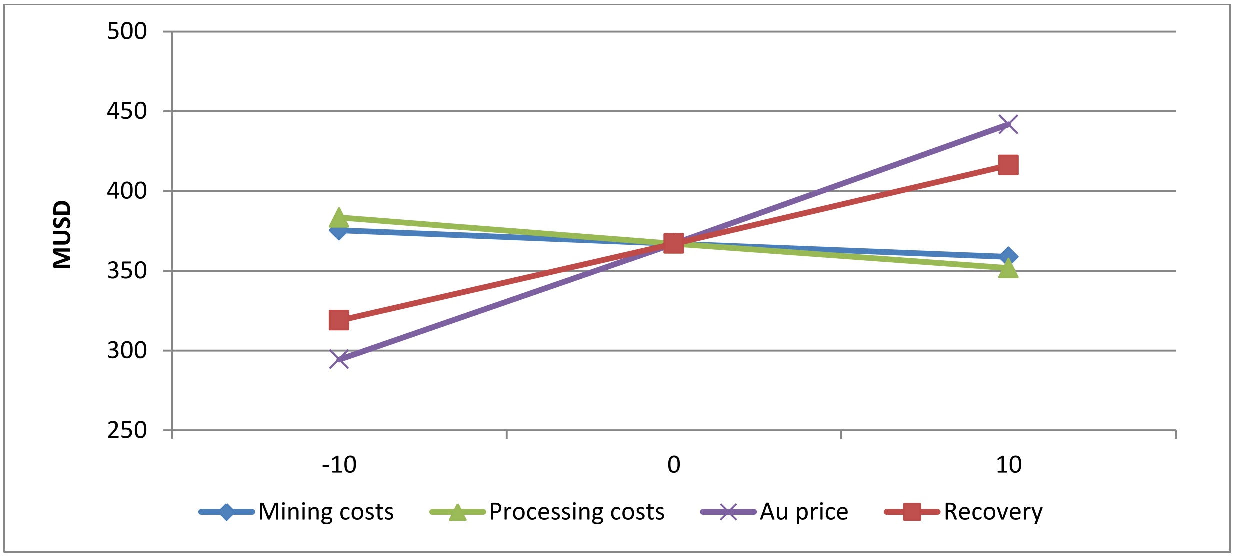


Figure 15.5: Sensitivity Analysis Graph, Pit Shell #8

Project economics are most sensitive to the gold price and process recovery, and less sensitive to mining and processing costs.

15.4 Practical Pit Design

The practical pit designs were prepared using the optimized pit shells as templates. Surpac software was used to prepare the practical pit, and to incorporate the haul roads and ramps together with the appropriate inter-ramp slope angles.

The open pit design criteria were:

- Bench height, berm width and bench face angle were designed according to geotechnical recommendations of Golder Associates (see Table 15.1) depending on rock type and area.
- Haul road width of 22m including safety berms providing sufficient room for two-way traffic for the 90t capacity truck fleet that are preferred by AMS. This width was considered and based on manufacturer recommendations. The recommendations indicate a minimum of 3.0 to 3.5 truck widths for two-way traffic in straights sections and 3.5 to 4.0 truck widths at corners. The resulting road widths are 20m on straights and 26m on corners for this truck size. Minor ramps at the lower elevations of the pits have been reduced in width where traffic density will be lower.
- A haul road gradient of 9% has been used throughout.

Staged development of the pit is driven by the desire to minimize waste pre-stripping and the requirement for consistent total material movement. Staged mining has generally a positive impact on the project net present value (NPV) by reducing the duration of the pre-production phase and reducing the strip ratio in the early years of production.

The Whittle analysis was used to provide an indication of the potential pit staging. Three pits were designed for Adamus as follows:

- Adamus Starter Pit– exploiting the upper sections of main ore body using Whittle pit #2 as a template.
- Adamus Final Pit- exploiting the lower sections of Adamus ore body using Whittle pit #08 as a template.
- Adamus North West- exploiting the Adamus satellite ore body.

The plan and three dimensional views of these cuts are shown in Figure 15.6, Figure 15.7 and Figure 15.8.

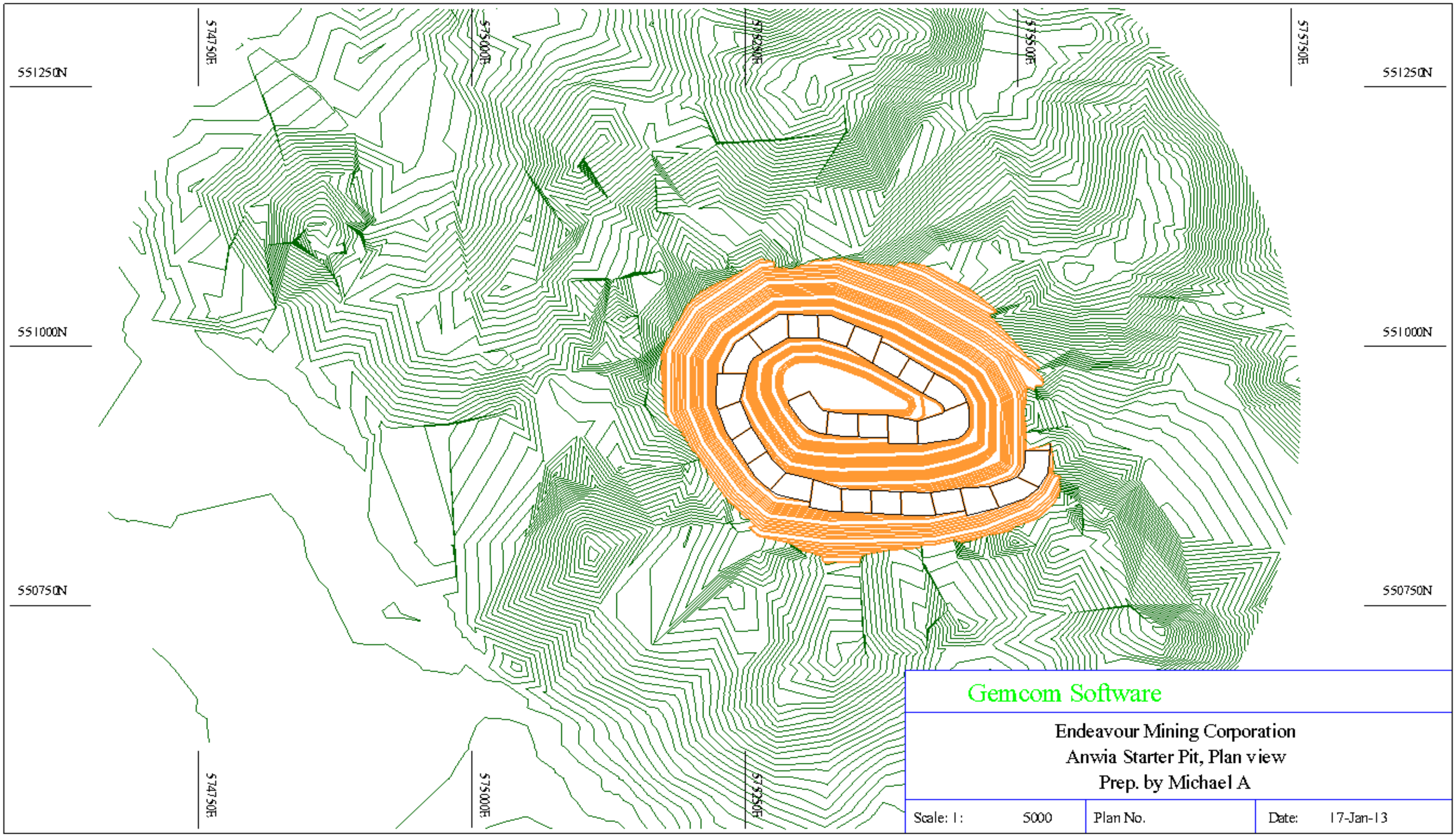


Figure 15.6: Adamus Starter Pit, Plan View

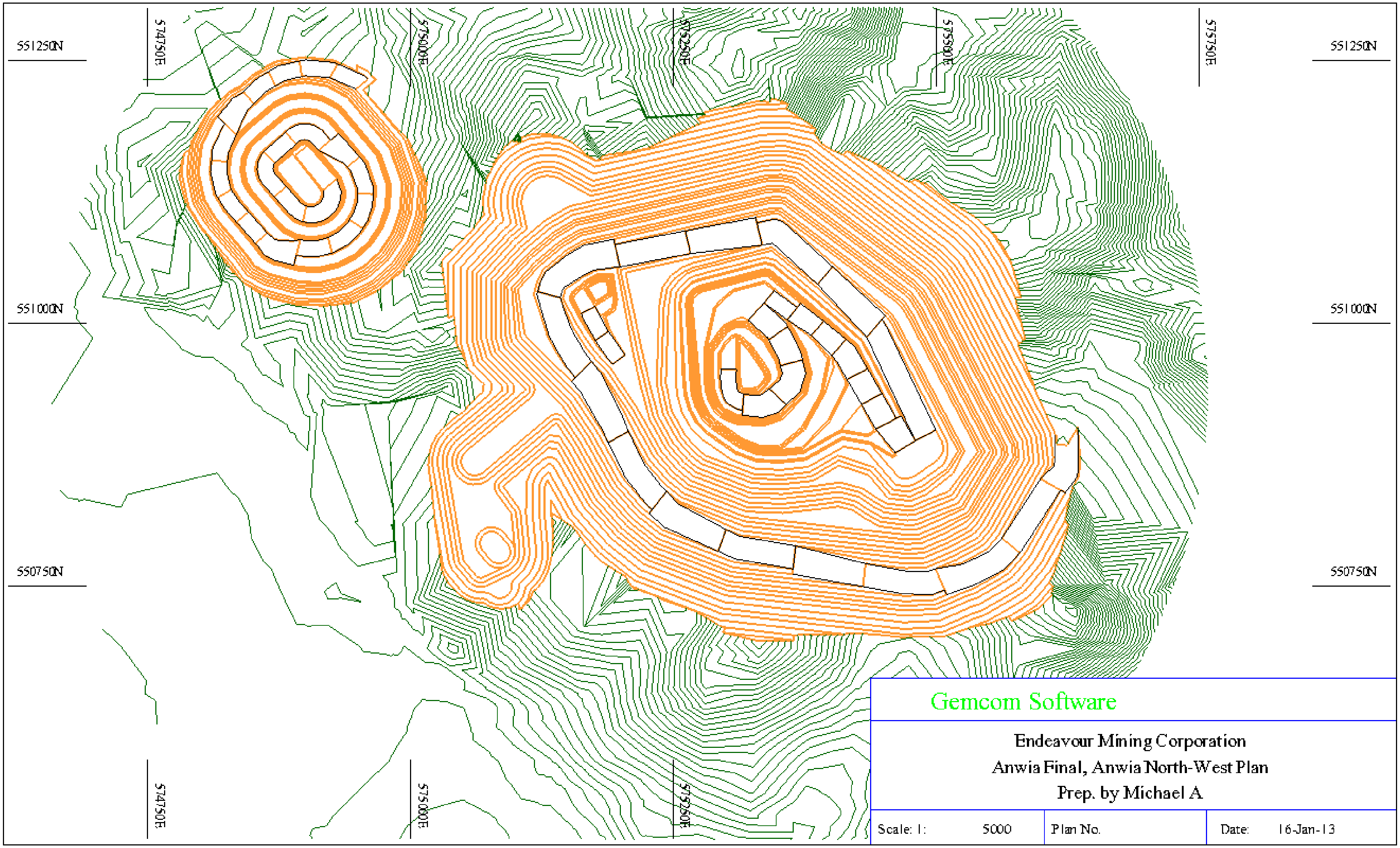


Figure 15.7: Adamus Final and North West Pits, Plan View

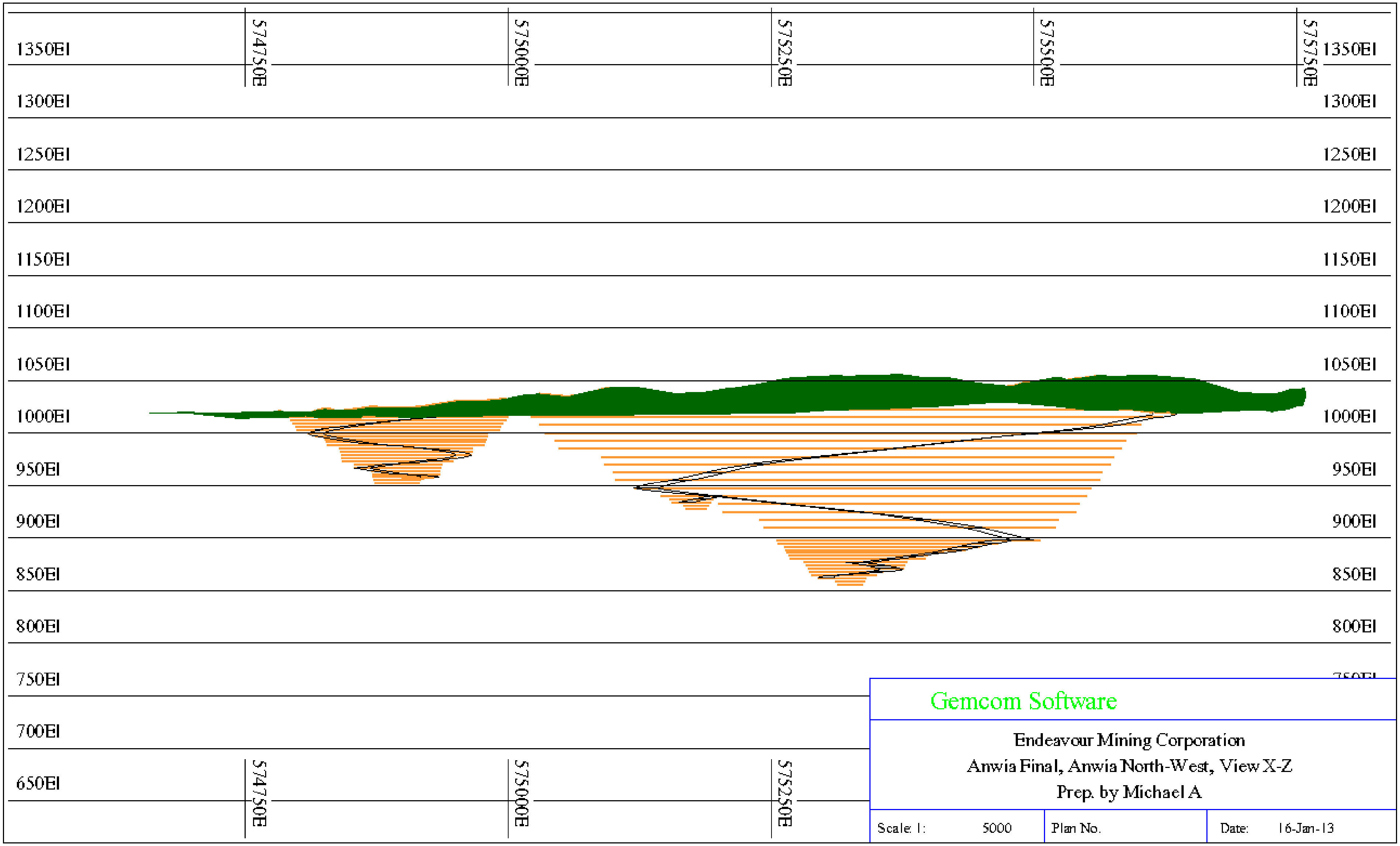


Figure 15.8: Adamus Final and North West Pits, View Direction: Facing North

15.4.1 Mineral Reserves Calculation, Adamus

Mineral Reserves are quoted within specific pit designs based on Measured and Indicated Mineral Resources only and take into consideration all appropriate modifying factors including metallurgical parameters, infrastructure requirements and permitting requirements.

This reserve estimate has been determined and reported in accordance with Canadian National Instrument 43-101, 'Standards of Disclosure for Mineral Projects' of June 2011 (the Instrument) and the Definition Standards adopted by CIM Council in November 2010

Table 15.13 shows the mineral reserves estimated to be contained in the Adamus practical pit designs and the production schedule.

Table 15.13: Mineral Reserves, Adamus Deposit

Material	CoG g/t	Proved			Probable			Proved and Probable		
		Ore kt	Au g/t	Koz	Ore kt	Au. g/t	Koz	Ore kt	Au g/t	Koz
Oxides	0.7	464	1.5	22.5	79	1.3	3.2	543	1.5	25.7
Upper transition	0.7	906	1.4	40.5	65	1.2	2.4	971	1.4	42.9
Lower transition	0.7	1,331	1.9	81.3	161	2.2	11.3	1,492	1.9	92.7
Fresh	0.7	3,658	2.1	247.0	1,609	2.2	115.8	5,267	2.1	362.8
Total		**6,359**	**1.9**	**391.3**	**1,914**	**2.2**	**132.7**	**8,273**	**2.0**	**524.0**

The Table 15.14 and Figure 15.9 represent a comparison of Whittle pit shell #8 with practical pit design.

Table 15.14: Comparison of Whittle Pit Shell with Practical Pit Design

Pit Shell	Total volume		Ore reserves		In-situ Au Koz	
	t	Diff. %	t	Diff. %	Au Koz	Diff. %
Whittle	46,786,905	-7.2%	8,673,203	-5%	544	-4%
Design	43,650,629		8,273,198		524	

15.4.2 Salman, Bokrobo, Nfutu, Aliva

The same optimization, mine design and reserve calculation approach was used for Salman, Bokrobo, Nfutu and Aliva deposits, which together comprise approximately 34% of Nzema Mineral Reserves. In total, 17 pits were designed and incorporated in Life of Mine plan. Cut-off grades, derived from recovery for every material type, processing costs (including haulage to the process plant) and ore related in-pit activities were calculated within optimization analysis and used in Mineral Reserves estimation.

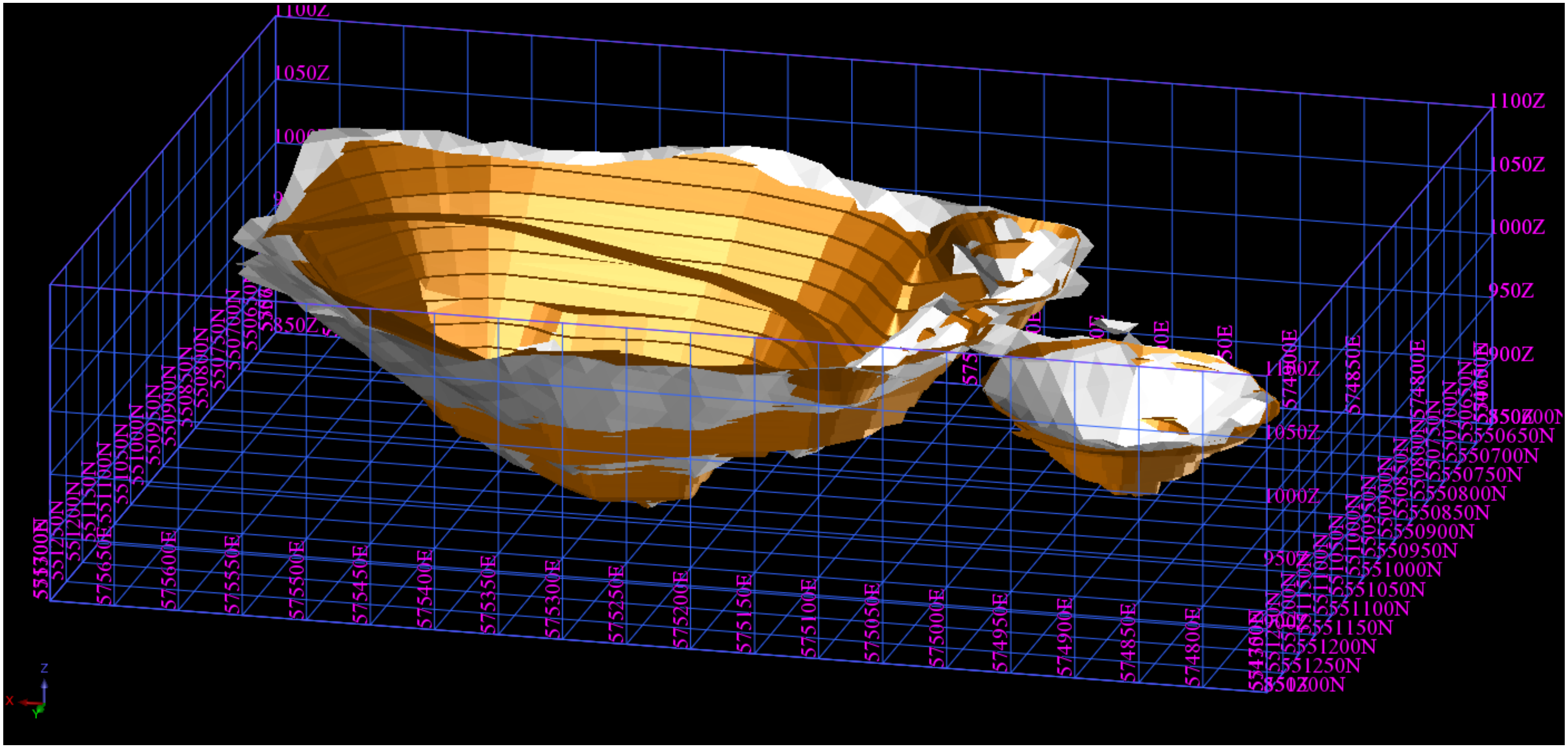


Figure 15.9: Whittle Pit Shell #8 and Adamus Final Pit Design

15.4.3 Mineral Reserves Statement

Mineral Reserves are quoted within specific pit designs as described above, based on Measured and Indicated Mineral Resources only and take into consideration all appropriate modifying factors including metallurgical parameters, infrastructure and permitting requirements.

This reserve estimate has been determined and reported in accordance with Canadian National Instrument 43-101, 'Standards of Disclosure for Mineral Projects' of June 2011 (the Instrument) and the Definition Standards adopted by CIM Council in November 2010.

The mining engineering work on the Mineral Reserve statement has been carried out by Michael Alyoshin, MEng Mining, a fulltime employee of Endeavour Mining Corporation, Member of the Australasian Institute of Mining & Metallurgy, CEng (Israeli Engineers' Union). Quinton de Klerk, Mining Engineering Director of Cube Consulting ™, Fellow of the Australasian Institute of Mining & Metallurgy acted as the Qualified Person for the Mineral Reserve estimation. Mr, Alyoshin worked under supervision of Mr. Klerk for this report.

Ore tonnes are reported by applying a marginal gold cut-off grade as presented in Table 15.15. There are some Inferred mineral resources within the pit designs which cannot be classified as reserves under NI43-101. Therefore the tonnage, grade and in-situ gold content of the "Inferred" mineralized material was calculated separately, but was accounted for as waste and did not participate in optimization cash flow generation.

The tonnage of waste to be mined is 60.2Mt. This amount includes 506kt of Inferred resources at an average grade of 2.2g/t that was treated as waste. The strip ratio over the life of mine is 4.7 to 1.

Table 15.15: Nzema Gold Mine Mineral Reserves, December 31st 2012

Deposit	Material Type	CoG g/t	Proved			Probable			Proved and Probable		
			Ore 000t	Au g/t	Koz	Ore 000t	Au. g/t	Koz	Ore 000t	Au g/t	Koz
Adamus (Anwia)	Oxides	0.7	464	1.5	22.5	79	1.3	3.2	543	1.5	25.7
	Upper transition	0.7	906	1.4	40.5	65	1.2	2.4	971	1.4	42.9
	Lower transition	0.7	1,331	1.9	81.3	161	2.2	11.3	1,492	1.9	92.7
	Fresh	0.7	3,658	2.1	247.0	1,609	2.2	115.8	5,267	2.1	362.8
	Sub total		**6,359**	**1.9**	**391.3**	**1,914**	**2.2**	**132.7**	**8,273**	**2.0**	**524.0**
Salman	Oxides	0.6	1,267	1.2	50.3	205	1.2	7.7	1,472	1.2	58.0
	Upper transition	0.7	646	1.5	31.7	31	1.4	1.4	677	1.5	33.1
	Lower transition	1.1	362	2.0	23.2	2	2.2	0.2	365	2.0	23.4
	Fresh	1.8	64	2.9	5.9	-	0.0	0.0	64	2.9	5.9
	Sub total		**2,339**	**1.5**	**111.2**	**238**	**1.2**	**9.3**	**2,577**	**1.5**	**120.4**
Bokrobo	Oxides	0.7	9	3.8	1.1	12	3.6	1.3	21	3.7	2.4
	Transition	0.8	62	2.7	5.4	87	3.7	10.5	150	3.3	15.9
	Fresh	0.8	508	3.4	54.9	153	5.1	25.3	661	3.8	80.2
	Sub total		**580**	**3.3**	**61.4**	**252**	**4.6**	**37.2**	**832**	**3.7**	**98.6**
Nfutu	Oxides	0.7	67	1.1	2.4	52	1.1	1.9	118	1.1	4.3
	Transition	0.7	50	1.2	2.0	34	1.2	1.3	84	1.2	3.3
	Fresh	0.7	204	1.5	9.5	226	1.3	9.2	431	1.4	18.8
	Sub total		**321**	**1.4**	**13.9**	**312**	**1.2**	**12.4**	**633**	**1.3**	**26.4**
Aliva	Oxides	0.7	47	1.3	2.0	8	1.1	0.3	55	1.3	2.3
	Upper transition	0.7	242	1.3	10.2	9	1.2	0.4	251	1.3	10.6
	Lower transition	0.7	191	1.3	7.8	15	1.3	0.6	206	1.3	8.4
	Fresh	0.7	43	1.4	2.0	8	1.4	0.4	51	1.4	2.3
	Sub total		**523**	**1.3**	**22.0**	**40**	**1.2**	**1.6**	**563**	**1.3**	**23.6**
Total In-Situ Mineral Reserves			**10,122**	**1.8**	**599.8**	**2,756**	**2.2**	**193.2**	**12,878**	**1.9**	**793.0**
Stockpile			151	0.9	4.20	0	0.0	0.0	151	0.9	4.20
Total Mineral Reserves			**10,273**	**1.8**	**604.0**	**2,756**	**2.2**	**193.2**	**13,030**	**1.9**	**797.2**

16 Mining Methods

16.1 Mining Equipment

Nzema used conventional open pit mining methods with drilling and blasting of competent material followed by load and haul. African Mining Services Ghana Ltd (a subsidiary of Ausdrill) is the mining contractor and has provided mining services for Nzema since 2009. Drilling and blasting is performed on 6 to 15m benches, depending on geological and geotechnical settings of given deposit, with blasted material excavated in discrete 3m high flitches.

The current fleet list is summarized in Table 16.1.

Table 16.1: Current Mine Production Fleet

Equipment unit	Brand	Type	Current Fleet
Drills	Tamrock	1500	1
Haul trucks	CAT	777D	1
	CAT	777C	7
	CAT	777F	4
	Volvo	A35F	4
Loading Equipment	Liebherr	984C	2
	Liebherr	964C	1
	Liebherr	944B	1
	CAT	980H	3
Auxiliary Equipment	CAT	16M	1
	CAT	14H	1
	CAT	D9R	3
Water truck	CAT	773D	2

16.2 Mining Schedule

The primary objective of the production schedule has been to maximize the early cash flow from the operation by delaying the mining costs and bringing revenue forward as much as possible. This objective has been achieved within the following constraints:

- Ensuring continuous ore supply to the processing plant for the selected 2Mtpa throughput rate
- Land access constraints
- Keeping the vertical mining advance rates generally below 9m (3 flitches) per month (except at the start and end of the pit stages depending on the bench quantities)
- Maintaining approximately four weeks supply of mill feed in the ROM stockpile at a reasonable grade
- Maintaining constant working strip ratios and consequently smoother mining rates for extended periods of time as much as possible.

The mining schedule represents a simplified version of results generated in Microsoft EXCEL® based bench-by-bench scheduling software. The Gemcom MineSched® scheduling tool also has been used for long term mine planning and financial modeling. The full version of the schedule comprises ore and waste tonnages on monthly (2013), quarterly (2014) and annual basis for the rest of the Life of Mine.

Table 16.2: Nzema LOM Mining Schedule

Year	Mining	Oxide ore		Upper Transition ore		Lower transition ore		Fresh ore		Waste	Total, processed		Au rec.
	t	t	Au g/t	t	Au g/t	t	Au g/t	t	Au g/t		t	Au g/t	Koz
2013	9,729,970	708,194	1.42	631,591	1.54	746,067	1.96	135,620	2.23	7,508,498	2,160,000	1.64	95,917
2014	11,147,094	577,098	1.52	559,211	1.59	175,723	1.63	806,237	1.84	9,028,826	1,826,350	1.77	92,840
2015	13,574,016	244,443	1.56	356,298	1.63	820,307	1.66	494,538	1.66	11,658,429	1,897,378	1.77	94,298
2016	13,284,352	35,762	1.86	262,929	1.84	205,765	1.82	1,269,316	1.82	11,510,580	1,859,540	1.78	96,253
2017	11,612,724	12,029	1.19	110,697	2.15	-	-	2,067,098	2.38	9,422,899	1,863,711	2.13	114,996
2018	8,766,875	13	1.34	29,527	1.34	-	-	1,349,926	2.21	7,387,408	1,718,110	2.35	116,084
2019	4,557,537	607,975	1.40	144,901	1.46	64,853	1.50	349,375	4.30	3,390,433	1,704,845	1.97	95,237
Total	**72,672,567**	**2,185,514**	**1.46**	**2,095,154**	**1.63**	**2,012,715**	**1.78**	**6,472,110**	**2.21**	**59,907,074**	**13,029,934**	**1.91**	**705,625**

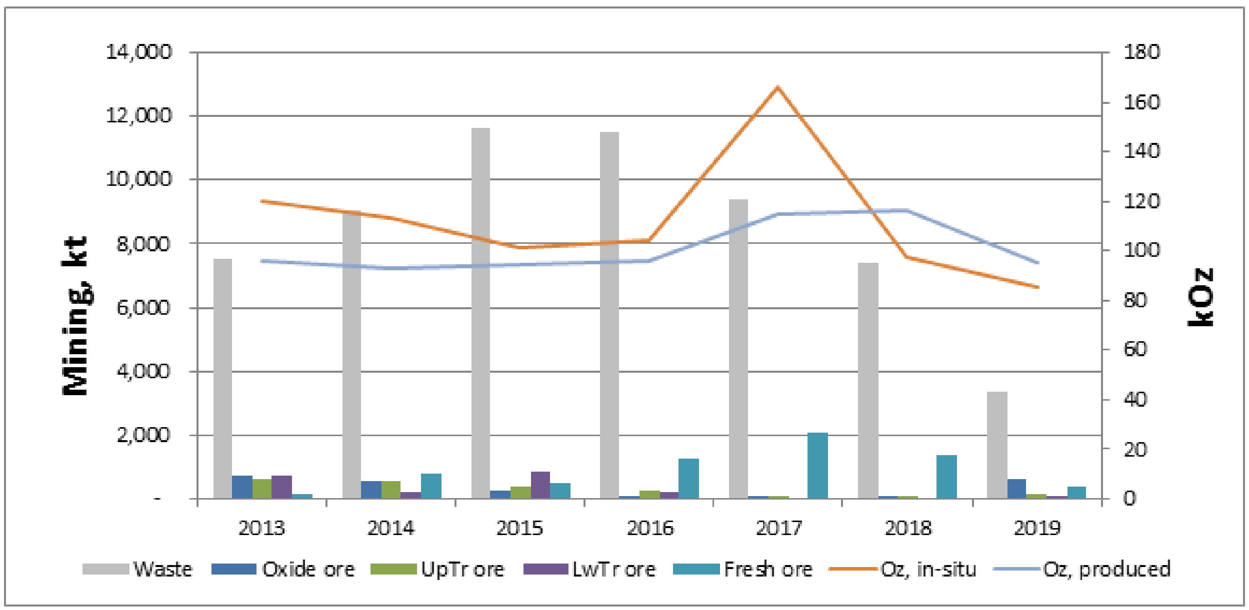


Figure 16.1: Nzema LOM Mining Schedule

During the year 2018-2019 a significant amount of plant feed will come from the stockpile.

16.3 Waste Dump Design

16.3.1 Waste Dump Design Parameters

The waste rock dumps, associated with mining operations, will be constructed to meet the requirements of the Ghana Mining Regulations and the EPA. The condemnation drilling, covering areas allocated for waste dumps, was conducted during 2009-2010.

The Nzema waste dumps have been designed using the following parameters:

- Face slope angle – 37 degrees
- Bench height – 10m
- Berm width – 12m
- Overall slope – approximately 20 degrees.

The waste dump capacity has been based on swell factors of 20% for all waste material.

Selected waste rock was used for the construction of the ROM pad, tailings storage facility (TSF) walls and other infrastructure items during the site construction phase and will be used for further TSF wall lifts during the life of mine.

16.3.2 Adamus Waste Dump

The total volume of designed waste dump is 19Mm^3 which is enough to accommodate the amount of waste generated during mining of the Adamus Main Pit and Northwest Pit (17.3Mm^3, swell factor taken into account).

The waste dump will be progressed by tipping from a higher level against a windrow and progressively pushing the waste out with a dozer. Waste dumps will be progressively rehabilitated with topsoil, where possible. All rehabilitation work will be carried out progressively. Rock-lined drains were constructed, where required, to ensure excess run-off is controlled and directed down to sediment traps. The waste dump design incorporates the features to minimize the effect of leaching of contaminants.

The location of the Adamus waste dump is shown in Figure 16.2.

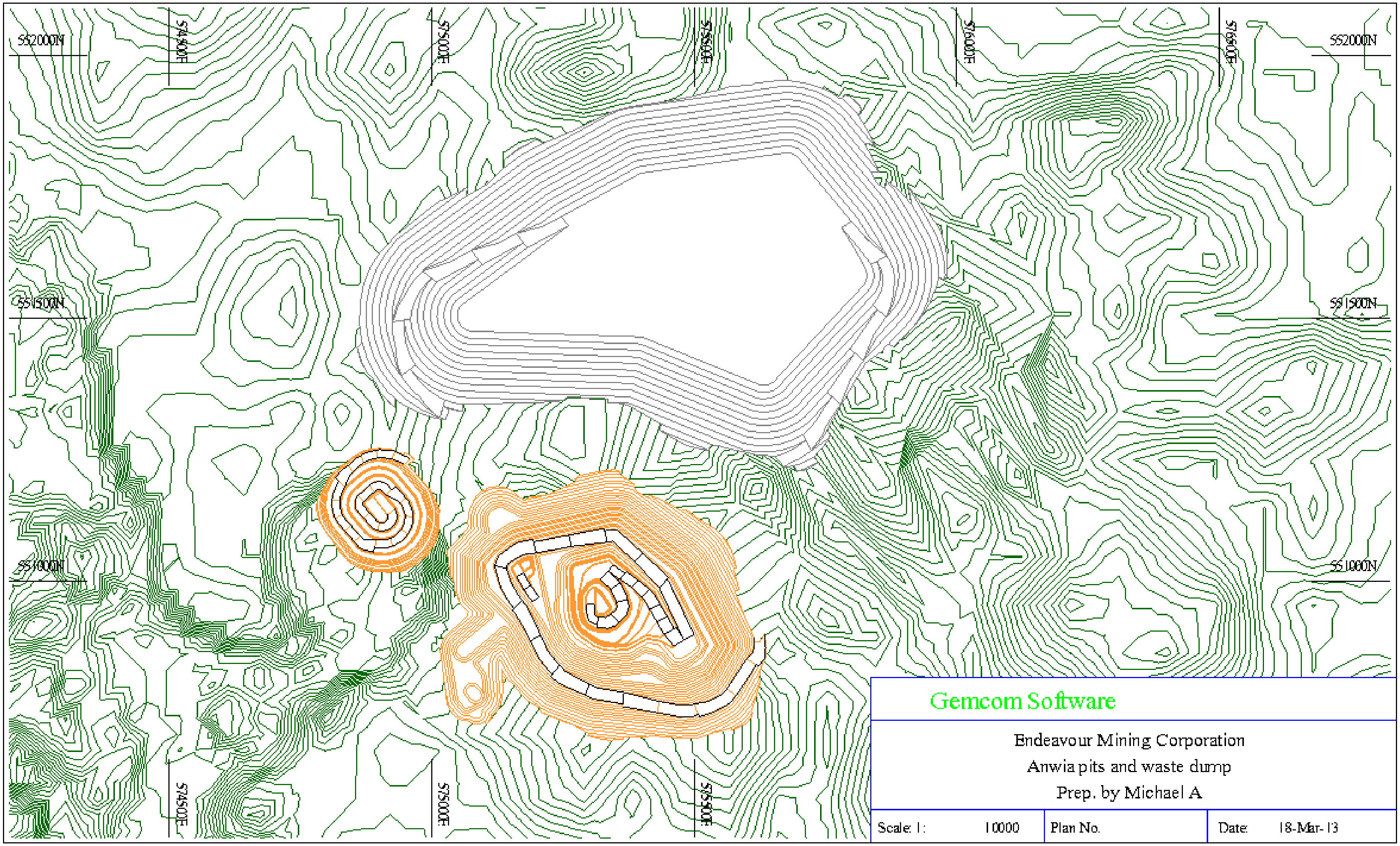


Figure 16.2: Adamus Final Pit and Waste Dump Design

Salman, Bokrobo, Nfutu and Aliva waste dumps were designed using the same approach. Additional information about Nzema waste dumps and material movement is provided in Section 18.4.5.

16.3.3 Blasting and Explosives

Production blasting is performed by MAXAM Ghana Ltd (MAXAM).

The explosives magazine on site consists of the ammonium nitrate mixing shed for the manufacturing of bulk explosives, four 20 footer containers for storing detonators, high explosives and other explosive accessories. The supply of detonators, boosters, bulk explosives, initiating systems and other explosives material into the magazines for storage and further use on the mine is the responsibility of MAXAM.

The fencing on the perimeter of the magazine area, the grouting (lightening arresters), loose earth bund in addition to other internal and external safety features were designed and constructed in compliance with the requirements of the Mining and Explosives regulation 2012.

16.3.4 Hydrogeology and Pit Dewatering

Nzema Mine is located in the highest rainfall region of Ghana where an average rainfall figure of 2,000mm is recorded annually producing huge amounts of surface run off into the pits. During the year there are only 3 months of dry season, with the remaining 9 months characterized by heavy rainfall. In addition there are other streams and rivers (e.g. Ankobra River) running within the vicinity of the pits and ground water has the impact of water seepage into the pits.

Currently, Salman South and Adamus are the pits where dewatering activities are carried out. However, Teberu 04 and Nugget Hill 01 (part of Salman deposit) have been mined to a grade control floor and serve as a source of water for dust suppression and to supplement the raw water dam at the TSF.

The main groundwater flow in the area is through fractures, weathered zones and shear zones as a result of the relatively low matrix porosity of greywacke and phyllite. All run off, ground water and other sources of water ingressing into the pits are directed into a sump and pumped out. The water from these sumps are tested by the environment department and certified free from any contaminants before pumping into the environment.

Dewatering is strategically designed with Goodwin centrifugal high lift pumps in the pits. The water is pumped from sumps into sediment control structures or a rock barrier filtering mechanism that filters the water for a cleaner effluent discharge into the environment. These centrifugal pumps are easier to manage, are efficient and cost effective.

Dewatering activities in the pits are done by the mining contractor that is controlled and monitored by Endeavour. Dewatering equipment consists of:

- 3 (three) 6” Goodwin pumps
- 1 (one) Nessie tractor pump
- 1 (one) 4” pump with a flexible hose used for small scale pumping operations
- 6” diameter HDPE pipes and accessories
- Two (2) 6” diameter flow meters.

Other strategies such as ditching along the edge of the pits and constructing earth bunds to divert water and surface run offs from the pits are implemented mine wide in controlling the possibility of back surges from streams and rivers entering the pits when they over flood their banks.

At the end of the mine life all entrances to the mined out pits will be blocked by construction of earth windrows or fencing to inform and warn of the open excavation. The mined out pits will be subjected to the approved closure plan described in the overall mine closure plan

16.4 Grade Control

The grade control aims to delineate ore and waste using RC holes piercing multiple benches. Drilling is performed by Reverse Circulation using a ROC L8 drill on regular pattern of 8mx5m and 10mx5m depending on ore continuity in the target area. Depth of grade control drilling ranges from 12m to 30m depending on pit design and mine schedule. The hole diameter is 135mm and 140mm. Hole inclination is 50 to 70 degrees depending on dip of the ore body to be intercepted.

The grade control drill plan, with designated Hole Ids, is generated by the mine geologist who is conversant with the geology and mineralization style of the resource target. The target sample weight per 1m drill interval is 4 to 5 kg.

Safety and environmental policies are strictly adhered to at all times at the drill site, including pre-shift inspections, equipment and tool checks, and housekeeping. Adequate logistics are also provided at the drill site to avoid shortages and wastages are cautiously minimized.

Set out and pick-up of collars are done by the surveyors. Drilling is strictly done by planned hole ID's as designed by the mine geologist during drilling.

To achieve good sample recovery, an air core bit is used for the first couple of metres or the first rod (1-6m) prior to changing to a RC hammer depending on the ground conditions.

Sample material must pass through a cyclone arrangement. A triple stage splitter is used to get approximately one-eighth (1/8) of the total sample drilled to be sent for assay. The remainder of the sample is left in the pit for geological logging.

Standard samples comprising certified reference materials are inserted into the sampling sequence at a frequency of 1 in 25 routine samples to check and monitor analytical accuracy of the laboratory. Blank samples comprising oxide and rock chips from the Voltaian Basin are inserted at a frequency of 1 in 20 samples, alternating with the standards, to monitor potential contamination between samples at the sample preparation stage. Both standards and blanks are inserted into the sample stream on-site and are numbered sequentially within the sample sequence.

Field duplicate samples are inserted into the sample stream. Monitoring of analytical precision is carried out through analysis of internal laboratory repeats and duplicate samples. QC plots are generated to monitor compliance and advised when acceptable standards are not met.

The number of holes, metres drilled, drill time, and other relevant field data is captured, entered, and validated daily.

The information, obtained by grade control drilling, represents an input to geological model, used by mine geologists and surveyors for the final dig line mark-up.

17 Recovery Methods

17.1 Process Plant

The Nzema processing plant is designed to treat oxide, transition and primary ores from the various pits. The design throughput treatment rate depends on the hardness of the ore with 2.1 Mtpa of softer oxide ore and 1.6 Mtpa of the harder transition and fresh ore. The plant has been operating since February 2011 and achieved commercial production in April 2011. The average throughput rate is currently 2.1 Mtpa given the mix of ore feed.

The treatment plant flow sheet (Figure 17.1) is based on single stage crushing, single stage 3.5MW SAG milling, gravity recovery of free gold from a portion of the cyclone underflow using Falcon 5200 followed by an Inline Leach Reactor (ILR) to treat the gravity concentrate and a six-stage carbon-in-leach (CIL) circuit to treat cyclone overflow as leach feed. The treatment circuit also includes a Counter Current Decantation circuit (CCD) for the recovery of cyanide from the tails slurry via thickening and decants return dilution to achieve less than 50 ppm of free cyanide to tails. The stripping plant includes a six tonne Zadra elution circuit with electro winning, removal of the gold deposition from the stainless cathodes with high pressure water sprayers and smelting to produce doré bullion.

The average monthly throughput rate from July 2011 to July 2012 was 175,859 dry tonnes, achieving 2.1mtpa as in the plant design (Table 17.1, Figure 17.2). The monthly throughput was variable mainly due to planned management of throughput during wet and dry periods during the year. Going forward, the oxide material throughput will continue to meet projected rates. The mill currently treats an average 5,843tpd equivalent to 2.13mtpa (slightly above plant design), at a reconciled grade of 1.66g/t.

Plant availability was 92.1% during the same period (Figure 17.3). Power outages have impacted plant availability and an onsite power plant is being installed. The installation of the power plant will improve plant availability.

17.1.1 Primary Ore Crushing and Stockpile

The primary crushing circuit compromises a Run-of-Mine (ROM) Bin with an 800mm static grizzly, a fine chute, a primary feeder and a single toggle jaw crusher (Figure 17.1). Ore is transported to the surge bin by means of a 400t/hr capacity discharge conveyor.

The Rom Bin has a capacity of 80 t/hr .The design capacity for the apron feeder is 346 wet ton but 400 wet tonnes per hour is being achieved currently.

The in-plant stockpile conveyer is designed to deliver 150 t/hr. The emergency stockpile is a 5 day capacity stockpile and holds approximately 30,000 tons of crushed ore.

Ore is trucked from the Salman and Adamus pits to the ROM Pad and is reclaimed by front end loaders (FEL) into the ROM Bin. The ROM Bin has a capacity of 80 t/hr. Ore is screened via the static grizzly and crushed by the single toggle jaw crusher to P80 of 110mm and conveyed to the surge bin which has a capacity of 72 t/hour. In the event of crusher breakdown, ore is reclaimed from the stockpile using FEL into the surge bin.

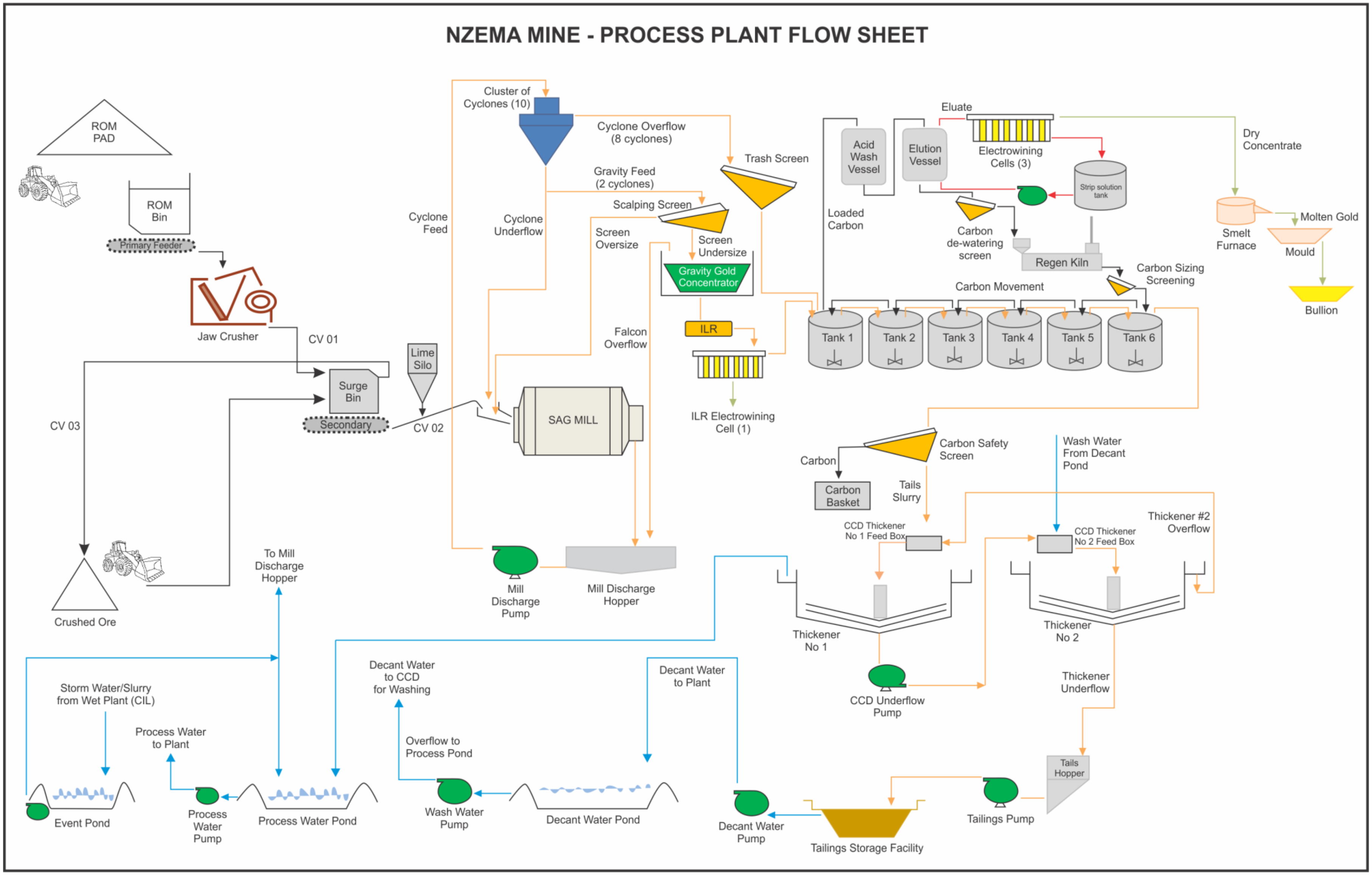


Figure 17.1: Nzema Mine Process Plant Flowsheet

Table 17.1: Monthly Plant Operating Statistics

	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12
Milled Tonnes dt	178,000	178,000	168,000	169,000	168,000	178,000	178,062	166,574	169,654	164,244	153,133	144,660	170,379
Milled Tonnes Rate dt/h	263	263	256	250	256	263	263	263	251	251	226	221	252
Reconciled Grade g/t	1.61	1.61	1.71	1.69	1.70	1.61	1.72	1.65	1.67	1.73	1.82	1.92	1.70
Grind Size Passing 106um	80	80	80	80	80	80	85	85	85	85	85	85	85
SAG Mill Power Draw Mw	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
SAG Mill Charge Level %	15	15	15	15	15	15	15	15	15	15	15	15	15
Availability %	91	91	91	91	91	91	91	91	91	91	91	91	91
Utilisation %	91	91	91	91	91	91	91	91	91	91	91	91	91
Operational Hours	677	677	655	677	655	677	677	633	677	655	677	655	677
Hours in Month	744	744	720	744	720	744	744	696	744	720	744	720	744

17.1.2 Grinding and Classification

The milling and classification circuit consists of a 3.5 MW SAG mill in closed circuit with a cluster of 10 cyclones .The SAG mill has a diameter of 5.5m and an Effective Grind Length (EGL) of 7.32m .The mill is fed by a 320m long conveyor belt at a rate of 290 dry tons per hour. The ore is milled to achieve a P80 of 106µm in size which is feed for the leaching circuit.

The product from the mill is classified using hydro cyclones .The SAG mill operates in closed circuit with classification cyclones to produce the leach feed.

Plant performance over the third and fourth quarter of 2011 and first and second quarter of 2012 is shown in the graph below.

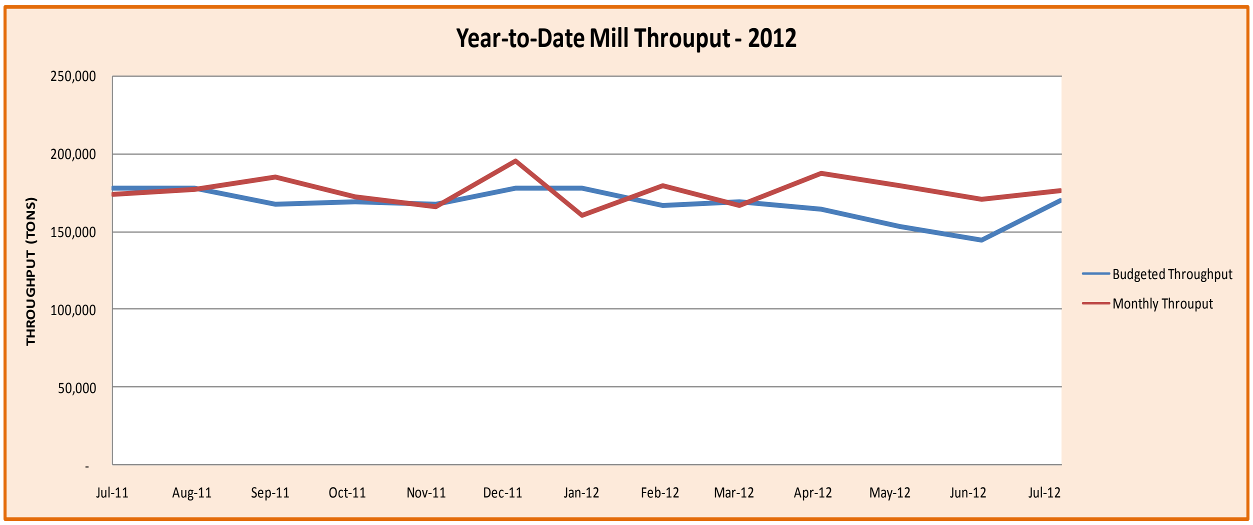


Figure 17.2: July 2011 to July 2012 Mill Throughput

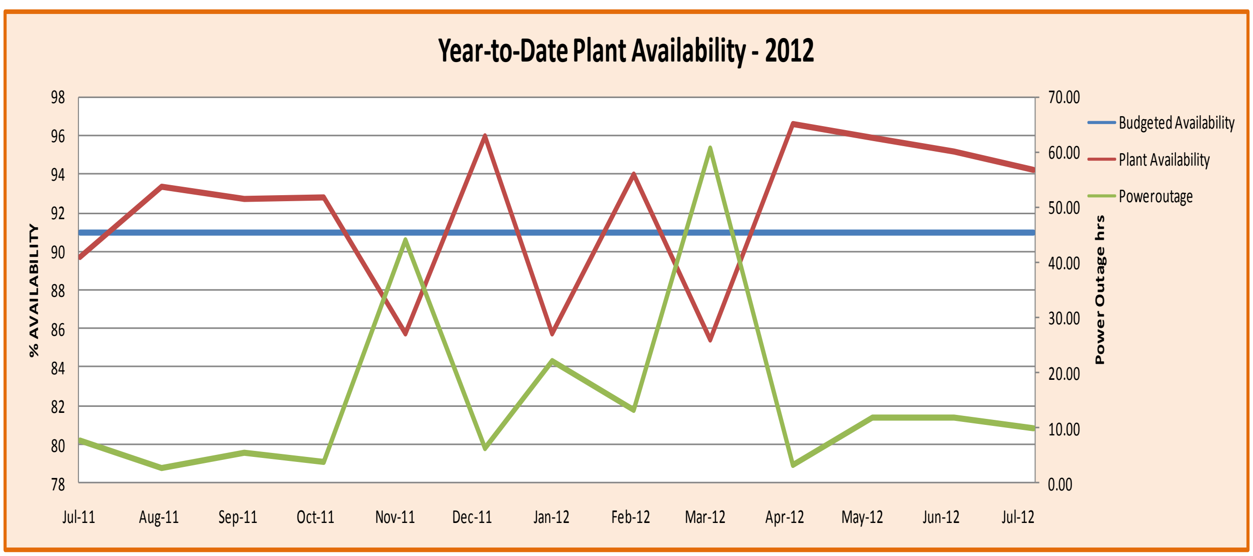


Figure 17.3: July 2011 to July 2012 Plant Availability

17.1.3 Gravity Concentration

The gravity circuit is comprised of a centrifugal concentrator (Falcon 5200), a Gekko In-Line Leach reactor and a dedicated electro-wining circuit. The gravity circuit is fed by underflow from two (2) cyclones representing approximately 10-20% of the feed to the cyclones. The gold, after being leached into solution in the leached reactor, is recovered in an electrowinning cell.

The gravity recovery from the Salman ore is currently between 10-15%. Adamus is expected to be 25 to 30% gravity recoverable gold.

17.1.4 Carbon -In -Leach (CIL)

The CIL circuit consists of six (6) 2,000 cubic meter capacity leach/adsorption tanks. The circuit is fed from the Cyclone overflow generated by maximum of eight (out of ten) hydrocyclones. The flow of slurry into the circuit is by gravity with counter current carbon advancement using air lifts. The tanks are sparged with air via the agitating shafts to enhance the leach kinetics.

Prior to leaching, the pulp is passed over the feed trash screen to ensure removal of tramp material such as wood-chips, plastics and grit larger than about 0.63 mm. This is done to minimize screen blocking in the adsorption section. After pre-screening of the feed, the pulp flow through a cascade of well mixed adsorption tanks.

The average operational live volume of each tank is 1,890m3. The tanks are mechanically agitated and each contains a batch of carbon at a concentration of 10 to 15 grams of carbon per litre of pulp. The carbon is retained in each tank by means of screens having an aperture of 0.8mm which allows pulp to flow through and out of the tanks whilst retaining the carbon.

The gold aurocyanide complex in the aqueous phase is readily adsorbed onto the activated carbon. By the time the pulp leaves the last tank in the adsorption cascade the concentration of gold in the aqueous phase is between an average of 0.001 and 0.008 ppm. The year to date CIL efficiency is between 85–87% depending on the tenor of the feed grade.

The following parameters were achieved in the first year since commissioning;

- Average pH - 10.2
- Average Dissolved Oxygen – 6.1
- Average Cyanide Consumption – 0.47kg/t
- Average Lime Consumption – 2.01kg/t
- Average grind value of 86% passing 106 µm

The trend of the overall plant recovery shows that the recovery to date has been generally on the decline but above target. The decline is due to progressively processing more Salman Trend transitional ore as mining accesses deeper material in this area. The mining of the Adamus ore will help to improve the recoveries given the non-refractory nature of that deposit.

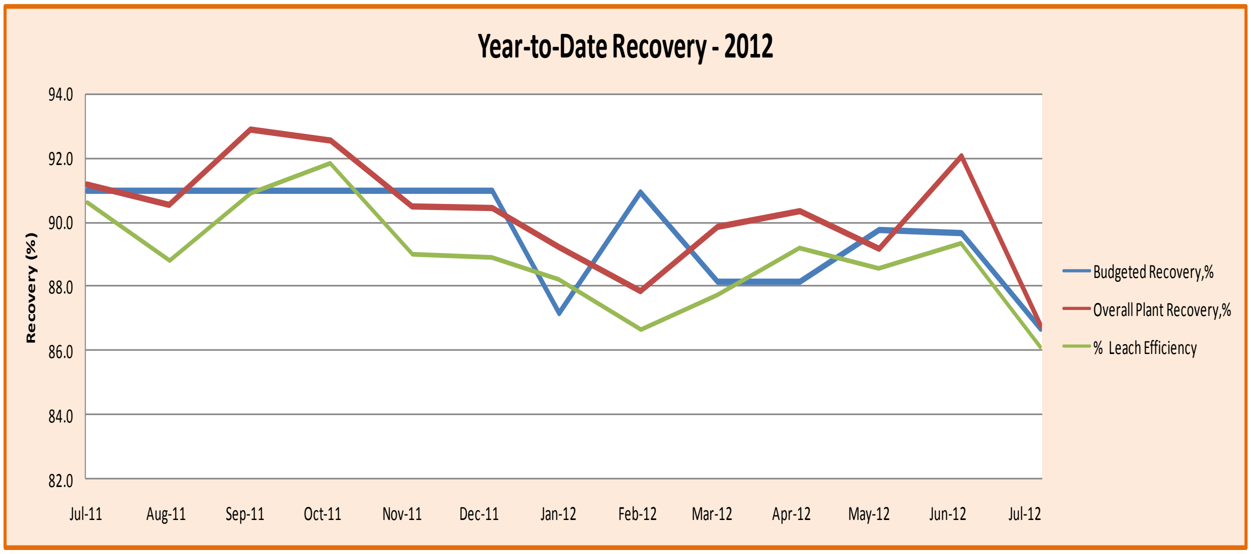


Figure 17.4: July 2011 to July 2012 Gold Recovery

17.1.5 Carbon Elution and Gold Recovery

Six (6.5 tons) tonnes of Carbon is recovered daily from the CIL head tank onto the loaded carbon recovery screen and gravitates to the acid wash column where acid wash treatment is performed. During acid washing, the dilute hydrochloric acid solution pumped into the bottom of the column removes contaminants, predominantly carbonates, from the carbon. Dilute acid and rinse water is disposed of to the tailings hopper.

The carbon is then transferred to the elution column for gold elution. The carbon elution circuit utilizes the Zadra elution process. Sodium hydroxide and sodium cyanide is pumped from their respective storage and mixing tanks into the strip solution tank and mixed with cleaned filtered water. The circuit has achieved an average of 7 strips a day with an average carbon loading of 1500ppm and barren carbon below 90ppm, thus achieving average of 95% strip efficiency.

The gold in solution is recovered by electrowinning and the gold transfers to cathodes. The cathodes are then stripped of the material that has plated onto them. The gold bearing material is put through a filter press, calcined and then smelted in a diesel-fired furnace to produce doré bars for shipment.

The electrowinning cells have fume extraction equipment which remove noxious and explosive gases.

After completion of the elution process, the barren carbon is transferred from the elution column to a dewatering screen prior to entering the feed hopper of the horizontal carbon regeneration kiln. Kiln off-gases are used to dry the carbon prior to entering the kiln. The average year to date carbon activity stands at 88% of the virgin carbon.

17.1.6 Cyanide Recovery

The tailings from the CIL tank #6 gravitates to the tailings counter current decantation (CCD) thickeners via a vibrating carbon safety screen designed to recover any carbon leaking from a holed screen in the last tank. The slurry is treated through a counter current, 2-stage thickening circuit to recover water and cyanide to ensure WAD cyanide compliance and low water volumes on the TSF. The washed cyanide from the tailings slurry is recovered into the process water pond for re-use as mill feed water addition, water addition to the cyclone feed hopper and for other purposes in the process plant.

Total cyanide recovered from tailings slurry achieved was 86% (Figure 17.5). This implies that average total cyanide going to tails over the 12 months period was 14% of that used.

Average WAD cyanide to the TSF over the 12 month period was 16ppm. The Average Free Cyanide to the TSF over the 12 month period was 18ppm which is lower than the UN guidelines value of 50ppm.

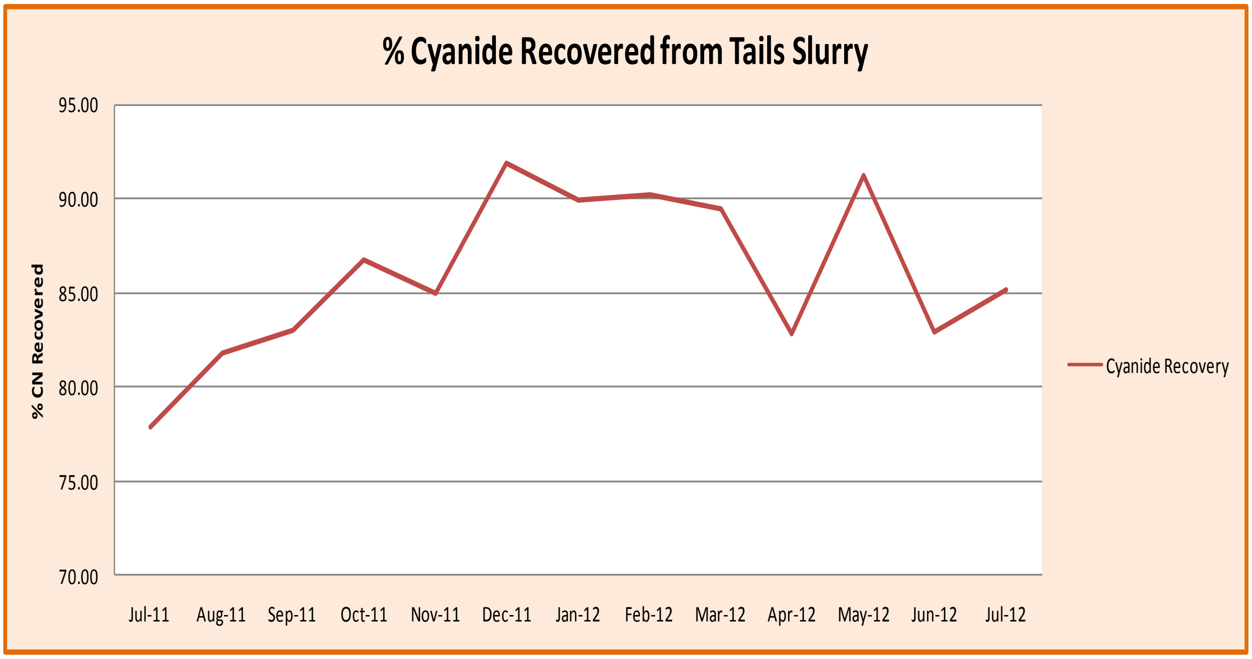


Figure 17.5: Cyanide Recovered from Tails Slurry

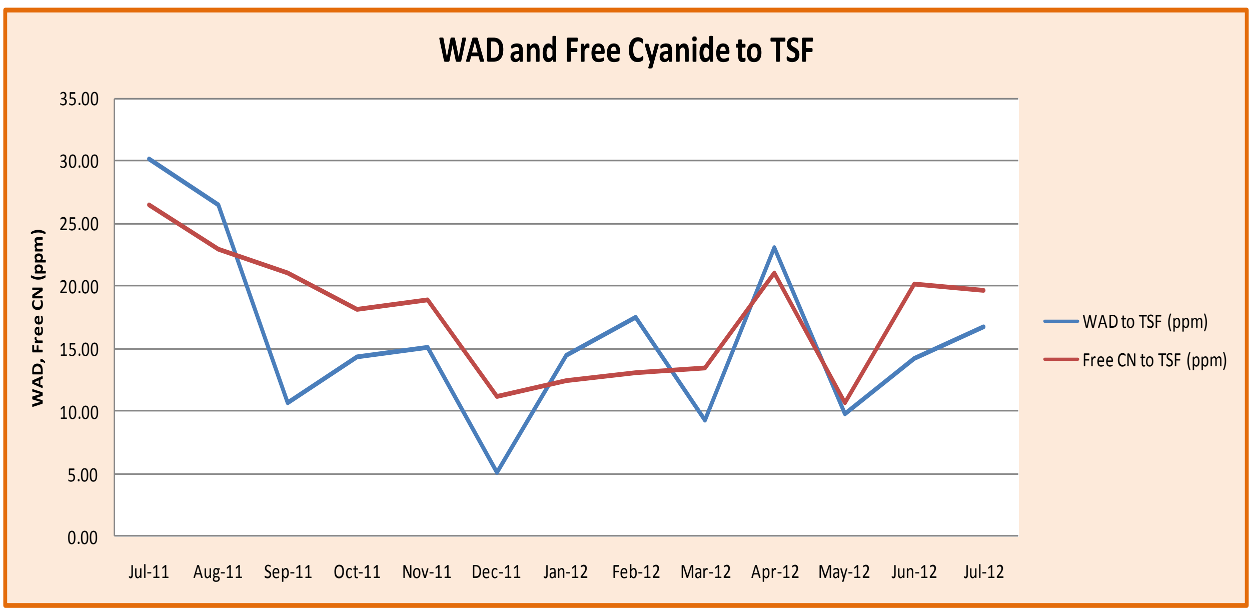


Figure 17.6: WAD and Free Cyanide to the TSF

17.2 Process Materials

17.2.1 Consumables

The major reagents used in the gold plant with their respective kg/t consumption are listed below. The types and quantities of the reagents and control of reagent additions are critical to the optimal leaching strategy and to achieving high performance and effective leach kinetics. The major reagents used in the gold plant with their respective kg/t consumptions are listed in Table 17.2.

Table 17.2: July 2011 to July 2012 Reagent Consumption

Reagent	Period	kg/t of Ore Milled		Variance %
	July 11 - July 12 (Tonnes)	Actual	Budget	
Grinding Media	1,852	0.78	0.81	4%
Sodium Cyanide	1,155	0.49	0.51	4%
Activated Carbon	91	0.02	0.04	38%
Lime	5,487	2.31	2.40	4%
Hydrochloric Acid	559	0.22	0.24	12%
Caustic Soda	286	0.12	0.13	6%

Automatic monitoring systems are in place to ensure that all reagents on the process plant are well monitored and consumption optimized in accordance with the accepted and standard practices and procedures. In general the consumption pattern falls within the plant design and is a positive variance (Table 17.2 and Figures 17.7 to 17.9).

SAG Mill Grinding Media

The 100 mm SAG mill grinding media is delivered in bulk and stored in the SAG ball bunker. SAG balls are loaded into the surge bin and deposited into the mill via conveyor CV-02 as required.

The average grinding media consumption for the oxide ore over the period under review was 0.78kg/t of ore milled at an average SAG Mill Power draw of 2.5MW.

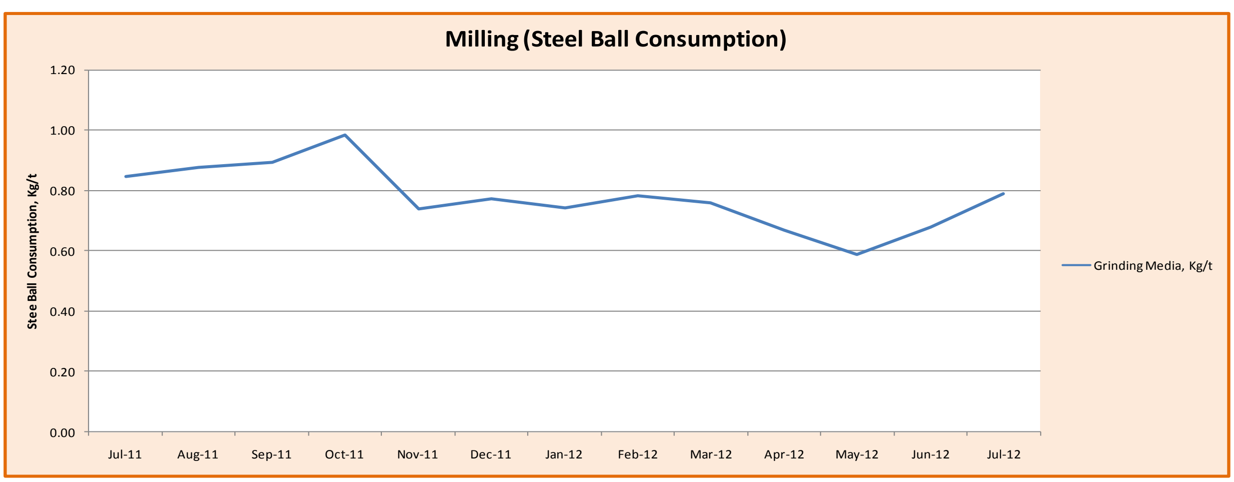


Figure 17.7: Ball Consumption

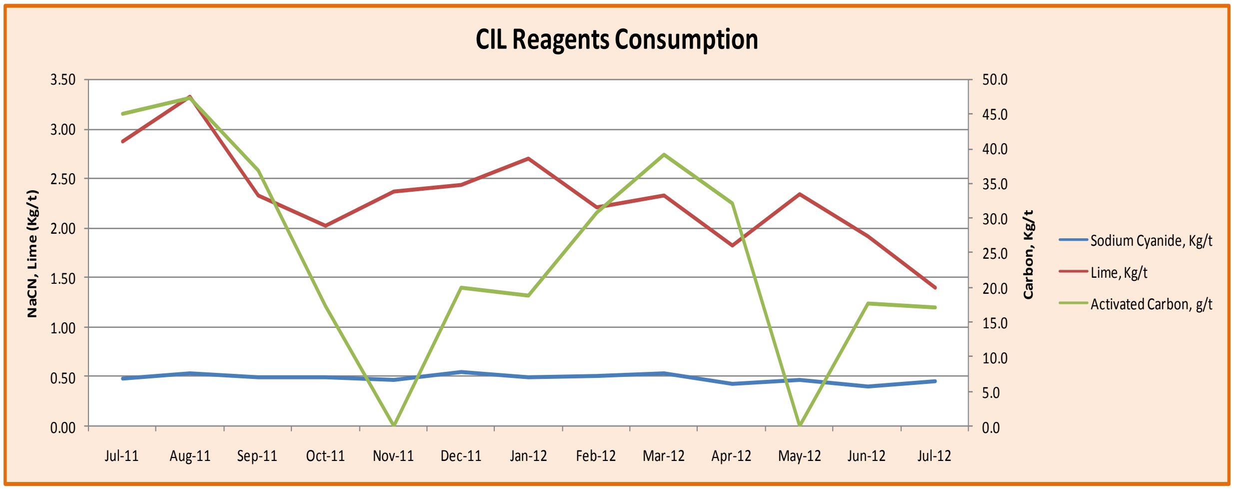


Figure 17.8: CIL Reagents Consumption

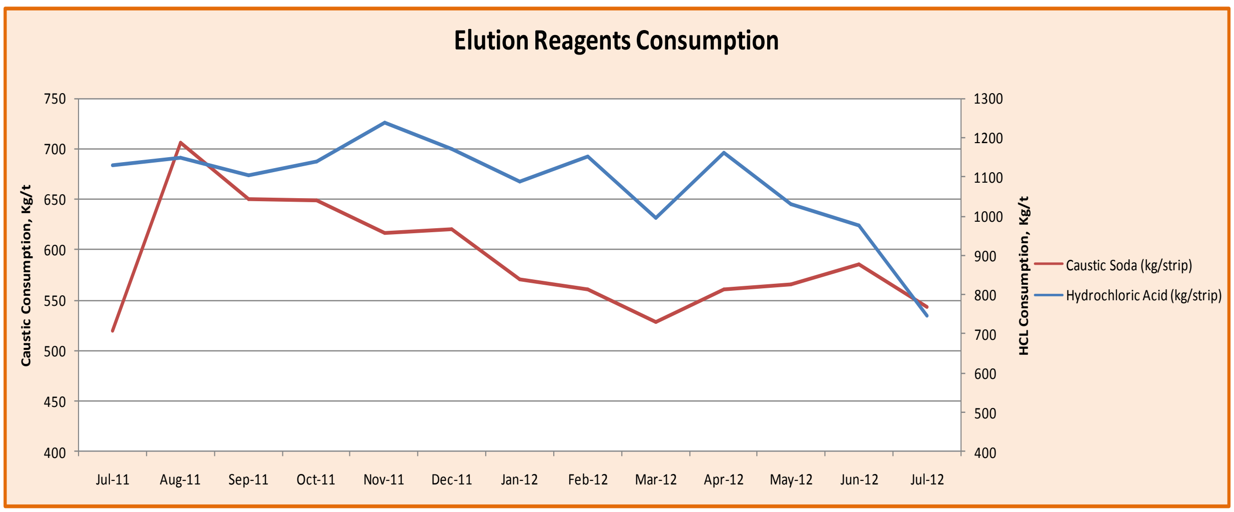


Figure 17.9: Elution Reagents Consumption

Lime

Quicklime deliveries are in bulk 40 tonne road tankers. The road tankers are pneumatically unloaded directly to an 80 tonne silo. The dry powder quicklime is metered via a rotary valve directly onto the SAG mill feed conveyor CV-02 for circuit pH control. Average lime consumption over the period under review was 2.3kg/t of oxide ore. The natural pH of the ore is acidic, averaging between 4 and 5.53.

Sodium Cyanide

Cyanide is delivered in 1.1 tonne bulk bags. The bulk bags are lifted by monorail hoist to an enclosed bag breaker above the cyanide mixing tank. The cyanide is mixed to a 20% w/v solution with process water and then transferred to the cyanide solution storage tank.

The cyanide solution is added to the leach feed distributor and the Intensive Cyanidation Reactor from a single ring main system fed by duty and standby fixed speed, centrifugal distribution pumps. The cyanide is also dosed into the strip solution tank during preparation and mixing of the strip solution via a dedicated variable speed, positive displacement pump.

The total cyanide consumption over the period under review, averaging 0.49kg/t of oxide ore milled is within target.

Activated Carbon

Fresh activated carbon is delivered in 500 kg bulk bags. Carbon consumption of 20g/t of ore milled as against target of 40g/t indicate a prudent carbon management plan is in place.

17.3 Supporting Infrastructure

17.3.1 Water Supply

Additional information on the water supply is provided in Section 18.3 of this report.

The plant re-circulates approximately 85% of water used and the remaining 15% is raw water.

The process water pond is located in the plant and is supplied from CCD overflow and is the main water used in the plant. The process water pond is topped by the cyanide recovery CCD thickener No. 1 overflow and from the decant pond via the CCD wash water pumps. Two recirculation pumps supply water to the milling circuit (mill addition and dilution water), screen sprays, thickeners and tailing and service hose points.

The potable water treatment plant is situated in the process plant to treat water for drinking, ablution water, and laboratory water and safety showers. Potable water is sourced from a bore hole drilled 300m from the process plant.

This water is filtered through a dual media/carbon/cartridge/UV filter system and chemically treated prior to storage in a 60m3 potable water tank. The water treatment plant produces an average of 60m3 of water daily.

Partly treated water from the potable water treatment plant is used as cooling water for the SAG mill lubrication system and the SAG mill liquid resistance starter (LRS). The return water from the SAG mill lubrication system is cooled using the SAG mill lube/LRS cooling system heat exchanger and cooling tower before returning to the SAG mill system. Treated water is used as cooling water to reduce scaling in the cooling circuit.

Duty and standby pressure system pumps are connected to this tank to distribute potable water around the plant, to the plant workshop, the safety showers in the plant, the laboratory, the mining and commercial administration and other site buildings.

17.3.2 Power Supply and Distribution

Additional information on the power supply is provided in Section 18.2 of this report.

Power is supplied from the GRIDCo power supply network via a 161/34.5Kv, 25/33MVa step down substation located at Essiama and approximately 14Km away from the process plant. The process plant is fed via a 33Kv overhead power line.

17.3.3 Other Plant Services

Cyanide Event Pond

The process plant is designed with spillage containment areas for each area of the plant. In the case of a major spill event, spillage will gravitate to the event pond with a capacity of 2,200 m^3, located at the lowest part of the plant, adjacent to the process water pond. This pond is equipped with an event pond monitoring level sensor and a pump to allow spillage to be pumped back to the process plant once the plant is stabilized.

Plant and Instrument Air

The plant air system supplies clean and dry air from high pressure screw Atlas compressors complete with an air filter system. A discharge manifold then distributes the air around the plant from the air receiver.

The plant instrument air system is provided via take-off from the plant air system, two stage coalescing air filter system, refrigerated air driers and a dedicated air receiver. The system feeds the carbon regeneration kiln, the CV-01 and lime silo dust collectors and mill girth gear lubrication systems.

17.4 Tailings Storage Facility

The tailings storage facility (TSF) is located north of the plant. The facility has a current capacity of 2.1M m3 and is due for the next lift in January 2014 and this will provide an additional 2.9 million m3 capacity.

Design criteria and specifications used for the construction of the TSF are listed in Table 17.3.

Table 17.3: TSF Design Criteria and Specifications

TSF DESIGN	
Storage Capacity *Stage 1* - *Stage 9 (Final)* Embankment Freeboard	3.0 Mt (16 months) 18.0 Mt (9 years) Greater of: (i) 0.3m above maximum tailings elevation, or (ii) 0.5m above maximum required storm-water elevation
Storage-Water Capacity - Short duration - Long duration	1 in 100 year/24 hour storm event superimposed over average rainfall sequence 1 in 100 year/12 months wet rainfall sequence
Spillway - Intermediate Stages - Final Stage	- 1 in 100 year, short term (time of concentration) event, occurring when supernatant pond is at spillway inlet level. - 24 hour PMP storm event occurring when supernatant pond is at spillway inlet level
Earthquake Loading - Operating - Final	Operating Basis Earthquake (OBE) Maximum Credible Earthquake (MCE)
Factors of Safety - Static (Operation) - Pseudo – static (Operation) - Static (Closure) - Pseudo – static (Closure)	1.3 1.1 1.5 1.1
TSF CONSTRUCTION	
Construction Materials - Low permeability fill (Zone A) - Bulkfill (Zone C) - Drainage/filter material - Erosion protection (drains)	Sourced from mine waste or local borrow material. Sourced from mine waste or local borrow material. Imported from off site. Sourced from mine waste material or imported from off site.
Construction Equipment -Stage 1 -Stage 2 onwards	Contractor Fleet (10 wheel tipper trucks), Mining Fleet (CAT 777 or equivalent to deliver material to embankments) Contractor Fleet (10 wheel tipper trucks), Mining Fleet (CAT 777 or equivalent).
Construction Description - Cut-off Trench	Upstream toe cut-off through residual/transported material.

- Embankment - Basin liner - Underdrains	Multi zoned embankment, utilising low permeability central core. Water retaining embankments to contain downstream seepage collection system. Low permeability soil liner (permeability not greater than 1x 10^{-8} m/s) over TSF basin. System of finger and collector drains within low lying areas of the TSF basin.
TSF OPERATION	
Production Days Per Year	336 (92% availability).
Slurry Characteristics -Oxide -Sulphide	 45% solids by weight. SG = 2.76. Max. Density = 1.40 t/m^3 50% solids by weight. SG = 2.84. Max. Density = 1.58 t/m^3
Fluid Management	Partial basin under drain gravity system into collection tower. Return to supernatant pond, via submersible pump. Decant tower system for removal of supernatant solution. Return to the plant via submersible pump. Return to the plant via submersible pump.
General	Upstream spigot deposition of tailings from embankment crest. Supernatant pond to be maintained remote embankments, at decant tower location. Embankments which may be water retaining during operation to be constructed with seepage interception and collection system.
TSF REHABILITATION	
Final Embankment Slopes	1V:3.5H (overall), with benches at 10m height increments.
Closure spillway	24 hour PMP storm event, discharging from site.
Cover profile	Shaped to achieve dry closure with no ponding.
Capping	Low permeability mine waste (0.5 – 1.0m thickness). Topsoil (200 mm), re-vegetation.

18 Project Infrastructure

18.1 Introduction

Project infrastructure includes power, water, tailings facility, mine services facilities and site offices.

18.2 Power Supply

Power supply to Nzema mine is provided from GRIDCo power supply network via a 161/34.5Kv, 25/33MVa step down substation located at Essiama and approximately 14Km away from the process plant. This substation is equipped with 1x25/33 ONAN.ONAF transformer with a set of 161Kv and 34.5Kv outdoor switchgear and the process plant is fed via a 33Kv overhead power line. GRIDCo also supply other local consumers including ECG from the same transformer at the same substation. At the process plant substation, the incoming power supply is further stepped down to 11.5Kv, via a 34.5/11.5Kv, 10MVa transformer.

Plant power distribution is maintained at 11.5Kv and stepped down to 415v at various load centers. The main circuits connected to the 11Kv board are:

- Incoming breaker with standard protection scheme
- SAG Mill (3.5MW) starter panel
- Remote services power line feeder
- Power factor correction capacitor feeder
- Plant distribution transformer feeding plant MCC
- TSF power

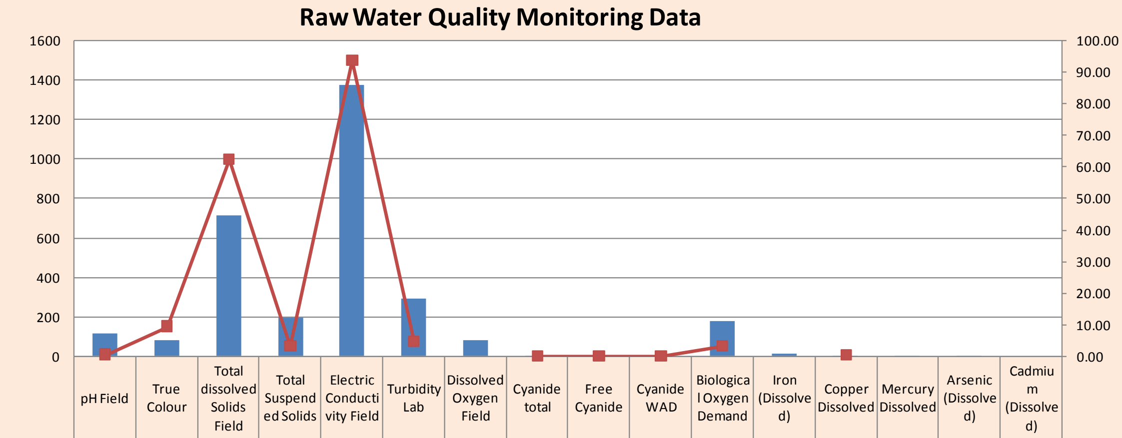
All other low voltage drives feed from the MCC.

The standby power supply/generator is also connected to the same MCC via a standard set of hard wired interlocks to ensure that the grid is switched off when the generator is in operation. The standby supply is provided via a 800Kv generator and operating at 415. Currently, a-6MW genset standby plant is being constructed to eliminate some of the downtime currently being experienced.

18.3 Water Supply

Raw Water

Prior to plant commissioning the raw water was initially sourced from the Ankobra River which was piped through a 225 mm HDPE to the Water Storage Dam (WSD) to meet raw water requirements for both process plant and mine services area. The operation is now dependent solely on rain water and surface run-off. The WSD has a catchment area of 64 ha with a reservoir surface area of 11 ha which is located between the natural topography of the TSF and the process plant with a storage capacity of ~600,000 m3.



	pH Field	True Colour	Total dissolved Solids Field	Total Suspended Solids	Electric Conductivity Field	Turbidity Lab	Dissolved Oxygen Field	Cyanide total	Free Cyanide	Cyanide WAD	Biological Oxygen Demand	Iron (Dissolved)	Copper Dissolved	Mercury Dissolved	Arsenic (Dissolved)	Cadmium (Dissolved)
Raw Water Parameters	7.07	5.00	44.58	12.28	85.78	18.28	5.14	0.01	0.01	0.01	11.00	0.64	0.01	0.00	0.01	0.00
EPA Mining Limits	7.5	150	1000	50	1500	75		1	0.2	0.6	50		5			

Figure 18.1: Raw Water Quality Monitoring Data

Figure 18.1 shows the quality of the water in the WSD as opposed to EPA limits. The plant maximum requirements for raw water average 40,000m3 monthly.

Emergency / Fire Water

Fire water is supplied from the raw water tank to an electric fire pump feeding the fire water ring main. This main supplies water to hydrants and hose reels distributed around the site. An electric jockey pump maintains pressure in the ring main and the main fire pump will start if one of the hydrants or hose is activated. A DC battery backup pump supplies water in the event of power failure.

Potable Water

The potable water treatment plant is situated in the process plant to treat water for drinking, ablution water, and laboratory water and safety showers. Potable water is sourced from the bore hole drilled 300m from the process plant.

This water is filtered through a dual media/carbon/cartridge/UV filter system and chemically treated prior to storage in a 60m3 potable water tank. The plant produces an average of 60m3 of water daily.

Duty and standby pressure system pumps are connected to this tank to distribute potable water around the plant, to the plant workshop, the safety showers in the plant, the laboratory, the mining and commercial administration and other site buildings.

A separate dedicated pump supplies water to the gravity concentrator and ILR reactor circuits.

18.4 Mining Infrastructure

The mining infrastructure currently at Nzema mine includes:

- Explosives magazine
- Contractor laydown
- Diesel fuel farm
- Haul roads
- Waste dumps

Figure 18.2 shows the mining infrastructure and the process plant and associated facilities.

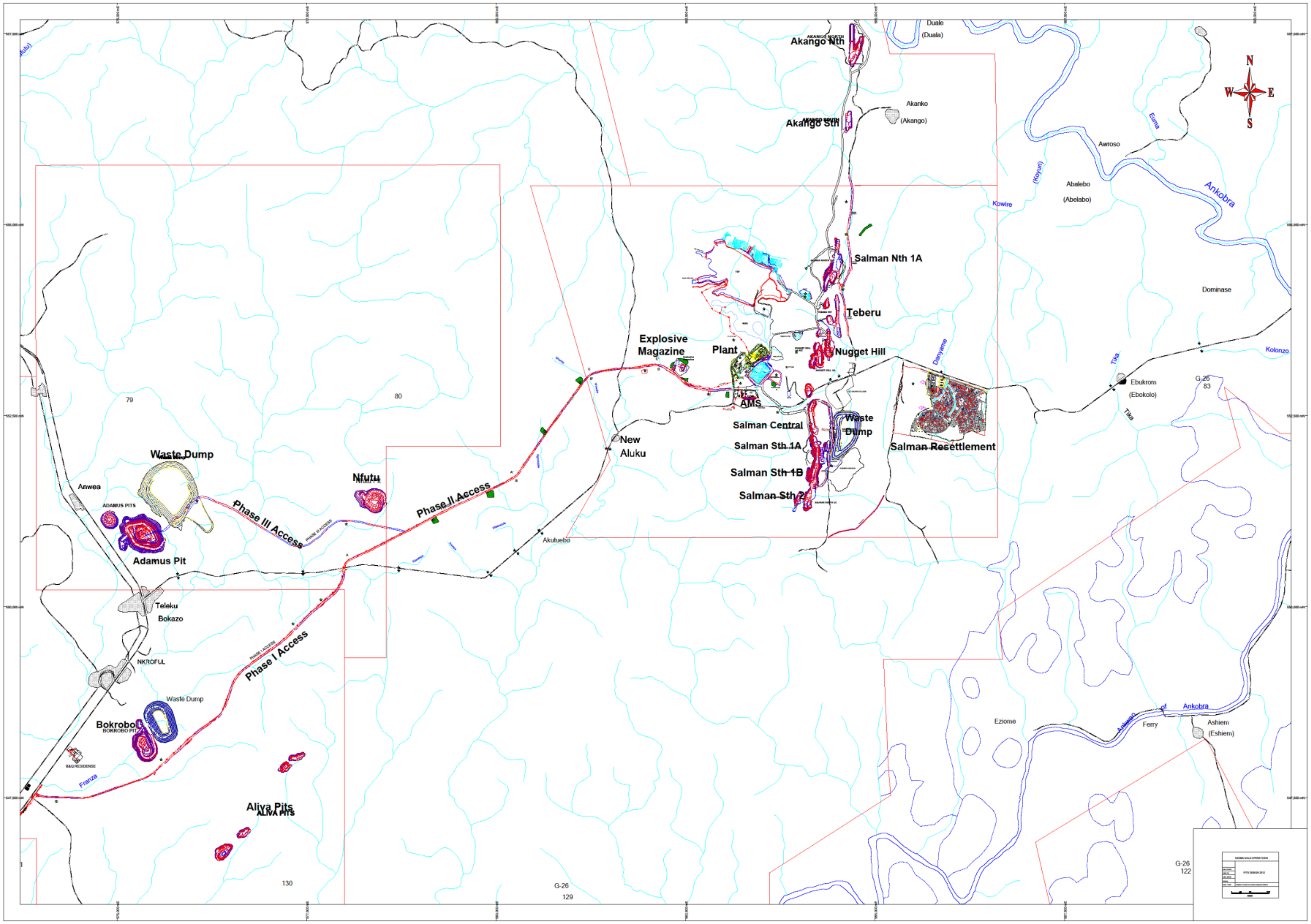


Figure 18.2: Nzema Mine Site Layout

18.4.1 Explosives Magazine

The explosives magazine on site was constructed by MAXAM Ghana Ltd (the explosives supplier contractor) after the site preparation and earthworks were completed. A description of the explosives magazine is provided in Section 16.3.3.

The location of the magazine area in relation to other facilities is shown on Figure 18.2.

18.4.2 Contractor Laydown

The mining contractor laydown yard consists of the following facilities:

- Ablution house for contractor employees
- Offices, shop rooms, and car park
- Workshops and store rooms

The construction and arrangement of these facilities including all fittings and safety devices satisfies the requirement of existing legal and other regulatory bodies (Figure 18.3).

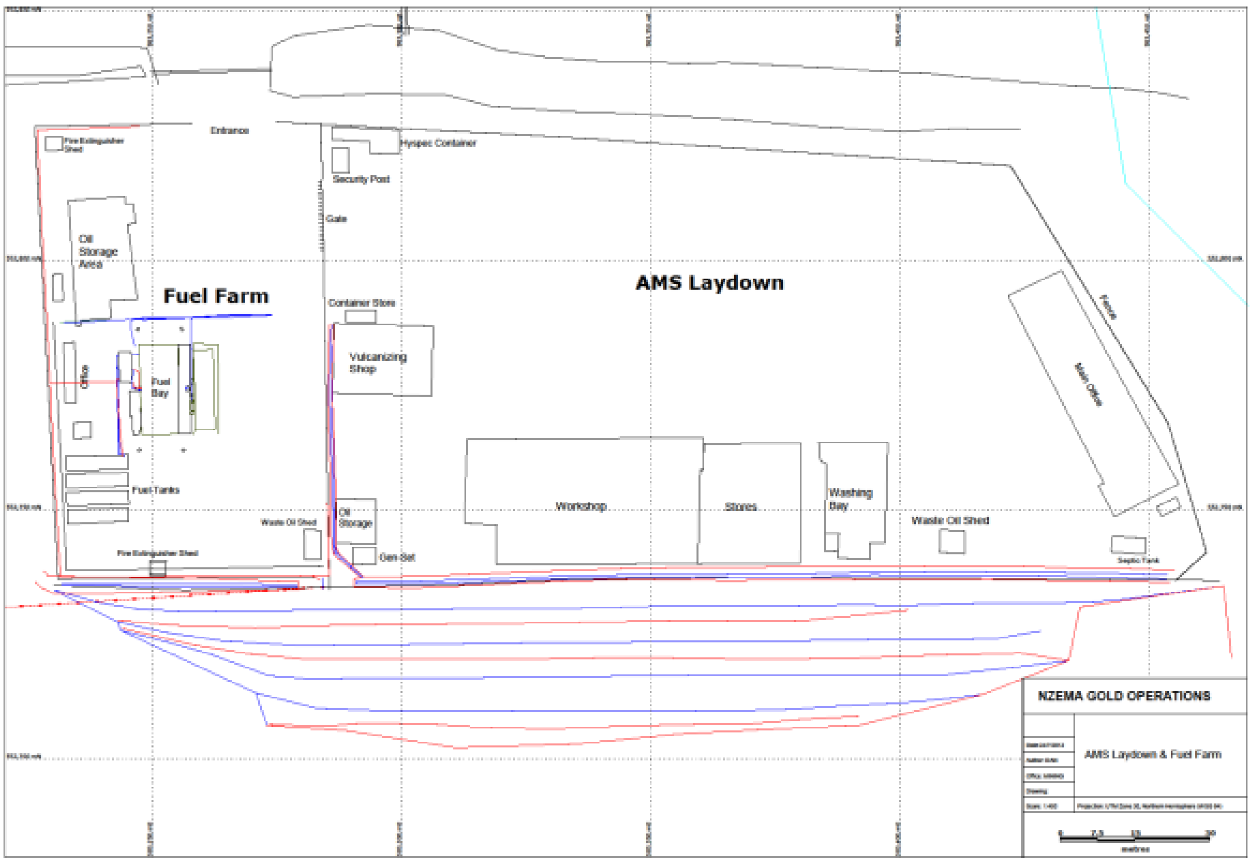


Figure 18.3: Contractor Laydown Area

18.4.3 Diesel Fuel Farm

The diesel fuel storage facility is located adjacent to the contractors' laydown yard (Figure 18.3). The fuel is stored in 4 ISO – containers having a total capacity of 240m^3. The fuel is dispensed to company and contractor vehicles, the mining contractors' fleet and other mobile service units at cost.

18.4.4 Mine Haul Roads

The mine haul roads were designed specifically for 777 rear dump trucks on a single lane carriage way. The width of the haul road is 22 meters and accommodates a safety windrow on the edge, drain and drainage window, road delineators and safety signages thereby leaving a running surface of 18 meters for the trucks.

On the other hand, access roads have been constructed on the mine to serve as a haul road for Road Trucks hauling ore material from the Adamus pits areas to Salman Rom Pad. These roads are single lane and have a running surface of 14 meters. Typical haul road design is shown in Figure 18.4.

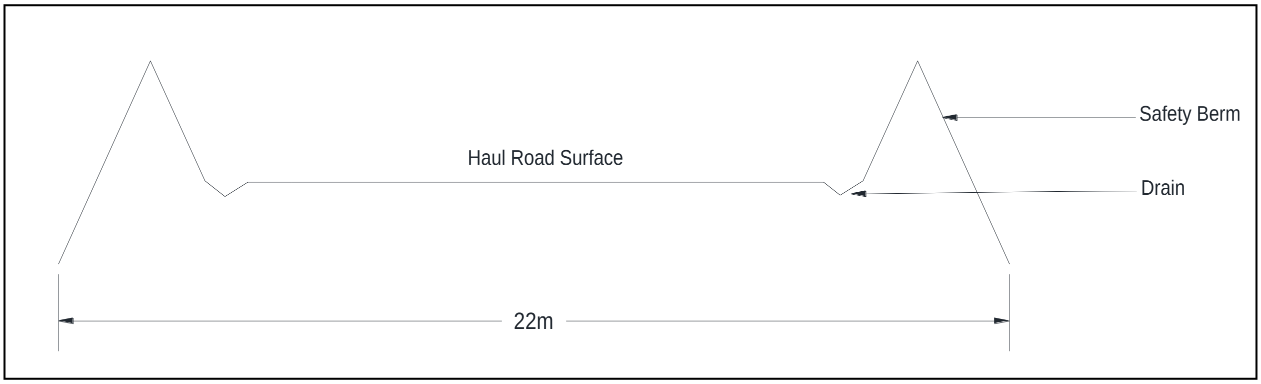


Figure 18.4: Typical Profile of Mine Haul Roads

18.4.5 Waste Dumps

Nzema mine currently operates at the Salman south pits (Salman Central, Salman South 1A, 1B, and 1C), Salman North pits (Salman North 1A, 1B; Salman North 02, and Salman North 04), and Adamus pits using the open pit mining methods. With this method waste material is stripped in order to mine the ore. In the near future Nfutu, Bokrobo and Aliva deposits will also be mined using the same methods. Waste material from the pits will be sent to the respective designed Waste Dumps.

These waste dumps were strategically located so that they can be able to accommodate the campaigned waste from the pits over the entire life of mine. In choosing locations for these waste dumps, EPA, WRC and Mines department recommendations were sought for and followed. Over the life of the mine, it is expected that 60Mt of waste rock will be mined from the pits. The name of the waste dump, location and the respective capacities are shown in the Table 18.1.

Table 18.1: Summary of Waste Dumps and Capacities

Location/Name of Waste Dump	Capacity (m^3)	Completion
Salman South	3.3M	2014
Akango North	1.0M	2019
Akango South	1.1 M	2019
Adamus	19 M	2018
Nfutu	3.5 M	2018
Bokrobo	4.1M	2019
Aliva	1.3M	2017

It is also expected that 4Mt of mined waste will be campaigned from the Teberu and Nugget hill area to buttress the tailings storage facility (TSF) project and other mine infrastructure.

Acid waste rock characterization study is underway which will provide guidance regarding waste rock dumping requirements and implementation.

19 Market Studies and Contracts

Dore alloy (87% Au average) produced by the Nzema process plant is usually shipped to Rand Refinery (Johannesburg, South African Republic). Before the alloy leaves the site, a state customs representative inspects the weight and seals the container with a government customs seal, signifying that the government is fully aware of the gold content of Dore alloy leaving the country. A helicopter transports the Dore alloy (under appropriate security) to the Accra airport, and the same day it is shipped under supervision of a Ghanaian branch of an international security company.

Nzema mine purchases a small amount of gold ore from a third party (approximately 48,000 t per year). The minimum quantity is 4,000 tonnes per month at a minimum grade of 6g/t. The purchases are based on 58.5% of the spot gold price.

20 Environmental Studies, Permitting and Social or Community Impact

20.1 Introduction

The Nzema Gold Mine has a corporate commitment towards sustainable development that focuses on achieving a high standard of environmental, economic and social performance in its operations.

Nzema maintains compliance with environmental and social regulatory requirements, as stated in the company social and environmental policy and follows through with the requirements of the AKOBEN programme as mandated by the Environmental Protection Agency (EPA).

20.2 Ghanaian Legislation and Guidelines

There are a number of mining related laws and regulations that have been put in place to promote and regulate the extraction and marketing of various minerals in the country. The legislative framework for mining in Ghana is laid out in the Mineral and Mining Act (Act 703) 2006.

An overview of the Ghanaian legislative framework and guidelines considered to be applicable to the mining operations are listed below:

- Environmental Protection Law
- EPA Act 490 (1994)
- Ghana Mining and Environmental Guidelines (1994)
- Environmental Assessment Regulations (1999)
- Minerals and Mining Act 703 (2006)
- Mining Regulations (1970)
- Sector Specific Effluent Quality Guidelines for Discharge into Natural Water Bodies (EPA)
- General Environmental Quality Standards (Regulation 20)
- Water Resources Commission Act 552 (1996)
- Water Use Regulations (2001) LI 1692
- Wildlife Conservation Regulations (1971)
- Factories, Offices and Shops Act 328 (1970)
- Wild Animals Preservation Act 43 (1961)
- Labour Act 651 (2003)
- Planning Standards for Settlements in Ghana
- National Development Planning Act (1994)

20.2.1 International Guidelines

Nzema Gold Mine is committed to comply fully with all of Ghana's national legislation and also plans to adopt the following international guidelines in order to provide additional guidance for the operation:

- The Equator Principles (WBG, 2006);
- International Finance Corporation (IFC) Guidelines;
- World Health Organization (WHO) Guidelines for Drinking-Water Quality;

Nzema is a member of the Ghana Chamber of Mines. As required of all members, Nzema has committed to adopt the principles of the International Cyanide Code for all aspects of cyanide management.

20.2.2 Project Permitting Process

The various acts, regulation, procedures and guidelines directly relevant to impact assessment in Ghana are presented in Table 20.1.

Table 20.1: Legal Framework for Environmental Impact Assessment and Quality in Ghana

Category	Title
Acts	Environmental Protection Agency Act, 1994 (Act 490)
Regulations	Environmental Assessment Regulations, 1999 (LI 1652)
Procedures	Environmental Impact Assessment Procedures, 1995
Guidelines	Environmental Quality Guidelines for Ambient Air (EPA) 1995
	Environmental Quality Guidelines for Ambient Noise (EPA) 1995
	Ghana's Mining and Environmental Guidelines, 1994
	Quality Guidelines for Discharges into Natural Water Bodies (EPA) 1995
	Environmental Assessment in Ghana, A Guide, 1996

20.2.3 Environmental Permit

An Environmental Impact Assessment (EIA) for developments, projects or undertakings have been a requirement since 1989. The EPA established new procedures for EIA's involving gradual phases depending on the nature, complexity and location of the undertaking (Ghana Environmental Impact Assessment Procedures, 1995). This procedure was subsequently reviewed, adopted and passed by Parliament as Legislative Instrument 1652 Environmental Assessment Regulations (L.I. 1652) in June 1999. According to the 1999 Environmental Assessment Regulation the aim of the EIA is to provide a clear assessment of the proposed undertaking and also address the potential impact of the development on the health of the surrounding communities. These procedures require that an EIS is prepared by the proponent, reviewed and approved by EPA for an Environmental permit prior to project commencement.

20.2.4 Environmental Permit

The environmental management of Nzema is defined under the schedule attached to the Environmental Permit EPA/EIA/278 issued on 18th December 2008[13]. The table below gives a summary of the Environmental permits issued to Nzema Gold mine operations.

[13] Environmental Protection Agency, 2008: Environmental Permit for Adamus Resources Limited Proposed Southern Ashanti Gold Project in the Nzema East and Jomoro Traditional Areas of the Nzema East Municipality and Ellembelle District in the Western Region; Environmental Permit No EPA/EIA/278 issued on December 12, 2008 by the EPA (File No. CM:1064/02).

The environmental permit conditions refer to the following environmental operations and control documents. These documents and plans provide fundamental information on the pre-mine environment and guidelines for the post-mining rehabilitation of the site.

- Reclamation Plan (April 2010)
- Environmental Management Plan (August 2011).

Table 20.2: Summary of Environmental Permits Issued to Nzema Gold Mine

Type of Permit	Agency	Date
Environmental Permit	Environmental Protection Agency	18th December 2008
Water Abstraction Permit	Environmental Protection Agency	8th October 2010
Modified TSF and By-pass Road	Environmental Protection Agency	20th December 2010
Water use permit	Water resources Commission	22nd October 2010
Mining Area Declaration	Minerals Commission	9th October 2010
Water Discharge Permit	Environmental Protection Agency	10th October, 2012

Other commitments under the Schedule to the Nzema environmental permit and in the projects EIS also include:

- Posting of a Reclamation Bond
- Compliance with Minerals and Mining Act, Act 703 (2006)
- Compliance with Mining Regulations LI665 (1970).

20.2.5 Ghana Audit Process

In order to maintain the mining and environmental permits annual environmental audits are conducted to assess the environmental performance of the operation. Major environmental audits undertaken since 2010 include:

- EPA AKOBEN audit - Is an environmental performance rating and disclosure initiative of the Environmental Protection Agency (EPA), Government of Ghana. Under the AKOBEN initiative, the environmental performance of a mine site is assessed using a five-color rating scheme.
- Tailings Storage Facility (TSF) third party audit – A requirement from the EPA which requires Nzema to conduct annual audit on the TSF to assess the performance and integrity of the dam.

20.3 Environmental Studies

As part of the environmental permitting process (LI1652) an Environmental and Social Impact Assessment (ESIA) was submitted to the EPA in 2008. The following summarizes some of the aspects of the study:

20.3.1 Meteorology

Air quality in the area of the mine site is affected by the seasonal variation in rainfall that acts, to a greater or lesser degree, to suppress the generation of dust. The soils in the area are highly permeable and tend to permit the rapid infiltration of any rainfall. The surface layers tend to dry quickly and dust generation from roads is common. In addition, during the dry season (November to March), the Harmattan winds carry dust to the area from the Sahara Desert.

The meteorological station at Axim, located 8km south of the site provides a long-term database for climate data (Figure 20.1). Rainfall can be classified into a major and minor wet season with peak rainfall occurring in May and June with a small wet season peaking in October. The total annual rainfall is over 2m and the temperatures range from 24.5°C to 27.8°C.

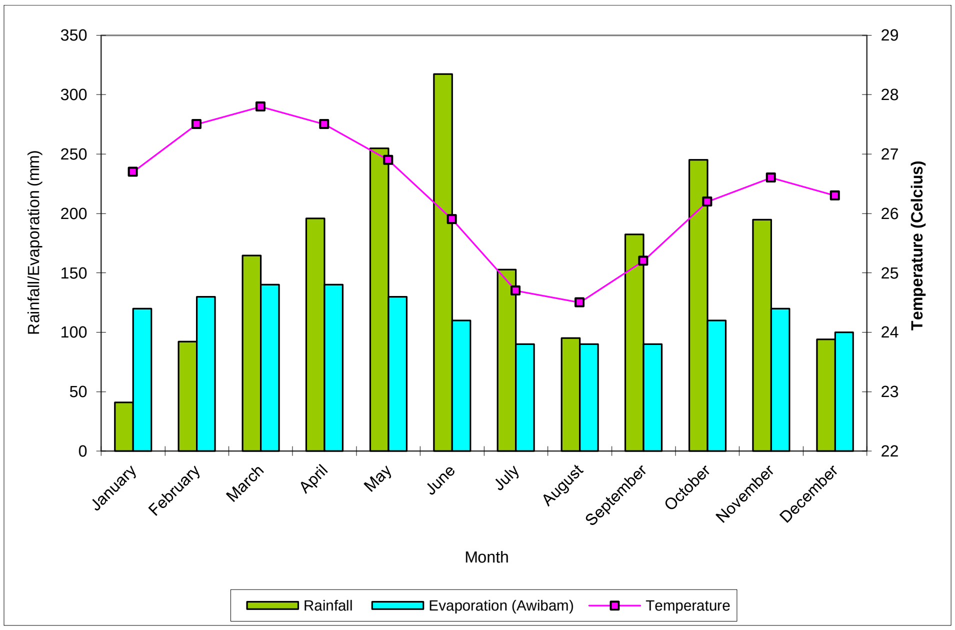


Figure 20.1: Average Monthly Climate Data for Axim, Ghana

20.3.2 Hydrology

The drainage of the area of influence is dominated by the Ankobra River to the east and the Amansuri Lagoon to the west. A smaller drainage, known as the Biare catchment flows to the south into the Atlantic Ocean.

The Ankobra River forms a significant part of the southwestern drainage of Ghana, draining a catchment area of approximately 8,300km2. A number of smaller streams on the eastern side of the area of influence drain directly into the Ankobra River. These streams include the Mines, Angajale, Kokweiba, Tika and a number of other un-named tributaries. These rivers drain the villages of Salman and Akanko.

The western side of the area of influence is drained by a number of rivers which lead into the Amansuri Wetland System. The eastern half of the Amansuri Wetland catchment comprises the Broma and Subele

Rivers, which later become the Franza River. These rivers drain the villages of Teleku Bokazo, Anwia[14] and Nkroful. The Amansuri Wetland at the mouth of the river has been identified as a site of internationally significant biodiversity.

The Biare Catchment drains directly into the Atlantic Ocean to the south. This drainage which is referred to as the Biare catchment comprises a number of smaller streams including the Anuaye, Ngontubile, Wowule, Kokokulo and Eliabrazule. This drainage includes the village of New Aluku.

Stream channels are generally undefined, overgrown with weeds and also contain dead organic matter.

The numerous minor streams in the area which show dendritic drainage pattern suggest low percolation but high incidence of runoff and/or flooding during the rainy season. Most of the streams in the area of influence are utilized for domestic and economic purposes.

A number of illegal artisanal mining activities occur within the Broma and Subele basins while the minor catchments of Anuaye, Ngontubile and Wowule are known for kaolin extraction. Other activities include recreation, fishing and palm wine distillation.

20.3.3 Hydrogeology

Hydrogeological surveys were undertaken in the area of influence in 2007.

The geology of the Project area is comprised of predominantly metamorphic rocks, namely, greywackes and phyllites. Intrusive granitoid domes also outcrop in the central part of the Project area, with few dolerite dykes intruding on the Adamus (Anwia) area. The Project area is highly weathered with fractures orientated randomly at various depths. As a result of the low matrix porosity of greywackes and phyllites, groundwater flow is concentrated along fractures and shear zones. Flow rates and direction vary with fracture orientation, density and connectivity. The hydrogeological setting is therefore expected to have high transmissivity but low storativity.

In order to further characterise the groundwater in the Project area, 21 percussion boreholes were drilled, five in the Adamus area and 16 in the Salman shear zone. Boreholes were sited through visual inspection of the Adamus and Salman ore bodies and surrounding areas, detailed inspection of available geological maps, reports and an assessment of the local topography. No geophysical surveys to site the boreholes were conducted and the estimated sustainable yield may be conservative.

The fractured nature of the local geology was confirmed by field testwork which showed that the transmissivity, storativity and yield of the aquifers in the Project area to be highly variable. Generally, the fracture network in the Anwia area is more transmissive than that of the Salman area. No perched water tables were identified during the work.

A numerical model was used to interpolate the static water elevation (or initial hydraulic head) in the two areas and simulate groundwater flow directions. The difference in flow directions at a relatively small scale is most likely attributed to the local fracture networks of each site. However, on a larger scale the hydraulic head tends to follow the local topography. It is important to note that there may be lineaments such as fractures for which no information was available for the modeling exercise and which can form conduits for the movement of water and contamination.

20.3.4 Water Quality

Surface and groundwater quality in the area of influence can be considered normal for Western Ghana.

[14] Also spelled Anwea.

Surface water is slightly acidic and contains naturally high concentrations of dissolved iron and manganese.

Arsenic was also recorded at relatively high concentrations, a function of the local geology. Levels of total suspended solids and total dissolved solids, apparent colour, true colour and turbidity were mostly recorded below internationally recognized levels for drinking water. Faecal coliforms were recorded at a number of sites in the Project area.

While most of the streams draining the Project area are considered to be of relatively good quality, artisanal mining has led to significant degradation in a number of catchments. Surface water quality downstream of artisanal mining activities typically shows high suspended and dissolved solid concentrations, with elevated concentrations of arsenic, iron, aluminum and manganese. Traces of mercury were also found downstream of artisanal mining activities. Other activities contributing to the degradation of water quality included normal domestic activities such as washing and cleaning in rivers, as well as poor sanitation.

Physical parameters of the groundwater quality showed that groundwater had a low to neutral pH with relatively low nutrients levels. Some villages showed possible contamination from domestic activities due to high nitrate and phosphorus concentration. Faecal coliforms and total coliforms were not detected above laboratory detection limits in the groundwater. As with surface water, the concentration of iron was naturally high. Some concentrations of manganese and arsenic were recorded but they were below the recommended WHO limits for drinking water.

20.3.5 Floral Environment

Flora surveys were undertaken in the area of influence in January 2006. The area of influence lies within the vegetation zone classified by Hall and Swaine (1981) as Wet Evergreen tropical rain forest. The pristine forest in the area has long been destroyed by various human activities, giving way to different types of land use, including settlements, roads, food and cash crop farming and other human activities that tend to degrade the environment.

Although the immediate area has no forest reserve, forest fragments that were floristically, but not structurally, similar to wet evergreen forest reserves were found. No flora species of local, national or international significance were recorded within the Project area.

20.3.6 Fauna Environment

An investigation on to the fauna of the area of influence was undertaken in January 2006. The fauna surveys found the area of influence to be highly disturbed and degraded. Fauna species were found to be more plentiful in mature secondary forest patches and along rivers. Species found within the area of influence are typical of this type of graded habitat in Ghana and West Africa. Bush meat is one of the primary sources of protein for the local population and animals are hunted in large quantities with locally made rifles and traps. Of particular interest were the following species considered to be of international conservation significance, Maxwell's Duiker, Royal Antelope, White-collared Mangabey, Pel's Flying Squirrel and Zenker's Fruit Bat.

While all of the species of international significance are 'forest zone' species, and are adapted to a forested environment, none are dependent on primary or mature forest cover. Many of the species recorded within the area of influence are considered to be habitat generalists, capable of surviving in both mature forest and degraded and highly fragmented habitat. Except for the White-collared Mangabey all of the species listed as being of international significance, are considered to be fairly widespread in south-west Ghana.

20.3.7 Characterisation of Mined Materials

The conclusions of the 2008 Environmental Impact Statement (EIS) indicated that further studies are required to effectively characterized mined material from the pits.

20.3.8 Environmental and Social Management System

The Environmental Management System (EMS) adopted by the company conforms to ISO 14001 requirements and is in line with international best practice which is factored into the business decisions to ensure that the development of the mine is environmentally and socially sustainable.

At a practical level, the Nzema Environmental and Social Responsibility Policies provide the framework for the development of the Environmental Management System.

20.4 Socio-Economic Surveys

20.4.1 Traditional Ownership of Land

Baseline studies revealed that, most of the lands in the project area are owned by the traditional stool and the local chief is the custodian of the lands. There are however, few individuals and families who claim ownership of land. Individuals and families have portions of the stool land assigned to them to cultivate.

20.4.2 Population

According to the projections from the 2000 national population and housing census, the total population of the Ellembelle District as at the end of 2009 was 114,839 with annual growth rate of 3.2 percent. The total population of the project area constitutes about 7.4 percent of the total population of Western region. Similar to the national population trend, communities in the project area have relatively young population.

In-migration is the major contributory factor to the population growth in the district due to the attraction of the mining activities and its economic impact.

It is estimated that over 65% of the economically active population is engaged in agriculture (including fishing) and agro-processing.

Nzema mine is the only mining company which is in full-scale operation in the area. In recent times, there has been an influx of small-scale gold miners popularly called “galamsey” into the district which has brought in its wake a lot of social challenges.

Christianity is the predominant (79%) religion in the area followed by Islam (8%) and Traditional religion (3%). About 10 percent of the population has no religious affiliation.

20.4.3 Cultural Heritage and Archaeology

All the communities in the Ellembelle District are under one traditional authority, the paramount chief of Eastern Nzema Traditional Area with the Paramountcy at Atuabo. The communities in the project area have common traditional festival of Kundum which is celebrated between August and October every year.

The major language spoken all over the District is Nzema with other dialects like Evalue and Gwira. Twi and Fanti are also widely spoken in the project area.

Total land impacted by the Nzema Mine is 1,290.2 ha (3,185.8 acres) from January 2009 - December 2012. Compensation is paid on scale based on the area and the land use.

20.4.4 Land Access and Compensation

Adamus is committed to and has in place a formalized policy and detailed transparent procedures for compensation which conforms to the Minerals and Mining Act, 2006 (ACT 703). Crop compensation rates are established through negotiations between Adamus and stakeholders including farmers' representatives, Traditional Authorities, Government Agencies (District Assemblies, Ministry of Food and Agriculture (MOFA), and Land Valuation Division (LVD) of Lands Commission) among others. Prior to negotiations, workshops are held for stakeholders to brainstorm and make inputs in the variables used in setting compensation rates. The negotiations are usually held annually to determine the rates for the ensuing year.

Endeavour/Adamus employees work with independent valuation teams, farmers' representatives and representatives from LVD in determining the value of properties for compensation.

20.4.5 Social and Community Impacts

The buffer zones around the Salman and Adamus open pit mining areas impinge on the Salman and Teleku Bokazo respectively. The Salman resettlement agreement package was signed on 11th May 2010 to commence construction of a new village. The Teleku Bokazo Partial Resettlement Negotiation Committee signed the resettlement agreement package on 24th October 2012. See Section 20.5.1.

20.4.6 Community Development

Adamus believes in the philosophy of "to act as a responsible corporate citizen to build a long-lasting, beneficial partnership with the local communities in which we do business" and also understands that our operations are closely linked with the socio-economic environment of the communities where we operate. As an example of the implementation of that commitment, Adamus is playing an active role in education, healthcare, provision of potable water, youth capacity-building, public infrastructure maintenance, institutional capacity building, sponsorship and donations in the project areas.

The total amount spent on social responsibility activities from pre-mining stages 2007 – 2010 and mining/production phase 2011 - October 2012 was US$ **1,550,647.** The projects supported by Adamus are listed in Table 20.3 below.

Table 20.3: CSR Projects from 2007 to October 2012

Project Type	Project Classification	Amount US$
Construction/Maintenance of School blocks/Teachers Quarters	Education	56,274
Scholarship	Education	25,462
Donation of stationery to Basic School Pupils	Education	7,179
Youth capacity-building program	Vocational/Technical Skills	162,837
Construction/maintenance of Boreholes with Pumps	Water & Sanitation	133,081
Institutional Capacity-Building	Health	57, 728
Public Road Maintenance	Public Infrastructure	1,118,458
Sponsorship/Donations	Institutional Capacity-	99,217
Total		**1,660,237**

ARL has set up a working group consisting of representatives from local community, government agencies and Opportunity Industrialization Centers International (OICI) who have developed and implementing livelihood strategies for the project impacted communities. In 2011/2012, ARL spent US$ 836,000 on livelihood strategies for impacted farmers who had been compensated.

20.5 Resettlement

20.5.1 Salman Resettlement

The Salman resettlement agreement package was signed on 11th May 2010 to commence construction of a new village. ARL completed the resettlement project in February 2012 and commissioned the new village in March 2012. A total population of about 2,154 had to be resettled due to close proximity to the Salman South pits (250m). Some of the activities involved in the project are as follows;

- 650 Residential structures
- 56 Public structures: 2 Public Schools with 3 Teachers Quarters,1 Private School,74 individual KVIPs,23 Public KVIPs,1 Community Health Clinic with 2 Nurses Quarters,1 Police Station with 3 Quarters,10 churches/Mosque, 2 markets, 17 commercial stores etc.
- Stone Pitching for slope protection
- Drainage structures
- External Electrical Power
- Electrical Power connection to individual houses
- 17 Boreholes with pump for potable water
- 7km road network in the community

20.5.2 Teleku Bokazo Partial Resettlement

The Teleku Bokazo Partial Resettlement Negotiation Committee signed the resettlement agreement package on 24th October 2012. About 224 acres of land has been acquired as host site for construction of 548 structures, including 377 residential houses and 171 public/commercial buildings. The project is estimated to be completed by the end of 2013.

20.6 Closure Plan

At the end of the mine in 2019, the mining project and infrastructure will be demobilized subject to the mine closure plan in compliance with the existing legal and statutory regulations. The closure plan will be subjected to the approval of the Mine Closure Plan by the Chief Inspector of Mines and EPA recommendations.

The Environmental Protection Agency of Ghana (EPA) under the Environmental Assessment Regulation, 1999 (LI 1652), Regulation 23 requires all mining companies to submit a closure plan indicating the various tract of land and the aspect that requires reclamation and remediation. Adamus commissioned AERC to develop a costed reclamation plan for the mine. The reclamation plan forms part of the process for posting a Reclamation bond with the EPA.

The objectives for the reclamation plan for the mine are as follows:

- Provide a final land-use that considers the needs of the stakeholders
- Create landforms that blend with the existing natural topography in the project area
- Leave the facilities physically and chemically stable including erosion control
- Reduce the aesthetic impact of the facilities
- Leave disturbed areas in a safe and stable condition
- Minimise the impact of the facilities on surface water drainage patterns and also on groundwater characteristics
- Minimise the impact of the facilities on contamination in general
- Restore as much of the mining area to a sustainable land-use capability as is practicable
- Minimise or eliminate any post-reclamation environmental impacts
- Provide rehabilitated areas that contribute to the long-term sustainability of the local economy
- Ensure that potential environmental liabilities associated with the closure of the site are minimized.

The closure plan considered open pits, partially filled pit and also completely backfilled pits.

Completely Backfilled Pits - which cover an area of 13ha will be Akanko South, Teberu Footwall, Salman Central 1 and 2 and Adamus North. The specific activities will include:

- Battering of waste dump slopes and contouring to stabilise the slopes
- Haulage of material from waste dump to complete backfilling of pits above daylight elevation.
- Re-deposition of topsoil from the topsoil stockpiled close by. Establishment of primary erosion control structures for enhancement and restoration.
- Re-vegetation with the selected species
- Implementation of sustainable alternative livelihood programs towards relinquishment.

Partially Backfilled Pits - partially backfilled pits which cover an area of 13ha will be Nugget Hill, Salman south and Salman SW. The specific activities will include:

- Stable slopes free from rock and soil movement
- Bench height between 3-6 meters with berm width not less than 10 meters and slope angles of not more than 65 degrees.
- Water discharge meets with Ghana's environmental effluent quality guidelines
- Protected access to rock faces and all steep slopes

- Inert waste rock where possible, placed as perimeter bund at minimum distance of 50 meter from the pit face.
- Establishment of protective zones around the pit to protect community members from water hazards.

Open Pits - open pits, which cover an area of 28ha, will be Akanko North, Salman North and Adamus. The pits that will not be backfilled and have water in them can be used to generate sustainable livelihood support project e.g. Aquaculture. The specific activities will include:

- Confirmatory sampling of pit water and pit bottom sediments
- Re-contouring of pit walls to stabilize to meet reclamation specification
- Abandonment zone creation with bund walls around the pits (in the case of the Adamus pit the bund wall will be 15m high)
- Ramp Construction/Peripheral Access
- Sandy gravel beach creation
- Landscaping
- Water stabilization process
- Introduction of aquaculture program.

Waste Rock Dumps - At the closure of the mine, there will be 5 waste rock dumps, covering an area of about 109ha to be reclaimed. These dumps are Akanko, Salman North, Salman Central, Salman South and Adamus.

The top surfaces will be flat to gently sloping. Due to the mining schedule the majority of the waste at the end of mine life will be fresh rock and this fresh rock will comprise the final surface. It is planned to spread a layer of approximately 50 cm of subsoil (and/or saprolite) and capped with topsoil to cover the fresh rock forming the surface of the dumps. The waste dump batters will be cut to slopes of 1V:3H (20%) and shaped to minimise concentration of surface runoff. Provision will be made at closure for safe access to the dumps by future stakeholders having farm and/or agro-forestry rights on the rehabilitated dumps.

Treatment (Processing) Plant - At the close of the mine, the plant will remain intact and will therefore need to be decommissioned and then reclaimed together with the area. The reclamation activities will include:

- Breaking and removal of steel and concrete structures
- Demolition of existing site super structural works
- Removal of all piping structures, concrete floor and asphalt surfacing
- Re-contouring of the whole area, spreading of topsoil and re-vegetation of the area.

Tailings Storage Facility - On completion of tailings deposition, the tailings facility will be rehabilitated in accordance with the reclamation plan. The following activities will be undertaken:

- The supernatant pond will be drained to allow the tailings beaches to dry
- A suitable location will be selected for locating the spillway channel within natural ground on the eastern side of the facility and adjacent to the lowest point of the dry tailings beach. This would ensure that ponding resulting from surface runoff is minimized
- The drained tailings beach will be re-vegetated in accordance with the requirements of the closure plan and/or reclamation plan. Amendment of the upper tailings deposit with topsoil and or fertilizers, or placement of suitable cover materials, may be required for successful re-vegetation

- All infrastructure associated with the TSF including pipelines and power-lines will be removed
- Seepage flows collected within the sumps will be monitored, treated if necessary, and released to the environment. Once monitoring establishes treatment of the seepage is not necessary, the sumps shall be backfilled and the flows released directly to the receiving environment.

Infrastructure - The main infrastructure that will be left to be reclaimed at closure of the mine cover an area of about 96ha and include: Adamus Mine Area, Salman-Akanko Mine Area, Explosives Magazine, Current Salman Village, Public and Mine Haul Roads, Ore Stockpile Areas, Topsoil Stockpile Areas and Sediment Control Structures. The specific reclamation activities include:

- Demolition of all concrete and steel structures
- Re-contouring of the whole area
- Spreading of topsoil and re-vegetation of the area.

Post-reclamation monitoring and maintenance will be conducted by both the company and the relevant regulatory bodies. It will begin after completion of any reclamation work and extend through the period of physical stabilization towards final relinquishment.

It is expected that such monitoring will be for a minimum of three years. The reclamation program will be concurrent with the mining operation wherever feasible, although for this relatively short-lived mining operation, the opportunities for concurrent reclamation will be maximized.

Environmental risk to mineral resources is considered very minimal. A Reclamation Security Agreement (RSA) has been agreed with the EPA and a US$12million bond posted as per covenant in the environmental permit issued December 2008. Work is underway to fulfil all outstanding permit provisions.

21 Capital and Operating Costs

21.1 Sustaining Capital Costs

For the Nzema Gold Mine, the majority of capital costs have already been spent during construction of the mine. The principal contractor was Lycopodium Limited, the Australian EPCM contractor, for process plant and related infrastructure construction.

The main projects requiring sustaining capital expenditures in 2013 are as follows:

- Purchase and installation of 6 MW diesel genset from SDMO of France. The contract sum is US$4M.
- Relocation and development of relocation site at the Adamus Pit is ongoing at a total cost to completion of US$27 million. FF Construction Ltd and other contractors have been engaged at the construction site.
- Tailings storage facility lift is underway and has been contracted to Naakyea Plant Pool Ltd with Knight Piesold providing the technical support.

As the earthmoving is carried out by mining contractor (AMS), no mining capital for mobile fleet replacements or additions was allocated or required.

The Table 1.9.1 represents the annual CAPEX distribution over the Life-of-Mine period.

Table 21.1: CAPEX and Sustaining Capital, LoM

	Units	Totals	2013	2014	2015	2016	2017	2018	2019
Mine Development	US$ '000	39,322	28,820	4,870	5,633	-	-	-	-
Sustaining Capital	US$ '000	17,571	3,267	4,228	991	4,315	3,453	1,193	125
Total Capital	US$ '000	56,893	**32,087**	**9,097**	**6,624**	**4,315**	**3,453**	**1,193**	**125**

21.2 Operating Costs

Mining costs calculations were based on current mining rates fixed in a contract between Nzema Gold Mine of Endeavour Mining Corporation and African Mining Services (AMS) as well as on 2012/2013 budgets. The cumulative mining cost of a single block in the resource model is based on three components- material type, blasting requirements and vertical component of the distance to the pit entrance. The average haul distances, considering plant and waste dump locations, were calculated separately for each pit, fixed in the current AMS contract and taken into account in optimization. During the mining of Oxide and Transition material drill and blast fragmentation is assumed to be required for rock with specific gravity greater than 2.1 t/m^3. Fresh material is assumed to require blasting.

Table 1.6 represents an example of depth and material type dependent mining cost calculations for Adamus, which represents approximately 66% of Nzema mineral reserves.

Table 21.2: Mining Cost Components for the Adamus Pit

	Oxide/bcm		Transition/bcm		Fresh/bcm
Depth from Surface	Earthmoving	D&B	Earthmoving	D&B	
Surface +3m	2.41	1.40	3.02	1.93	4.95
Surface	2.42	1.40	3.03	1.93	4.96
Surface -3m	2.43	1.40	3.04	1.93	4.97
Surface -6m	2.44	1.40	3.05	1.93	4.98

Ore related mining and processing costs, metallurgical recoveries for the different material types, namely oxide (very weathered), upper transition (moderately weathered), lower transition (weakly weathered) and fresh, were obtained from the mine contract, processing plant management and relevant other parameters from the current production plan.

Table 21.3: Processing Costs for the Adamus Pit (Main and Satellite)

PARAMETER		Deposit			
		ADAMUS			
Description	Units	Oxide	Up-Trans	Low-Trans	Fresh
Ore mining & Processing					
Rehabilitation	$/t-m	0.15	0.15	0.15	0.15
Grade Control	$/t-ore	2.88	2.88	2.88	2.88
Ore Haulage	$/t-ore	2.91	2.91	2.91	2.91
Rehandle Cost	$/t-ore	0.33	0.33	0.33	0.33
Dewatering/Crusher/Supervision	$/t-ore	4.26	4.26	4.26	4.26
Processing Cost	$/t-ore	10.05	11.74	11.74	11.92
Site G&A Cost	$/t-ore	5.25	5.25	5.25	5.25
Total 'Process' Cost	**$/t-ore**	**25.68**	**27.37**	**27.37**	**27.55**

Table 21.4: Annual Operating Costs (US$ '000s)

	Units	Totals	2013	2014	2015	2016	2017	2018	2019
Total Waste Tonnes Mined	kt	59,907	7,508	9,029	11,658	11,511	9,423	7,387	3,390
Total Ore Tonnes Mined	kt	12,765	2,221	2,118	1,916	1,774	2,190	1,379	1,167
Mining Costs (incl rehandle)	US$ '000	235,109	37,220	42,481	41,551	31,684	30,598	33,104	18,471
Unit Mining Cost Per Total Tonne Mined	$/t mined	3.24	3.83	3.81	3.06	2.39	2.63	3.78	4.05
Tonnes Processed	kt	13,030	2,160	1,826	1,897	1,860	1,864	1,718	1,705
Processing Costs (incl maintenance)	US$ '000	157,993	34,769	21,184	21,101	21,508	20,382	20,996	18,053
Unit Processing Cost Per Tonne Milled	$/t processed	12.13	16.10	11.60	11.12	11.57	10.94	12.22	10.59
General and Administrative Costs	US$ '000	99,294	14,788	14,078	14,078	14,116	14,078	14,078	14,078
Unit Gen & Admin Cost Per Tonne Milled	$/t processed	7.62	6.85	7.71	7.42	7.59	7.55	8.19	8.26

22 Economic Analysis

The results of the economic analysis represent forward looking information (cash flows, net present value, production rates, and total metal produced) that are subject to a number of known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented here.

As noted in Item 22 of NI 43-101 FormF1, "Producing issuers may exclude the information required under Item 22 for technical reports on properties currently in production unless the technical report includes a material expansion of current production". Endeavour summarizes the assumptions and parameters used but has not provided the cash flow in this report.

22.1 Assumptions

The economic analysis was performed using conventional discounted cash flow (DCF) analysis. In this method of valuation, all future cash flows are discounted to convert them to a present value. The sum of these present cash flows is the net present value (NPV). The discount rate applied represents the time value of money. For discounting purposes, all cash flows are assumed to occur at the end of the year of occurrence.

As the operation is a going concern and majority of the capital has been spent at Nzema, the date of valuation was set to the start from the production commissioning date of April 2011. Capital costs incurred prior to this time are considered sunk, but used for depreciation calculations

The standard economic measures of Internal Rate of Return and Payback Period are, in this peculiar case, meaningless and not reported as the net cash flows are positive each period of the mine life.

22.2 Financial Model Parameters

Endeavour maintains a cash flow for the Nzema Mine based on the operating parameters and anticipated costs and metal prices. The economic analysis base case uses commodity prices for gold as US$1,600/oz.

The mine plan, presented in section 16, features a 7-year life, ending in early 2019. Inferred resources have been treated as waste.

Sustaining capital costs and operating costs are discussed in section 21. A working capital allocation of one month of operating costs has been applied.

Royalties payable consist of Ghanaian Government royalty of 5% of ounces produced and sold at spot price.

Taxation rates are updated according to the 2012 Ghana physical regime and the Government Budget Statement. A holder of a mining license operating a gold mine shall pay income tax on the taxable income at a rate of 35%. This becomes payable after you have exhausted all capital allowances on your investment. Taxable income is to be computed on a historical accrual accounting basis by subtracting from gross income for the accounting year by taking into consideration all allowable revenue, expenditure, depreciation which, for tax purposes is deductible.

Nzema withholds and pays to the Government 5% from all payments of suppliers of goods and services and 8% from supplier or owners of rented properties and pay same to the Government. PAYE (personal income taxes) of both residents and non-residents of Ghana are deducted and paid to the Government. The tax rate ranges from 5% to 35%.

The holder of a Mining License producing exportable minerals can open and operate a foreign currency account in Ghana and retain aboard a portion of his earnings to be able to pay for importation of machinery, pay for services, for reimbursement of loans and for compensation of employees and other activities that may contribute to enhancement of the mining operations.

The closure and reclamation costs applied are based on those estimated by AERC and fully represented in the reclamation agreement submitted to the EPA of Ghana.

Inflation has not been included in the economic analysis.

23 Adjacent Properties

23.1 Other Endeavour Properties

Endeavour holds several prospecting licenses that are adjacent to and contiguous with the Salman, Ebi Teleku-Bokazo, Nkroful and Akanko mining licenses and are considered to be part of the Nzema mine property and included in this technical report. All of the information on the mining and prospecting licenses is provided in the mineral tenure information provided in Section 4 of this report.

23.2 Properties Held by Other Companies

There are no adjacent properties that are held by third parties that are relevant to the Nzema mine property.

24 Other Relevant Data and Information

A Preliminary Economic Assessment of the Salman Sulphide Mineralization was completed during 2012 and is reported as a separate technical report (GRES, MPR, and Cube, 2013).

There is no other relevant data and information that is not included or summarized in this report.

25 Recommendations

Nzema is an operating mine and requires ongoing monitoring of the impacts of changes in the gold price and the inflationary effects on power, fuels, labour and spare components must be monitored. Continued sustaining capital expenditures should be completed as described.

Additional metallurgical testwork is required for the fresh mineralization in the Akropon and Avrebo deposits.

The 2013 exploration program is $2.55M and will focus on identification of new resources close to existing deposits that can readily be converted to reserves. Table 25.1 summarizes the exploration program by metres of drilling and by costs. The following programs are planned:

- Reverse Circulation (RC) drilling at Adamus to convert Inferred mineral resources to Indicated mineral resources
- RC drilling between Salman North and Akango South deposits at Salman to target continuation of the known mineralised structures through low lying areas
- Reconnaissance RC (RRC) drilling along adjacent structures to the Salman Trend.

In addition to the near mine programs, the following will be completed:

- RRC drilling near the Avrebo deposit to identify additional mineral resources in that area.

Table 25.1: 2013 Nzema Planned Exploration Program

Item	metres	Cost US$
RRC Drilling	4,350	435,000
RC Drilling	6,000	320,000
Analysis		135,000
Consumables, Support, Land access and permitting		750,000
Labour		910,000
Total		**2,550,000**

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27 Certificates

CERTIFICATE OF QUALIFIED PERSON

I, Nicolas James Johnson, of 123 Colin St, West Perth, WA, a qualified person responsible for co-authoring of the technical report entitled “Technical Report and Mineral Resource and Reserve Update for the Nzema Gold Mine, Ghana, West Africa” dated April 2, 2013 (the “Technical Report”), do hereby certify that:

(1) I am a geologist employed by MPR Geological Consultants Pty Ltd at Unit 19, 123 Colin St West Perth, Australia since 2011.

(2) This certificate applies to the technical report titled “Technical Report and Mineral Resource and Reserve Update for the Nzema Gold Mine, Ghana, West Africa” (the “Technical Report”), with an effective date of December 31, 2012.

(3) I graduated with a Bachelor of Science degree in 1987 from Latrobe University.

(4) I have worked as a geologist since graduation and have over 25 years experience in resource estimation and mine geology of gold projects. My relevant career experience includes mine geologist roles at Marvel Loch Gold Mine (1987-1995) and as Consulting Geologist with FSSI Consultants (Australia) Pty Ltd (1995-1999), Hellman and Schofield Pty Ltd (1999-2011) and MPR Geological Consultants Pty Ltd (2011-Present).

(5) I am a Member of the Australian Institute of Geoscientists - Membership No 1783.

(6) I have read the definition of “qualified person” set out in National Instrument 43-101 (“NI 43-101”) and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101.

(7) I am co-author for all or part of Sections 1, 2, 6-12, 14, 23, and 27 of this report.

(8) I have personally visited the Nzema Gold Mine on numerous occasions (between 2007 to 2012), the latest being an 8 day period commencing on the 4th December, 2012 for the purpose of updating the resource estimates for the Salman deposit.

(9) I am independent of the Issuer applying the test in Section 1.5 of NI 43-101.

(10) I have read NI 43-101, NI 43-101CP and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.

(11) As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

(12) I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Effective Date: December 31, 2012.

Report and Signature Date: April 2, 2013

Nicolas Johnson

MPR Geological consultants Pty Ltd

CERTIFICATE OF QUALIFIED PERSON
Quinton de Klerk

I, Quinton de Klerk, residing at 11 Kauri Place, Duncraig, Perth, Western Australia, do hereby certify that:

1. I am an independent consulting mining engineer employed by Cube Consulting Pty. Ltd. of West Perth since March 2006.
2. This certificate applies to the technical report titled "Technical Report and Mineral Resource and Reserve Update for the Nzema Gold Mine, Ghana, West Africa" (the "Technical Report"), with an effective date of December 31, 2012.
3. I hold a National Higher Diploma (mining engineering), graduating from the Technikon Witwatersrand in 1993.
4. I have been practicing my profession as a mining engineer for 20 years. My relevant career experience includes responsibility as the principal mining consultant and study manager in numerous studies for projects across Africa, Europe and Australasia. Specifically in West Africa, I have been responsible for studies and reporting of Mineral Reserves for gold projects in Ghana, Cote d'Ivoire, Burkina Faso and Mali. My site based experience in open pit gold mining includes working as a senior mining engineer in operations in Africa (5 years) and Australia (2 years).
5. I am a Fellow in good standing, with the Australasian Institute of Mining and Metallurgy, membership number 210114.
6. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
7. I am co-author and am responsible for all or part of Sections 1-3, 15, 16, 25-27 of this report.
8. I have personally visited the Nzema Gold Mine during 2011 and 2012, the most recent being 23rd to 26th September, 2012.
9. I am independent of the Issuer applying the test in Section 1.5 of NI 43-101.
10. I have read NI 43-101, NI 43-101CP and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.
11. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
12. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Effective Date: December 31, 2012
Signature Date: April 2, 2013
{SIGNED AND SEALED}
[Quinton de Klerk]

Quinton de Klerk, FAusIMM

CERTIFICATE OF QUALIFIED PERSON
William J.A.Yeo

I, William James Alfred Yeo, residing at 5 Charborough Way, Sturminster Marshall, Dorset, United Kingdom, do hereby certify that:

1. I am a geologist employed by Endeavour Mining Corporation at the Nzema Gold Project as Geology Manager since May 2011.
2. This certificate applies to the technical report titled "Technical Report and Mineral Resource and Reserve Update for the Nzema Gold Mine, Ghana, West Africa" (the "Technical Report"), with an effective date of December 31, 2012.
3. I graduated with a Bachelor of Science degree in geology from the Oxford Polytechnic of Oxford, U.K, in 1979 and a Ph.D from the University of Bristol in 1984.
4. I have worked as a geologist since graduation and have over 20 years experience in resource estimation and mine geology of gold projects.My relevant career experience includes Geology Superintendent at the Macraes Gold mine in New Zealand (1998-2004), Consulting Geologist for Hellman and Schofield Pty Ltd in Australia (2004-2008), Chief Mine Geologist for at the Sabodala Gold Mine in Senegal (2008-2010) and Geology Manager at the Nzema Gold Mine (2011 to date).
5. I am a Member Australian Institute of Geoscientists - Membership No 5047.
6. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
7. I am co-author and am responsible for all or part of Sections 1-12 and 27 of this report.
8. I am currently and have been a full-time employee since May 2011 at the Nzema Gold Mine that is the subject of this report. My place of employment is at the mine site.
9. I am not independent of the Issuer applying the test in Section 1.5 of NI 43-101.
10. I have read NI 43-101, NI 43-101CP and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.
11. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
12. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Effective Date: December 31, 2012

Signature Date: April 2, 2013

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William Yeo, MAIG

CERTIFICATE OF QUALIFIED PERSON
Adriaan A. Roux

I, ADRIAAN ALMERO ROUX,(Pr.Sci.Nat.), residing at YB15, Augusto Neto Road, Airport Residential, Accra, Ghana, do hereby certify that:

I am a Metallurgical Engineer employed by Endeavour Mining Corporation in Accra, Ghana since 2010.

1. This certificate applies to the technical report titled "Technical Report and Mineral Resource and Reserve Update for the Nzema Gold Mine, Ghana, West Africa" (the "Technical Report"), with an effective date of December 31, 2012.
2. I graduated with a Higher National Diploma in Metallurgical Engineering from the University of Johannesburg, South Africa, in 1980.
3. I have worked as a Metallurgical Engineer, General Manager and currently the Chief Operating Officer since graduation and have over 32 years experience in the mining industry. My relevant experience includes Anglo American, De Beers Consolidated, AngloGoldAshanti, Adamus Resources and Endeavour Mining and includes extensive project and operational experience in gold, uranium, sulphuric acid and diamonds processing and in roles of Metallurgist, Operational Management, Technical Head, General Management, Consulting Metallurgist, Director, and currently COO with area of control spread over multiple countries.
4. I am a Member of the Mine Metallurgical Managers Association of South Africa (MMMA). I am also a Registered Professional Natural Scientist (Pr.Sci.Nat.) with the South African Council for Natural Scientific Professions (SACNASP) – Membership No 400156/04.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that, by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for all or part of Sections 1-3, 13, 17-22 and 24-27 of this report.
7. I was based on site in 2010 and 2011and visited numerous times during 2012, most recently in December 2012.
8. I am not independent of the Issuer applying the test in Section 1.5 of NI 43-101.
9. I have had extensive involvement with the project that is the subject of this Technical Report.
10. I have read NI 43-101, NI 43-101CP and Form 43-101F1 and this Technical Report has been prepared in compliance therewith.
11. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
12. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Effective Date: December 31, 2012
Signature Date: April 2, 2013

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Adriaan A. Roux (Pr.Sci.Nat.)