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Osino Resources Corp.

Definitive Feasibility Study of the Twin Hills Gold Project, Namibia

National Instrument 43-101 Technical Report

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OSINO RESOURCES

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DISCLAIMER

Purpose of This Document

This report was prepared exclusively for Osino Resources Corp. ("the Client" or "Osino") by the authors with Lycopodium Minerals Canada Ltd. ('Lycopodium") as independent process consultant. The quality of information, conclusions, and estimates contained in the report are consistent with the level of the work carried out by the authors to date on the assignment, in accordance with the assignment specifications agreed between Lycopodium and the Client.

Notice to Third Parties

The authors prepared this report having regard to the needs and interests of the Client, for the purposes of the Client's reporting in accordance with NI 43-101 (as defined herein).

Results are Estimates and Subject to Change

The interpretations and conclusions reached in this Report are based on current scientific understanding and the best evidence available to the authors at the time of writing.

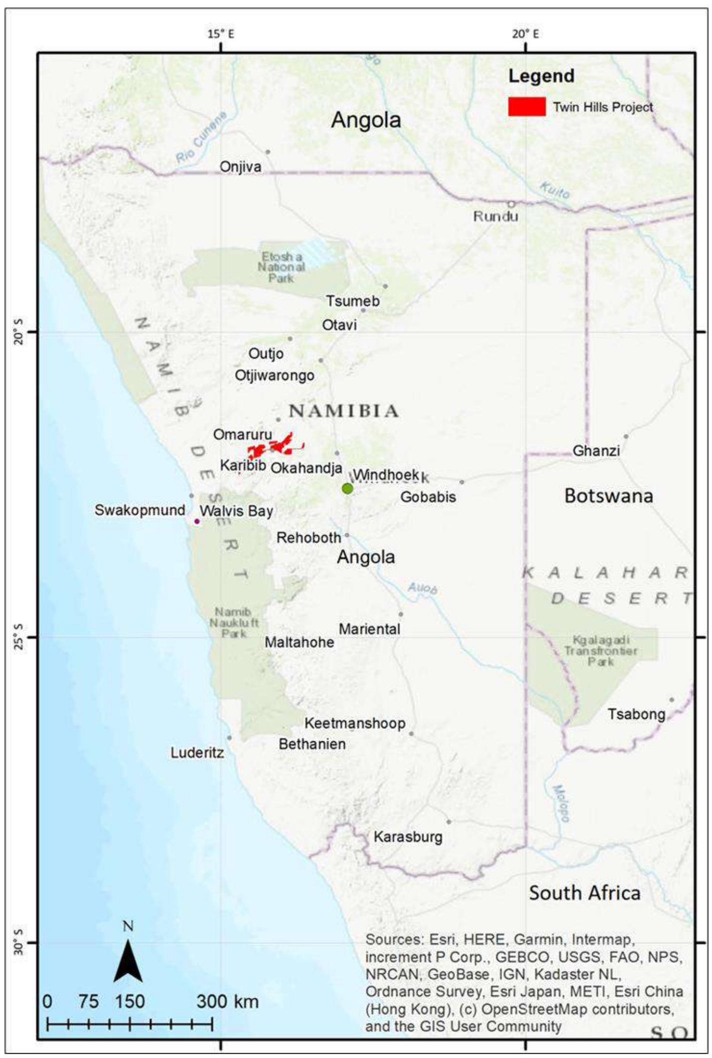
The ability of any person to achieve forward-looking production and economic targets is dependent on numerous factors that are beyond the control of the authors, which cannot be anticipated for all eventualities. These factors include, but are not limited to, variations in cost elements and marketing conditions, developing and operating the mine in an efficient manner, and unforeseen changes in legislation. Any of these factors may substantially alter the performance of any mining operation.

1.0 SUMMARY

1.1 Property Description, Location and Ownership

The Twin Hills Gold Project (the Project) is located in central Namibia approximately 150 km northwest of the capital city of Namibia, Windhoek and is owned by Osino Resources Corp. (Osino) through local subsidiary companies. The Project is comprised of 12 exclusive prospecting licenses (EPLs) granted by the government of Namibia, which are held over a combined area of 153,658 ha in and around the regional towns and settlements of Usakos, Karibib, Omaruru, and Wilhelmstal in the Erongo Region of Namibia as shown in Figure 1.1.1 below.

Figure 1.1.1 Site Location of Twin Hills (Courtesy of CSA Global)



The EPLs are listed in Table 1.1.1 below. This geological technical report (the Technical Report) is a Definitive Feasibility Study (DFS) of the Project prepared in accordance with National Instrument 43-101—Standards of Disclosure for Mineral Projects (NI 43-101). The report was commissioned by Osino to be prepared by the authors.

Table 1.1.1 Details of the 12 Active EPLs that Constitute the Project

EPL	Osino Subsidiary % owned	Date from	Date to	Area ha	Comments
ML238	Osino Gold Exploration and Mining (Pty) Ltd (100%)	3 Nov 2022	2 Nov 2042	6,209.27	
EPL 3739	Osino Gold Exploration and Mining (Pty) Ltd (100%)	11 Sep 2007	15 Aug 2023	22,235.61	
EPL 5196	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	9 Apr 2014	8 Apr 2023	2,197.13	Renewal submitted
EPL 5533	Richwing Exploration (Pty) Ltd (Osino 80%)	4 Feb 2014	17 Oct 2023	17,503.82	
EPL 5641	Flocked Consultancy Services (Pty) Ltd (Osino 51%)	17 Oct 2016	19 Jul 2022	5,667.07	Renewal submitted
EPL 5649	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	30 Sep 2014	27 Jan 2024	1,304.66	
EPL 5658	Osino Gold Exploration and Mining (Pty) Ltd (100%)	23 Sep 2014	19 Oct 2022	19,905.80	Renewal submitted
EPL 5880	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	4 Oct 2016	21 Nov 2023	39,589.19	
EPL 6167	Osino Gold Exploration and Mining (Pty) Ltd (100%)	23 Feb 2017	21 Nov 2024	1,422.39	
EPL 6953	Osino Gold Exploration and Mining (Pty) Ltd (100%)	13 Jun 2018	12 Jun 2023	513.92	Renewal submitted
EPL 7301	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	13 Aug 2019	21 Nov 2024	12,911.80	
EPL 7344	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	13 Aug 2019	12 Aug 2022	29,957.96	Renewal submitted

The Project area is located in arid to semi-arid shrub land, arid savannah and grassland, and is characterized by moderate relief with local elevations ranging from 900 m to 1,500 m above sea level. Local elevations or hills in the Project area are generally associated with marble outcrops and granitic intrusions. The primary economic activities in the Project area are agricultural (cattle ranching and game farming). The Project is accessible via Namibia's extensive sealed and well-maintained secondary gravel road networks and is 150 km (approximately 2-3 hours' drive) from the capital city, Windhoek, by road. Within the Project area, access is provided on a series of non-maintained roads and cross-country four-wheel drive tracks.

Local elevations or hills in the Project area are generally associated with marble outcrops and granitic intrusions.

The area is characterized by hot summers and winters with cold night-time and warm day-time temperatures. Average rainfall is 216 mm per year, generally associated with short intense thunderstorms during the summer months. There are several ephemeral streams at the Project. The climate offers no impediment to exploration in the Project area, except for difficult road access conditions during the peak rainfall periods in certain areas.

Namibia is a country with a long and successful mining, exploration, and Project development history. Skilled workers may be contracted out from smaller regional centres, e.g., Karibib, or the capital city Windhoek. Electrical power is available from the national grid. Both groundwater and surface water supply are considered for fresh water supply, with groundwater and pit dewatering sources being able to supply the plant water demand.

1.2 Geology and Mineralization

The Project is in an area of known gold deposits hosted within the inland arm of the Pan African Neoproterozoic Damara Belt, a northeast-striking Neoproterozoic fold, thrust, and metamorphic belt. It reflects a Neoproterozoic rifting-accretionary event between the Congo Craton to the north and the Kalahari Craton to the south. Peak deformation within the Damara Belt occurred between 500 Ma and 530 Ma. The Damara Belt comprises a gently folded Northern Zone, a Central Zone and a Southern Zone.

The Central Zone consists predominantly of calcareous and pelitic sediments that were deposited in a back-arc environment. The Southern Zone is considered to represent the suture zone and was intensely deformed, at high pressures and low temperatures, by a series of southeast verging thrusts. A range of syn- and post-tectonic intrusives are present and these range from mafic to acid (i.e. gabbros to granites). Of these, the early syn-tectonic to late tectonic I-type Salem granites are the most abundant. These were followed by post-tectonic I-type granites. A much later Jurassic to Cretaceous event led to the emplacement of various alkaline ring complexes and granitic batholiths, as well as flood basalt provinces.

Geologically, the Project lies in the Southern Central Zone of the Damara Belt, lying to the south of a prominent regional scale lineament (the Omaruru lineament) and 20–55 km east-northeast of the Navachab Gold Mine. The north-eastern part of the Project area is largely underlain by undifferentiated syn-tectonic Salem-type granite. The balance of the Project area is underlain by meta-sedimentary rocks of the Swakop Group. This Group comprises the Arandis Formation (biotite schist, minor quartz schist calc-silicate rock and amphibolite), the Karibib Formation (dominantly dolomitic and calcitic marbles), and the overlying Kuiseb Formation (schistose quartz feldspar mica meta-greywacke and meta-pelite).

The structural geology of the Project area in the Twin Hills area is dominated by features typical of the Southern Central Zone of the Damara Belt; Basement and/or basal Damara meta-sedimentary rocks in the cores of dome and anticlinal structures and regional synclinal structures with thick packages of Kuiseb Formation schists "filling" these synclines.

Osino has made a series of gold discoveries along the Karibib Fault Zone (KFZ), which was originally interpreted from regional magnetic data to have a strike length of over 100 km. Osino's licences cover more than 70 km of this strike extent. The KFZ is manifested as a belt of very high strain, intense silicification, and partial remelting. The calcrete covered central portion of the KFZ has been the most prospective to date and is where the Twin Hills deposit is located. Twin Hills is a cluster of gold mineralized zones associated with schists of the Kuiseb Formation. Gold mineralization is closely associated with arsenopyrite and pyrrhotite.

1.3 Status of Exploration

Parts of the Project area were explored historically by Anglo American, as part of their regional exploration campaign associated with the development of the Navachab gold mine. This work includes stream sediment and soil geochemical surveys, as well as limited rotary air blast (RAB) and diamond drilling. From 2008 onwards, Bafex Exploration (Bafex) undertook soil geochemical sampling, reverse circulation (RC), and diamond drilling over Twin Hills East, Goldkuppe, and Albrechtshöhe. Additionally, Bafex also carried out several geophysical campaigns (induced polarization (IP), electromagnetics (EM), and gravity) over Goldkuppe.

Osino has actively and systematically explored the Project since 2016. Soil geochemical surveys have been used to good effect to identify potentially mineralized areas, and the geochemical surveys were later extended to calcrete-covered areas too. The soil and calcrete sampling campaigns have been augmented with rock chip sampling and limited trenching. Osino has used government regional aeromagnetic data, and carried out a detailed ground magnetic survey, and IP surveys to define drill-ready targets. In addition to Twin Hills (including the Bulge, Twin Hills Central and Clouds lobes), numerous other targets along the KFZ and related structures have been identified.

1.4 Mineral Processing and Metallurgical Testing

1.4.1 Metallurgical Testwork

Testwork on drill core and composite samples was conducted during the Preliminary Economic Assessment (PEA) and Preliminary Feasibility Study (PFS) stages of this Project, and the results of these tests were reported in a previous Technical Report of the Twin Hills PFS. The most influential of the PFS results are summarized briefly below, with a short description of additional metallurgical tests that have been completed since the PFS and the results thereof also reported here.

The drill core samples were taken from the Twin Hills Central, Bulge, Clouds, Clouds West and Twin Hills West sections of the ore body. Transitional (weathered and/or oxidized) as well as fresh ore samples were collected, the physical location in three dimensions was varied considerably and both low and high-grade samples, in the context of this ore body, were collected.

During the DFS, the following PFS tests and results were used directly to support the DFS process plant design:

- Bond Crusher. Rod Mill and Ball Mill Work Indices.
- Abrasion Index and SMC tests.
- Head sample analyses for gold and a full suite of other elements including carbon and sulphur.
- Mineralogical investigation of composite head samples of THC, Bulge, Clouds and Transitional core samples.
- Diagnostic leach of composite samples, which confirmed that the fresh ore samples typically contained about 5% of gold associated with pyrrhotites and recoverable with pre-oxidation, as well as 5-10% of gold associated with arsenopyrite and about 6% still locked in silicate or other gangue minerals at the target grind size.
- Confirmation of gold deportment by size fraction.
- Gravity recoverable gold tests, confirming that between 23% and 32% of gold could be recovered, from fresh ore samples, depending on the specific source of the feed sample to GRG. Gold recovery from transitional ore samples was about 18%.
- Grind versus gold recovery tests, to confirm design grind target of 80% passing 63 micron.
- Cyanide leach tests of gravity tails which confirm the 24 hours retention time of slurry containing 50% solids.

- Pre-oxidation with oxygen in a two-pass shear reactor followed by comparative leach tests, confirming that four hours of pre-oxidation was beneficial.
- Leach tests using site water and tap water and reagent optimization tests.
- Tailings settling and filtration tests.
- Cyanide detoxification tests.

The recovery of gold from individual blocks or from sections of each pit was modelled following the testwork, using the final gold grades to develop recovery versus head grade algorithms for each portion of the resource. Gold recovery from any part of the ore body was proportional to head grade, with a minimum possible ultimate gold grade in final tailings, distinct for each ore source shown below.

Table 1.4.1 Overall LOM Average Gold Recovery for Different Pits (Sections of the Ore Body)

Material	Pit	LOM Recovery %	Initial 5 Years % Recovery
Transitional	Bulge	93.4	94.1
	TH Central	93.4	94.1
	Clouds	93.4	94.1
	TH West	89.6	
Fresh	Bulge	90.4	90.3
	TH Central	93.8	94.0
	Clouds	89.1	89.1
	TH West	88.7	

In the plant design and cash flow models these recoveries were discounted by about 0.7% to take account of gold losses in fine carbon and solution associated with filter cake reporting to the tailings storage facility (TSF).

Variability test work was conducted after completion of the PFS, on core samples from diverse locations in the ore body. The results confirmed the flowsheet tested and developed on composite samples and showed that the recovery algorithms developed during the PFS and DFS were valid for each ore type and over the whole range of head grades constituting economically viable ore.

Successful arsenic precipitation tests were conducted following cyanide detoxification, but the mass balances developed for the plant and long-term geochemical leach tests on tailings samples indicated that this circuit was not required in the Twin Hills metallurgical flowsheet, and it has not been included in the DFS capital cost estimates.

Filtration tests carried out on tailings samples showed that moisture content of tailings could be reduced to about 15-16% water, using pressure filtration at 6 bar, and that the filtered tailings could be conveyed to the TSF on belt conveyors and deposited in a stable storage facility.

1.5 Mineral Resource Estimate

A total of 225,574 m of drilling from 1,069 holes (135,980 m of diamond core from 482 holes and 89,594 m of reverse circulation from 586 holes) was completed at Twin Hills since 2019.

Diamond drillholes (DD) range from 63 m to 555 m in depth, while reverse circulation (RC) holes range from 30 m to 260 m in depth. The average drilled depth for DD and RC holes is 282 m and 153 m, respectively. DD holes generally targeted deeper mineralization while RC holes targeted shallower mineralization.

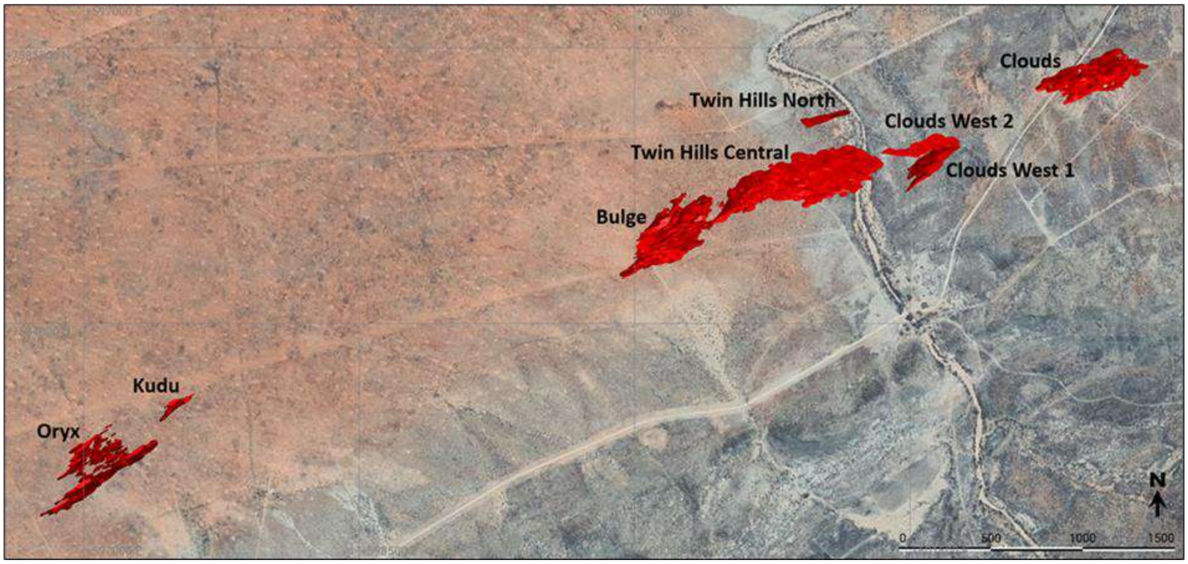
Most of the drillholes were oriented at 160° azimuth and 60° dip, except at Oryx and Kudu where the holes were drilled at 340° azimuth and 60° dip. Both the DD and RC holes were sampled at one-meter intervals at the Osino core-yard in Omaruru and the drill rigs respectively. A sub-sampling process using a riffle splitter was used at the RC drill rig to reduce sample mass.

Sulfide-hosted gold mineralization was interpreted and modelled from a combination of structural and assay data for each of the Twin Hills mineralization domains (Figure 1.5.1). The primary mineralization, hosted in meta-greywacke, dips between 60° and 80° and ranges from a few meters to 200 m in thickness.

The modelled mineralization includes mineralized intersections, with the geometry guided by local structural trends. A 0.4 g/t Au threshold was used to model the mineralized volumes however a 0.3 g/t Au threshold was used for Twin Hills North for continuity purposes. Most modelled mineralization is overlain by a barren calcrete layer. The mineralization at Kudu and Oryx dips in the opposing direction relative to the mineralization at the main targets.

Gold grade was estimated using localized uniform conditioning (LUC) at Bulge, Twin Hills Central, Clouds and Oryx + Kudu (referred to as Twin Hills West) from 2 m composites into 60 m x 60 m x 5 m (XYZ) panels and 5 m x 5 m x 5 m selective mining units (SMU). Ordinary kriging was used for grade estimation at Clouds West and Twin Hills North.

Figure 1.5.1 Twin Hills Mineralization Domains in Plan View



Bulk density was determined using an Archimedes-type technique on core and assigned to the model based on oxidation / weathering and lithology, such that calcrete was assigned a density of 2.24 t/m^3, oxide 2.57 t/m^3, transitional material 2.65 t/m^3 and fresh rock 2.76 t/m^3.

CIM Definition Standards for Mineral Resources and Mineral Reserves states that a mineral resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction (RPEEE). To satisfy the requirement of RPEEE by open pit mining, reporting pit shells were determined based on conceptual parameters and costs and assuming a gold price of US$1800/oz. gold recovery is planned to be achieved using a conventional crushing, milling, gravity, pre-oxidation and carbon-in-leach (CIL) circuit.

Material within the reporting pit shell was classified according to mineral resource confidence categories defined in *CIM Definition Standards for Mineral Resources and Mineral Reserves*. Data quality and quantity, geological and grade continuity, and confidence in the grade and density estimates were considered when classifying the mineral resource.

Mineral resources were classified as either Inferred, Indicated or Measured.

Measured mineral resources were classified where the modelled mineralization and grade estimates were supported by infill drilling spaced on a 12.5 m x 12.5 m grid on surface. Indicated mineral resources were generally classified where the mineralization and estimation are supported by infill drilling at a spacing of 35 m x 35 m on surface. Inferred mineral resources are classified up to a drill spacing of 50 m x 50 m and no more than 50 m beyond drilling data (Figure 1.5.2).

It is reasonable to expect that the majority of Inferred mineral resources could be upgraded to Indicated mineral resources with continued infill drilling.

Figure 1.5.2 Twin Hills Mineral Resource Classification in Plan View

Mineral Resource Statement

The database was established by the collection, validation, recording, storing, and processing of data and forms the foundation for the MRE. Standard operating procedures were established to govern the collection of all data, while a rigorous QAQC program is in place to support the database.

The Mineral Resource meets the minimum requirement of reasonable prospects for eventual economic extraction (RPEEE) as defined by "CIM Definition Standards – For Mineral Resources and Mineral Reserves" and it is based on geological premises, facts, interpretations, and technical information, and used appropriate estimation methods, parameters, and criteria for the deposit under consideration.

The Mineral Resource is that material within the US$1800/oz reporting pit shell above a 0.3 g/t Au cut-off grade and the Mineral Resource Estimate has an effective date of 15 March 2023 (Table 1.5.1).

Table 1.5.1 Mineral Resource for the Twin Hills Gold Project at a 0.3 g/t Au cut-off by Domain, as at 15 March 2023

Category	Tonnes millions	Grade g/t Au	Troy Ounces millions
Measured	0.7	1.48	0.03
Indicated	83.6	1.08	2.91

Category	**Tonnes millions**	**Grade g/t Au**	**Troy Ounces millions**
M&I	84.3	1.08	2.94
Inferred	7.0	1.10	0.25

Notes on mineral resource reporting:

1. Figures have been rounded to the appropriate level of precision for the reporting of mineral resources.

2. Mineral resources are stated as in situ dry tonnes. All figures are in metric tonnes.

3. The mineral resource has been classified under the guidelines of the CIM Definition Standards for Mineral Resources and Mineral Reserves and adopted by the CIM Council, and procedures for classifying the reported mineral resources were undertaken within the context of the Canadian Securities Administrators NI 43-101.

4. The mineral resource is reported within a conceptual pit shell determined using a gold price of US$1,800/oz and conceptual parameters and costs to support assumptions relating to reasonable prospects for eventual economic extraction:

a. 4% royalty (3% government royalty and 1% export levy)

b. Selling costs of US$2.75/oz

c. Mining costs of US$2.00/t ore and US$1.85/t waste, with additional cost attributed to depth below surface

d. Processing and rehandling costs of US$8.15/t run of mine ore

e. G&A cost of US$4.00/t run of mine ore

f. Slope angle of 48° in weathered rock and 55° in fresh rock

g. 90% gold recovery from CIL circuit

5. Mineral resources that are not Mineral Reserves do not have demonstrated economic viability.

Table 1.5.2 Mineral Resource Domains for the Twin Hills Gold Project at a 0.3 g/t Au cut-off, as at 15 March 2023

	MEASURED & INDICATED			**INFERRED**		
Domain	**Tonnes millions**	**Grade Above Cut-Off g/t Au**	**Troy Ounces millions**	**Tonnes millions**	**Grade Above Cut-Off g/t Au**	**Troy Ounces millions**
Bulge	38.5	0.99	1.22	2.3	1.04	0.08
Twin Hills Central	27.8	1.15	1.03	2.2	1.03	0.07
Clouds	9.9	1.29	0.41	1.8	1.26	0.07
Twin Hills North	0.1	1.37	0.004	0.0	1.20	0.000
Clouds West	0.6	1.23	0.02	0.1	0.65	0.002
Kudu	0.6	0.70	0.01	0.2	0.82	0.004
Oryx	6.8	1.10	0.24	0.6	1.24	0.02
TOTAL	84.3	1.08	2.94	7.0	1.10	0.25

The MRE was carried out by Mr. Anton Geldenhuys (MEng), a registered Professional Natural Scientist (SACNASP, membership number 400313/04) of CSA Global, who is an independent Qualified Person as defined by CIM Definition Standards for Mineral Resources and Mineral Reserves in accordance with NI 43-101.

1.6 Mineral Reserves and Mine Production Schedule

The DFS has been conducted using the updated Mineral Resource for the Twin Hills Gold Project prepared by CSA Global Mining Industry Consultants (CSA). The study complies with guidelines as defined within NI 43-101 Standards of Disclosure for Mineral Projects for a DFS, a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves and the estimates have been prepared by appropriately experienced and qualified, competent persons with a thorough knowledge of the operation.

Inferred resources were excluded from the pit optimization runs and the Reserve statement and were classified as waste during the LOM production schedule runs. The deposit is a large, shallow gold deposit amenable to open-pit mining. The orebody will be mined as a conventional shovel and truck operation, with bulk mining augmented by more selective mining in areas with narrow ore zones.

The Whittle pit optimization was run at a base gold price of $1,700 per ounce of gold and a 5% discount rate and included a 3% gross royalty and 1% export levy to the Namibian government. Stated below in Table 1.6.1 are the significant assumptions used to generate the Twin Hills Gold Project DFS Mining Study.

Table 1.6.1 Mine Planning and Whittle Pit Optimization Assumptions

Parameter	Units	Values
Base Currency		US$
Base Date		Q2 2023
Exchange Rate – real	(NAD : US$)	17.50
Discount Rate (for NPV calculation)	(%)	5.00%
Base Gold (Au) Price – real	(US$/oz)	1700
Government Royalty (3%) + Export Levy (1%)	(%)	4.00%
Selling Costs – Gold Refining Costs	(US$/oz)	0.55
Selling Costs – Gold Transport Costs	(US$/oz)	2.20
SMU Block Size	X(m) x Y(m) x Z(m)	10 x 5 x 2.5

Mining will take place by conventional open pit methods and the whole mining operation, except for the mine technical services function, will be outsourced to a reputable mining contracting specialist. This includes drilling, blasting, loading, and hauling of ore and waste. The mining contractor will supply all materials, equipment, facilities and services, supervision, and labour necessary to conduct the mining operations per the contract specifications.

Drilling and blasting will be performed on 5 m benches for ore and selective waste material; and 10m benches for bulk waste material. The entire waste benches will be excavated in a bulk mining fashion with excavators on two 5.0 m bench flitches. In contrast, the mineralized benches will be selectively loaded in two 2.5 m flitches to minimize dilution. The truck and shovel match on the ore and waste benches have been considered and are planned as follows:

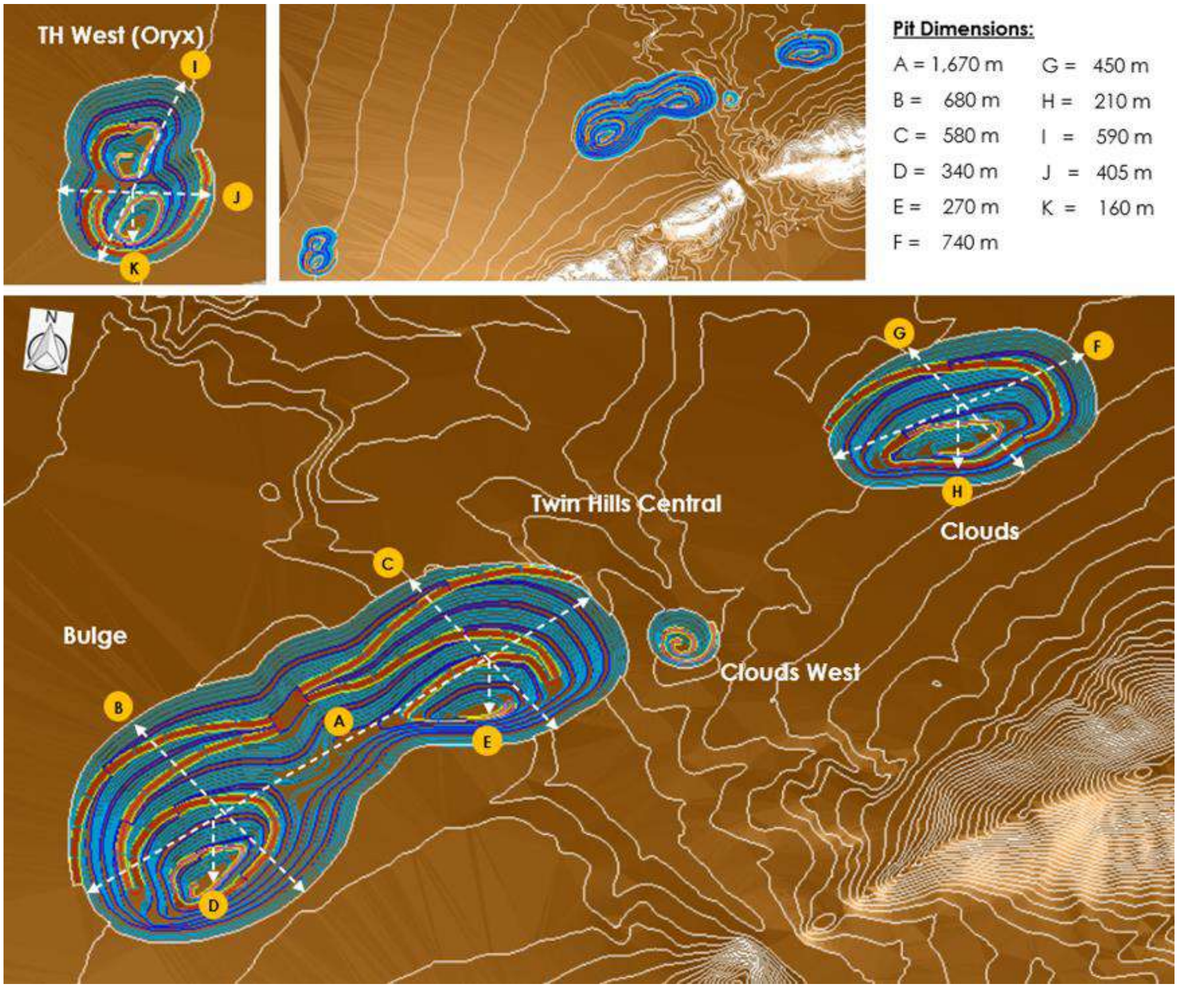
- 130 t hydraulic backhoe excavator to be employed for selective loading purposes.
- A 200 t hydraulic backhoe excavator will load the bulk waste benches.
- 100 t capacity, off-highway rigid haul trucks and standard open-pit drilling equipment will be required.

Ore and waste will be loaded with hydraulic excavators and hauled by diesel-powered trucks to the primary crusher, ROM pad stockpiles, low-grade stockpiles, or waste rock dumps. The remainder of the mining production fleet consists of support equipment, including graders, track and wheel dozers, front-end loaders, rock breakers, and utility excavators.

The Project is planned as a multi-pit mining operation (Figure 1.6.1 below) with seven pushbacks in the main pit (Twin Hills Central & Bulge) three separate satellite pits (Clouds, Clouds West and Twin Hills West) to be mined in different phases throughout the life of mine.

The pit design and scheduling have been undertaken to allow for interim pushbacks, which will be mined early, thereby allowing higher grade to the plant to be maximized in the early years, and waste stripping deferred as far as possible into the future.

Figure 1.6.1 Design and Layout of the Reserve Pit Designs



The stockpile strategy is to maintain at least two months of ROM ore on finger stockpiles to allow for flexibility in blending to optimise recovery and plant throughput. The processing plant will continue to process lower-grade stockpiles after open-pit mining ends.

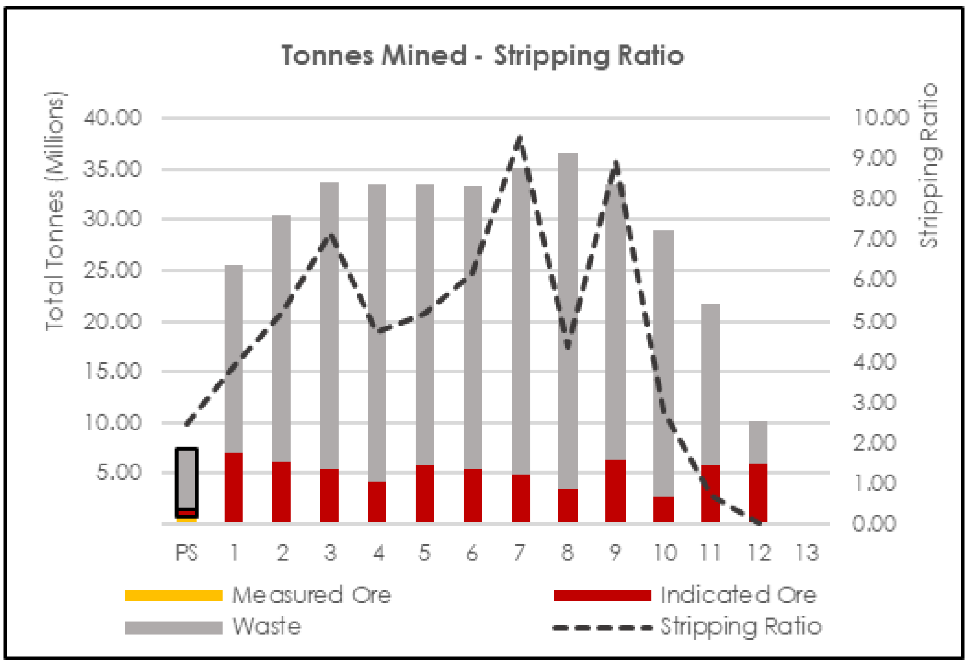
The Twin Hills Gold Project Reserve estimate has been determined and reported under the guidelines provided by NI 43-101 Standards of Disclosure for Mineral Projects. The Ore Reserve, as summarized in Table 1.6.2, was determined as of 31 May 2023 based on an economic gold cut-off grade of 0.45 g/t.

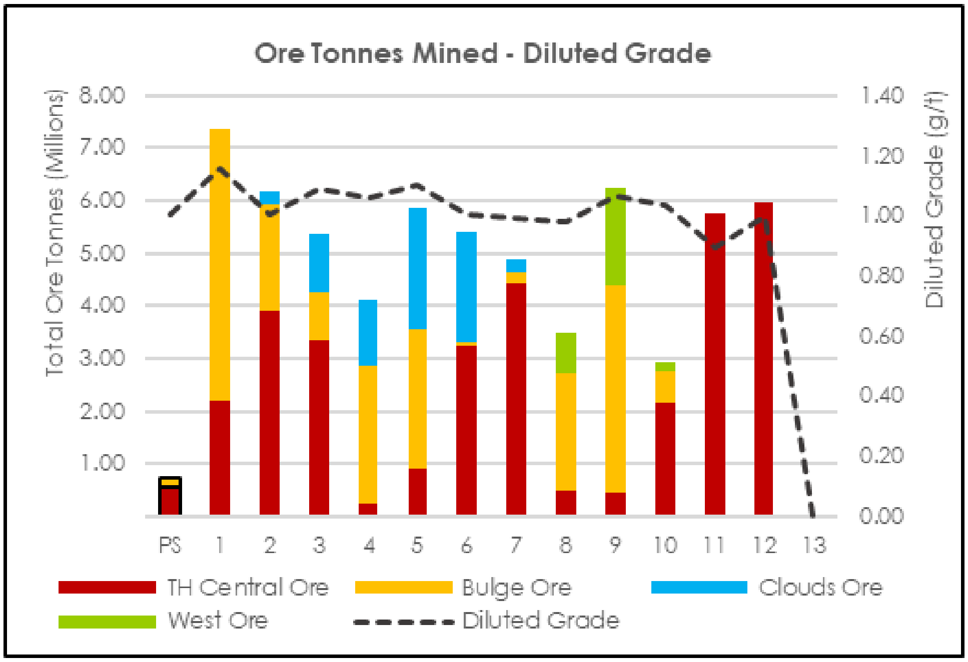
Table 1.6.2 Twin Hills Gold Project Reserves as of 31 May 2023 (Economic Cut-off Grade of 0.45 g/t)

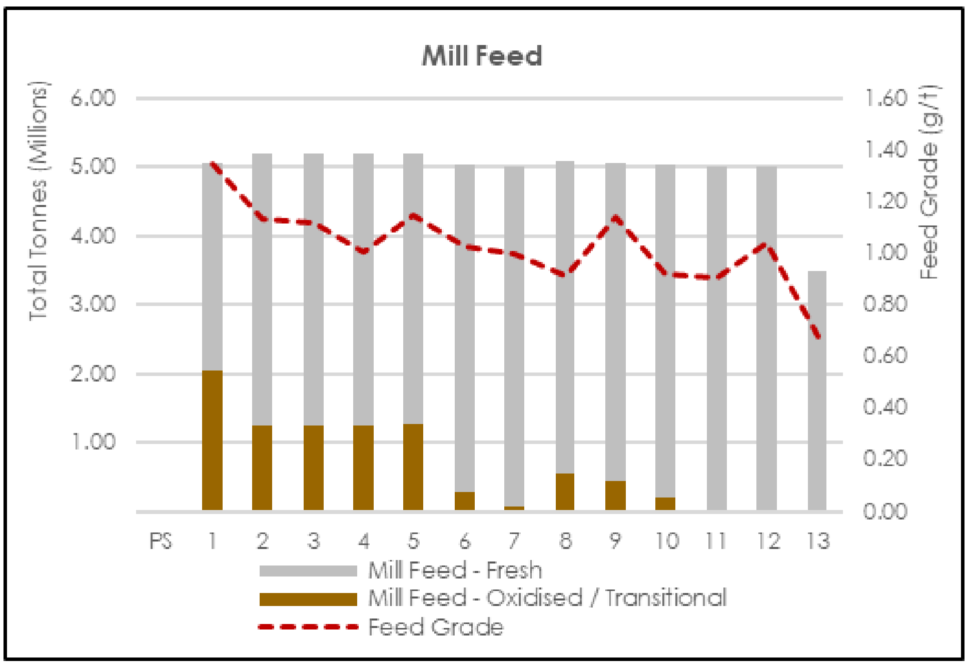
Mine Project	Classification	Tonnes Mt	Grade g/t	Contained Metal Moz
Twin Hills Gold Project	Proven	0.87	1.19	0.03
	Probable	63.64	1.03	2.12
	Total Ore Reserve	**64.51**	**1.04**	**2.15**

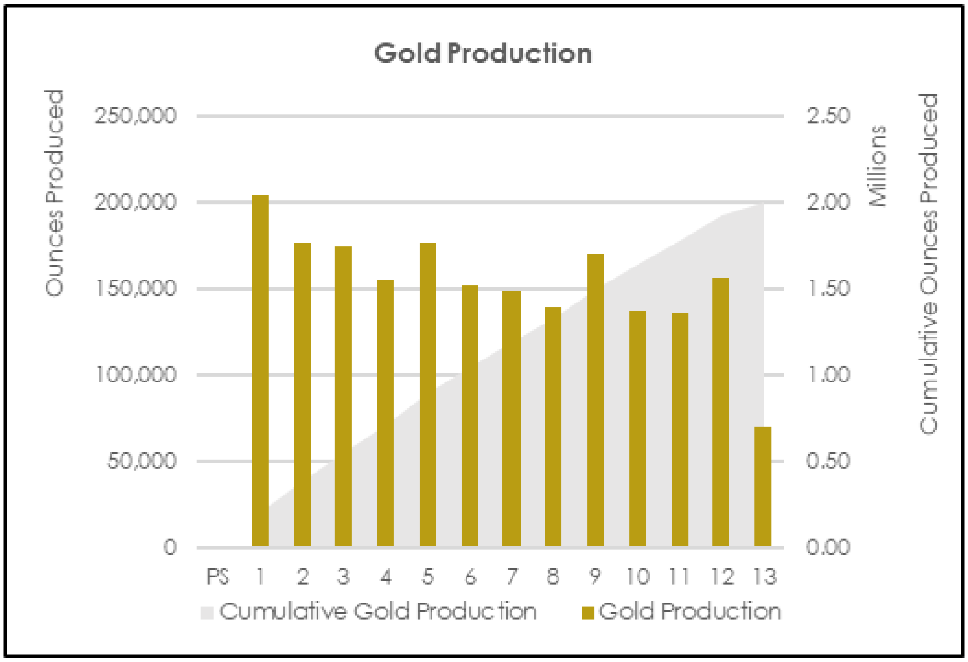
The DFS mine production schedule was produced with an average material movement of 33.5mtpa (Figure 1.6.2), providing approximately 13 years' ore supply at 5 Mtpa. The figures below summarize the LOM production schedule and key production metrics.

Figure 1.6.2 Key Mining Production Schedule Graphs




Ore Tonnes Mined - Diluted Grade
Total Ore Tonnes (Millions)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
Diluted Grade (g/t)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
PS 1 2 3 4 5 6 7 8 9 10 11 12 13
TH Central Ore
Bulge Ore
Clouds Ore
West Ore
Diluted Grade


Mill Feed
Total Tonnes (Millions)
6.00
5.00
4.00
3.00
2.00
1.00
Feed Grade (g/t)
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
PS 1 2 3 4 5 6 7 8 9 10 11 12 13
Mill Feed - Fresh
Mill Feed - Oxidised / Transitional
Feed Grade



The pre-strip period is six months, with a total of 6.79 Mt mined from the first two pushbacks. After the pre-strip period, the ore inventory on the grade control and ROM stockpiles is 0.73 Mt. The plant production ramp-up is three months after commissioning, in line with similar gold plants commissioned by Lycopodium.

Table 1.6.3 Key Mining Parameter Results

Key Mining Parameters	Unit	Total / LOM
Operations		
Mining pre-strip period	Months	6
Mine production life	Years	12
Processing production life	Years	13
Mining		
Ore mined	Mt	64.5
Strip ratio	X	4.6
Waste mined	Mt	299.1
Processing		
Ore processed	Mt	64.5
Average gold head grade	g/t	1.04
Average CIL gold recovery	%	92.0%

Key Mining Parameters	Unit	Total / LOM
Output		
Gold production	Moz	1.98
Mining start-up CAPEX	M USD	24.31
Mining Opex (average)	USD/t	2.64

1.7 Process Plant Recovery Methods

The mine production schedule developed for the DFS allows for most of the ore to be direct tipped with the remainder being rehandled into the crusher by a front-end loader.

The Twin Hills Gold Project plant design for this definitive feasibility study (DFS) is based on a flowsheet that comprises three stages of crushing and screening followed by milling and size classification, gravity recovery, a carbon-in-leach (CIL) circuit, carbon elution, and a gold recovery circuit. CIL tailings will be treated in a cyanide destruction circuit followed by thickening and pressure filtration.

Tailings filter cake will be transferred on an overland conveyor for stacking at the tailings storage facility (TSF). Some mine waste rock will be delivered to the TSF by dump truck and used in the construction of the outer containment berm and capping of the TSF. The TSF will be lined to prevent seepage of any acid or dissolved arsenic generated after deposition from potentially coming into contact with groundwater.

The key criteria for equipment selection for this DFS were suitability for duty, reliability, and ease of maintenance. The plant layout provides ease of access to all equipment for operating and maintenance requirements, whilst in turn maintaining a layout that will facilitate construction progress in multiple areas concurrently.

The key project design features for the plant were consistent with the test work results summarized above, and included:

- Nominal throughput of 5.0 Mtpa of ore feed.
- A primary gyratory crusher with a crushed coarse ore stockpile providing about 12 hours of surge capacity, secondary and tertiary cone crushing and screening, with an annual utilization of 6,132 hrs.
- A covered fine ore stockpile providing about 12 hours of surge capacity, followed by a ball mill grinding circuit in closed circuit with hydrocyclones, and a downstream processing plant with an annual utilization of 8,000 hrs. This includes a cyclone underflow gravity concentration and intensive leach circuit, thickening, pre-oxidation and carbon-in-leach (CIL) plant, cyanide detoxification with possible future arsenic precipitation, tailings thickening and gold elution and recovery operations.

- The pressure filtration circuit and downstream tailings belt conveying, and deposition circuits have been designed for annual utilization of 7,008 hrs. The circuit therefore includes agitated slurry storage tanks ahead of filtration, providing about 12 hours of surge capacity for tailings thickener underflow.

- Reagent and services make-up, storage, and distribution circuits to support all of the processing circuits.

An overall process flow diagram depicting the unit operations incorporated in the selected process flowsheet is provided below as well as being described in Section 17 of this report.

Figure 1.7.1 Twin Hills Gold Project Process Plant Flow Diagram

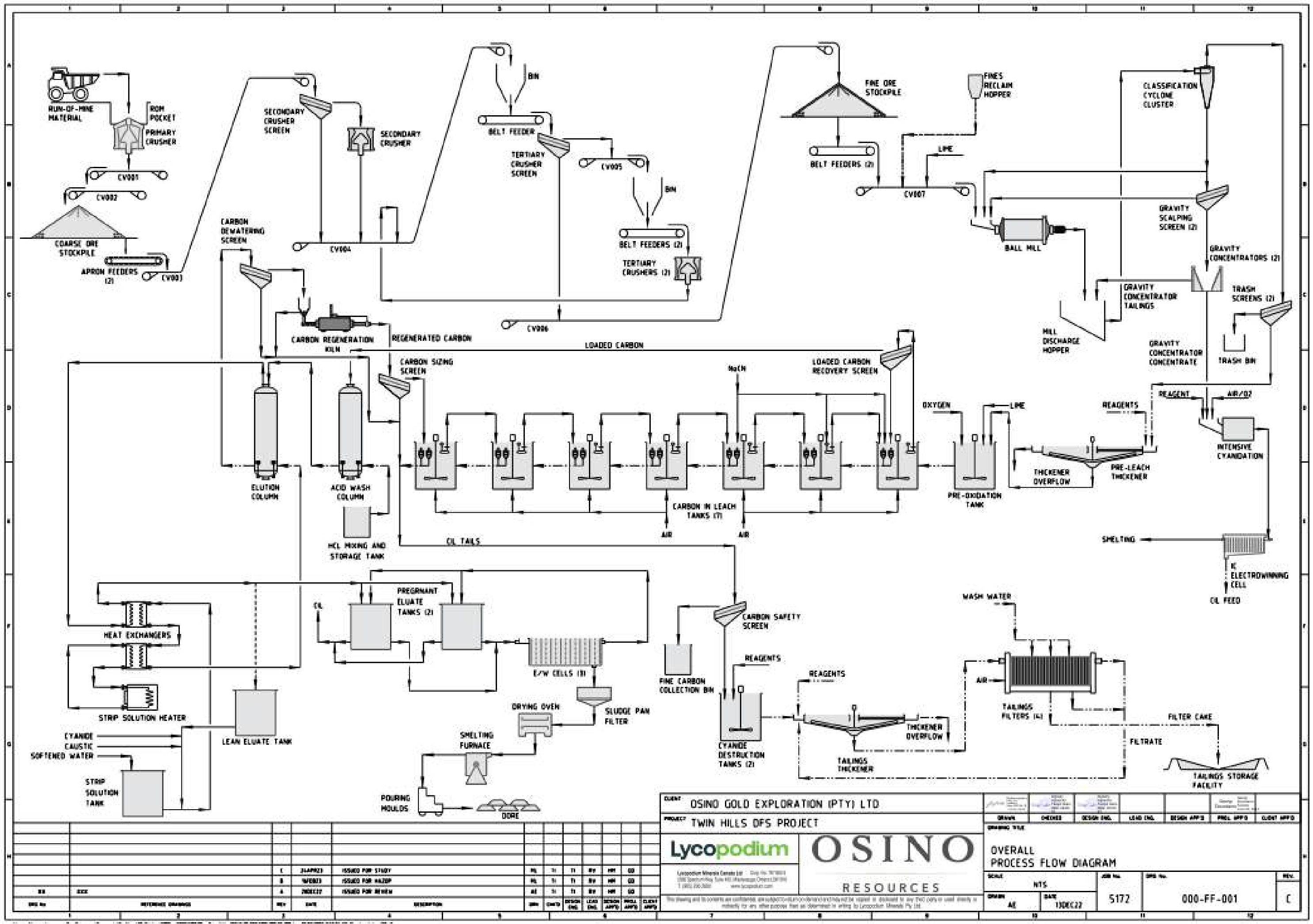


Figure 1.7.2 Schematic Process Plant Layout

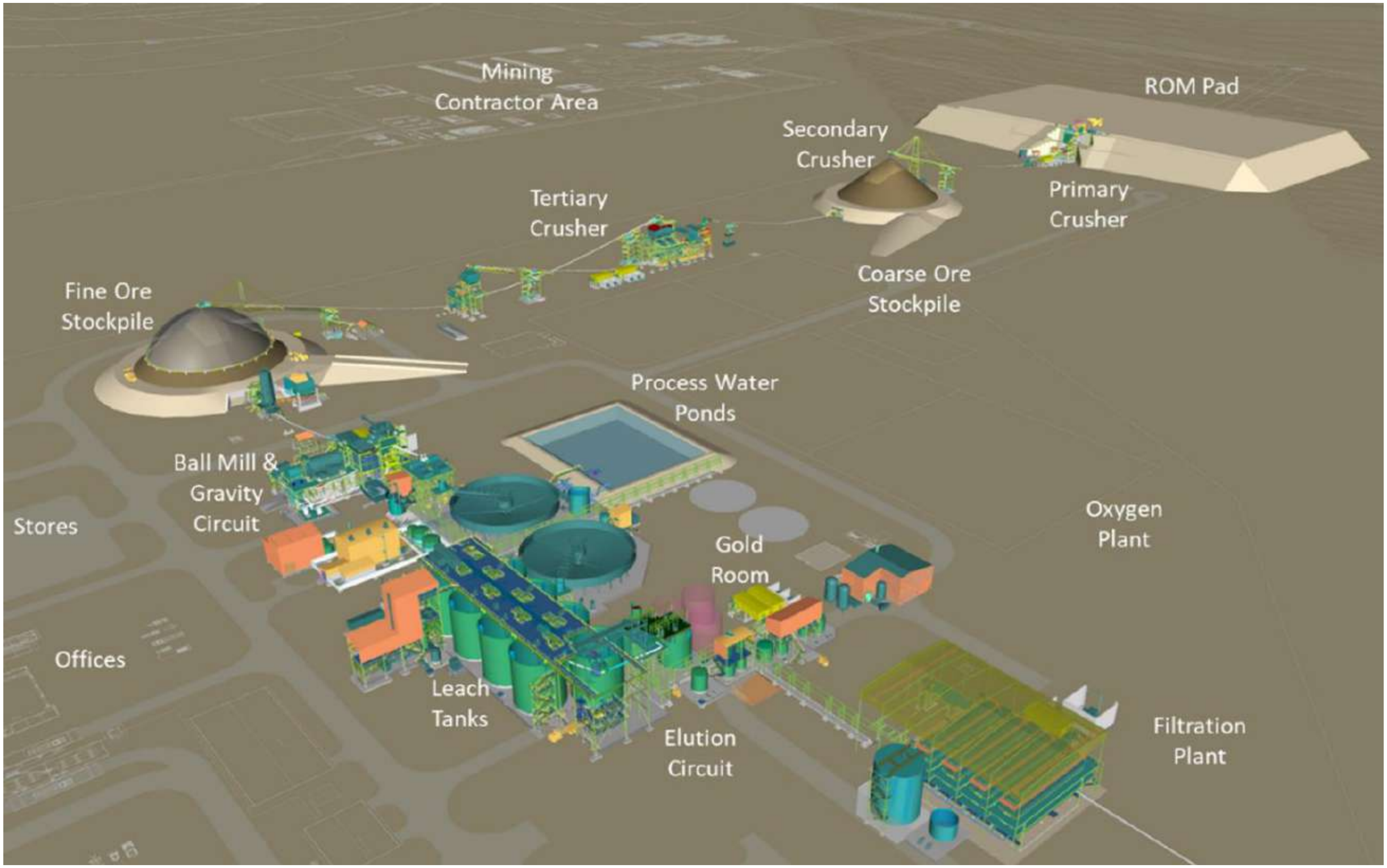
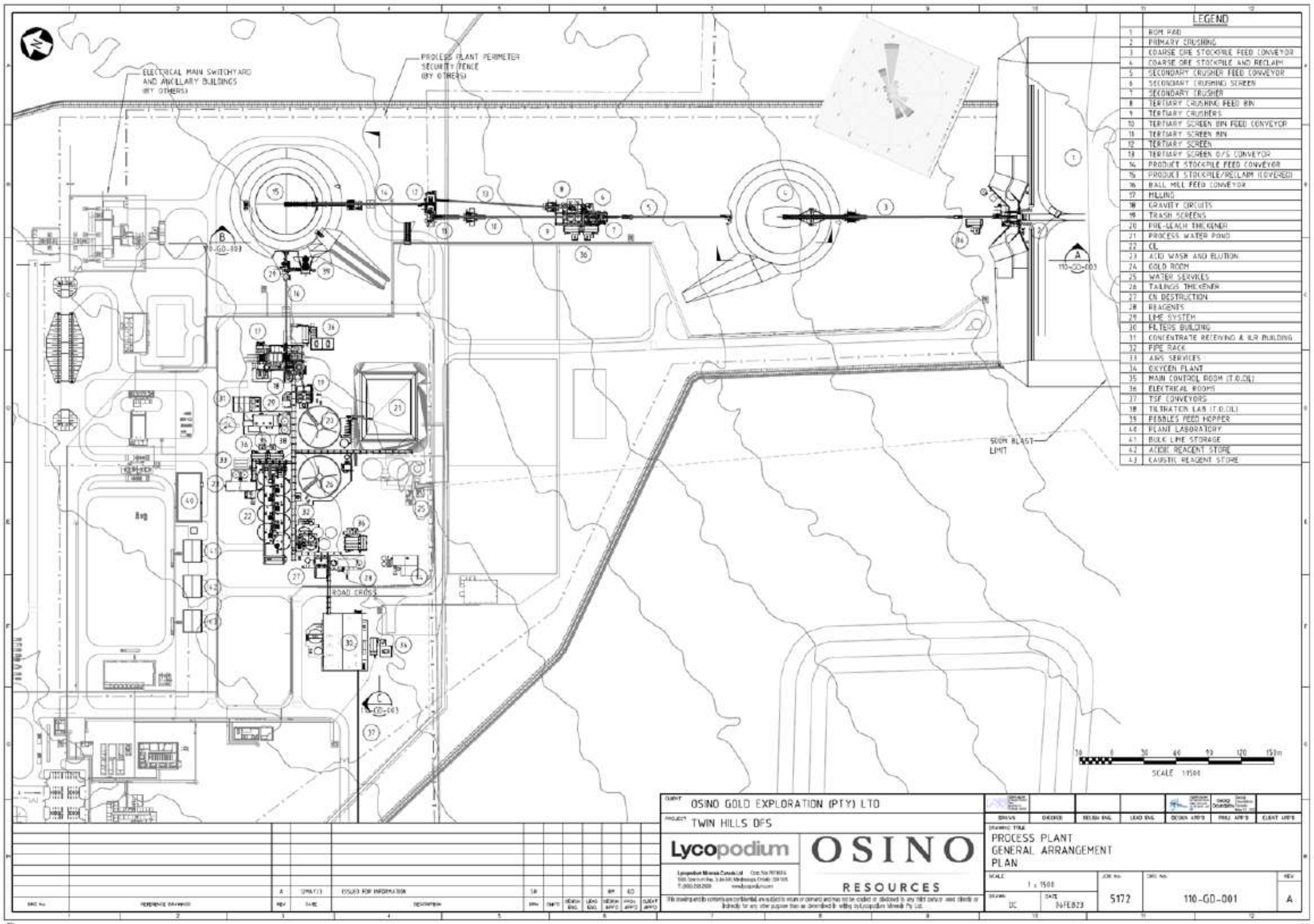


Figure 1.7.3 Twin Hills Gold Project: Process Plant General Arrangement Plan



1.8 Infrastructure

1.8.1 Process Plant Design and Related Infrastructure

The Process plant infrastructure will include for site security and access control, change house facilities, Training and induction facilities, canteen facility, administrative offices, medical and emergency response facilities, warehousing facilities including open air laydown areas, workshop facilities, ablution facilities, emergency backup generation facilities, waste management and recycling facility, reagents stores and laboratories.

1.8.2 Non-Process Infrastructure

General Infrastructure

The Project Infrastructures consists of access, water supply and distribution, power supply and distribution, the TSF, as well as ancillary and off-site infrastructures. Mining infrastructure will be installed by the Mining Contractor and is not included in the DFS designs or Capital Cost Estimates prepared by Lycopodium and DRA, other than site and terrace preparation costs. Similarly, infrastructure for the photovoltaic installation will be provided by the Independent Power Producer and is not included in the scope of this Technical Report.

Employees and contractor personnel will be housed in the nearby towns of Karibib or Omaruru which are located approximately 20 km and 50 km away from the Project. No accommodation will be provided at the site during construction or operations, with the exception of limited management and guest accommodation.

The Osino Twin Hills Mine permit area boundary is located 7.5 km due east of the Karibib Air Force Base.

Infrastructure required outside of the process plant footprint include:

- A new re-routed district road DR1941 which forms the main access road to the mine and process plant.
- Borehole water supply and distribution network.
- Power supply from the National Power Utility NamPower.
- The TSF.
- Fuel and lubrication services.
- Mining contractor’s establishment.

In general, the process plant infrastructure and off-site infrastructure buildings, facilities and services were laid out to minimize the impact on the environment, while still fulfilling their functional requirements.

Access and Site Access Road (rerouted DR1941 road)

The Project is located less than 16 km northeast from the intersection of the C33 and B2 National Roads and approximately 230 km from Walvis Bay Port. The town of Omaruru is 50 km North from the mine site further along the C33. National Roads are sealed with bitumen tar and constructed generally to 120 km/h design standards, traversing relatively flat areas.

The C33 connects the nearby towns of Karibib to the south-west and Omaruru to the north, and the B2 connects to the capital of Namibia Windhoek to the east and the harbour town of Walvis Bay to the west.

The site access comprises a new re-routed district road DR1941 road intersecting with the C33 tar road from the mining town of Karibib and the farming town of Omaruru, as well as access roads from the DR1941 road to the process plant area and the mining operations. The section of road from the intersection of the DR1941 onto the C33 road all the way up to the mine operations access road is tarred. Thereafter the road will become a gravel road all the way to where it ties into the existing DR1941 road again. From the new DR1941 access roads will be provided to the process plant and to the mining contractor's laydown facility.

Borehole Water Supply and Distribution Network

The processing plant water demand for a process throughput at 5.0 million tonnes per annum (Mtpa) is estimated at 1.1 Mm^3/yr. The process design aims to maximize the re-use of water by recycling process solutions wherever possible through filtration systems in the plant.

The plant water balance shows that most of the water contained in leach residue slurry leaving CIL is recycled at the plant and the remaining water is lost in filtered tailings cake containing 15% water which is sent to the TSF.

The groundwater supply requirement was estimated using an overall site water balance which includes the open pits dewatering, surface water accumulation in storage structures, and estimated groundwater flows. It accounts of plant losses, dust suppression, pit inflows and evaporation, as well as the potential impact of extended periods of drought. The site water balance indicates that the process cycle is in a water deficit through the year under various climatic conditions and relies on groundwater supply and/or other sources. The groundwater supply wells, and distribution system were sized to be able to accommodate a full water supply to the processing plant.

A 22 km water pipeline network complete with water storage facilities and pumps from the borehole pumping scheme are required to ensure adequate water supply at a sustainable yield for the project requirements. Boreholes are situated to the North and the South of the Process plant facility on the mine property. The boreholes can supply approximately 1.2 millionm^3/year of water at a sustainable yield if required in the first few years while the pit dewatering is being established that will complement the water extraction from the boreholes supply.

The ephemeral Okawayo stream diversion of potential storm water into the Clouds West satellite pit will also provide additional water storage facilities or could be used for groundwater recharge. It will be constructed before year four of the life of mine when the main pit will be extended across the riverbed.

Other mitigation measures are being investigated for any water shortages in future. This includes the Khan River sand storage dam with groundwater recharge sites to increase the sustainability of borehole abstraction conveyed to site through a pipeline, and the Kranzberg aquifer located next to the B2 Main Road between Usakos and Karibib. NamWater has offered for this aquifer to be developed for use of the abstracted water by the mine and other future consumers in need. The extent and the yield, as well as the locations of the abstraction and monitoring boreholes are currently being determined in liaison with NamWater.

Fuel and Lubrication Services

Mining fleet and LDV fuel and lubrication bulk storage / dispensing system and fuel management facilities, as well as a separate much smaller fuel storage/dispensing facility for the process plant have been included in the DFs designs and cost estimates.

The supply, storage and dispensing of fuel and lubricants will be outsourced to a reputable service provider in the Namibian fuel industry. The service provider will supply, install maintain and operate all the surface infrastructure including (but not limited to) self-bunded tanks, offloading and dispensing fuel and lubrication pumps, metering systems and all auxiliary equipment necessary to fulfil their operational service agreement including the provision of personnel, operators, maintenance staff, offices, stores, and toilet facilities.

Mining Contractors establishment.

The terraces for the Mining Contractor site laydown which includes on-site roads and parking areas, laydown areas for offices, workshops, stores, ponds and bulk fuel storage and dispensing areas were catered for.

The Mining Contractor will be responsible for establishing and maintaining their equipment on site. Hence, the Mining Operations office buildings, control rooms, heavy vehicle, mining equipment and mining light delivery vehicle workshops and wash bays, heavy vehicle tyre workshop, heavy vehicle fuelling bays, mining warehouse, emulsion storage facilities, explosives magazine and mining personnel bus stops are excluded. They will be required but the costs will be included in the mining contract operating or capital costs.

Bulk Electrical Supply Infrastructure

Bulk electrical supply will be sourced from the NamPower electrical transmission network, via a new 20 km 66 kV overhead line and 66/11 kV mine substation. NamPower are presently developing this new transmission level substation near to the town of Karibib (the 'Erongo' substation), from which power for the mine will be derived. The planned commissioning date of the mine facilities has been aligned with the planned commissioning date of the Erongo substation.

The mine switchyard will incorporate two 40 MVA step down transformers and an 11 kV Consumer Substation for reticulation of supply to the mine consumers, and to the planned renewable energy plant. The average power demand of the mine is 23.5 MW (24 MVA), and the maximum demand is 31 MVA. The step-down transformers within the mine substation are therefore sized with redundancy in mind.

Renewable Energy Plant

To minimize the greenhouse gas emissions due to the mine operation, an industrial scale solar photovoltaic farm has been included in the design and cost estimate. The solar farm will be constructed, owned and operated by an independent power producer, with the sale of renewable energy taking place via a private power purchase agreement.

The cost of energy proposed within the private power purchase agreement is less than that of NamPower, thereby reducing the effective annual energy cost of the project. No battery storage system is proposed, with the supply from NamPower therefore making up the energy demand shortfall during low-light or night hours.

The solar farm will be capable of generating between 25.5 – 27.1 MWac at peak production and is expected to offset approximately 37% of the Mine's total energy. The effective reduction in greenhouse gas emissions equates to 19.9 kt annually when compared to a coal fired power generation source.

The renewable energy plant will be embedded within the mine's electrical network and will couple to the 11 kV mine consumer substation.

1.9 Tailings Disposal and Surface Water Management Including Conveyors

The tailings filter cake will be conveyed by an overland belt conveyor to the tailings storage facility where it will be deposited in predetermined layers using a series of stacking conveyors. Deposited tailings material will be left to dry and later will be covered with capping material for environmental protection (to prevent washing out and erosion). No water is expected to be recovered and recycled to the processing plant in the base case, although provision has been made for seepage collection and return to the plant.

A purpose build forward stacking conveying system was selected that will adhere to the process requirements of the TSF dry stacking methodology. The system design allows advance planning for i.e., stacking, movement of equipment and uninterrupted safe access during the pad lining process whilst offering the best overall availability and production reliability offering a simplified, cost-effective design which incorporates commonality of spares and standardization / interchangeability with associated equipment.

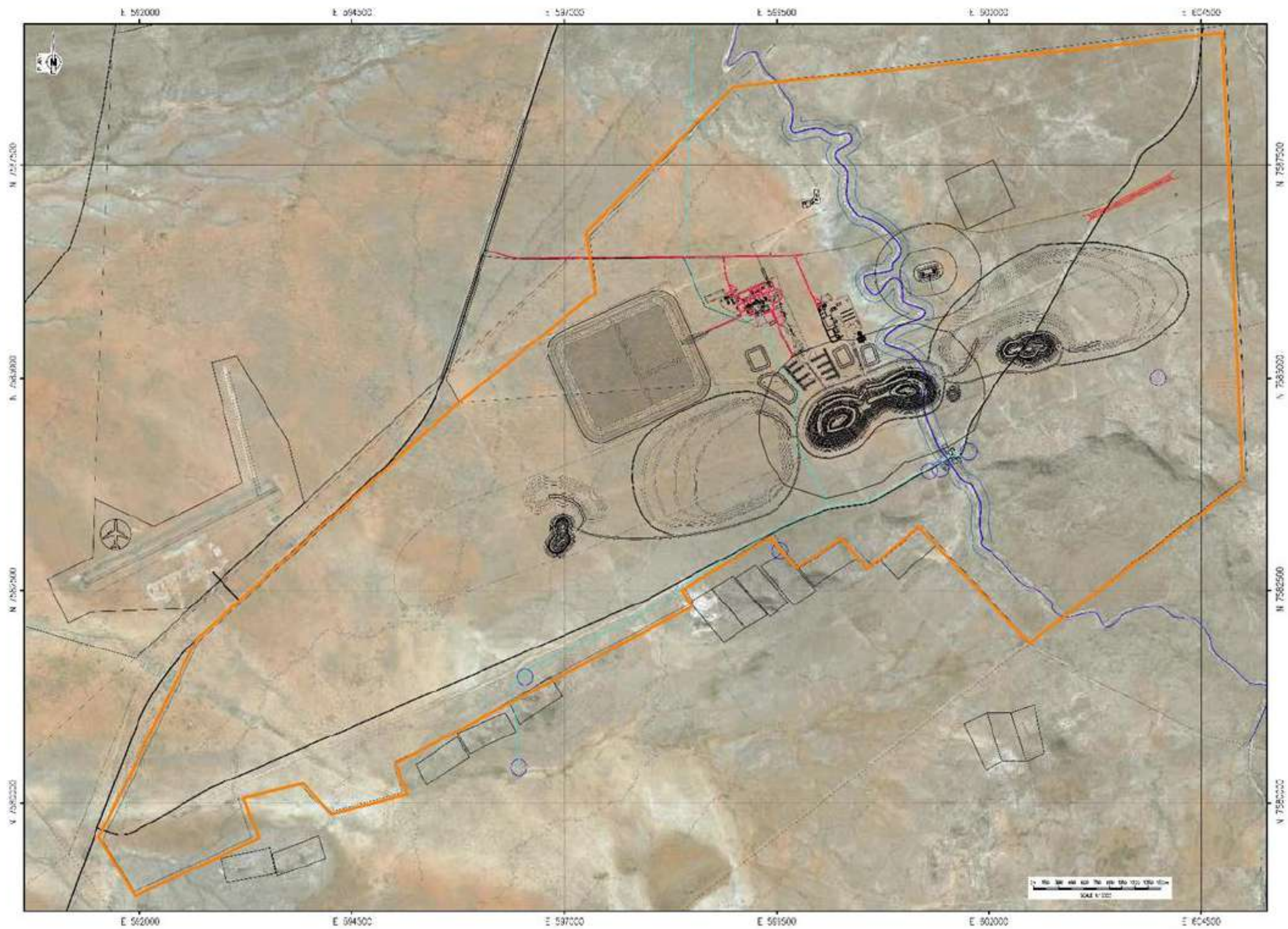
The complete tailings disposal system will comprise of a 6-layer configuration. The first layer will be 8 m high, and 5 layers will be at 5 m increments with a total pad height of 33 m. The conveying system will comprise of a plant feed, emergency, and forward stacking streams #1 and #2. One stream will always work as the primary stream and the other stream will then follow as the emergency stream. These two off streams will alternate in function as either-or stream comes to the end of the stacking at the far side berm.

The outer perimeter of the filtered tailings storage facility will be progressively capped with material from selected waste rock material sourced from the pit.

The test work on the filtered tailings material indicated that minimal free water would be released from the filtered tailings, and as a result very little seepage from the material is expected. The addition of precipitation collected within the facility may produce sufficient water to collect and potentially re-use. The geochemical profile includes high abundance and readily mobile arsenic content and an acid generating potential, which classes the tailings as high risk. A liner system is recommended to restrict the seepage to groundwater resources.

Each phase will include a drainage system to collected seepage and runoff from the lined area. The drainage system will be installed on top of the HDPE geomembrane and will include a perforated HDPE pipe placed in a lined trench, surrounded by a washed granular drainage material, all wrapped in a filter geotextile. The drainage system will be arranged in a herringbone pattern across the basin of each of the three phases. The drainage system for each phase will report to a sump that will comprise of a sunken area at the low end of each basin. The sump will be filled with clean granular drainage material. A large diameter HDPE pipe will be positioned up against the upstream side slope of the lined perimeter embankments such that the lower end of the piped is positioned in the sump and the upper end of the pipe is accessible on the embankment crest. This arrangement will allow for a submersible pump to be lowered into the sump and pump the collected any seepage from the sump.

Figure 1.9.1 Preliminary Site Layout



1.10 Environmental Studies, Social Impact and Permitting

A full environmental and social impact assessment (ESIA), undertaken to international lender standards, and complete with an environmental management plan (EMP), was completed by Environmental Compliance Consultancy (Namibia) for the Twin Hills Project. It was prepared to obtain an environmental clearance certificate (ECC) for the Project from the Namibian authorities and to supplement this technical report in accordance with NI 43-101 providing environmental, permitting, social and compliance components for the Project DFS. The report details the ESIA process and legal requirements, baseline studies, design considerations related to environmental, social, and economic aspects of the Project, related impacts of the Project activities on the area, and notes mitigation strategies to manage those impacts.

The following environmental baseline description has been developed from available literature and studies and specialist studies undertaken for the Twin Hills Gold Project. The following specialist baseline and impact studies were completed as part of the ESIA:

- Terrestrial Ecology.
- Hydrology.
- Groundwater.
- Air quality.
- Noise and sense of place.
- Soils and land use.
- Traffic.
- Heritage and culture.
- Visual and tourism.
- Social and economic.
- Geochemistry.
- Blast vibration.

The socio-economic baseline study has collated information from a variety of resources, including the 2011 Census, Labour Force surveys, Namibian demographic, and Health Survey, amongst others. An overview of the two towns closest to the proposed Twin Hills mine is presented (Table 20.4.1). Karibib will be affected by the traffic bringing equipment and supplies to the Project and is an option for both the construction camp, and for permanent employee residences.

Karibib is some 20 km by road from the Project whereas Omaruru is 52 km by road. The proponent is further considering Karibib for housing mine employees, based on both financial and socio-economic implications. Omaruru is a well-serviced town, with well-established stores, banks, and restaurants. Karibib is known as a stop off on the way to the coast and to Windhoek, and for the Navachab Gold Mine and over 750 employees live in the town, contributing to Karibib's economy.

The Environmental Management Act requires that an environmental clearance certificate is required to undertake any of the listed activities identified in the act and its associated regulations. Potential listed activities triggered by the proposed Twin Hills Gold Project are listed in Section 20 of the report and were included in the ESIA impact assessment process.

A list of permits, licences and clearances required for the Twin Hills Gold Project are provided in Section 20 along with the estimated time to secure the necessary approvals.

The Environmental Management Act, No. 7 of 2007 and its associated regulations guide the environmental and social assessment processes in Namibia. The Twin Hills Gold Project Scoping Study was completed in 2021 as a first step in the Environmental and Social Impact Assessment Report (ESIA) process which allowed for wide public consultation and information gathering and ensured the most applicable aspects and associated impacts were identified for the ESIA. The ESIA was completed in early 2022 with a detailed EMP and as application for a clearance certificate for mining.

The Namibian Ministry of Mines and Energy (MME) together with the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development has drafted a Namibia Mine Closure Framework which will become a legal requirement when the Minerals Act, 1992 revisions are reviewed and gazetted. Minerals Act revisions are currently being reviewed by the Chamber of Mines and other stakeholders. The Twin Hills Gold Project detailed conceptual mine rehabilitation and closure plan was prepared consistent with the framework and submitted to supplement the clearance and mining application.

1.11 Capital and Operating Costs

1.11.1 Capital Cost Estimate

The Project capital cost estimate (CCE) for this definitive feasibility study (DFS or FS) was compiled by Lycopodium Minerals Canada (Lycopodium) with input from DRA Global (DRA), Knight Piésold, Qubeka, GSFA, ECC and Dornier Suntrace.

The respective qualified persons or third-party experts of these companies contributed to the preparation of this report for the general infrastructure, tailings storage facility, mining infrastructure and establishment costs, bulk power supply, closure, renewable power supply and water infrastructure. Osino provided project specific Owner's team and facility capital cost estimates.

The CCE reflects the Project scope as previously described in this study report, particularly in Sections 16, 17 and 18. The estimated capital cost is summarized in Table 1.11.1. It excludes mining pre-strip costs of about US$18 million that have also been capitalised in the DFS financial model. Approximately 30% of the estimates received for the CCE were denominated in Namibian Dollars (NAD) with the remainder nearly all being United States Dollar (US$) prices.

Table 1.11.1 Plant CCE Summary (US$ Millions (M), 1Q23, Range –10% to +15%)

Main Area	Capital US$ M
Treatment Plant	118.8
Reagents & Plant Services	23.9
Infrastructure	65.2
Mining	8.3
Construction Distributables	36.3
Logistics and Transportation	15.9
Subtotal	**300.7**
Management Costs	23.8
Owners Project Costs	22.8
Subtotal	**46.6**
Project Total (Including Contingency)	**347.3**

1.11.2 Operating Cost Estimate

The processing operating costs shown in Table 1.11.2 have been developed for a plant with an annual throughput equivalent to 5 Mtpa of fresh mineralized material plant feed, based on a 24 hour per day operation, 365 days per year.

The operating costs have been compiled by Lycopodium based on costs developed by:

- Lycopodium / Osino – Process plant operating costs (Osino provided bulk power supply rates and labour costs).
- DRA - General Site Infrastructure OPEX.
- Knight Piésold – TSF Operating Costs.

- Qubeka – Contract Mining Operating Costs.
- Dornier Suntrace – Renewable Power Purchase Agreement Operating Costs.
- Osino – Site General and Administration Costs

The estimate is considered to have an accuracy of +15 / -10% and is presented in US$ based on an exchange rate US$1=ZAR/NAD 18.5. It is based on costs and exchange rates obtained or applicable during the first quarter of 2023 (Q1 2023).

Approximately 30% of process plant and G&A operating costs and 60% of mining costs were estimated to be Namibian dollar based, with the remainder being provided by suppliers denominated in United States Dollars.

Table 1.11.2 Processing Cost Estimate (Blended Life of Mine Estimates)

Average Au Production pa (first four years)	koz pa	176
Average Au Production over life of mine (LoM)	koz pa	162
C1 Cash Operating Cost (LoM)	US$/oz	918
AISC All-In Sustaining Cost (LoM)	US$/oz	1011
Unit Mining Cost (LoM)	US$/t mined	2,64
Unit Processing Cost	US$/t milled	8,05
General & Administrative Cost	US$/t milled	5,52
Total Cost per tonne milled	US$/t milled	28,16

Processing operating costs were developed by Lycopodium for the life of mine (LOM) processing schedule developed by Qubeka and Osino. It is expected that the plant will operate on a material blend predominantly consisting of fresh ore but with a maximum of 25% of transitional (oxidized or weathered) ore. Operating cost calculations took this into account.

Processing operating costs have been developed for a plant with an annual throughput equivalent to 5.0 million tonnes of fresh mineralized material plant feed at a P_{80} grind size of 63 µm, based on a 24 hour per day operation, 365 days per year. The plant will operate at the following availabilities:

- 70% (6,132 h/y) – primary, secondary, and tertiary crushing.
- 91% (8,000 h/y) – milling and all subsequent downstream processing plant sections, other than
- 80% (7,008 h/y) for the tailings pressure filtration circuit.

The operating costs have been compiled from a variety of sources, including the following:

- Labour pay-rates and complement developed by Osino, with benchmarking advice from other similar projects provided by Lycopodium and DRA. Pay rates were nominated in US Dollars per year, with housing allowances included.

- Grid power costs as advised by Osino, based on NamPower's published rates in Namibian Dollars.

- Renewable power costs from Dornier Suntrace obtained by competitive budget price quotations from potential independent power producers in US$. The cost estimates include provision for solar power to supply 37% of total demand of the project.

- Consumable and reagent prices were prepared using supplier budget quotations, mostly in US$.

- Modelling by OMC was used in support of crushing and grinding energy and consumables, based on physical mineralized material characteristics determined from comminution testwork for the various mineralized material types.

- Other energy consumption quantity estimates were developed by Lycopodium and DRA, by sizing and selecting all mechanical and major electrical equipment then incorporating data from the preferred vendors to compile overall electrical requirements for the operation.

- Plant reagent consumptions and gold extractions were based on the results from a metallurgical testwork programme, benchmarked against other similar gold recovery operations.

- Vehicle diesel consumption was based on calculations prepared by Qubeka, DRA and Osino.

- Water costs were based on the project expectation that all make-up water will be sourced from limestone aquifer boreholes on site or from open pit dewatering.

- Osino and Knight Piésold applied first principle estimates based on typical operating data and standard industry practice. to calculate Owner's team expenses and TSF operating costs.

1.12 Economic Analysis

Table 1.12.1 presents the annual production schedules as well as the revenues, costs, and cash flows for the Life of Mine. All the Tables and Figures in this sub-section are based on the production charts shown in Sub-section 1.6 above.

Table 1.12.1 Life of Mine Production, Revenue, Cost and Cash Flow Schedule

	Units	Total/Avg.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mining			Pre-strip														
Ore - Oxide & Transitional	kt	**8,580**	729	3,603	1,350	1,157	173	262	56	60	540	437	214				
Ore - Fresh	kt	**55,933**	3	3,961	4,840	4,235	3,940	5,606	5,340	4,821	2,933	5,805	2,722	5,769	5,957		
Ore Tonnes Mined	kt	**64,513**	732	7,564	6,190	5,392	4,113	5,868	5,396	4,881	3,473	6,242	2,936	5,769	5,957		
Ore Grade Mined [1]	g/t	**1.04**	1.00	1.15	1.01	1.09	1.06	1.10	1.00	0.99	0.98	1.07	1.03	0.90	1.00		
Waste Tonnes Mined	kt	**299,072**	6,063	18,589	24,262	28,280	29,467	27,712	27,879	30,247	33,027	27,195	26,183	16,039	4,130		
Total Tonnes Mined	kt	**363,585**	6,795	26,153	30,452	33,672	33,580	33,580	33,275	35,128	36,500	33,437	29,119	21,808	10,087		
Strip Ratio		**4.64**	8.28	2.46	3.92	5.24	7.16	4.72	5.17	6.20	9.51	4.36	8.92	2.78	0.69		
Stockpile Balance (closing)	kt		732	3,241	4,243	4,447	3,373	4,052	4,406	4,278	2,670	3,847	1,751	2,519	3,476		
Stockpile Grade	g/t		1.00	0.83	0.72	0.71	0.68	0.69	0.69	0.68	0.62	0.66	0.56	0.65	0.67		
Processing																	
Plant Feed	kt	**64,513**		5,055	5,188	5,188	5,187	5,189	5,042	5,009	5,081	5,066	5,032	5,000	5,000	3,476	
Feed Grade	g/t	**1.04**		1.34	1.13	1.12	1.01	1.15	1.03	1.00	0.92	1.14	0.92	0.90	1.04	0.67	
Au Produced	koz	**1,979**		198	177	174	156	177	152	149	135	170	135	133	157	66	
Revenue																	
Gold Price	US$/oz	**1,750**		1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	
Gold Sales	US$m	**3,463**		347	309	305	273	309	266	261	237	298	236	233	274	116	
Royalty & Export Levy [2]	US$m	**(139)**		(13.9)	(12.4)	(12.2)	(10.9)	(12.4)	(10.7)	(10.4)	(9.5)	(11.9)	(9.4)	(9.3)	(11.0)	(4.6)	
Selling & Marketing Costs	US$m	**(5)**		(0.5)	(0.5)	(0.5)	(0.4)	(0.5)	(0.4)	(0.4)	(0.4)	(0.5)	(0.4)	(0.4)	(0.4)	(0.2)	
Operating Costs																	
Mining	US$m	**(941)**		(63.8)	(73.9)	(78.9)	(82.0)	(84.6)	(86.4)	(89.4)	(94.7)	(91.7)	(75.9)	(67.3)	(41.0)	(11.8)	
Processing	US$m	**(720)**		(56.4)	(57.4)	(57.4)	(57.4)	(57.4)	(56.3)	(56.1)	(56.6)	(56.5)	(56.3)	(56.0)	(56.0)	(39.9)	
Administration / Fixed / G&A	US$m	**(155)**		(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(9.0)	
Total Cash Operating Cost	US$m	**(1,817)**		(132.4)	(143.6)	(148.6)	(151.7)	(154.3)	(154.8)	(157.6)	(163.5)	(160.4)	(144.3)	(135.4)	(109.2)	(60.7)	
Unit Costs																	
Cash Operating Cost (C1)	US$/oz	**(918)**		(667.5)	(813.3)	(854.0)	(973.9)	(874.0)	(1,017.8)	(1,057.1)	(1,209.2)	(941.3)	(1,070.9)	(1,018.6)	(697.0)	(918.0)	
All-in Sustaining Cost (AISC) [3]	US$/oz	**(1,011)**		(760.0)	(986.5)	(934.1)	(1,123.1)	(952.9)	(1,095.7)	(1,135.2)	(1,287.8)	(1,018.7)	(1,149.5)	(1,097.3)	(769.8)	(990.8)	
Capital Expenditure																	
Project Capex (excl. contingency) [4]	US$m	**(331)**	(331)														
Contingency @ 15%	US$m	**(34)**	(34)														
Sustaining Capex (incl. closure) [5]	US$m			(3.9)	(17.7)	(1.3)	(11.9)	(1.1)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(11.5)	(11.5)	35
Tax Paid	US$m	**(387)**			(4.8)	(7.6)	(36.6)	(52.8)	(37.3)	(34.4)	(23.4)	(46.7)	(30.3)	(32.5)	(53.3)	(14.5)	(13.1)

	Units	Total/Avg.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cash Flow																	
Net Free Cash Flow before Tax	US$m	**1,108**	(365)	207	137	142	98	141	100	93	63	122	82	86	136	32	35
Net Free Cash Flow after Tax	US$m	**721**	(365)	207	132	134	61	88	63	58	39	75	52	54	83	18	22
Discount Factor		**5%**	1.00	0.95	0.91	0.86	0.82	0.78	0.75	0.71	0.68	0.64	0.61	0.58	0.56	0.53	0.51
Discounted Cashflow$_{5\%}$ before Tax	US$m	**742**	(365)	197	124	122	81	111	75	66	42	78	50	50	76	17	18
Discounted Cash Flow$_{5\%}$ after Tax	US$m	**480**	(365)	197	120	116	50	69	47	41	27	48	32	31	46	9	11
Payback Period (post-tax)		**2.2**															
IRR (post-tax)		**33%**															

[1] **Mining dilution and ore loss has been applied to the ore tonnes**

[2] **Namibian Government royalty (3%) and export levy (1%)**

[3] **AISC comprises C1 costs + sustaining capex + royalties + export levies + gold refining, transport & marketing costs**

[4] **The project capex of US$365m includes US18m of mining pre-strip costs plus US$34M contingency (9.8% of total construction capital). US$35m salvage value is accounted for as a credit in the sustaining capital costs.**

[5] **Sustaining capital is estimated based on replacement of vehicles and IT assets + US$25M dry-stack expansion capital from year 4+ US$23M in estimated closure costs – estimated salvage value**

Table 1.12.2 below summarizes the results and key valuation metrics of the DFS on a pre- and post-tax basis.

Table 1.12.2 Definitive Feasibility Study Economic Assessment Summary

	Units	US$1750/oz		US$1950/oz	
		Pre-Tax	Post-Tax	Pre-Tax	Post-Tax
$NPV_{5\%}$	US$m	742	480	1024	656
$IRR_{5\%}$	%	34%	28%	46%	36%
Payback	years	2.2	2.2	1.9	1.9
LOM Cashflow	US$m	1108	721	1488	958

The financial model was completed on a 100% project basis and includes a 3% gross royalty and 1% export levy to the Namibian government. The economic analysis carried out for the Project uses a cash flow model at a base gold price of US$1,750 per ounce gold and a 5% discount rate.

The financial assessment of the Project was carried out on a 100% equity basis, not accounting for potential sources of funding which may include debt. No provisions were made for the effects of inflation, and Osino's understanding of current Namibian tax regulations were applied to assess the tax liabilities.

It should be noted that there is scope for optimization and improvement to the mine design and production schedule which will be reflected together with an updated mineral resource in the next technical assessment of the Project.

Sensitivity Analysis

An after-tax sensitivity analysis to the key project variables was carried out which indicates that the project is most sensitive to a change in grade or gold recovery, as indicated by the slope of the blue line in the diagram below.

The breakeven (NPV=0) is at a gold price of US$1,230/oz and implies that the capital investment is repaid plus a 5% return using a 5% discount rate. The nominal breakeven (sum of undiscounted cashflows = 0) gold price is US$1,167/oz.

The project is most sensitive to changes in gold grade, with every 5% change in gold grade resulting in a change in NPV of around 15%. This is indicated by the slope of the blue line graph in the diagram below, which confirms that the project NPV is most sensitive to changes in the average gold grade.

Figure 1.12.1 Post-Tax Project NPV Sensitivity to Variation in Key Project Parameters at US$1750/oz

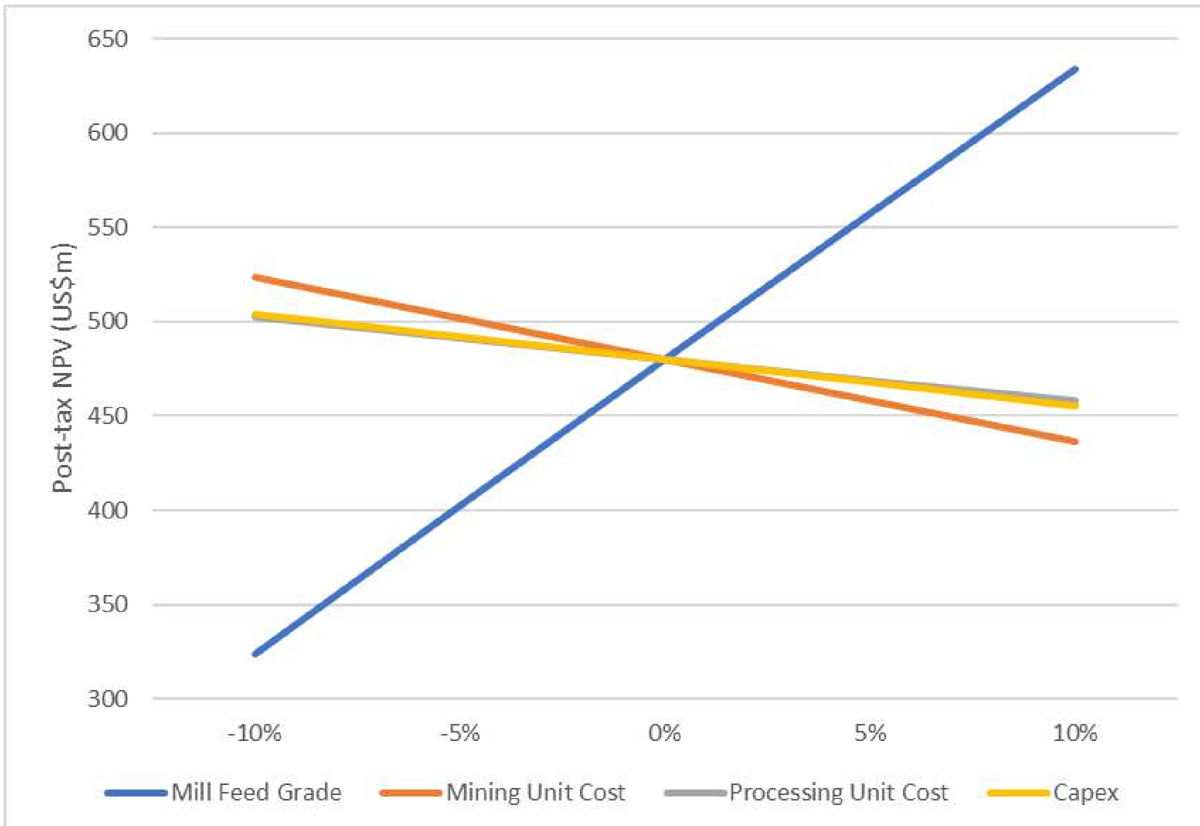


Table 1.12.3 Two-Factor Post-Tax Project BPV Sensitivity Analysis

Discount Rate & Gold Price - Post-Tax $NPV_{5\%}$ Sensitivity							
	1500	1600	1700	1750	1800	1900	2000
5%	256	346	436	480	524	612	700
6%	230	316	401	443	485	568	652
7%	206	288	369	409	449	528	607
8%	183	262	339	377	415	490	565
9%	163	238	312	348	384	456	527
10%	144	216	287	321	355	423	492

Mill Feed Grade & Gold Price - Post-Tax $NPV_{5\%}$ Sensitivity							
	1500	1600	1700	1750	1800	1900	2000
0,93	118	201	283	324	364	445	524
0,99	188	274	360	402	445	529	612
1,04	256	346	436	480	524	612	700
1,09	323	418	511	557	603	696	788
1,14	391	489	586	634	682	779	876

Mining Unit Cost & Gold Price - Post-Tax $NPV_{5\%}$ Sensitivity							
	1500	1600	1700	1750	1800	1900	2000
2,38	300	390	479	523	567	655	743
2,51	278	368	457	502	546	634	722
2,64	256	346	436	480	524	612	700
2,78	234	324	414	458	503	591	679
2,91	211	302	392	437	481	569	657

Processing Cost (Variable) & Gold Price - Post-Tax $NPV_{5\%}$ Sensitivity							
	1500	1600	1700	1750	1800	1900	2000
7,24	278	369	458	502	546	634	722
7,64	267	357	447	491	535	623	711
8,05	256	346	436	480	524	612	700
8,45	244	335	425	469	513	601	689
8,85	233	324	413	458	502	590	678

Construction Capex & Gold Price - Post-Tax $NPV_{5\%}$ Sensitivity							
	1500	1600	1700	1750	1800	1900	2000
329	281	371	460	504	548	636	724
347	269	359	448	492	536	624	712
365	256	346	436	480	524	612	700
384	243	333	423	468	512	600	688
402	230	321	411	456	500	588	676

Table 1.12.4 IRR Sensitivity to Gold Price

IRR Sensitivity to Gold Price							
Discount	1500	1600	1700	1750	1800	1900	2000
5%	16%	21%	26%	28%	30%	34%	38%

1.13 Conclusions and Recommendations

1.13.1 Risks and Opportunities

Risks

The following material risks have been identified by the authors. Additional less significant risks are recorded in Section 25.

- Although not currently evident, environmental, permitting, legal, title, taxation, socio-economic, and political risk issues could potentially affect access, title, or the right to perform the work recommended in this report.
- A key risk, common to all exploration companies, is that the targeted mineralization type may not be discovered, or if discovered, may not be of sufficient grade and/or tonnage to warrant commercial exploitation. The volume of work carried out to date and the Indicated classification of the great majority of the Mineral Resource at the Twin Hills, Clouds and Twin Hills West deposits may have mitigated this risk.
- Some weak geotechnical zones have been identified in cores which are the result of deeper weathering along structures, which requires further investigation to understand their orientation and interaction with the geology and planned pits. Since identifying structures across drillholes is unreliable, deep geophysics should be undertaken to aid in assessing the risks associated with these structures. Once these uncertainties are better understood, the stability of the slopes should be reassessed.
- Opting for a larger mining fleet to cater for the 33 Mtpa total tonnes optimally moved requirement; the 2.5 m selective loading flitch height needs to be revisited. A detailed bench height, smallest mining unit (SMU) and mining dilution study will be performed during the FEED stage.
- The DFS pit design has only one dedicated ramp system going into the Bulge and Twin Hills Central pits, and this needs to be revisited during FEED to compare the possibility of a single ramp access failure versus increased mining costs due to increased stripping ratios with a double ramp system.

- During the pit design stage, the geotechnical catch berms were tapered in when intersected by a ramp to minimize waste stripping. Thus, access to cleaning benches could be hindered, and the overall slope angle could be compromised in these localized pit sectors. This will be addressed during the FEED in close consultation with the geotechnical consultant.

- A key project risk is water supply. In order to mitigate this risk Osino has confirmed the long-term supply potential from the nearby aquifers in limestone formations, has begun investigations to construct a small dam on the nearby ephemeral river, upgrade the Karibib water treatment plant and pump water from there or from the Kranzberg aquifer to site, and has modelled the expected significant quantity of excess pit water after approximately year four of the mining schedule.

- An additional key project risk is the 36 to 48-month NamPower grid power procurement and construction lead time. Once the initial grid power deposit payment under the signed PSA has been made (expected Q4 2022) Osino intends to investigate various alternative options to accelerate the grid power procurement and construction lead time.

- Maintaining pressure filtration performance and availability is a continual operating challenge.

- The ramp up period of three months to nameplate capacity following commissioning and plant handover to Osino might be slightly extended in a plant with a pressure filtration circuit in comparison to the traditional option of tailings thickening and pumping. Experienced operating and maintenance skills are a prerequisite to achieving pressure filtration operating efficiency in a shorter time duration.

- It is possible that dissolved arsenic concentrations in the CIL circuit could eventually increase to a steady state value that may not comply either with gold processing working practices or general health & safety standards. An arsenic removal circuit was investigated during the PFS and could be retrofitted in the plant if related operational challenges are identified following commissioning of the process.

- Stability of filter cake and potential dust generation from the TSF will both need to be investigated further during FEED.

- Damage to the liner and also possible lifting of exposed liner by wind action are both potential risks with significant possible consequences.

Opportunities (also see Section 25)

- There is scope for further mining and processing schedule optimization to be completed in the next project development phase.

- A detailed owner vs contractor mining operating cost trade-off study will be performed during the FEED. The owner cost study will be modelled from first principles supported by requests for quotations from original equipment manufacturers for the supply and service of mining equipment, explosives, tyre, and fuel suppliers.

- Additional metallurgical testwork especially related to the Clouds and Twin Hills West may result in improved overall gold recovery from these specific portions of the ore body.

- Reduction of soluble gold loss from CIL tails using filtration before cyanide detoxification will further reduce soluble gold loss and recover cyanide, both will improve the economics of the operation. If an arsenic removal step is found to be necessary, it could be applied to the filtrate from this step.

- Further investigation of the tailings filtration and conveying steps could also improve operability of these steps if water content of the tailings can be reduced.

- The orientation of the TSF could be changed to take more advantage of site topography, and more work on the TSF design could improve cash flow and reduce overall costs.

- The conceptual pit shell used to report the Mineral Resource to satisfy RPEEE, resulted in the majority of the block model being reported as Mineral Resource. This suggests that undrilled material below the current RPEEE pit shell could potentially satisfy RPEEE requirements and that the deposit is effectively open at depth.

- It is reasonable to expect that most of the remaining Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued infill drilling.

- The on-going brownfields exploration program on the numerous occurrences and targets delineated along the Karibib fault zone suggests the possibility of additional gold resource discoveries along strike from Twin Hills which would result in further resource growth and concomitant improvement in project economics.

1.13.2 Conclusions

The Twin Hills Project DFS still includes some inferred Mineral Resources that are considered too speculative geologically to be categorized as mineral reserves, but a great deal of additional resource drilling and modelling has been done since the preliminary economic analysis was completed in July 2021. A mineral reserve statement has been generated and included in this report which provides confidence in the resource tonnage and grade that have been included in the positive DFS economic assessment of the Project.

Lycopodium's conclusion was that the Twin Hills Gold Project DFS is a low technical risk conventional open pit mine and carbon-in-leach processing facility with a flowsheet which is based on unit operations that are proven in industry.

Commercial gold mining has been established in Southern Africa for over 100 years and Namibia and surrounding countries have varying levels of established mining infrastructure.

Sovereign risk is understood with Osino and its subconsultants having considerable experience in Namibia and in other neighbouring Southern African countries.

Residual environmental risks and the social issues are low and manageable, especially with a neighbouring gold mine within 20 km.

Work undertaken to date is sufficient to support DFS level design and cost estimating. The Project has economic potential at current gold prices. The main techno-economic highlights of the Project are comprised of the following:

- Net present value (NPV) of US$742m (pre-tax) and US$480m (after-tax) at 5% discount rate and US$1750/oz gold price.

- Internal rate of return (IRR) of 34% (pre-tax) and 28% (post-tax) at US$1750/oz gold price with Payback period of 2.2 years.

- 13-year Life-of-Mine (LOM) at 5.0 million tonnes per annum (Mtpa) processing capacity.

- Average annual gold production (first five years) of 176,000 Troy ounces per annum.

- Life of mine gold production of 1.98 million ounces at US$1,011/oz all-in sustaining cost.

- Overall capital cost of US$365 million (including US$18m capitalized pre-strip and US$34m contingency).

- LOM gold processing recovery for the first six years of operation is 93.2% and 92.0% average LOM gold recovery utilising conventional 3-stage crushing, ball milling, gravity gold recovery, pre-oxidation and CIL plus filtration and dry stacked tailings.

- The Project's mineral resource block model uses a cut-off grade of 0.3 g/t Au that resulted in a Measured and Indicated Mineral Resource of 84.3 million tonnes (Mt) at 1.08 g/t Au for a total of 2.94 million Troy Ounces (Moz) and an Inferred Mineral Resource of 7.0 Mt at 1.10 g/t Au for a total of 0.25 Moz.

To summarize, an economic analysis of the mine schedule generated from the DFS resource model has shown financial viability of the Project at a gold price of US$1750/oz, and the sensitivity analysis has demonstrated continued profitability against changes in key Project parameters at different gold prices.

A review of the outcomes of the DFS analysis indicates that the Project is robust and has no fatal flaws, and it is therefore recommended that the Project is progressed to the next stage of project development.

1.13.3 Recommendations

The following high level implementation plan for the Project is currently recommended:

- Commence with a front-end engineering design (FEED) package to commence at the end of the DFS and to be based on the DFS design work. The main objectives of the FEED exercise will be to advance basic engineering designs to the point at which conditional orders for major long lead items can be placed, to obtain certified vendor drawings, to establish the core Project implementation team, to set up the design procedures for Project implementation and to enable preparatory earthworks to commence on site.

- A small Owner's Project team should be appointed by the start of the FEED contract. They will have some responsibilities for coordination of the Project implementation contractors but will also be responsible for planning and beginning the implementation of the Operational Readiness set up activities for the future mine and plant operation.

- As soon as Project Finance is available, preferably by the time the FEED contract is completed, Project implementation will commence. The main Project development contract to put in place will be for design, procurement, and construction of the 5 Mtpa process plant. It is currently intended that this will be a reimbursable EPCM (engineering, procurement, and construction management) contract. The EPCM contractor will be responsible for the delivery of the Project according to the agreed schedule and within the capital cost budget but will work very closely with the Osino's team in this contractual model.

- It is intended that this principle will also be applied to the mine, bulk power supply and site infrastructure to ensure that everything needed for the Project to be commissioned on time is under Osino's overall control.

The following table is a working budget, based on actual costs incurred to date, for the completion of Osino's exploration and infill drill program.

Table 1.13.1 Recommended Budget for Drilling Program

Drill Project	Total Metres	Diamond Drilling m	Reverse Circulation m
Resource infill	9,000	4,000	5,000
Exploration	8,600	4,400	4,200
Project (Hydro, Geotech, Metallurgy, Condemnation)	7,000	2,000	5,000
Total	**24,600**	**10,400**	**14,200**
Drill Project	**Total (C$)**	**Diamond (C$)**	**RC (C$)**
Resource infill	$1,054,000	644,000	410,000
Exploration	$1,052,800	$708,400	$344,400
Project	$732,000	$322,000	$410,000
Total	**$2,838,800**	**$1,674,400**	**$1,164,400**
Unit costs (C$)			
Diamond	$128/m		
RC	$53/m		
Assay	$24/m		
RC consumables	$5/m		
Diamond consumables	$9/m		

The budget for the contemplated front end engineering design (FEED) work is estimated at US$2,080,000, as follows:

Table 1.13.2 Recommended Budget for FEED Work

Item	US$
Resource Evaluation	70,000
Hydrogeology	110,000
Civil Geotechnical Study	100,000
Environmental	80,000
Plant and Infrastructure Design	1,300,000
Mine Planning and Optimization	70,000
Tailings Design	50,000
Metallurgical Testwork	110,000

Item	US$
Operational Readiness Consultancy	100,000
Power and Water Investigations	90,000
Total	**2,080,000**

An approximate cost of US$2,080,000 is estimated for completion of the FEED and other pre-project implementation preparatory work, which together with the US$2,838,800 drilling program will total approximately US$4,918,800.

2.0 INTRODUCTION

2.1 Context, Scope, and Terms of Reference

Lycopodium was commissioned by Osino to prepare this Technical Report for the definitive feasibility study (DFS) on the Twin Hills Gold Project in Namibia, Southern Africa, in accordance with NI 43-101, companion policy 43-101CP, and form 43-101F1. This Technical Report discloses a material change to the project in the form of a first / maiden mineral reserves estimate.

The Twin Hills Gold Project is a gold exploration project situated in central Namibia, 20-55 km along strike east of the 5 Moz Navachab gold mine. The Project was initiated by Osino in late 2016 with a review of the nearby Goldkuppe gold occurrence and regional mapping, structural interpretation, and soil sampling. Follow-up sampling programs, geophysical surveys, and scout drilling led to the discovery of the Twin Hills gold deposit in August 2019. An intense drill program was launched in October 2019 which has resulted in the mineral resources estimate and the mineral reserves estimate reported in this technical report.

The mineral reserves estimate has been prepared in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves as per NI 43-101 requirements.

The effective date of this report is 12 June 2023, and the report is based on technical information known to the authors and Lycopodium at that date.

Osino has reviewed draft copies of this report for factual errors and omissions. Any changes made as a result of these reviews did not include alterations to the interpretations and conclusions made. Therefore, statements and opinions expressed in this document are given in good faith and the belief that such statements and opinions are not false and misleading at the date of this report.

2.2 Cautionary Notes

2.2.1 Independence

The Qualified Persons (QPs) for this report are Mr. Robert Armstrong, Mr. Paul-Johan Aucamp, Ms. Veronique Daigle, Mr. Georgi Doundarov, Ms. Diana Duthe, Mr. Anton Geldenhuys, Mr. Olav Mejia, Mr. Werner Moeller, Mr. Luke Towers, and Mr. Rob Welsh.

Robert Armstrong

Mr. Robert Armstrong is a Principal Consultant and Partner of SRK Consulting (South Africa) (Pty) Ltd. and holds a BSc (Hons) in Mining and Exploration Geology from The University of the Witwatersrand (South Africa). He is a Fellow in good standing of the Geological Society of South Africa, a member in good standing of the South African National Institute of Rock Engineering, a holder of a South African Chamber of Mines Rock Engineering Certificate and a registered Professional Natural Scientist (PrSciNat) with the South African Council for Natural Scientific Professions (SACNASP, membership number 400073/09). He has over 20 years' continuous professional experience in project and operational mining geotechnical studies. He is familiar with NI 43-101 and, by reason of his education, experience, and professional registrations, he fulfils the requirements of an independent Qualified Person as defined in NI 43-101.

Paul-Johan Aucamp

Mr. Aucamp is a Principal Consultant and Partner of SRK Consulting (South Africa) (Pty) Ltd ('SRK Consulting') And a registered Professional Natural Scientist (PrSciNat) with the South African Council for Natural Scientific Professions (SACNASP, membership number 400422/04). He holds and MSc in Engineering and Environmental Geology from The University of Pretoria. He has over 20 years of continuous consulting experience in the field of engineering and environmental geology. He has no material present or contingent interest in the outcome of this report, nor does he have any pecuniary or other interest that could be reasonably regarded as being capable of affecting his independence in the preparation of this report. SRK Consulting has contributed to this report in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent on the results of this report. No member or employee of SRK Consulting is, or is intended to be, a director, officer, or other direct employee of Osino. No member or employee of SRK Consulting has, or has had, any shareholding in Osino. Furthermore, there is no formal agreement between SRK Consulting and Osino as to Osino providing further work for SRK Consulting.

Veronique Daigle

Ms. Veronique Daigle, Pr. Eng. at Knight Piésold Consulting (Pty) Ltd., is an independent Qualified Person (QP) as defined by CIM Definition Standards for Mineral Resources and Mineral Reserves in accordance with NI 43-101. She is responsible for the tailings storage facility and associated capital costs estimates, as well as operating costs. She is a Lead Engineer and Director of Knight Piésold Consulting (Pty) Ltd (Namibia) and registered member of the Engineering Council of Namibia (license number PE2017-19). She is also member in good standing with the South African Committee on Large Dams, the Canadian Dam Association, and the Ordre des Ingénieurs du Quebec, Canada (member no 143 74). She has visited the Project site prior to the initiation of the Definitive Feasibility Study in November 2022; and is familiar with the general lay of land. She has 17 years of continuous experience in tailings, geotechnical engineering and water management employed at Knight Piésold.

Georgi Doundarov

Mr. Georgi Doundarov is Senior Study Manager of Lycopodium Minerals Canada Ltd. based in Mississauga, Canada. He holds a M.Eng. degree in Infrastructure Management and Metallurgy (2005) from Yokohama National University, a MSc degree in Mineral Processing and Metallurgy (1996) and a BSc degree in Mineral Processing (1995) from University of Mining and Geology in Sofia, Bulgaria. He is a member in good standing with the Professional Engineers Ontario (P.Eng. nr. 100107167), Project Management Institute (Project Management Professional nr. 1218345), and the Association for Advancement of Cost Engineering International (Certified Cost Professional nr. 42319). Mr. Doundarov has practiced as an engineer continuously since 1996 and has over 28 years managerial, operations, technical, project, and financial engineering experience globally in mining, mineral processing, and metallurgy. He is familiar with Ni 43-101 and, by reason of his education, experience, and professional registrations, he fulfils the requirements of a Qualified Person as defined in NI 43-101.

Diana Duthe

Ms. Diana Duthe is Lead Hydrogeologist of Knight Piesold Consulting based in Sandton, South Africa. She holds a BSc (Hons) degree in Geology (1985) from the University of Witwatersrand, South Africa and a MSc degree in Hydrogeology (1991) from the University of Neuchatel, Switzerland. She is a member in good standing of the Professional Registration of South African Council for Natural Scientific Professions (PrSciNat nr. 400091/01) and the Groundwater Section of the South African Geological Society. Ms. Duthe has practiced as a scientist continuously since 1985 with over 30 years of consulting experience in the field of geology, geochemistry, and hydrogeology. She is familiar with NI 43-101 and, by reason of her education, experience, and professional registrations, she fulfils the requirements of a Qualified Person as defined in NI 43-101.

Anton Geldenhuys

Mr. Anton Geldenhuys is a Principal Consultant of CSA Global South Africa (Pty) Ltd. and holds a BSc (Hons) Geology degree from Rand Afrikaans University (South Africa) and an MEng from the University of the Witwatersrand (South Africa). He is a member in good standing of the Geological Society of South Africa and a registered Professional Natural Scientist (PrSciNat) with the South African Council for Natural Scientific Professions (SACNASP, membership number 400313/04). He has over 20 years' continuous professional experience in exploration, mineral resource development, and evaluation of mining projects. He is familiar with Ni 43-101 and, by reason of his education, experience, and professional registrations, he fulfils the requirements of a Qualified Person as defined in NI 43-101.

Olav Mejia

Mr. Olav Mejia is a Lycopodium Minerals Canada Ltd (Lycopodium) employee who has no material present or contingent interest in the outcome of this report, nor does he have any pecuniary or other interest that could be reasonably regarded as being capable of affecting his independence in the preparation of this report. Lycopodium has contributed to this report in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent on the results of this report. No member or employee of Lycopodium is, or is intended to be, a director, officer, or other direct employee of Osino. No member or employee of Lycopodium has, or has had, any shareholding in Osino. Furthermore, there is no formal agreement between Lycopodium and Osino as to Osino providing further work for Lycopodium. Mr. Mejia graduated from the University of San Marcos with a B.Eng. degree in Chemical Engineering and a graduate of the University of British Columbia with a MASc degree in Mineral Processing and has 25 years of experience as a chemical engineer and mineral processing engineer since graduation. He is a registered Professional Engineers Ontario (membership number 100602612). He is familiar with NI 43-101 and, by reason of his education, experience, and professional registrations, he fulfils the requirements of an independent Qualified Person as defined in NI 43-101.

Werner Moeller

Mr. Werner Moeller is a Director and Principal Mining Engineering Consultant of Qubeka Mining Consultants CC based in Windhoek, Namibia. He holds a BEng degree in Mining Engineering and a BEng (Hons) degree in Industrial Engineering from the University of Pretoria (South Africa). He is a Fellow of the Australian Institute of Mining and Metallurgy (membership number 329888) and a Member of the South African Institute of Mining and Metallurgy (membership number 704793). Mr Moeller has been practicing his profession continuously since 2002 and has twenty years of mine planning and operations experience across a range of African projects. He is familiar with NI 43-101 and, by reason of education, experience in exploration, mineral resource development, estimation and reporting of ore reserves, evaluation of mining projects and professional registration, he fulfils the requirements of a Qualified Person as defined in NI 43-101. He has been involved with the Project since September 2020.

Luke Towers

Mr. Luke Towers is an associate of Environmental Compliance Consultancy (ECC) a registered professional member of the South African Council for Natural Scientific Professions (Pr.Sci.Nat. nr 114418) and a member of the Groundwater Division of the Geological Society of South Africa (member nr. 8254). He has no material present or contingent interest in the outcome of this report, nor does he have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. Mr. Towers has prepared this report in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent on the results of this report. No member of ECC is or is intended to be, a director, officer, or other direct employee of Osino. No member or employee of ECC has or has had, any shareholding in Osino. Furthermore, there is no formal agreement between ECC and Osino as to Osino providing further work for ECC. He is familiar with NI 43-101 and, by reason of his education, experience, and professional registrations, he fulfils the requirements of an independent Qualified Person as defined in NI 43-101.

Rob Welsh

Mr Rob Welsh is a Senior Project Manager for DRA Projects Pty Ltd of Building 33 Woodlands Office Park, 20 Woodlands Drive, Woodlands, Sandton, 2080, South Africa and 2 Long Street, Cape Town, 8000, South Africa. He holds a BSc Engineering degree in Electrical Engineering from the University of Natal (Durban, South Africa). He is a Senior Member of the Institute of Electrical Engineers (Membership number 5534) and a Professional Engineer in good standing registered with the Engineering Council of South Africa (Registration number 990118). Mr. Welsh has been practicing his profession continuously since 1991 and has 32 years of experience across a range of African projects. He is familiar with NI 43-101 and, by reason of his education, experience, and professional registrations, he fulfils the requirements of an independent Qualified Person as defined in NI 43-101.

2.2.2 Element of Risk

The interpretations and conclusions reached in this report are based on current geological theory and the best evidence available to the authors at the time of writing. It is the nature of all scientific conclusions that they are founded on an assessment of probabilities and, however high these probabilities might be, they make no claim for absolute certainty. Any economic decisions which might be taken based on interpretations or conclusions contained in this report will therefore carry an element of risk.

2.3 Sources of Information

Sources of information for the work conducted are listed in Section 27 (References) and include information provided by Osino. The authors have undertaken their own review of the technical aspects contained in this report. Based on the data supplied by Osino, CSA Global's author has prepared a mineral resource estimate and Lycopodium and other supporting companies' authors have prepared the definitive feasibility study for the Project. The authors have made all reasonable endeavours to confirm the authenticity and completeness of this data.

2.4 Data Conventions

The following units and conventions are used in this technical report:

- Coordinate system: WGS_1984_UTM_Zone_33S.
- Datum: D_WGS_1984.
- Units of measurement: Metric.
- Gold grade: grams per tonne.
- Width of mineralized intersections: Apparent (true widths not known).
- Reported intersections: Unconstrained (contain internal waste).
- Currency: US dollars (US$) and Namibian dollars (N$). The exchange rate used in the report is US$ 1 = N$ 18.5. (Note: The Namibian Dollar [N$] is linked at parity to the South African Rand [ZAR].)

2.5 Qualified Person Property Inspection

A site visit was conducted by the Qualified Person, Mr. Anton Geldenhuys (Principal Resource Consultant at CSA Global), from 28 to 31 March 2021 and 2 February 2022. During the trip, the following sites were visited:

- Operating drill rig in the vicinity of Karibib.
- Core processing facility in Omaruru.
- Actlabs sample preparation facility in Windhoek.
- Osino head office in Windhoek.

Mr. Moeller, Ms Duthe and Mr. Theron visited site on 2 February 2022 and specifically inspected the proposed sites for the open pits, waste rock dumps, stormwater drainage and tailings storage facility.

2.6 Contributing Consultants

Sections of this report were authored or co-authored by the Qualified Persons of the Technical Report (see Section 2.7 below) who supervised others who contributed from Lycopodium, CSA Global, SRK, DRA, Qubeka Mining, Knight Piesold, Environmental Compliance Consultancy and Osino Resources.

Lycopodium has provided engineering and project management services to the international mining industry for over 25 years.

CSA Global is an international firm of Mining Industry Consultants with experience in the mining industry. The South African offices of CSA Global contributed to the geological studies for the Twin Hills Gold Project, which the Qualified Persons listed in Table 2.7.1 supervised and were responsible for.

Qubeka Mining is a mining consulting group based in Namibia. Qubeka contributed to the mining design, which the Qualified Persons listed in Table 2.7.1 supervised and were responsible for.

SRK Consulting based in South Africa completed a DFS level geotechnical study for the mining design, which was supervised by the Qualified Persons listed in Table 2.7.1.

DRA Global based in South Africa completed the non-process infrastructure for the Project. DRA was also responsible for Bulk Grid Power Supply, Alternative Power Supply, Bulk Water Connection to National Infrastructure, Hydrology, Water Balance / Alternative Supply Option, which Qualified Persons listed in Table 2.7.1 supervised and were responsible for.

Knight Piesold Consulting based in South Africa contributed to the geohydrological studies including surface water, groundwater, water balance and water supply, which the Qualified Persons listed in Table 2.7.1. supervised and was responsible for. Knight Piesold were also responsible for the tailings storage portion of the Project, which the Qualified Persons listed in Table 2.7.1 supervised and were responsible for.

Environmental Compliance Consultancy (ECC) an independent environmental consultancy based in Namibia, provided environmental consulting services, which the Qualified Persons listed in Table 2.7.1 supervised and were responsible for.

2.7 Qualified Persons

At the request of Osino, Lycopodium was engaged to prepare this Technical Report for the Project in accordance with NI 43-101 through the authors as qualified persons and specialised consultants. Table 2.7.1 provides a detailed list of qualified persons as defined in Section 1.5 of NI 43-101 and their respective sections of responsibility.

Table 2.7.1 Qualified Persons / Responsibility

Section	Title of Section	Qualified Person
1	**Summary**	
1.1	Property Description, Location and Ownership	Anton Geldenhuys
1.2	Geology and Mineralization	Anton Geldenhuys
1.3	Status of Exploration	Anton Geldenhuys
1.4	Mineral Processing and Metallurgical Testing	Olav Mejia

Section	Title of Section	Qualified Person
1.5	Mineral Resource Estimate	Anton Geldenhuys
1.6	Mineral Reserves and Mine Production Schedule	Werner Moeller
1.7	Process Plant Recovery Methods	Olav Mejia
1.8.1	Process Plant Design and Related Infrastructure	Georgi Doundarov
1.8.2	Non-Process Infrastructure	Rob Welsh
1.9	Tailings Disposal and Surface Water Management	Veronique Daigle
1.10	Environmental Studies, Social Impact and Permitting	Luke Towers
1.11	Capital and Operating Costs	Georgi Doundarov
1.12	Economic Analysis	Georgi Doundarov
1.13	Conclusions and Recommendations	Georgi Doundarov
2	**Introduction**	**Georgi Doundarov**
3	**Reliance on Other Experts**	**Georgi Doundarov**
4	**Property Description and Location**	**Anton Geldenhuys**
5	**Accessibility, Climate, Local Resources, Infrastructure and Physiography**	**Anton Geldenhuys**
6	**History**	**Anton Geldenhuys**
7	**Geological Setting and Mineralization**	
7.1	Regional Geology	Anton Geldenhuys
7.2	Prospect and Local Geology	Anton Geldenhuys
7.3	Regional and Local Hydrogeology	Diana Duthe
7.4	Groundwater Levels and Low	Diana Duthe
7.5	Groundwater Quality	Diana Duthe
8	**Deposit Types**	**Anton Geldenhuys**
9	**Exploration**	**Anton Geldenhuys**
10	**Drilling**	**Anton Geldenhuys**
11	**Sample Preparation, Analyses and Security**	**Anton Geldenhuys**
12	**Data Verification**	
12.1	Mineral Resource Estimate Site Visit	Anton Geldenhuys
12.2	Database Management	Anton Geldenhuys
12.3	Laboratory Inspections	Anton Geldenhuys
12.4	Mining Geotechnical Site Visits	Robert Armstrong
12.5	Mining Reserve Model Data Evaluation	Werner Moeller
12.6	Civils Geotechnical Data Evaluation	Paul-Johan Aucamp
12.7	Tailings Storage Facility Area - Site Visits and Data Evaluation	Veronique Daigle
12.8	Environmental Fieldwork Data	Luke Towers
12.9	Hydrogeological Site Visit and Data Verification	Diana Duthe
12.10	Metallurgical Testing Site Visit and Data Verification	Olav Mejia
12.11	Conclusion	Georgi Doundarov
13	**Mineral Processing and Metallurgical Testing**	**Olav Mejia**
14	**Mineral Resource Estimates**	**Anton Geldenhuys**
15	**Mineral Reserve Estimates**	
15.1	Introduction	Werner Moeller
15.2	Input Assumptions and Broad Mining Strategy	Werner Moeller

Section	Title of Section	Qualified Person
15.3	Geotechnical Study	Robert Armstrong
15.4	Slope Stability Analysis	Robert Armstrong
15.5	Slope Design Recommendations	Robert Armstrong
15.6	Mining Model	Werner Moeller
15.7	Project Licensing Status	Werner Moeller
15.8	Pit Optimization	Werner Moeller
15.9	Pit and Pushback Designs	Werner Moeller
15.10	Mineral Reserve Estimate	Werner Moeller
16	**Mining Methods**	**Werner Moeller**
17	**Recovery Methods**	**Olav Mejia**
18	**Project Infrastructure**	
18.1	Process Plant	Georgi Doundarov
18.2.1	Non Process Infrastructure	Rob Welsh
18.2.2	Site Geotechnical Investigations and Assessment	Paul-Johan Aucamp
18.2.3 to 18.2.10	Non Process Infrastructure	Rob Welsh
18.3	Bulk Services – Power Supply and Distribution	Rob Welsh
18.4	Alternative and Supplementary Renewable Power Supply	Rob Welsh
18.5	Okawayo River Flood Attenuation Measures	Diana Duthe
18.6	Bulk Water Supply – KCA / TR	Diana Duthe
18.7	TSF Including Conveyors- KP / TR / HB	Veronique Daigle
18.8	Composite Liner System	Veronique Daigle
19	**Market Studies and Contracts**	**Georgi Doundarov**
20	**Environmental Studies, Permitting and Social or Community Impact**	**Luke Towers**
21	**Capital and Operating Costs**	**Georgi Doundarov**
22	**Economic Analysis**	**Georgi Doundarov**
23	**Adjacent Properties**	**Anton Geldenhuys**
24	**Other Relevant Data and Information**	**Georgi Doundarov**
25	**Interpretation and Conclusions**	
25.1	Introduction	Georgi Doundarov
25.2	Mineral Resource	Anton Geldenhuys
25.3	Mining	Werner Moeller
25.4	Production Schedule	Werner Moeller
25.5	Mineral Processing and Process Plant	Olav Mejia
25.6	Tailings Disposal and Storage	Veronique Daigle
25.7	Process Plant	Olav Mejia
25.8	Non-Process Infrastructure	Rob Welsh
25.9	Civils Geotechnical	Paul-Johan Aucamp
25.10	Bulk Grid Power Supply	Rob Welsh
25.11	Alternative Power Supply	Rob Welsh
25.12	Ground Water	Diana Duthe

Section	Title of Section	Qualified Person
25.13	Pit Geotech	Robert Armstrong
25.14	Environmental	Luke Towers
25.15	Sustainability	Georgi Doundarov
25.16	Proposed Project Development Plan	Georgi Doundarov
25.17	Overall Interpretation and Conclusions	Georgi Doundarov
25.18	**Risks**	
25.18.1	General Risks	Georgi Doundarov
25.18.2	Exploration and Mineral Resource Risks	Anton Geldenhuys
25.18.3	Minerals Processing and Metallurgy, Process Plant Risks	Olav Mejia
25.18.4	Tailings Storage Facility Risks	Veronique Daigle
25.18.5	Infrastructure Risks	Georgi Doundarov
25.18.6	Civil Geotech Risks	Paul-Johan Aucamp
25.18.7	Surface Water Risks	Diana Duthe
25.18.8	Groundwater Risks	Diana Duthe
25.18.9	Water Balance Risks	Diana Duthe
25.18.10	Pit Geotech Risks	Robert Armstrong
25.18.11	Environmental Risks	Luke Towers
25.18.12	Sustainability Risks	Georgi Doundarov
25.19	**Opportunities**	
25.19.1	Exploration and Mineral Resource Opportunities	Anton Geldenhuys
25.19.2	Mining and Mineral Reserve Opportunities	Werner Moeller
25.19.3	Mineral Processing and Metallurgy, Process Plant Opportunities	Olav Mejia
25.19.4	Tailings Opportunities	Veronique Daigle
25.19.5	Infrastructure Opportunities	Olav Mejia
25.19.6	Groundwater Opportunities	Diana Duthe
25.19.7	Environmental Opportunities	Luke Towers
25.19.8	Sustainability Opportunities	Georgi Doundarov
26	**Recommendations**	
26.1	Exploration	Anton Geldenhuys
26.2	Mineral Resource Estimate	Anton Geldenhuys
26.3	Pit Geotechnical	Robert Armstrong
26.4	Mining	Werner Moeller
26.5	Mineral Processing and Metallurgy, Process Plant Opportunities	Olav Mejia
26.6.1	Process Plant Site Geotechnical Investigations	Paul-Johan Aucamp
26.6.2	Process Plant Engineering	Olav Mejia
26.7	Infrastructure	Rob Welsh
26.8	Hydrological Studies	Rob Welsh
26.9	Sustainability	Georgi Doundarov
26.10	Environmental And Social	Luke Towers
26.11	Rehabilitation and Closure	Luke Towers

Section	Title of Section	Qualified Person
26.12	Next Steps in Project Implementation	Georgi Doundarov
27	**References**	**Georgi Doundarov**

2.8 Effective Date and Declaration

The effective date of this Technical Report is 12 June 2023. There were no material changes to the information on the project between the effective date and the signature date of the Technical Report.

2.9 Units and Currency

Unless stated otherwise, Le Système International d'Unités (SI) units have been used throughout the report (note, that some more commonly used non-metric units have been retained for ease of understanding, e.g. gold tenors are reported in troy ounces in some instances).

Currencies used in the report are US dollars, unless noted otherwise. Conversion rates from local or other currencies to US dollars used in cost estimates or financial analyses are reported in the relevant sections.

2.10 List of Abbreviations

The following terms and abbreviations are used:

°	Degrees
°C	Degrees Celsius
1VD	First vertical derivative
3D	Three dimensional
AA	Atomic Absorption
AACE	Association for the Advancement of Cost Engineering
AAS	Atomic Absorption Spectrometry
ABA	Acid base account
AC	Alternating current
Actlabs	Activation Laboratories Ltd
ADWF	Average dry weather flow
Ai	Abrasion index
AMD	Acid and metalliferous drainage
amsl	Above mean sea level
ANC	Acid neutralising capacity
ARD	Acid Rock Drainage
ASIB	Automatic Sprinkler Inspection Bureau
Au	Gold

Bafex	Bafex Exploration
BBWi	Bond Ball Mill Work Index
BoD	Basis of design
BoE	Basis of estimate
BOQ	Bill of Quantity
BRWi	Bond Rod Mill Work Index
C$	Canadian dollars
CaO	Calcium Oxide
CAPEX	Capital (expenditure) cost estimate
CBR	California Bearing Ratio
CCE	Capital Cost Estimate
CDA	Canadian Dam Association
CIL	Carbon-in-Leach
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
cm	Centimetre(s)
CNWAD	Weak acid dissociable cyanide
COLTO	Committee of Land Transport Officials
CPI	Consumer Price Index
CPN	Critical path network
CRM	Certified Reference Material
CSA Global	CSA Global South Africa (Pty) Ltd
CV	Coefficient of Variation
CWi	Crushing Work index
DC	Direct current
DCF	Discounted cash flow
DD (1)	Diamond drilling
DD (2)	Due diligence
DFS	Definitive Feasibility Study
DR	District Road
DTM	Digital Terrain Model
DWi	Drop Weight Index
EC	Electrical conductivity
ECC (1)	Environmental clearance certificate
ECC (2)	Environmental Compliance Consultancy
ECI	Electrical, control and instrumentation
EDF	Environmental Design Flood
EDGM	Earthquake Design Ground Motion
EL	Elevation
ELL	Electrical load list

EM	Electromagnetic(s)
EMA	Environmental Management Act
EMP	Environmental management plan
EPC	Engineering procurement and construction (fixed price contract)
EPCM	Engineering (design), procurement and construction management
EPFS	Enhanced prefeasibility study
EPL	Exclusive prospecting licence
EPP	Emergency Preparedness Plan
EPRA	Energy and Petroleum Regulatory Authority
ERI	Electrical resistivity imagery
ESG	Environmental, sustainability and governance
ESIA	Environmental and social impact assessment
ESMP	Environmental and social management plan
EV	Earned value
FAO	Food and Agriculture Organisation
FEED	Front end engineering design
FOS	Factor of Safety
FS	Feasibility study
g	Gram(s)
g/cm^3	Grams per cubic centimetre
g/t	Grams per tonne
GA	General arrangement
GDP	Gross domestic product
GISTM	Global industry standard for tailings management
GM	Gram metre
GPS	Global positioning system
GRG	Gravity recoverable gold
ha	Hectare(s)
HAZOP	Hazard and operability (study)
HCN	Hydrogen cyanide (gas)
HOD	Head(s) of department
HPF	High pressure
HPF	High pressure filtration
HSE	Health, safety and environmental
ICMC	International cyanide management code
ICP-MS	Inductively coupled plasma with mass spectroscopy
ICP-OES	Inductively coupled plasma with optical emission spectrometry
ICR	Intensive cyanidation reactor
IDF	Inflow Design Flood

IP	Induced polarisation
IPP	Independent power producer
IRR	Internal rate of return
JKMRC	Julies Kruttschnitt Mineral Research Centre
KFZ	Karibib Fault Zone
kg/t	Kilograms per tonne
kg/t Kilograms per tonne	Kilogram(s)
KLC	Kinetic leach column (test)
km	Kilometres
km^2	Square kilometres
kPag	Knight Piesold
kPag	Kilopascals (gauge)
KTC	Karibib Town Council
kV	Kilovolts
kVA	Kilovolt amps
kW	Kilowatt
L	Litre
LIMS	Laboratory information management system
LOM	Life of mine
LoR	Limit of reporting
m	Metre(s)
MAC-OMS	Mining Association of Canada operating, maintenance and Surveillance (manual)
MAR	Managed aquifer recharge
MASW	Multichannel analysis of surface waves
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MEL	Mechanical equipment list
mg	Milligrams
mm	Millimetres
MME	Ministry of Mines and Energy
Moz	Million ounces
MPA	Maximum potential acidity
MRE	Mineral Resource estimate
MSDS	Material safety data sheet
Mt	Million tonnes
Mtpa	Million tonnes per annum
MVA	Megavolt amps
MW	Megawatts

MWB	Mass and water balance
N$	Namibian dollars
NaCN	Sodium cyanide
NAF	Non-acid forming
NAG	Net acid generation
NAPP	Net acid producing potential
NEHRP	National earthquake hazards reduction program
NHC	National Heritage Council
NI 43-101	National Instrument 43-101 – Standards for Disclosure for Mineral Projects
NMD	Neutral mine drainage
NPR	Neutralization Potential Ratio
NPRA	National Radiation Protection Authority
NPV	Net present value
NRA	Namibian Road Authority
NSC	Noise sensitive receptor
OGEM	Osino Gold Exploration and Mining
OMC	Orway Mineral Consultants
OMS	Operation, Maintenance, and Surveillance
OPEX	Operating (expenditure) cost estimate
ORP	Operational Readiness Plan
Osino	Osino Resources Corporation
P&G	Preliminary and general
P&ID	Piping and instrumentation diagram
PAF	Potentially acid forming
PAG	Potential Acid Generating
PCD	Process control diagram
PDC	Process design criteria
PEA	Preliminary economic assessment
PFD	Process flow diagram
PFS	Prefeasibility study
PGA	Peak Ground Acceleration
PPA	Power purchase agreement
ppb	Parts per billion
PV	photovoltaic
Q20	1 in 20 years flood event
QAQC	Quality assurance / quality control
QP	Qualified person
RAB	Rotary air blast

RACI	Responsible, accountable, consulted and informed (matrix)
RC	Reverse circulation
RE	Renewable Energy
RFQ(P)	Request for quotation (proposal)
ROM	Run of Mine
RPEEE	Reasonable prospects for eventual economic extraction
RTX	Real Time extended
SAG	Semi-autogenous grinding
SANRAL	South African Roads Agency Limited
SANS	South African National Standard
SAPP	South African power pool
SARB	South African Reserve Bank
SFA	Screen fire assay
SGS	SGS South Africa (Pty) Ltd
SMBS	Sodium metabisulphite
SMC	SAG Mill Comminution
SMP	Steelwork, Mechanical Installation, Platework
SMPP	Structural, mechanical, platework and piping
ToR	Terms of reference
tph	Tonnes per hour
TSF	Tailings storage facility
TSM	Towards sustainable mining
UCS	Uniaxial compressive strength
US$	United States of America dollars
VBF	Vacuum belt filter or filtration
WAD	Weak acid dissociable
WBS	Work Breakdown Structure
WIP	Work in progress
WRD	Waste rock dump
XRD	X-ray diffraction

2.11 Glossary

Below are brief descriptions of some terms used in this report. For further information or for terms that are not described here, please refer to internet sources such as Wikipedia (www.wikipedia.org).

AAS	(Atomic absorption spectrometry). Detects elements in either liquid or solid samples through the application of characteristic wavelengths of electromagnetic radiation from a light source.

Accretionary	Mass of sediments and rock fragments which has accumulated by accretion.
Acid (composition)	Siliceous, having a high content of silica (SiO_2).
Aeromagnetic survey	Geophysical survey carried out using a magnetometer aboard or towed behind an aircraft.
Alkaline (composition)	Sodium rich, with a relatively high ratio of alkalis to silica (SiO_2).
Alteration (geological)	Any change in the mineralogical composition of a rock brought about by physical or chemical means.
Amphibolite	Rocks composed mainly of amphibole and plagioclase feldspar, with little or no quartz.
Amphibolite facies	Moderate to high metamorphic facies corresponding to temperatures of 500-800°C and 20-80 kbar (crustal depths of 5-30 km).
Anticline	A fold in a sequence of rock layers in which the older rock layers are found in the centre.
Aqua regia	Acid used to dissolve the noble metals gold and platinum during assaying.
Arsenopyrite	An iron arsenic sulphide with a chemical composition of FeAsS.
Back-arc	Submarine basins associated with island arcs and subduction zones.
Banded iron formation	Distinctive units of sedimentary rock consisting of alternating layers of iron oxides and iron-poor chert.
Batholith	Is a large mass >100 km^2 of intrusive igneous rock.
Blank	A standardized waste sample used for QAQC of assay laboratory processes.
Calcareous	Mostly or partly composed of calcium carbonate.
Calcite	A rock-forming mineral with a chemical formula of $CaCO_3$.
Calcrete	Calcium-rich duricrust.
Calc-silicate	A rock produced by metasomatic alteration of existing rocks in which calcium silicate minerals such as diopside and wollastonite are produced.

Carbon-in-Leach (CIL)	A method of recovering gold and silver from fine ground mineralised material by simultaneous dissolution and adsorption of the precious metals onto fine, activated carbon in an agitated tank of mineralised material solids / solution slurry.
Carbon-in-Pulp (CIP)	An extraction technique for the recovery of gold which has been liberated into a cyanide solution as part of the gold cyanidation process.
Chalcopyrite	A brass-yellow mineral with a chemical composition of $CuFeS_{2.}$
Craton	The stable interior portion of a continent characteristically composed of ancient crystalline basement rock.
Cretaceous	A geological period in the Mesozoic Era from 145.5 - 65.5 million years ago.
CRM	(Certified reference material). A prepared sample with a known concentration of the element of interest.
Cyanidation	A hydrometallurgical technique for extracting gold from low-grade mineralised material.
Deportment	A comprehensive and quantitative mineralogical description.
Dextral fault	Fault with right-lateral strike-parallel displacement component of slip.
Diamond core drilling	Drilling that uses a rotary drill with a diamond drill bit.
Disconformity	A break in a sedimentary sequence that does not involve a difference of inclination between the strata on each side of the break.
Disseminated sulphides	Metal sulphide deposit that consists of clots or patches of sulphides in the country rocks.
Dolomite	An anhydrous carbonate mineral composed of calcium magnesium carbonate, ideally $CaMg(CO_3)_{2.}$
Dolomitic	Descriptive of limestone or marble rich in magnesium carbonate.
Dropstone	Isolated fragments of rock found within finer-grained water-deposited sedimentary rocks.
Electromagnetic Survey	(EM). A geophysical imaging technique that uses the principle of induction to measure the electrical conductivity of the subsurface.

Electrowinning	Also called electroextraction, is the electrodeposition of metals from their mineralized materials that have been put in solution via a process commonly referred to as leaching.
Elution	The process of extracting one material from another by washing with a solvent.
Endemic	Native and restricted to a certain place.
felsic volcanic	Rock with high silica (SiO_2) content from 62 to 78 wt%.
Flood basalt	The result of a giant volcanic eruption or series of eruptions that cover large stretches of land or the ocean floor with basalt lava.
Fold	A stack of originally planar surfaces, such as sedimentary strata, that are bent or curved during permanent deformation.
Fold axial plane	The plane or surface that divides the fold as symmetrically as possible.
Fold axis	The intersection of the axial plane with one of the strata of which the fold is composed.
Gabbro	A coarse-grained, dark-coloured, intrusive igneous rock.
Garnet	A group of silicate minerals.
Glaciogenic	Derived from glaciers (or ice-sheets).
GPS	Global Positioning System.
Granite	A coarse-grained igneous rock composed mostly of quartz, alkali feldspar, and plagioclase.
Gravity Survey	A geophysical imaging technique that measures localised variations in the Earth's gravitational field using a gravity meter.
Greenschist facies	Low to medium metamorphic facies corresponding to temperatures of about 300–500°C and pressures of 3–20 kbar (crustal depths of 8–50 km).
Greenstone	A field term applied to any compact, dark-green, altered, or metamorphosed basic igneous rock.

Greywacke	A variety of sandstone generally characterized by its hardness, dark colour, and poorly sorted angular grains of quartz, feldspar, and small rock fragments or lithic fragments set in a compact, clay-fine matrix.
Grit (rock type)	Sedimentary rock that consists of angular sand-sized grains and small pebbles.
Heap leach	An industrial mining process used to extract precious metals from mineralised material using a series of chemical reactions that absorb specific minerals and re-separate them after their division from other earth materials. The mineralised material is piled in heaps on pads and sprayed with leach solution, which trickles down through the heaps while dissolving the values. The pregnant solution is drained away and taken to precipitation tanks.
HQ (core diameter)	Core with 63.5 mm diameter.
ICP-MS	Inductively coupled plasma mass spectrometry. A type of mass spectrometry that uses plasma to ionize the sample.
ICP-OES	Inductively coupled plasma optical emission spectrometry. A type of spectrometry that used characteristic emission spectra to analyze for elements of interest.
Indicated Mineral Resource	That part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit.
Induced Polarisation	(IP). A geophysical imaging technique used to identify the electrical chargeability of subsurface materials.
Inferred Mineral Resource	That part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity.
Intrusive	Rock formed when magma penetrates existing rock, crystallizes, and solidifies underground to form intrusions, such as batholiths, dikes, or sills.
Isoclinal fold	A fold in sedimentary rocks where the axial surface and limbs slope in the same direction and at approximately the same angle.

I-type granite	A category of granites originating from igneous sources.
Jurassic	The period of the Mesozoic era between the Triassic and the Cretaceous.
Kilowatt	A measure of power - 1,000 watts.
Lineament	Linear feature in a landscape that is an expression of an underlying geological structure such as a fault, fracture, or joint.
Mafic	A silicate mineral or igneous rock rich in magnesium and iron.
Marble	Metamorphosed limestone.
Mass pull	The percentage of the material (mass) sent to a processing method.
Massive sulphide	Metal sulphide mineralised material deposit which consists almost entirely of sulphides.
Meta-sedimentary	A rock of sedimentary origin that has been subjected to metamorphism.
Mixtite	Mixture of clay, pebbles, and boulders deposited by ice sheets.
Modal	Whole-rock chemical composition.
MW megawatt	A measure of power - 1,000,000 watts.
Neoproterozoic	The unit of geologic time from 1,000 million to 541 million years ago.
Orogen	Or orogenic belt develops when a continental plate crumples and is uplifted to form one or more mountain ranges.
Orogenic	Orogenic (mountain-building) belts formed wherever plates converged.
Pan African	A long interval of mountain building, rifting, and reorganization spanning most of the Neoproterozoic Era.
Parasitic fold	A fold of small wavelength and amplitude which usually occurs in a systematic form superimposed on folds of larger wavelength.
Pegmatite	An exceptionally coarse-grained plutonic igneous rock, commonly with the mineralogical composition of granite.

Pelitic	A metamorphosed fine-grained sedimentary rock, i.e. mudstone or siltstone.
Post-tectonic	A process or event which occurs after deformation.
PQ (core diameter)	Core with 85mm diameter.
Pyribole	Any mineral of either the pyroxene or amphibole groups.
Pyrite	A brass-yellow mineral with the chemical composition of iron sulphide (FeS_2).
Pyrrhotite	An iron sulphide mineral with the formula Fe(1-x)S (x = 0 to 0.2).
Quartzite	A hard, non-foliated metamorphic rock that was originally pure quartz sandstone.
RAB drilling	Percussion Rotary Air Blast drilling.
RC drilling	Reverse circulation drilling using a percussion hammer.
Reagent	A substance or mixture for use in chemical analysis.
Riffle splitter	A static and fractional sub-sampling device that can be used for dividing a lot of dry particulate material into two half-lots.
Rifting	The splitting apart of a single tectonic plate into two or more tectonic plates separated by divergent plate boundaries.
Ring complex	An association of intrusive rocks in the form of ring-dykes, cone and roof-sheets, plugs, and linear dyke swarms.
Riparian	Situated on the banks of a river
Saddle reef	A mineral deposit associated with the crest of an anticlinal fold and following the bedding planes.
Schist	A medium-grade metamorphic rock formed from mudstone or shale.
Selvage	A zone of altered rock at the edge of a rock mass.
Sericite	A common alteration mineral of orthoclase or plagioclase feldspars in areas that have been subjected to hydrothermal alteration.

Sheath fold	Closed folds, resembling sheaths or a sock, former in high-strain environments.
Siliciclastic	Clastic noncarbonate sedimentary rocks that are almost exclusively silica-bearing.
Silicification	A process in which the original minerals of a rock become replaced by silicate minerals.
Skarn	Hard, coarse-grained metamorphic rocks that form by a process called metasomatism.
Sparging	Gas flushing in metallurgy, a technique in which a gas is bubbled through a liquid in order to remove other dissolved gas(es) and/or dissolved volatile liquid(s) from that liquid.
Sulphide	A group of compounds of sulphur with one or more metals.
Suture zone	A linear belt of intense deformation, where distinct terranes, or tectonic units with different plate tectonic, metamorphic, and paleogeographic histories join together.
Syncline	A fold in a sequence of rock layers in which the younger rock layers are found in the centre.
Syn-tectonic	A geologic process or event occurring during any kind of tectonic activity, or of a rock or feature so formed.
Tailings	Materials left over after the process of separating the valuable fraction from the uneconomic fraction (gangue) of a mineralised material.
Thrust	A fault is a break in the earth's crust, across which older rocks are pushed above younger rocks.
Turbidite	The geologic deposit of a turbidity current, which is a type of amalgamation of fluidal and sediment gravity flow responsible for distributing vast amounts of clastic sediment into the deep ocean.
Variogram	A description of the spatial continuity of the data.

3.0 RELIANCE ON OTHER EXPERTS

This Technical Report was prepared by Lycopodium Minerals Canada Ltd. (LMC), DRA, CSA Global, Knight Piesold, Qubeka, SRK and Environmental Compliance Consultancy under the supervision of the authors of the Technical Report who are qualified persons (QPs) pursuant to NI 43-101 for Osino. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to the QPs at the time of this Report.
- Assumptions and conditions as set forth in this Report.
- Data, reports, and opinions supplied by Osino and other third party sources referred to in the References section of this Report.

In preparing this Report, the QPs have fully relied upon certain work, opinions and statements of experts concerning legal, political, environmental, or tax matters relating to the Project. The authors consider the reliance on other experts, as described in this section, as being reasonable based on their knowledge, experience, and qualifications. The following professional advisors have been retained by Osino to prepare various reports for the Project and have been relied upon in preparation of this Technical Report. The advisors and their involvement are listed as follows:

- Lorentz Angula Inc., a law firm qualified to practise law in Namibia, provided a title opinion dated as of 8 November, 2022 in connection with a US$15 million credit facility for Osino, which concluded that subsidiaries of Osino as listed in Table 4.2.1 (collectively, the 'Namibian subsidiaries') are validly existing and in good standing and owned directly or indirectly as described in Figure 4.2.1 by Osino Mining Investments Ltd., the Mauritius subsidiary of Osino (the 'Mauritius Subsidiary'), and by way of inspection of EPLs the QPs confirmed the EPLs owned by the Namibian Subsidiaries as listed in Table 4.2.1 and although several EPLs are due to imminently expire they are subject to renewal, and the Namibian Subsidiaries are compliant with the requirements for renewal, which information is relied upon for Section 4 (Property Description and Location) and the relevant parts of Section 1 (Summary).
- Appleby, a law firm qualified to practise law in Mauritius, provided a corporate title opinion dated as of 8 November 2022 in connection with a US$15 million credit facility for Osino confirming that the Mauritius Subsidiary, Osino Mining Investments Ltd., is validly existing and in good standing and is 100% owned by Osino's wholly-owned subsidiary, Osino Holdings Corp., and is relied upon for Section 4 and the relevant parts of Section 1.
- Boughton Law Corporation, a law firm licensed to practice law in British Columbia, Canada, provided a corporate title opinion dated as of 6 September 2022 confirming that Osino Holdings Corp. is validly existing and in good standing and is 100% owned by Osino, which is validly existing and in good standing., and is relied upon for Section 4 and the relevant parts of Section 1.

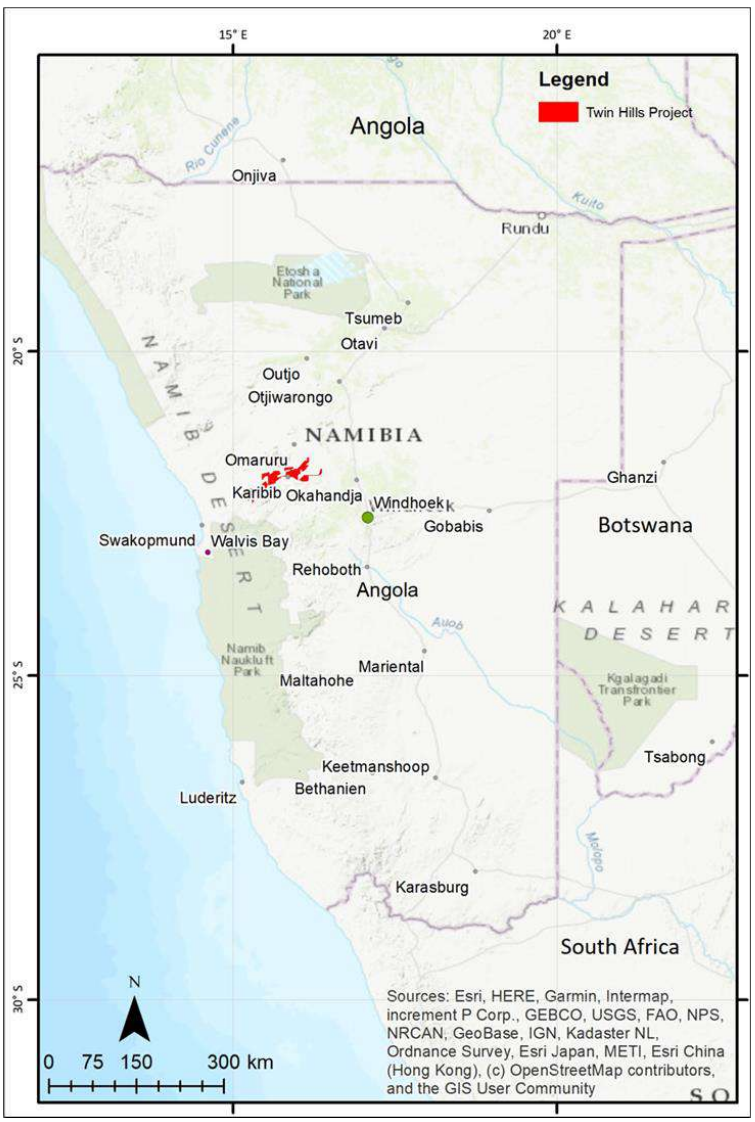
The QPs believe the information provided by the third parties to be reliable, but cannot guarantee the accuracy of conclusions, opinions or estimates that rely on such third-party sources for information that is outside their area of technical expertise. This Report is intended to be used by Osino as a Technical Report for Canadian securities regulatory authorities pursuant to applicable Canadian provincial securities laws.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 Location of Property

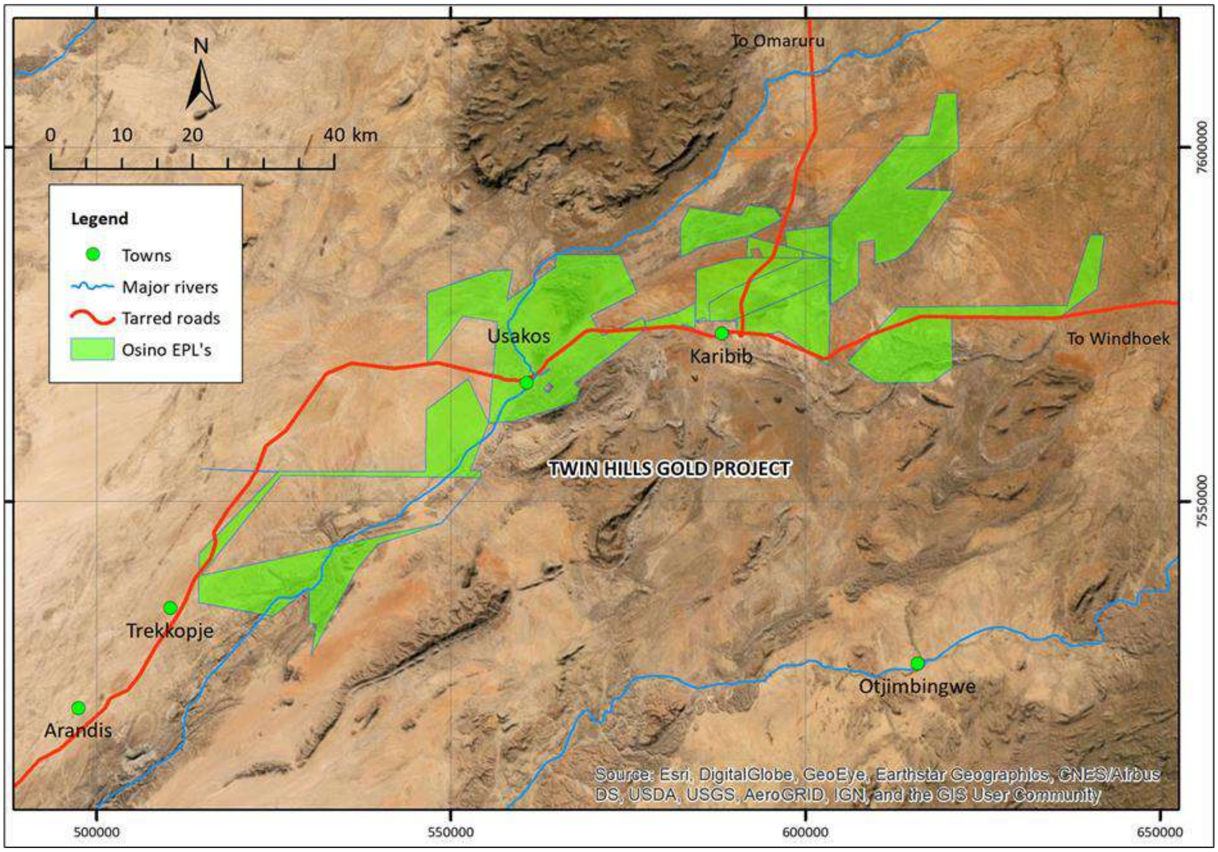
The Project is located in central Namibia approximately 150 km northwest of the capital city of Namibia, Windhoek (Figure 4.1.1). The Project covers an area of approximately 153,658 ha in and around the regional towns and settlements of Usakos, Karibib, Omaruru and Wilhelmstal in the Erongo region of Namibia (Figure 4.1.2).

Figure 4.1.1 Project Location Map



Source: Global

Figure 4.1.2 Location of the EPLs Which Make Up the Twin Hills Gold Project Area (UTM33S-WGSS84)



4.2 Mineral Tenure

4.2.1 Overview of Namibian Mineral Law

Mineral rights in Namibia are currently administered in terms of the Minerals Act of 1992 (Namibia). This Act stipulates that the rights in relation to the reconnaissance or prospecting for, the mining and sale or disposal of, and the exercise of control over, any mineral or group of minerals vests, notwithstanding any right of ownership of any person in relation to any land in, on or under which any such mineral or group of minerals is found, in the State. The following types of licences are granted by the State:

- Non-Exclusive Prospecting Licences.
- Mining Claims.
- Reconnaissance Licences.

- Exclusive Prospecting Licences (EPL).
- Mineral Deposit Retention Licences.
- Mining Licences.

The duration of the EPLs are normally three years maximum, and as may be determined by the Minister at the time of granting of such licences. Further periods can be renewed, but not exceeding two years at a time. According to the Minerals Act, EPLs shall not be renewed on more than two occasions, unless the Minister deems it desirable in the interest of the development of the mineral resources of Namibia that an EPL be renewed in any particular case on a third or subsequent occasion.

The requirements for renewal of EPLs are as follows:

- Renewal applications will be made not later than 90 days before the date on which such licence will expire.
- 25% of the licence area needs to be relinquished with every renewal application. A motivation needs to accompany the application if this requirement is not met, and it will be to the Minister's discretion to approve such a licence.
- Renewal applications must be accompanied by a geological report in duplicate prepared in respect of the immediately preceding period of such a licence, detailing all the exploration work undertaken, including reporting results of all these studies and expenditures incurred. Proposed future work on the licences must also be included.

4.2.2 Project Tenure

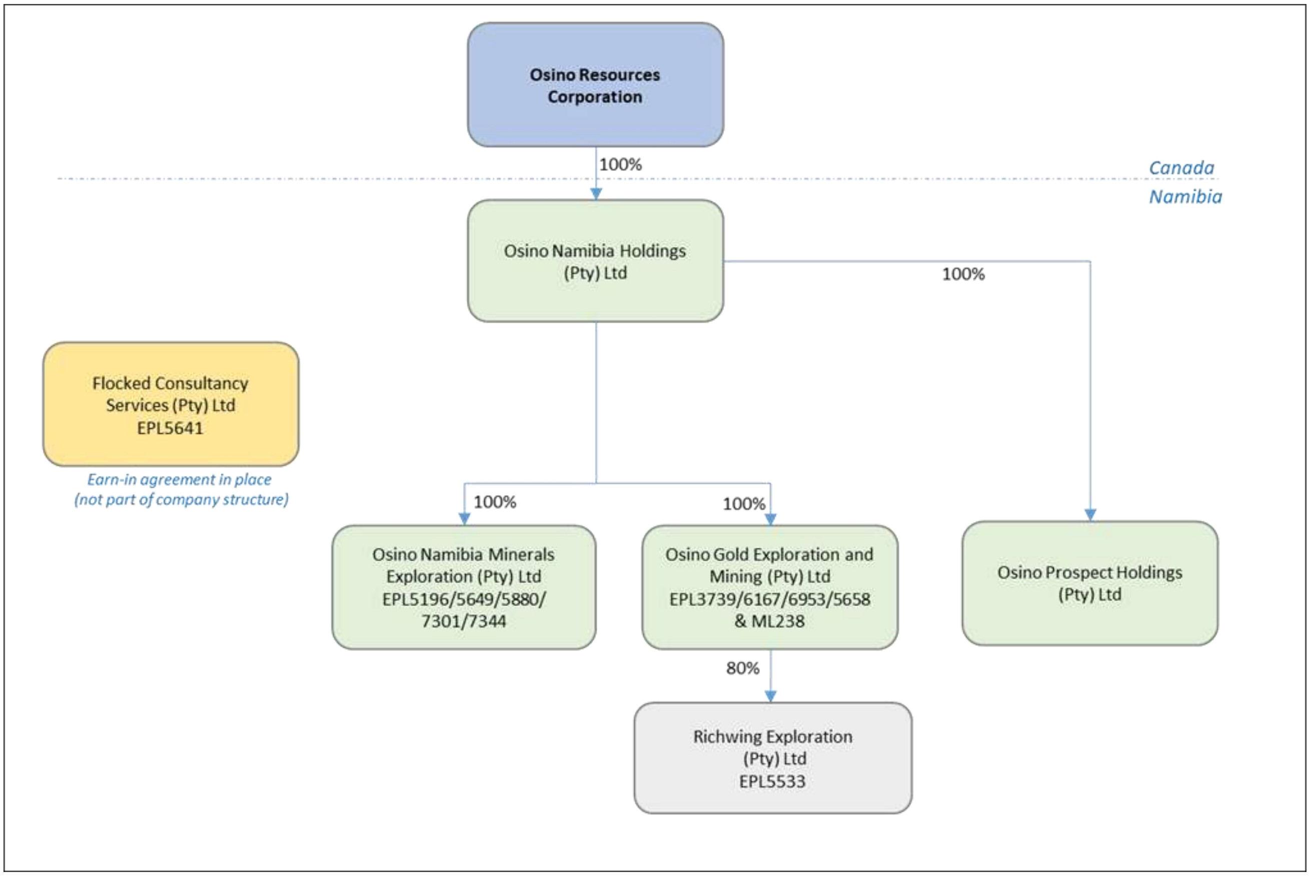
Osino, through various locally held and majority-owned subsidiaries, holds 11 EPLs, including an earn-in agreement to acquire a majority interest in EPL 5641 in central Namibia. These 11 EPLs cover a surface area of 151,551.93 ha which make up the Twin Hills Gold Project (Table 4.2.1). EPL 7426 and EPL 7427 (which were previously included in the list of EPLs) were merged with EPL 5196, increasing the size of this license from 2,062.89 ha to 2,197.13 ha. The Mining License (ML238) that was lodged on 25 August 2021 and which overlaps most of the EPLs on Table 4.2.1 was approved for 20 years. The relationship of the various subsidiaries, in relation to Osino, is shown in Figure 4.2.1.

Table 4.2.1 Details of the Active ML and 11 EPLs that Constitute the Project

EPL	Osino subsidiary (% owned)	Date (from)	Date (to)	Area (ha)	Comments
ML238	Osino Gold Exploration and Mining (Pty) Ltd (100%)	3 Nov 2022	2 Nov 2042	6,209.27	
EPL 3739	Osino Gold Exploration and Mining (Pty) Ltd	11 Sep 2007	15 Aug 2023	22,235.61	

EPL	Osino subsidiary (% owned)	Date (from)	Date (to)	Area (ha)	Comments
	(100%)				
EPL 5196	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	9 Apr 2014	8 Apr 2023	2,197.13	Renewal submitted
EPL 5533	Richwing Exploration (Pty) Ltd (Osino 80%)	4 Feb 2014	17 Oct 2023	17,503.82	
EPL 5641	Flocked Consultancy Services (Pty) Ltd (Osino 51%)	17 Oct 2016	19 Jul 2022	5,667.07	Renewal submitted
EPL 5649	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	30 Sep 2014	27 Jan 2024	1,304.66	
EPL 5658	Osino Gold Exploration and Mining (Pty) Ltd (100%)	23 Sep 2014	19 Oct 2022	19,905.80	Renewal submitted
EPL 5880	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	4 Oct 2016	21 Nov 2023	39,589.19	
EPL 6167	Osino Gold Exploration and Mining (Pty) Ltd (100%)	23 Feb 2017	21 Nov 2024	1,422.39	
EPL 6953	Osino Gold Exploration and Mining (Pty) Ltd (100%)	13 Jun 2018	12 Jun 2023	513.92	Renewal submitted
EPL 7301	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	13 Aug 2019	21 Nov 2024	12,911.80	
EPL 7344	Osino Namibia Minerals Exploration (Pty) Ltd (100%)	13 Aug 2019	12 Aug 2022	29,957.96	Renewal submitted

Figure 4.2.1 Relationship of Local Subsidiaries to Osino



Source: Osino

4.3 Tenure Agreements and Encumbrances

The right to the EPL is administered by the State of Namibia in terms of the approved Exploration Plan provided on the application for the original EPL or the most recent renewal application of the EPL. The EPL expires on the date as stated in Table 4.2.1 unless an application has been lodged for a renewal or mining licence. The licenses are valid, and activities can carry on once a renewal is submitted. Licenses are renewed as long as adequate expenditure is undertaken on exploration activities, which are in line with committed exploration programme submitted to the ministry.

4.3.1 Surface Rights, Legal Access

Surface rights in the Project area all belong to either private freehold farm owners or the Government of Namibia. Osino does not own or hold any title to the surface rights of any land in the area.

To gain access to all farmland within the Project area, Osino is required to enter into written land access agreements with each individual farm owner. In general, a compensation fee is paid to the landowner as compensation for exploration activities on the specific farm. Compensation generally ranges between N$1,000 and N$10,000 (C$87 and C$870) per month for the farm access agreements currently in place.

Table 4.3.1 shows a summary of the land access agreements currently in place, which provide access to the relevant farms listed, and where they are relative to specific target areas or areas of interest within the Project area. The farms to which Osino has signed access agreements represent approximately 80% of the primary areas of interest within the Project at the time of this report.

There are no other significant royalties, payments or agreements or risks that may affect access, title, or the right or ability to perform exploration work on the Project.

Table 4.3.1 Farm Access Agreement

Farm name	General terms (see notes below)	EPL	Targets / Areas of interest
Dobbelsberg	Access granted (1)	3739, 5658	Dobbelsberg and Puff Adder
Twinhill	Access granted (1)	3739	Twin Hills East (Courser)/KFZ
Okawayo	Access granted (1)	3739, 5658, 6953, 6167	Twin Hills Central/West, Clouds, Barking Dog
Otjimbojo West	Access granted (1)	3739	OJW/KFZ
Otjimbojo Ost	Access granted (5)	3739	Goldkuppe, Calidus, Oasis, Wedge, Dropstone
Klein Okawayo	Access granted (1)	3739, 5117, 5196	North Contact, North Bend
Rheinsheim	Access granted (5)	3739	Okapawe/KFZ
Ovikenga	Access agreement unlikely to be needed (4)	3739	
Omapyu Sud I	Access granted (5)	3739	North End, Bulls Eye
Omapyu Sud II	Access granted (1)	3739	
Otjakatjongo	Access granted (1)	3739	Goldkuppe, Dead Oryx, Spang
Wag 'n Bietjie	Access granted (5)	3739	
Noitgedag	Access granted (5)	3739	
Neubrunn	Access granted (5)	3739, 5533	KFZ
Albrechtshöhe	Access granted (5)	5533	Cheshire Cat, B1, Leatherman
Okakoara	Access granted (5)	5533	Dobbels South
Okatji	Access granted (1)	5533, 5658	Dobbels South
Karlsbrunn	Access granted (5)	5533	
Karibib	Access granted (1)	5658, 5649	Dobbels West

Farm name	General terms (see notes below)	EPL	Targets / Areas of interest
Beenbreek, Daheim, Spes Bona	Access granted (1)	5658, 5196	Kuiseb Deeps
Kranzberg South and North	Access granted (5)	5880	
Klein Aukas	Access granted (1)	5880	Klein Aukas

General terms and notes:

(1) Access agreements in place, monthly compensation paid only when active on the farm.

(2) Access agreements in place, monthly compensation paid monthly while relevant EPL(s) are valid.

(3) Access agreements being negotiated; permission to work is likely in following three months (none fit this description at present).

(4) Access agreement negotiations yet to begin or unlikely to be needed.

(5) Access granted, agreement has expired and will require renewal if access is needed again. Renewal expected without delays with the same or similar conditions.

4.4 Environmental Risks, Liabilities and Permitting

The QP has not conducted a detailed review of environmental risks, liabilities or permitting requirements, either current or potential, associated with the Project and has relied on representations provided by Osino and its consultants (Environmental Clearance Consultancy) pertaining to these matters. Permits are in place to carry out exploration on all the EPLs that make up the Project. In addition to the EPL documentation and related permits, which grant the right to explore for the relevant commodities, Osino is also required to enter Environmental Contracts for each EPL with the Ministry of Environment Forestry and Tourism (MEFT). This contract is concluded when the MEFT issues an Environmental Clearance Certificate (ECC) for each EPL granted to Osino. For drilling to take place, a 'Notice of Intention to Drill' is submitted to the Ministry of Mines and Energy (MME) in advance of drilling.

Environmental Clearance Certificates have been granted for all the EPLs which make up the Project. The Environmental Clearance Certificate is granted after submission to the MEFT of a scoping study and environmental impact assessment for the planned exploration activities on the relevant EPLs. The Project and its constituent 13 EPLs have no recognized environmental liabilities, and to maintain good standing, Osino must submit environmental progress reports every six months documenting work carried out, any environmental impact, and remedial actions and rehabilitation carried out.

Osino has standard operating procedures, which adhere to environmental rehabilitation related to exploration programs including rehabilitation of drill sites, pits, and trenches.

4.4.1 Environmental Risk Assessment

Environmental Compliance Consultancy (ECC) has completed an ESIA and EMP on the biophysical and socio-economic issues likely to be encountered in the Project area (ECC, 2022). A stakeholder engagement process was also completed as part of the ESIA and the full report and application was submitted on 9 March 2022 to the MEFT. The MEFT have completed the review of the ESIA and EMP and granted the Environmental Clearance Certificate on 3 November 2022 with standard conditions including a 'chance finds' clause. No significant environmental project impacts have been identified to date or potential impacts that may be of consequence to the Project in its transition from exploration to full-scale mining. Four grave sites were identified in the Twin Hills pit location, which were not previously known about during the baseline studies. The graves will need to be relocated before mining activities can commence in the area and Osino is in consultation with the family descendants about the specific requirements for the relocation.

The environmental risk assessment evaluated potential issues for the project and provides potential mitigation measures. It was determined that the Okawayo Stream will be diverted around the Twin Hills Central pit, and alternatives including an impact assessment were included in the ESIA. The size of the proposed mine footprint should be restricted as early as possible, and strict access control and monitoring measures must be implemented before and during construction and operational phases, as well as during the closure phases.

Stakeholder Engagement

Public perception of the Project is expected to be mixed, but no significant opposition is anticipated from the currently identified interested and affected parties. A stakeholder engagement process was completed as part of the ESIA with meetings held in Karibib, Omaruru and Windhoek. An invitation was sent to a comprehensive list of known stakeholders, and the meetings were advertised by published notices as well as advertisements in local and national newspapers. Project presentations were made to all the attendees at each of these meetings and stakeholders were invited to give their comments and views on the Project.

Important stakeholders include the landowners that are directly and indirectly affected by the Project and its associated linear infrastructure corridors. In particular, the landowners affected by water utilization and changes to the local river flows, and those affected by the proposed road diversion, have been consulted and continued consultation is planned. Ongoing focus meetings will be held with directly affected stakeholders.

There are minerals claims for dimension stone held over some parts of the Project area, namely Marble Ridge, and Osino is currently negotiating with the owners to achieve an amicable working relationship. Cognisance should be taken of the cumulative and joint liabilities for long-term remediation and rehabilitation.

The Karibib Air Force base, in proximity to the planned mine, is unique to this project, and security issues and civil aviation requirements must be taken into consideration during the mine site layout planning and positioning of tall infrastructure.

Significant Impacts Identified

The most significant potential environmental impacts identified were:

- Impact on riparian vegetation from the river courses affected by the Project.
- Surface water and local aquifer water impacts arising from the river diversion.
- Impacts on road users and farms with road diversion.
- Impacts on endemic biodiversity species.
- Visual impacts on the sense of place (from B2 and Erongo Mountain).
- Cumulative dust impacts from earthworks, blasting, crushing, haul roads, the tailings storage facility, and neighbouring quarries.
- Groundwater impacts from drawdown created by the open pits, and possible seepage from the tailings storage facility and waste rock dump.
- Social impacts on nearby towns during construction, during operations, and after closure.

The site is part of a relatively sensitive area of biodiversity, and detailed studies have been completed to verify the extent and impact of the Project development.

4.4.2 Environmental Permits and Legal Requirements

The Environmental Management Act, No. 7 of 2007 (EM Act) and its associated regulations guide the environmental and social assessment processes in Namibia. A scoping study is done as a first step toward developing the full ESIA report and which allowed for wide public consultation and information gathering, to ensure that the most applicable aspects and associated impacts were identified for the ESIA.

The EM Act also stipulates that an Environmental Clearance Certificate is required to undertake any of the listed activities identified in the act and its associated regulations. While these have been granted for the EPLs, development of the Project required the new Environmental Clearance Certificate.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Topography, Elevation and Vegetation

The Project area is located in arid to semi-arid shrubland in the southwest, with a gradational change to arid savannah and mixed woodland in the northeast. Relief is moderate with elevation ranging from approximately 900 m above sea level in the southwest to 1,500 m above sea level in the northeast. The significant hills are generally associated with marble outcrops and granitic plugs above subdued plains. The area in general supports dryland cattle ranching and game-farming as the principal agricultural activities.

5.2 Access to Property

The Project areas are accessible via Namibia's extensive sealed and well-maintained secondary gravel road networks (Figure 4.1.2). Generally, travel time from Windhoek to the Project, which is approximately 150 km northwest of Windhoek, is between three and four hours by road. Within the Project area, access is provided on a series of gravel roads and cross-country four-wheel drive tracks. As noted above, (Table 4.3.2) shows a summary of the land access agreements currently in place, which provide access to approximately 80% of the main areas of interest within the Project at the time of this report, which is presently sufficient for exploration and potential mining operations. The QP is not aware of other significant risks that may affect the Company's access, title, or the right or ability to perform exploration work on the Project.

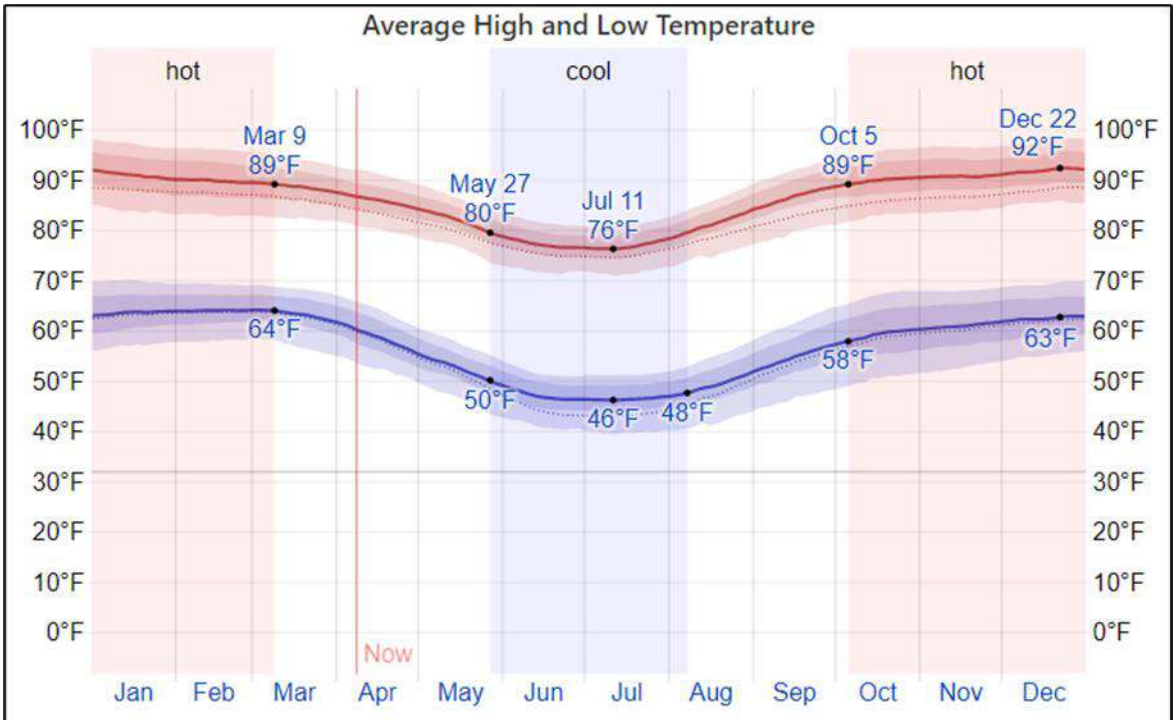
5.3 Climate

The coldest temperatures typically occur in the winter months between the beginning of June and the end of August. Minimum temperatures are commonly below 0°C, but generally in the range between 5°C and 25°C (41°F and 77°F) in winter. The highest temperatures occur in summer between late October and the end March when average temperatures range between 20°C and 35°C (68°F and 95°F) (Figure 5.3.1).

Rainfall varies across the country from southwest to northeast, with average annual rainfall of approximately 239 mm per year (nine inches) in the Karibib area (www.en.climate-data.org). Most rainfall is associated with short, but intense thunderstorms. During the rainy season from November to March, many of the ephemeral river's flow for short periods (hours) or even months (Figure 5.3.2). Major rivers within the Project area include the Khan River, located in the southwest of the Project area, the Omaruru River which flows through the town of Omaruru, and the Ugab River in the north. All three of these rivers drain southwest towards the Atlantic coastline.

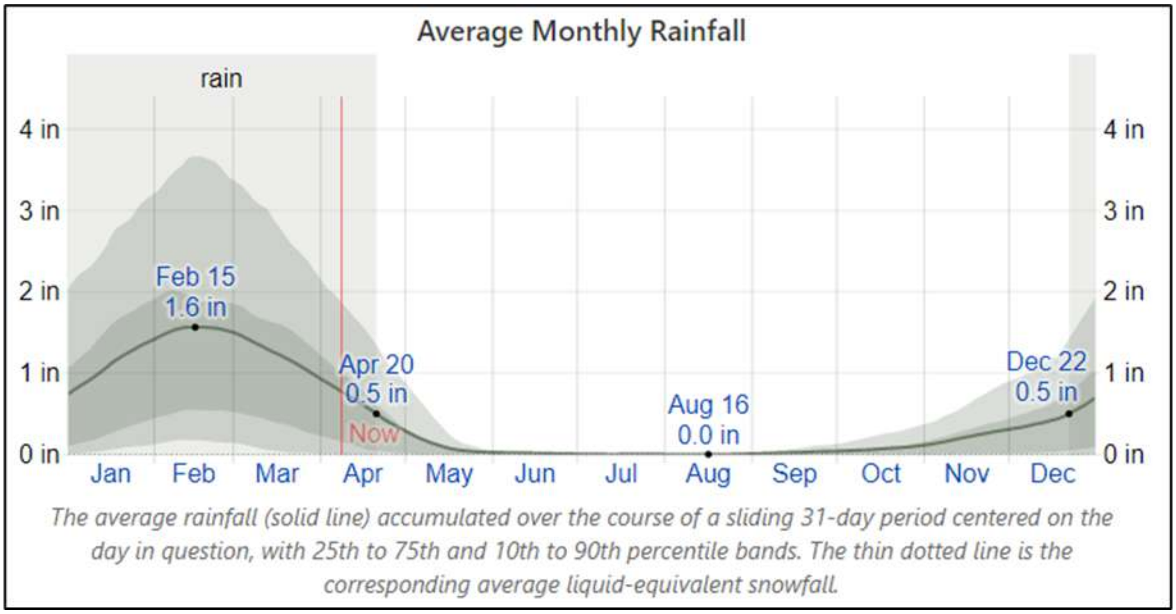
The climate is not an impediment to exploration in the Project area, except for difficult road access conditions during the peak rainfall periods in certain areas or minor disruptions related to thunderstorms. Mineral exploration activities are possible year-round.

Figure 5.3.1 Annual Temperature Variation at Karibib



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

Figure 5.3.2 Annual Rainfall Variatin at Karibib



5.4 Infrastructure

Namibia is a country with a long and successful mining, exploration, and project development history. Skilled workers may be contracted out from smaller regional centres or the capital city of Windhoek, located less than a four-hour drive from the Project area.

Windhoek has a population of 430,000 based on a 2020 census and includes a sufficient source of potential labour for the Project's mining personnel requirements.

Several regional towns and settlements are located close to the Project, including Karibib in the southwest and Omaruru in the northeast, which could provide an additional source of suitable labour.

5.4.1 Sources of Power

Electrical power is readily available from NamPower in the Project area, and the current strategy will be for plant power to be sourced from the national grid. A power supply agreement (PSA) has been signed with NamPower to supply a load connection to the Project with 16 MW of power based on the PEA plant design. An application to upgrade the PSA to a 30MW supply has been submitted to NamPower. The Navachab gold mine is currently linked to the grid by 66 kV transmission at Karibib. The proposed Twin Hills plant site would require a 20.1 km transmission line from the proposed Erongo substation which is planned to be built near Karibib. Further studies have confirmed the viability of solar power options to be integrated into a hybrid system which are presented in the infrastructure section of this report along with the grid power supply connection strategy.

5.4.2 Water

Surface Water

As part of the surface water appraisal, SLR consultancy has completed a preliminary assessment of the sand storage dams which have been evaluated a position along the Khan River to the north of the Project area. A sand storage dam consists of a weir-type structure placed across an ephemeral watercourse, behind which layers of sand are deposited by successive floods. Potential dam yield was also calculated by considering numerous parameters that influence the inflow yield of a dam. This is seen as upside potential to water supply to the mine and is presented in Section 24 of this report.

The Project is located within the greater Khan River catchment area. The catchment area is approximately 8,400 km2 (SLR, 2020) in size. Locally, the Okawajo River catchment area, in which the Project is located, is 92 km2 (KP, 2021a) and is approximately 1% of the total Khan River catchment area. The preliminary model predicted flow volumes into the open pit and volumes to be used by the mine, which approximated 25% of the model's domain budget and equates to less than 0.25% of the Khan River catchment. It is therefore anticipated that the mine workings will have a low risk of impact on the Khan River flow volume and will therefore not be listed as a receptor.

The water channel that runs through the proposed mine boundary is predominantly dry and is only fed by direct precipitation and flash floods. There is assumed to be no groundwater baseflow to the Okawajo River in this area, but likely along portions of the Khan River to the northwest. The vegetation in the region includes scrubs and small trees which are assumed to receive water through direct recharge.

5.4.3 Conceptual Site Layout

The area surrounding the Twin Hills Central (THC) and Clouds open pits has relatively flat topography to the east and west of the Okawayo River course. Waste rock dump (WRD) locations exist in the footwall and hanging wall of both pits providing a flexible waste rock dumping strategy through the course of the mine life (Figure 5.4.1).

The plant site location is situated to the north of the THC open pit in an area of flat ground covered by Kalahari sands. The open area designated for the plant site is situated optimally for the transportation of majority of the ore tonnes to be mined from the THC open pit.

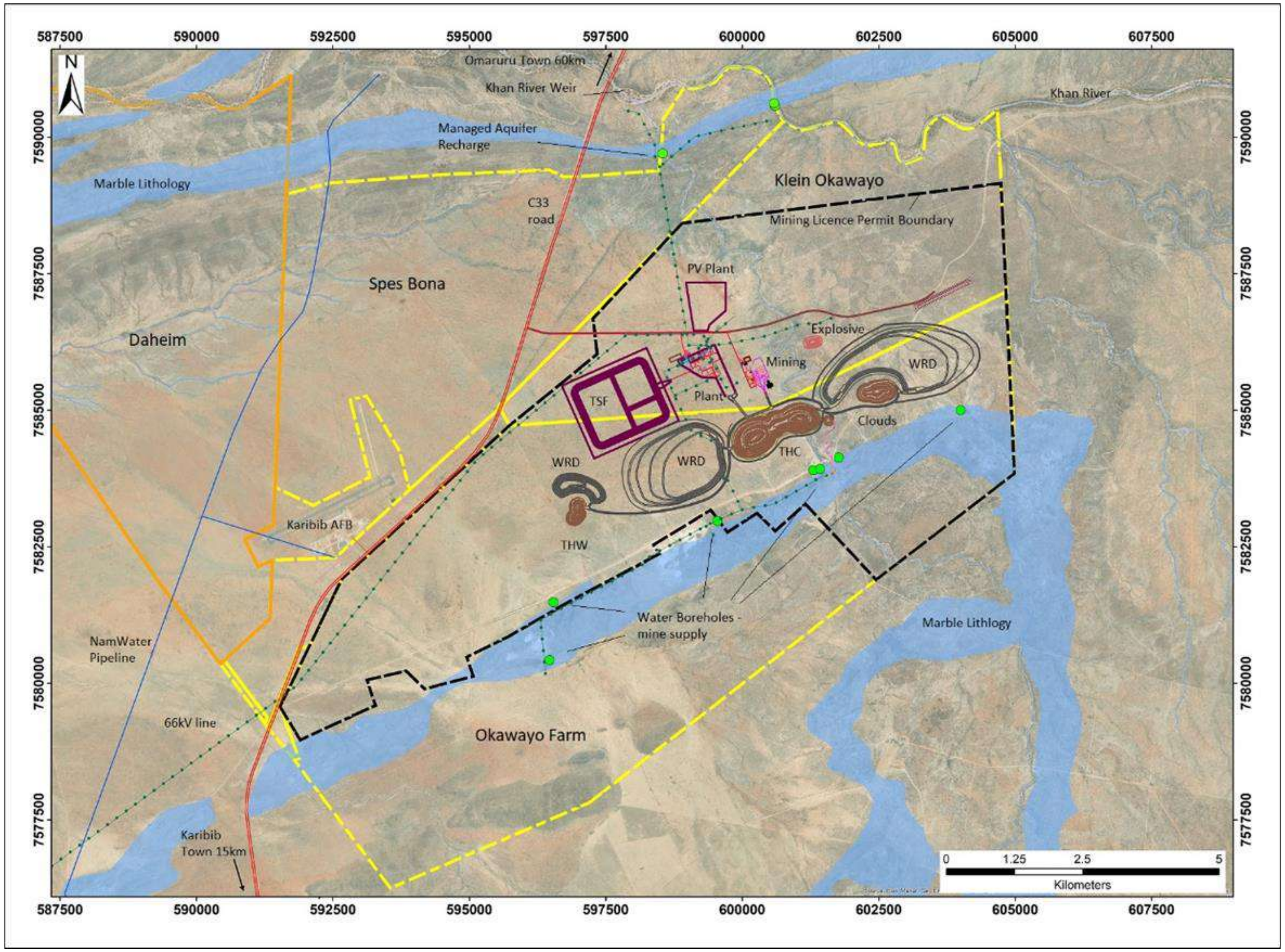
The buildings required on the Project site will generally be prefabricated buildings transported to site either as fully assembled units or as panels and assembled on site onto concrete block or strip footings. Buildings of this type will typically include:

- Main administration office.
- Clinic and emergency response.

- Gatehouse and access control.
- Security.
- Ablutions, change house, meals.
- Plant canteen.
- Plant laboratory.
- Mining facility building – general, change house.
- Mining administration.

The tailings storage facility (TSF) will comprise of a downstream-type facility, constructed from the waste rock excavated from the open pit. It is envisaged that the tailings facility will accommodate filtered tailings inside the waste rock embankments with the transportation of tailings undertaken by conveyors and is presented in detail in the infrastructure section of this report. Figure 5.4.1 shows the overview of the infrastructure features as part of the mine site layout.

Figure 5.4.1 Site Infrastructure Layout



Source: Osino (2023)

6.0 HISTORY

6.1 Property Ownership

The Project is located in a gold-bearing district that is also host to the Navachab gold mine, as well as the historical Onguati copper-gold, and Goldkuppe small-scale gold diggings. After the discovery of the Navachab gold deposit in 1984, Anglo American carried out a regional exploration program primarily using stream sediment sampling, targeting similar stratigraphic horizons and basement domes as found at Navachab.

The Anglo-American exploration included the following:

- EPL 5658 – Stream sediment sampling, soil sampling, RAB, and diamond drilling.
- EPL 3739 – Stream sediment sampling, soil sampling, and drilling of historical gold occurrence at Goldkuppe.
- EPL 3738 (now covered by EPL 5533) – Stream sampling, soil sampling, and drilling on the farm Albrechtshöhe.

Bafex took ownership of EPL 3739 and EPL 3738 (now covered by EPL 5533) in 2008 and follow-up exploration was carried out initially under a joint venture agreement by Desert Minerals Exploration and later by Bafex itself. The exploration included the following:

- EPL 3739 – Detailed soil sampling of Goldkuppe historical gold occurrence and strike extensions to the north and south. RC and diamond drilling of soil anomalies.
- EPL 3739 – Detailed sampling of Twin Hills East and area to the south.
- EPL 5533 (previously EPL3738) – Detailed soil sampling and RC drilling on the farm Albrechtshöhe.

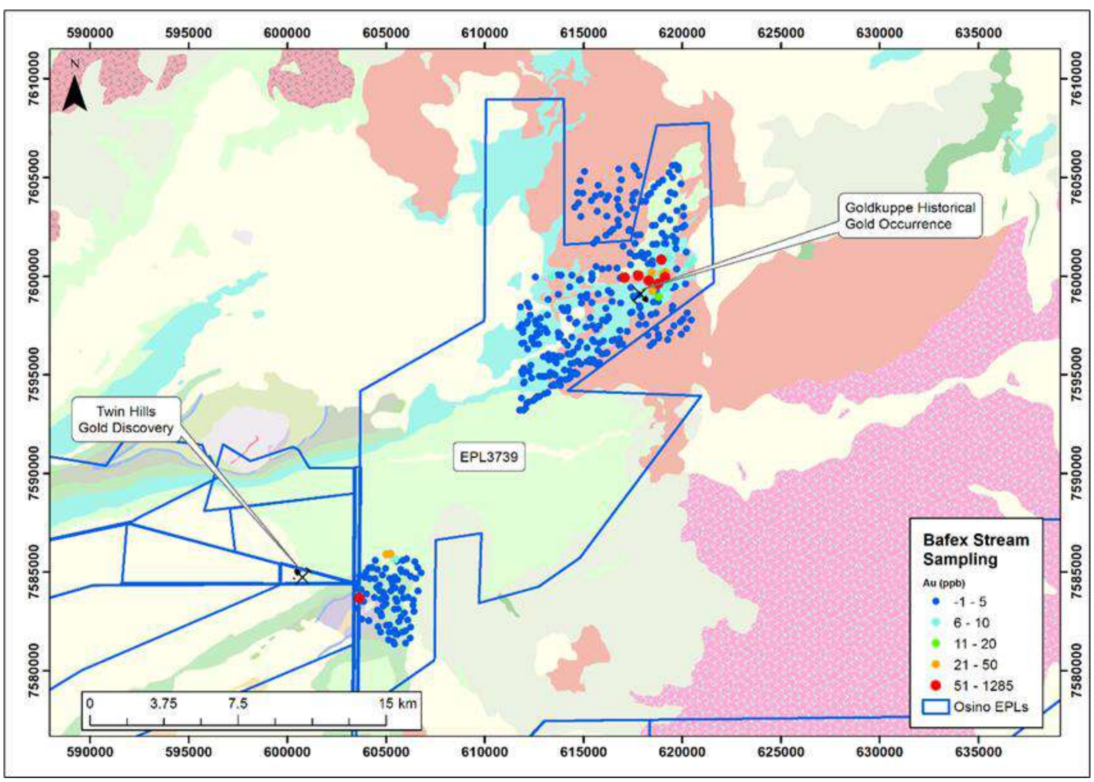
6.2 Project Results – Previous Owners

6.2.1 EPL 3739

Bafex conducted two stream sediment sampling programs totalling 412 samples, covering approximately 88 km2 (Figure 6.2.1). The initial stream sediment sampling was conducted in the vicinity of the Twin Hills target in the south-eastern part of EPL 3739. Ninety -212 µm stream sediment samples (50-100 g), including QAQC samples, were collected. In 2013, a larger-scale stream-sediment sampling program was conducted over the northern portion of EPL 3739 including the Goldkuppe area. A total of 322 samples (including QAQC samples) were taken. All stream sediment samples were bagged, sealed, and then shipped to ACME Analytical Laboratories in Vancouver, Canada. The samples were analyzed by aqua regia digestion followed by inductively coupled plasma with mass spectroscopy (ICP-MS) analyses, (30 g 1DX method).

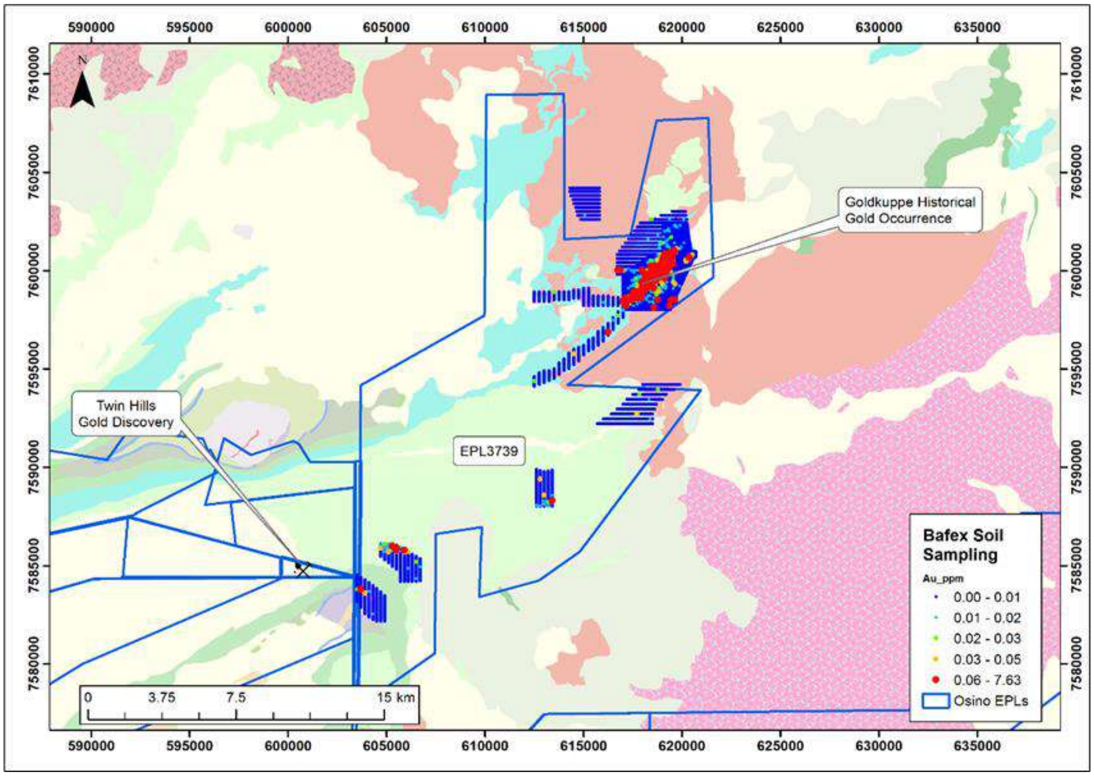
Bafex subsequently carried out soil sampling programs over various stream sediment anomalies, including the Goldkuppe target area and surrounding targets (Figure 6.2.2). A small soil grid was sampled just to the east of Twin Hills in the southwest corner of EPL 3739.

Figure 6.2.1 Bafex Stream Sediment Sampling



Source: Osino

Figure 6.2.2 Bafex Soil Sampling



Source: Osino

Bafex also carried out several geophysical survey programs over the Goldkuppe prospect including a 50 m spaced pole-dipole IP and 25 m spaced ground magnetic surveys. These surveys confirmed the presence of numerous areas with sizeable IP chargeability anomalies i.e. potential sulphide mineralisation, including, amongst others, the Calidus target to the north of Goldkuppe.

A minor fixed loop EM survey was conducted by Bafex over the massive sulphide target at Goldkuppe but failed to identify a sizeable anomaly. Downhole EM and magnetics were also conducted on selected drillholes (limited by the fact that some of the preferred holes had collapsed slightly or were obstructed) and identified anomalies for further testing. Finally, an orientation gravity survey was conducted over the core of the anomaly, centred on the massive sulphide target, and this confirmed that gravity anomalies underlie known gold mineralization.

Over the period 1984 to 2013, the three historical operators at the Goldkuppe target on EPL 3739 (Otjimbojo licence), Anglo American, Desert Minerals Exploration and Bafex had conducted geochemical, geophysical, reverse circulation (RC) and diamond drilling (DD) campaigns. The cumulative total of RC and DD was almost 17,000 m (see Table 6.2.1 below). No gold, silver, or base metal Mineral Resources had been estimated for the Goldkuppe target, but a variety of geological, geophysical, and geochemical datasets indicated that gold, in significant grades and widths, was encountered and warranted further investigation.

Table 6.2.1 Historical Drilling at Goldkuppe

Company	Drill Type	No. of Holes	Total Metres
Anglo American	DD	24	2,226
	RC	50	3,353
Bafex	DD	14	1,519
	RC	170	9,890
Cumulative total		258	16,988

6.2.2 EPL 55333 (Incorporating the Previously Held EPL 3738)

Rock Chip Samples

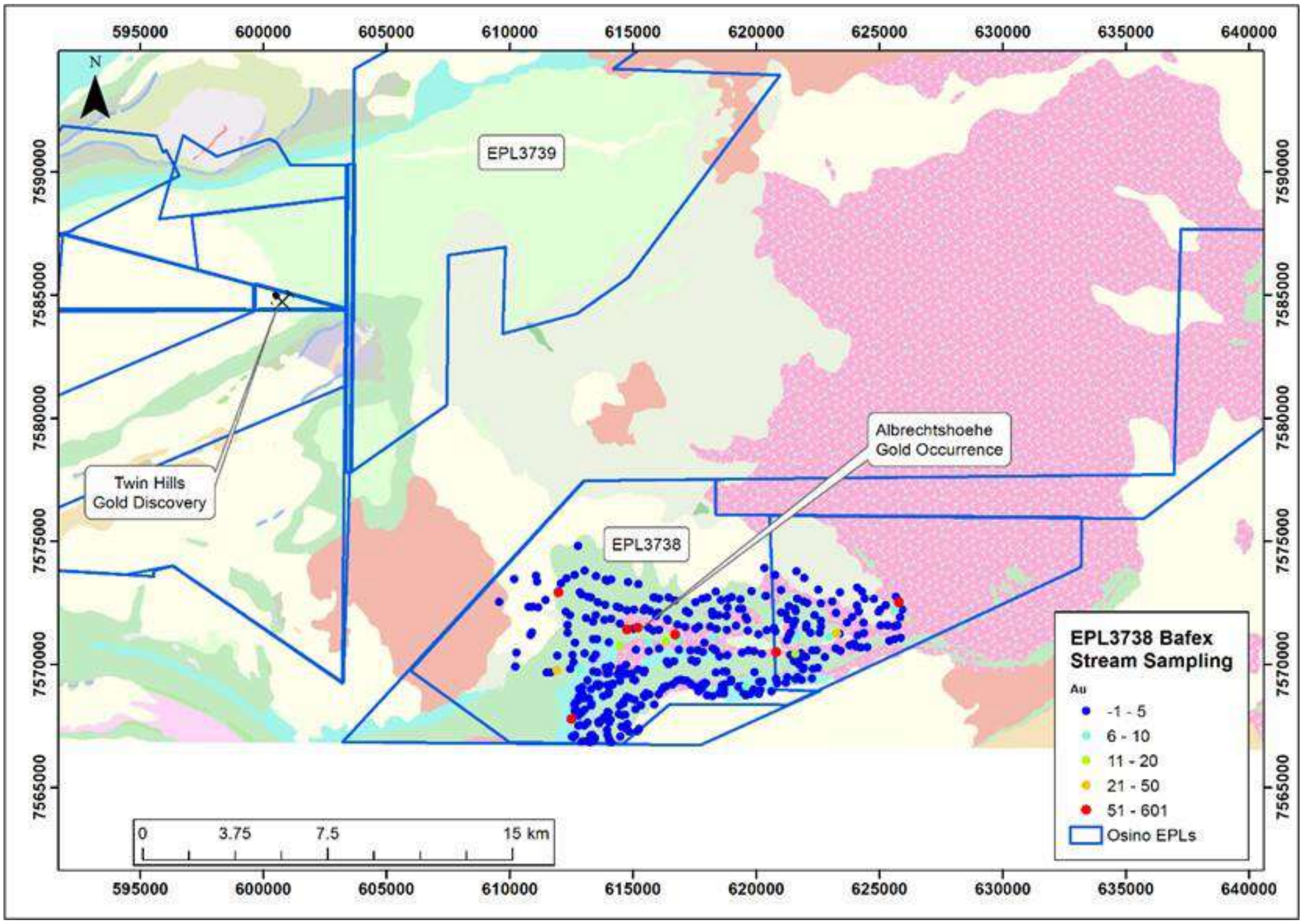
A total of 285 rock chip samples were collected by Anglo American on the licence which returned a range of values from 0.025 g/t Au to 20.7 g/t Au with a median of 0.05 g/t Au and an average of 0.339 g/t Au. A total of 22 rock chip samples were collected by Bafex on the licence and analyzed by Bureau Veritas in Swakopmund. The samples returned values with a range of 0.25 g/t Au to 46 g/t Au with a median of 0.25 g/t Au and an average of 2.65 g/t Au.

Stream Sediment Sampling

Bafex conducted a regional stream sediment sampling program over the southern part of the Project's Wilhelmstal property (EPL 3738), on the farm Johann Albrechtshöhe, to identify gold anomalies within the drainages for follow-up soil sampling work. A total of 404 stream sediment samples were collected (Figure 6.2.3). Sample size was 50–100 g and the -212 µm size fraction was used. Samples were bagged, sealed, and then shipped to ACME Analytical Laboratories in Vancouver, Canada, where they were analyzed by ICP-MS following an aqua regia digestion (Oliver, 2014).

The stream sediment sample positions and anomalous values are shown in Figure 6.2.3 with respect to the respective catchment areas.

Figure 6.2.3 Bafex Stream Sediment Sampling (ppb)



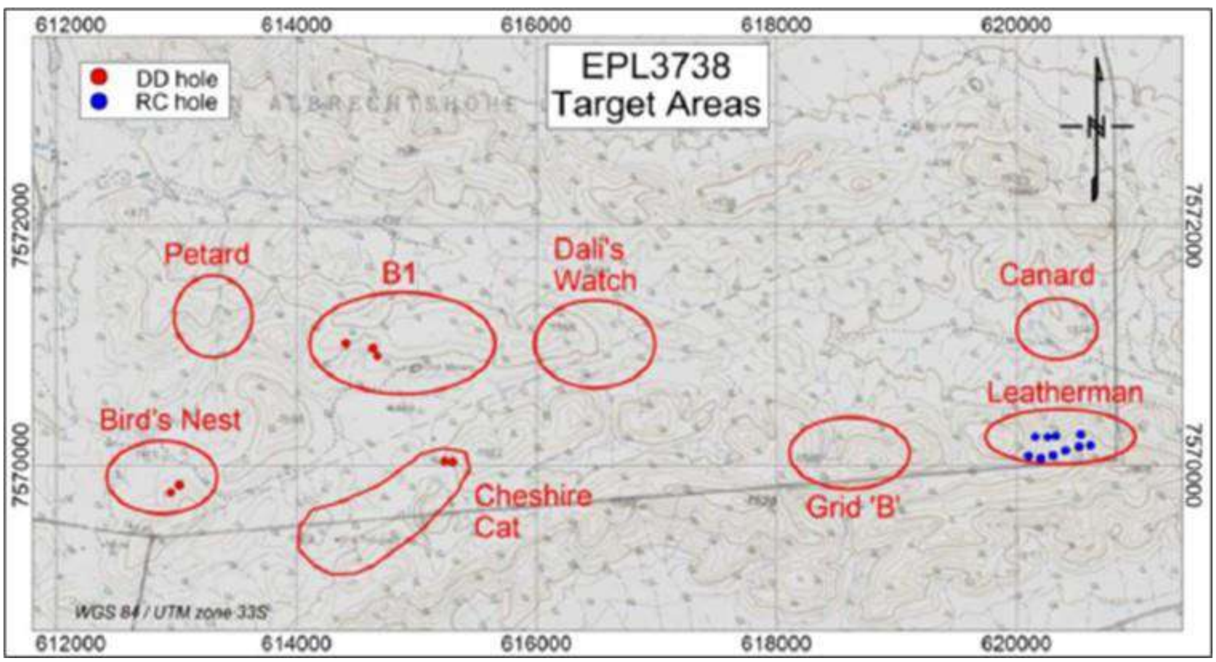
Source: Osino

Soil Geochemistry

Anglo American collected a total of 2,141 soil samples on the farm Albrechtshöhe to follow up on their regional stream sediment sampling program and known gold occurrences. The soils were collected on a spacing of 50 m x 50 m and analyzed for gold and copper. Several gold anomalies were found on Albrechtshöhe which were later followed up with percussion drilling (Figure 6.2.4).

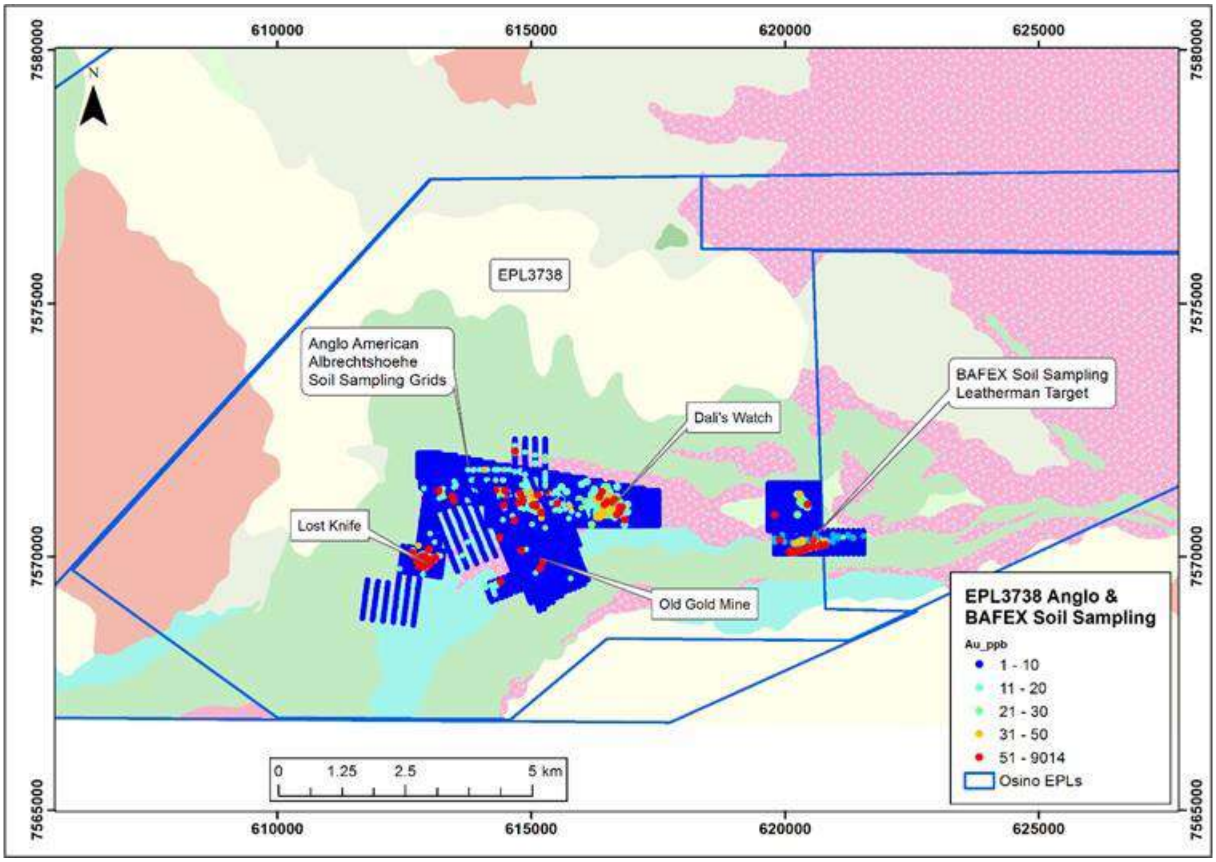
Bafex collected a total of 545 soil samples using the -500 µm size fraction, including quality control samples, on the Leatherman target. Samples were shipped to ACME Analytical Laboratories in Vancouver, Canada, where they were analyzed by ICP-MS (aqua regia digestion). A gold ± arsenic ± copper ± iron ± tungsten anomaly which trends east-northeast to west-southwest and is 800 m long and up to 70 m wide, as defined by the 30 ppb Au contour. The anomaly is open to the east along strike. Four samples within the anomaly have values over 500 ppb Au. The anomaly is underlain by sulphidized tremolite-skarn alteration within carbonates. Anglo American previously carried out a channel sampling program consisting of 17 channel samples varying in length from 1 m to 20 m. The metre assays ranged from 0.025 g/t Au to 11.3 g/t Au with a median of 0.025 g/t Au and an average of 0.149 g/t Au (Figure 6.2.5).

Figure 6.2.4 Bafex Drillholes on Albrechtshöhe, EPL 3738



Source: Osino

Figure 6.2.5 Soil Sample Grids on EPL5533 (Previously EPL 3738) by Anglo American and Bafex, Anglo American Drill Targets



Source: Osino

Geophysical Surveys

IP surveys at Cheshire Cat/Old Gold Mine (Figure 6.2.4) confirmed that the mineralized horizon identified in soil and rock sampling is underlain by a coincident chargeability anomaly, indicating the presence of disseminated sulphides. The IP anomaly is over 600 m long and is open along strike.

IP surveys conducted over the B1 grid (Figure 6.2.4) identified a chargeability anomaly, with a coincident gold-copper soil anomaly. The northeast trending anomaly covers approximately 1,000 m x 250 m.

Following its initial rock chip and soil sampling programs, Anglo American drilled two anomalies in 1988. The Old Gold Mine / Cheshire Cat anomaly was drilled with 17 holes for 430 m. Seven of the holes returned mineralized intercepts with a best of 7 m at 2.81 g/t Au in KEP8. The other intercepts were 3 m at 0.83 g/t Au (KEP3), 2 m at 2.3 g/t Au (KEP4), 2 m at 1.75 g/t Au (KEP7), 2 m at 0.55 g/t Au (KEP11), 2 m at 0.85 g/t Au (KEP12) and 3 m at 0.47 g/t Au (KEP16). The Birds Nest anomaly was drilled with 27 holes for 1,383 m. Only two of the 27 holes returned mineralized intercepts with a best of 8 m at 2.87 g/t Au in hole KLP13. The other intercept was 2 m at 1.28 g/t Au (KLP21). These mineralized intercepts were defined as 2 m or more of continuous mineralization with a cut-off grade of 0.4 g/t Au and no more than 2 m of internal dilution.

During 2005, following another campaign of soil sampling, Anglo American drilled six RC holes over a gold anomaly in marbles named Dali's Watch (Figure 6.2.4). The results were disappointing, and no further work was conducted.

Bafex subsequently carried out a drill program on four target areas on the Albrechtshöhe farm on EPL 3738. Eight DD holes (496.4 m) and 12 RC holes (1,386 m) were drilled. The positions of the drillholes in the selected targets are shown in Figure 6.2.4.

The eight DD holes were drilled at Birds Nest, Cheshire Cat and B1 to test surface anomalies. The twelve RC holes were drilled to confirm gold mineralization at the Leatherman target. Table 6.2.2 and Table 6.2.3 provide the significant intercepts.

Table 6.2.2 All Drill Intercepts >0.4 ppm at B1, Cheshire Cat, and Birds Nest Targets

Hole no.	From	Length	Au (ppm)
WID001	52	1	0.5
WID006	27	3	1.1
	34	1	0.5
	41	1	0.5
WID007	22	1	0.6
	29	1	0.8
WID008	2	2	0.5
	28	1	4.0

Note: The relationship between true thickness and intercept length is not known.

Table 6.2.3 All Drill Intercepts >0.4 ppm at the Leatherman Target

Hole no.	From	Length	Au (ppm)
WIR001	30	2	2.2
WIR002	12	2	0.6
WIR005	34	2	9.4

Note: The relationship between true thickness and intercept length is not known.

Drilling Pattern and Density

The drilling done by Anglo American and Bafex was of an exploratory nature and the drill pattern was not designed to delineate a Mineral Resource.

6.3 Historical Mineral Resource Estimates

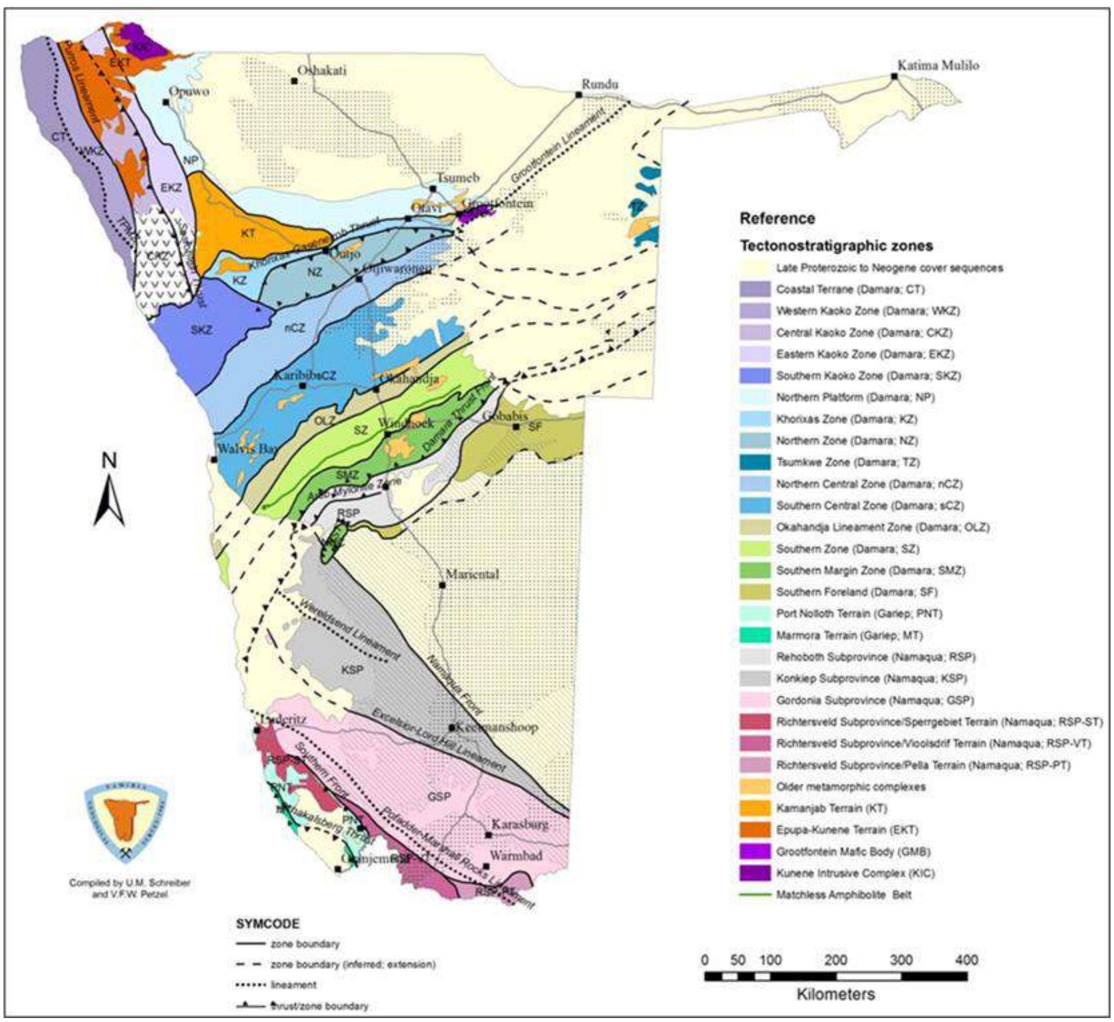
There are no historical estimates of Mineral Resources for the Property.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Project is in an area of known gold deposits hosted within the inland arm of the Pan African Neoproterozoic Damara Belt (Miller, 2008). The Damara Belt (Figure 7.1.1) is defined by a northeast striking Neoproterozoic fold, thrust, and metamorphic belt. It reflects a Neoproterozoic rifting-accretionary event between the Congo Craton to the north and the Kalahari Craton to the south. Related orogenic belts occur along the coast of Namibia and are represented by the north trending Kaoko Belt, and the Gariep Belt to the south.

Figure 7.1.1 Tectonic Map of Namibia



Source: Geol Soc Namibia

These rifting-accretionary cycles begin at 800–750 Ma and are largely concluded by 600 Ma (Hoffman, et al., 1996; De Kock et al., 2000). Peak deformation differs within the three belts with peak deformation in the Kaoko Belt at 550–580 Ma, in the Gariep Belt deformation culminated at 530–545 Ma and in the Damara Belt, deformation peaked between 500 Ma and 530 Ma.

As in many younger cordilleran environments, the Neoproterozoic collisional environments of the Damara Orogen have been divided into three major belts (Miller, 1983 and 2008):

- The North Zone comprising an openly folded foreland basin of low metamorphic grade.
- Calcareous and pelitic meta-sediments, and minor volcanic rocks, of the Central Zone which were initially deposited in a back arc, passive continental margin resting on pre-Damaran basement rocks.
- The Southern Zone defines the suture zone of the Damaran Orogen that is defined by a series of southeast verging thrust belts cutting pelitic sediments, and which have been deformed under high P/low T metamorphic conditions.

The Damara Belt was intruded by a suite of plutonic rocks during and after the Damara orogenic cycle. The intrusive rocks range from gabbro to diorite and various types of granite. Of these, the early syn-tectonic to late tectonic I-type Salem granites are by far the most abundant. These were followed by post-tectonic I-type granites. A much later Jurassic to Cretaceous event led to the intrusion of various alkaline ring complexes and granitic batholiths, as well as flood basalt provinces.

Burnett (1992) summarizes the various known gold occurrences known at that time in Namibia. Gold was discovered in Namibia during the German colonial period (1850s) in the Sinclair Formation in the Rehoboth district in southern Namibia. The deposits were small and led to only minor exploitation. The discovery in 1917, of more significant gold mineralization in the Ondundu area, lead to the mining of 614.4 kg of gold from mainly alluvial sources until closure in 1963 (Burnett, 1992). The Ondundu area is approximately 150 km from the Project but occurs within the same geological and tectonic belt. From 1937 to 1943, alluvial sources were mined at Epako-Otjua in the Omaruru district and yielded 46.9 kg of gold (Oliver, 2014). The Epako area is 65 km north of the Twin Hills deposit and is within another of Osino's EPLs, although this is not the subject of this document.

7.2 Prospect and Local Geology

The Project is located in the Southern Central Zone of the Damara Orogen in Namibia. The Project's principal assets are the newly discovered Twin Hills deposit and the Goldkuppe-Oasis-Wedge Cluster of prospects which are about 60 km south of the Omaruru Lineament and between 20 km and 55 km east-northeast of the Navachab gold mine (Figure 7.2.1). The northeast part of the Project area is largely underlain by undifferentiated syn-tectonic Salem-type granite. The bulk of the Project area is underlain by meta-sedimentary rocks of the Swakop Group, comprising the Arandis Formation (biotite schist, minor quartz schist calc-silicate rock, and amphibolite), the Karibib Formation (dominantly dolomitic and calcitic marbles), and the overlying Kuiseb Formation (schistose quartz feldspar mica meta-greywacke and meta-pelite). The stratigraphic position of other known gold deposits in the central zone of the Damara Orogen is shown in Table 7.2.1.

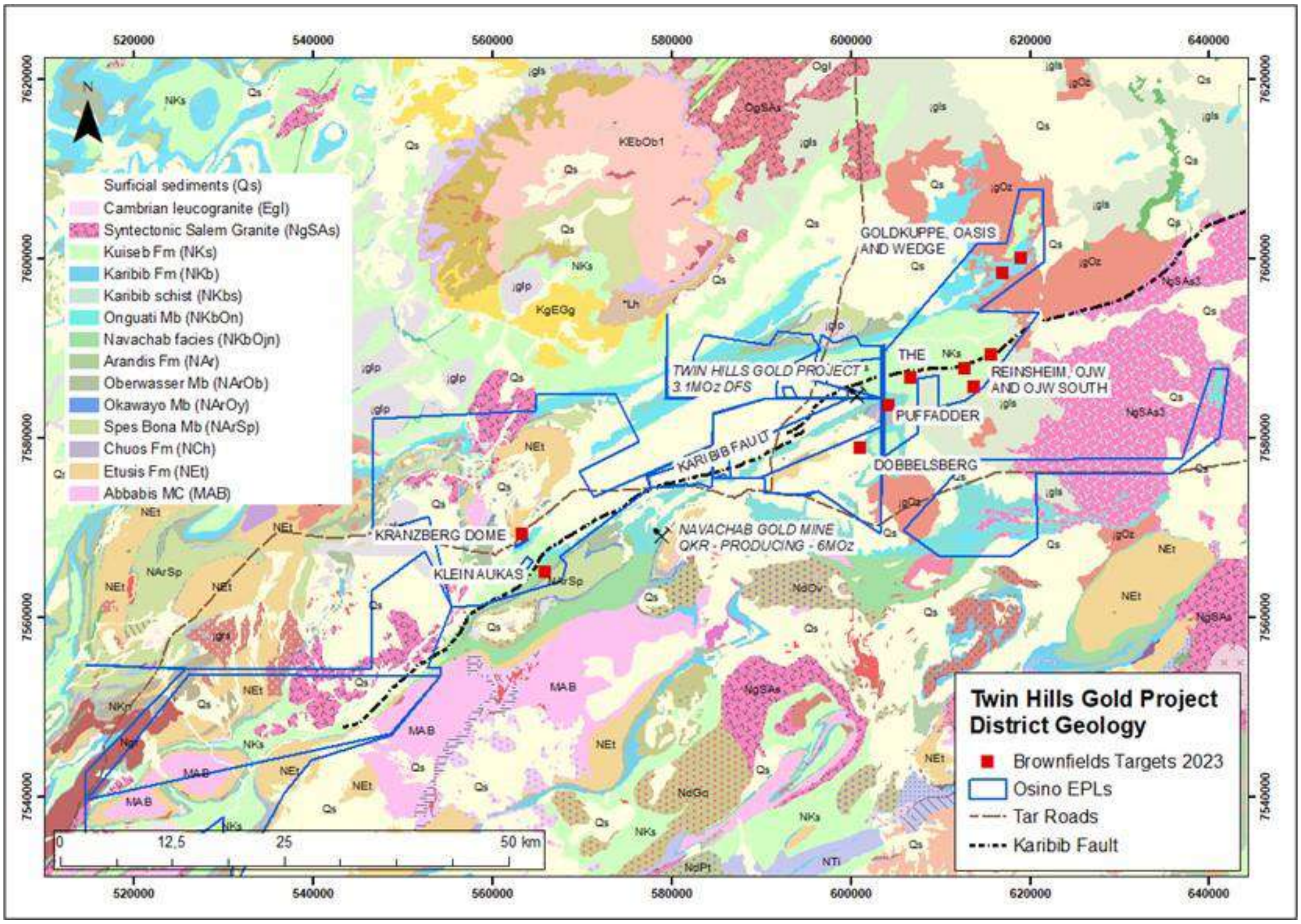
The sediments were deformed during poly-phase deformation and metamorphosed. In this area, the larger earlier folds have fold axes with northeast-southwest axial trends, parallel to the Omaruru lineament, and these were subsequently deformed into open basin and dome structures about fold axes with northwest-southeast axial trends. Later crosscutting lineaments parallel to the Welwitschia lineament are also evident in the area.

The Swakop Group sediments were intruded by a series of syn-, late-syn- and post-tectonic granite and pegmatite bodies. The pegmatite bodies host both black and coloured varieties of tourmaline, some of which are gem-quality and are mined by small-scale miners in the area. A number of these pegmatites are also being explored for lithium.

At least two deformation events are observed at Twin Hills primarily in the drill core. An early north-northwest to south-southeast compressional phase which resulted in tight to isoclinal folding overturned to the south or upright. The phase of folding is accompanied by flexural slip along the fold limbs which is particularly prominent in the interbedded meta-greywacke unit. A later northwest-southeast compressional phase resulted in the refolding of early folds and the formation of doubly plunging folds or domes. As the system locked up, the crustal scale Karibib Fault Zone (KFZ) on the southern margin of the Karibib Basin was re-activated as a dextral fault with associated secondary and tertiary structures.

Twin Hills is a cluster of gold mineralized zones associated with schists of the Kuiseb Formation. These schists are variably magnetic (due to pyrrhotite), and gold mineralization is intimately associated with arsenopyrite and pyrrhotite. Significant previously unknown or recorded gold mineralization has been discovered by Osino along the KFZ (Figure 7.2.1). The KFZ was originally interpreted from regional magnetic data to have a strike length of over 100 km. Osino's licences cover more than 70 km of this strike extent. The KFZ has been mapped in the field by Osino geologists in the eastern and western parts of the Project area where it is manifested as a belt of very high strain, intense silicification, and partial remelting. It is the calcrete covered central portion of the KFZ where Osino discovered the most significant new gold mineralization to date at Twin Hills.

Figure 7.2.1 Local Geology Showing the Location of Priority Prospects and Navachab Gold Mine



Source: Geological Survey of Namibia, 1:250,000 geological maps for Sheets 2114, 2116, 2214 and 2216.

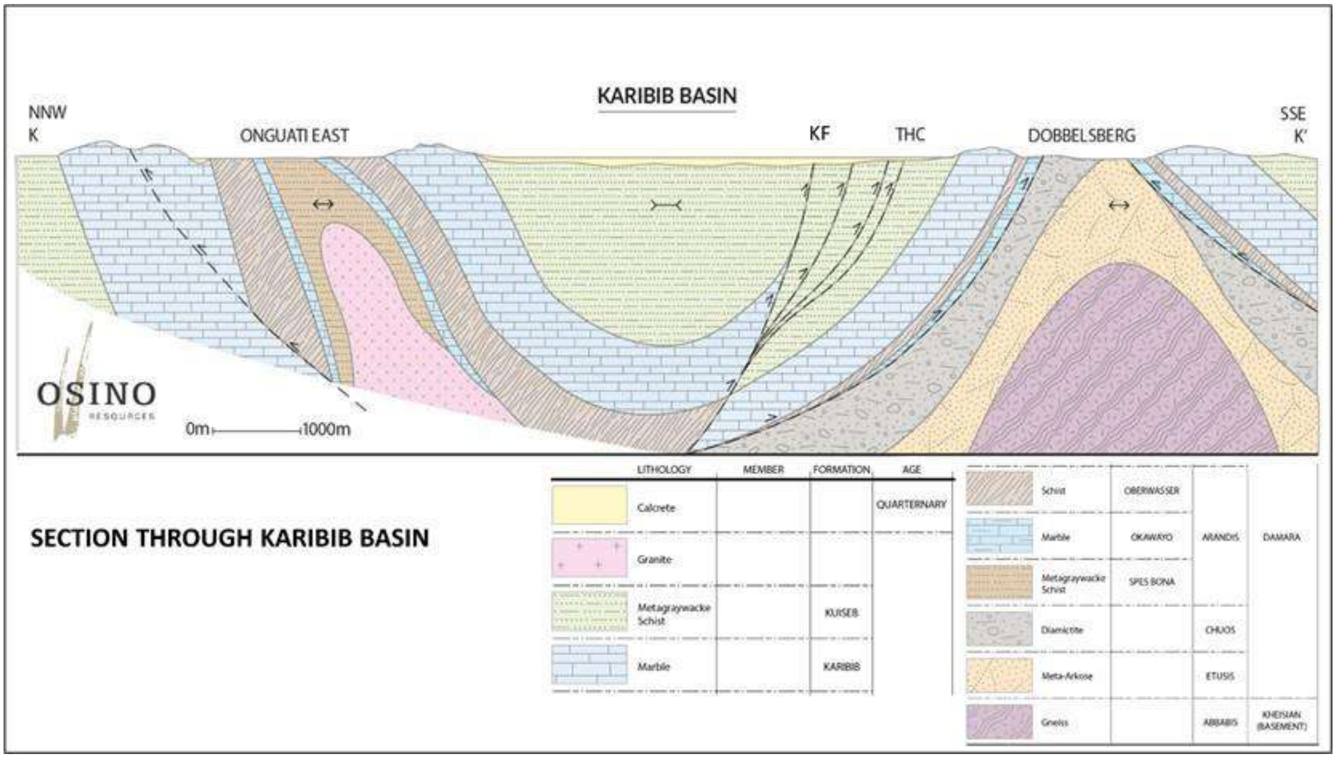
Table 7.2.1 General Stratigraphy of the Damara Supergroup in the Central Zone of the Damara Belo with Selected Significant Gold Occurances

Group	Formation	Member	Lithologies	Gold occurrences
Swakop	Kuiseb		Metaturbidites and biotite schists, minor calc-silicate rocks, and marble	Okawayo 146, Ondundu, Sandamap Noord 115, Twin Hills prospects
	Karibib		Quartzite, schist, calc-silicate rock, marble	
		Onguati	Calcitic and dolomitic marble, minor calc-silicate rocks, and schist	Navachab 58 (Grid A), Goldkuppe, Onguati, Albrechtshöhe 44
		Otjongeama	Dolomitic calcite marble, calcitic marble and dolomite, calc-silicate rocks, biotite schists	
	Ghaub	Omusema	Amphibolites (only in SCZ)	
		Daheim	Continental mafic volcanic rocks (only present in SCZ)	Daheim 106
		Kachab	Phyllitic schist / dropstone-bearing siliciclastic rocks	
	Arandis	Oberwasser	Biotite schist, calc-silicate rocks, very minor felsic volcanic rocks	Navachab Mine, Epako 38
		Okawayo	Calcitic marble	Navachab Mine, Kranzberg South 113
		Spes Bona	Biotite schist, calc-silicate rocks, and very minor felsic volcanic rocks	Navachab 58 (Eastern Zones)
	Chuos		Glaciogenic mixtite, banded iron formation	
	Rössing		Dolomitic marble, minor calc-silicate rocks and calcitic marble	
Nosib	Khan		Pyribole calc-silicate rocks, minor biotite schist, graphite schist and marble	
	Etusis		Feldspathic quartzite, grit and minor calc-silicate rocks and schist	Nordenburg 76

Source: Compiled from Steven et al. (1994), Steven et al. (2008), Miller (2008) and published Geological Survey of Namibia, 1:250,000 geological maps for Sheets 2114 and 2214.

The structural geology of the Twin Hills Project area is dominated by features typical of the Southern Central Zone of the Damara Belt; basement and/or basal Damara meta-sedimentary rocks in the cores of dome and anticlinal structures and regional synclinal structures with thick packages of Kuiseb Formation schists ‘filling’ these synclines. A cross-section through the Karibib Basin from Twin Hills in the south to the Onguati Dome in the north illustrates the large-scale folding and the basement or granite cored anticlinal domes (Figure 7.2.2).

Figure 7.2.2 Section Looking ENE, Through the Karibib Basin at Twin Hills



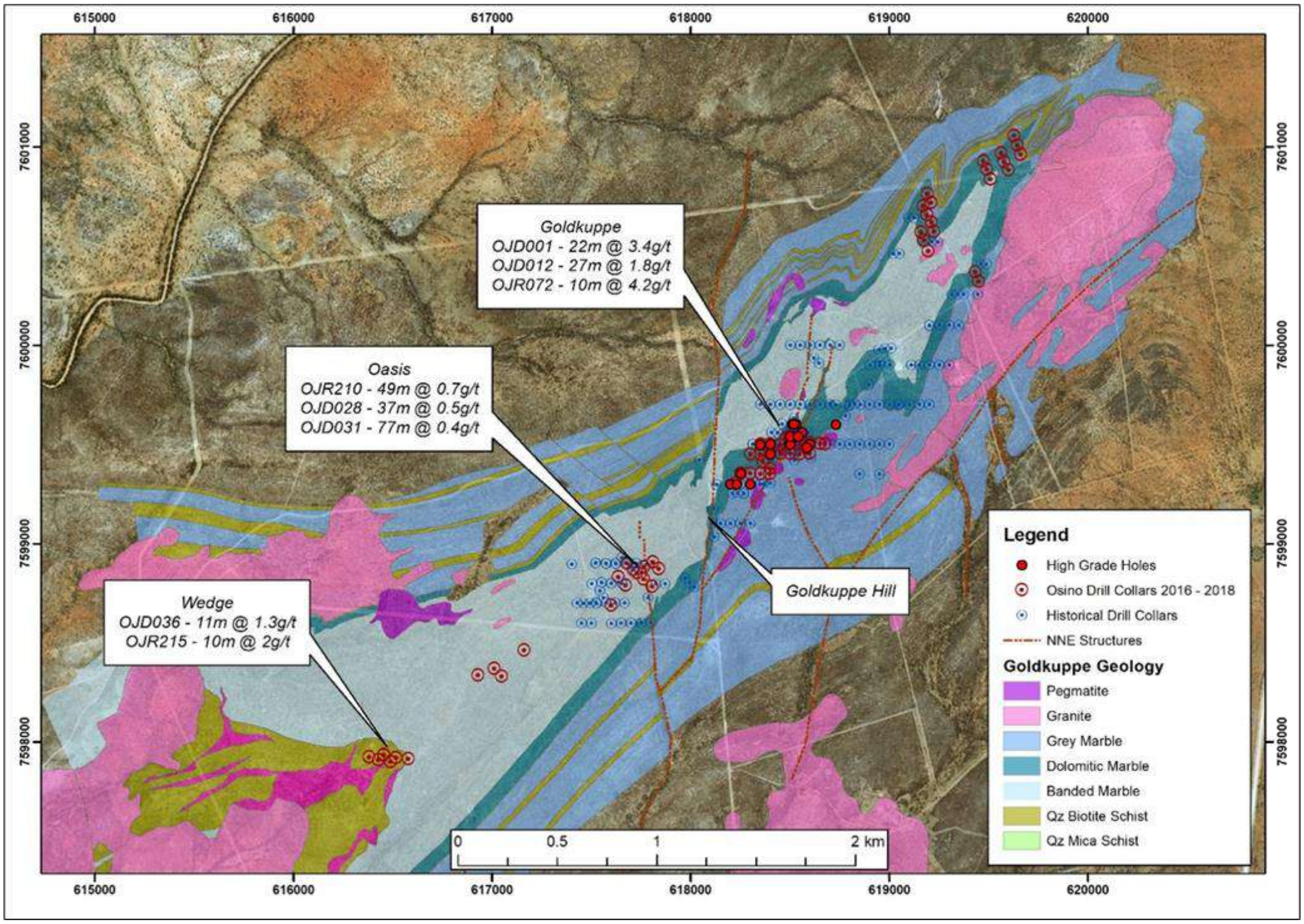
KF – Karibib Faily, THS – Twin Hills Central
Source: Osino

The geology of the Goldkuppe prospect is dominated by a series of interbedded marble and dolomite units of the Karibib Formation (Figure 7.2.3). The marbles are folded into an anticline, which plunges gently to the northeast with beds dipping to the southeast with the northwest limb of the fold overturned (verging to the northwest). These marbles are underlain by biotite schists which occur in the core of the anticline approximately 1 km towards the southwest in the Oasis and Wedge area and which outcrop further to the southwest at Wedge South.

Rare outcrops of quartz-rich schist and calc-silicate rock are found in the core of the Goldkuppe fold, where the structure opens towards the southwest. These rocks belong to the Oberwasser Member of the Arandis Formation. In the area southwest of Wedge, large areas of Kuiseb Formation biotite schists are exposed to the north and south of the Khan River.

At least two phases of folding appear to be present in the Goldkuppe target area. Small-, medium- and large-scale, tight to isoclinal reclined folds and sheath folds, with steep to sub-vertical fold axes and fold axial planes, dominate the structure in the Goldkuppe target area. The fold axial plane of the initial dominant large-scale folding is sub-vertical, striking approximately northeast-southwest. The later folding event has north-south or north-northeast axial planes with fold axes plunging steeply to the south.

Figure 7.2.3 Geology of the Area Around Goldkuppe – Oasis and Wedge



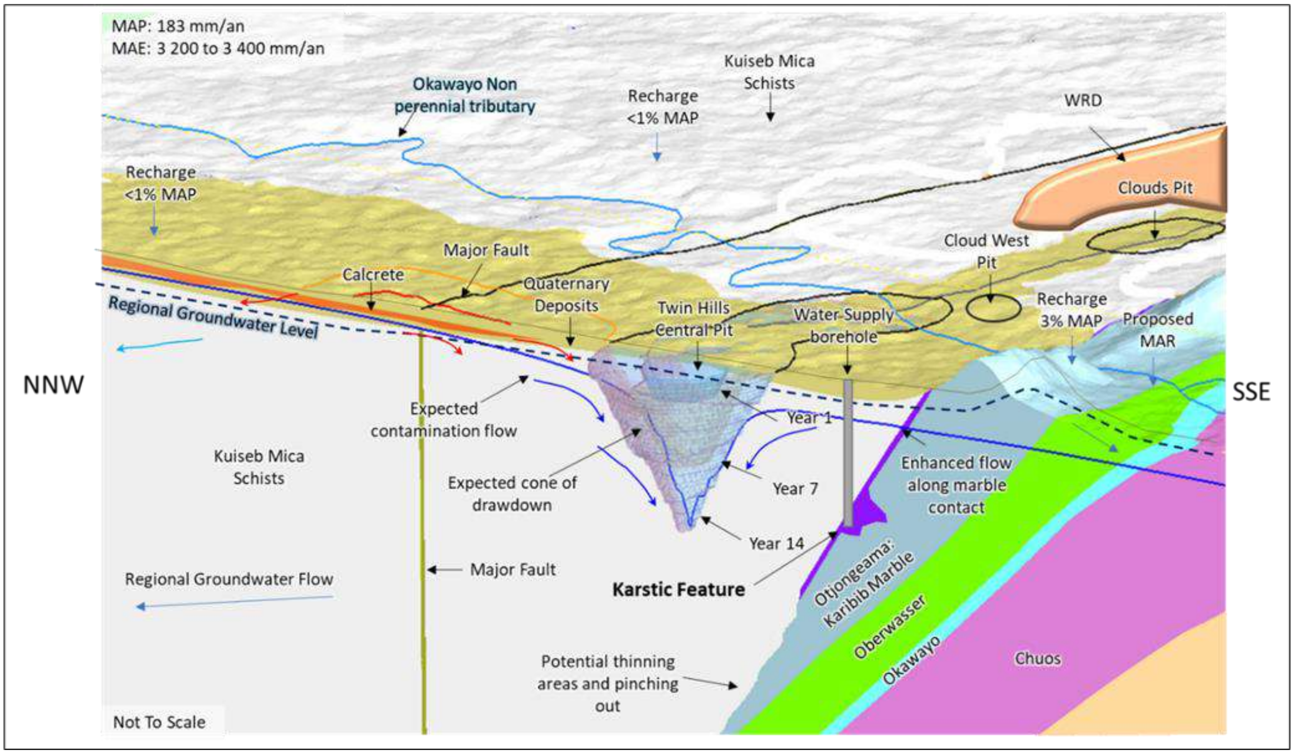
Source: Osino

7.3 Regional and Local Hydrogeology

7.3.1 Aquifer Characterization

The conceptual hydrogeological model is shown in a cross-section from NNW-SSE below and includes the proposed mine infrastructure (Central Pit, and waste rock dumps) located on the Kuiseb Schists with the south limb of Karibib Marble syncline to the south of the Twin Hills) where the main water supply boreholes have been located.

Figure 7.3.1 Hydrogeological Conceptual Model



The hydrogeological site investigation from 2020 to 2023, including geophysical surveying, drilling, and test pumping to target potentially water-bearing structures and lithologies. This investigation was done to determine the hydraulic properties of the aquifer and evaluate the groundwater resources as a potential water supply to the project. In summary:

- A total of 26 boreholes drilled into the Kuiseb Schists around and within the planned open pits confirmed the low permeability with minor secondary permeability developed in faults and fractures and associated with the northeast-southwest foliation. The bulk hydraulic conductivity is 0.01 to 0.03 m/day with low maximum pumping yields of < 200 m^3/day. Groundwater is localized in the schists and will likely be manageable as passive dewatering from in-pit sumps, although localised sub-horizontal drainholes may be required in zones of geotechnical weakness.

- Based on the drilling of 58 groundwater exploration boreholes into the Karibib Marbles, this formation was found to have the highest water supply potential. The test pumping yields of boreholes in the marbles varied from >2000 m^3/day to seepage consistent with the heterogeneity of the marble. The weathered and exposed upper contact of the Karibib Marbles (which is also the recharge zone) and areas of minor karstification developed where late brittle faults orientated NNW to SSE crosscut through the marbles, has localized hydraulic conductivity of more than 20 m/day. The bulk marble matrix has lower permeability (0.08 m/day to impermeable) resulting in an effective hydraulic conductivity of 0.01 m/day for the Karibib Marbles due to the dual porosity.

- A shallow alluvial aquifer is well developed along the Khan River which is used as a water supply to the region and has been characterised through testing of 12 boreholes.

7.4 Groundwater Levels and Flow

Groundwater flow is from an elevation of 1400 mamsl in the Karibib Marbles towards the northwest and the Khan River which is the receiving water body to the south of the mine pits at 1000 mamsl at the Khan River.

Groundwater levels are deeper in the mica schists, 40m to 70m below the surface (mbs) to 4 mbs in the alluvial aquifers associated with the Khan River. Static water levels in the marble are shallower than when intersected during drilling indicating confined conditions within the karstic features. This indicates there is a poor correlation (60%) between topography and measured water levels across the site.

The seasonal fluctuation of the water table is up to 2.5 m within the marble and 0.5 m to 1 m within the schists due to the higher recharge to the marbles (particularly where exposed as the calcsilicate ridges).

7.5 Groundwater Quality

The groundwater quality quantified by the Total Dissolved Solids (TDS) ranges from 300 mg/L in the Karibib marble aquifer to 900 - 3000 mg/L in the Kuiseb mica schists.

Active recharge from precipitation occurs in the karstic and silicified marble hills with bicarbonate as the main anion and calcium as the major cation. There is less recharge and longer residence time in the mica schists due to the low permeability resulting in higher concentrations of chloride, sodium and sulphate with elevated iron and aluminium in the groundwater samples. The alluvial aquifer has a mixed water quality type due to the interaction of surface water runoff and groundwater from the different lithologies.

Static and kinetic leach testing of the altered and mineralized waste rock and tailings material confirms they are potentially acid generating (PAG) with higher sulphates resulting from the oxidation of sulphides. Aluminium and iron are flagged as potential metals of concern from the waste rock and arsenic from the tailings that could result in a deterioration in groundwater quality. The waste storage facilities as the waste rock dumps (WRDs) and the tailings storage facility (TSF) could potentially impact the groundwater quality once mining operations commence and post-closure.

Mitigations that are under further investigation to reduce impacts on groundwater include:

- The unaltered and unmineralized waste rock that is non-acid generating can be used to encapsulate the altered and mineralised PAG waste rocks.

- The TSF will be lined and subsurface drainage materials to neutralize any leakage or breach from the tailings is under further investigation.

8.0 DEPOSIT TYPES

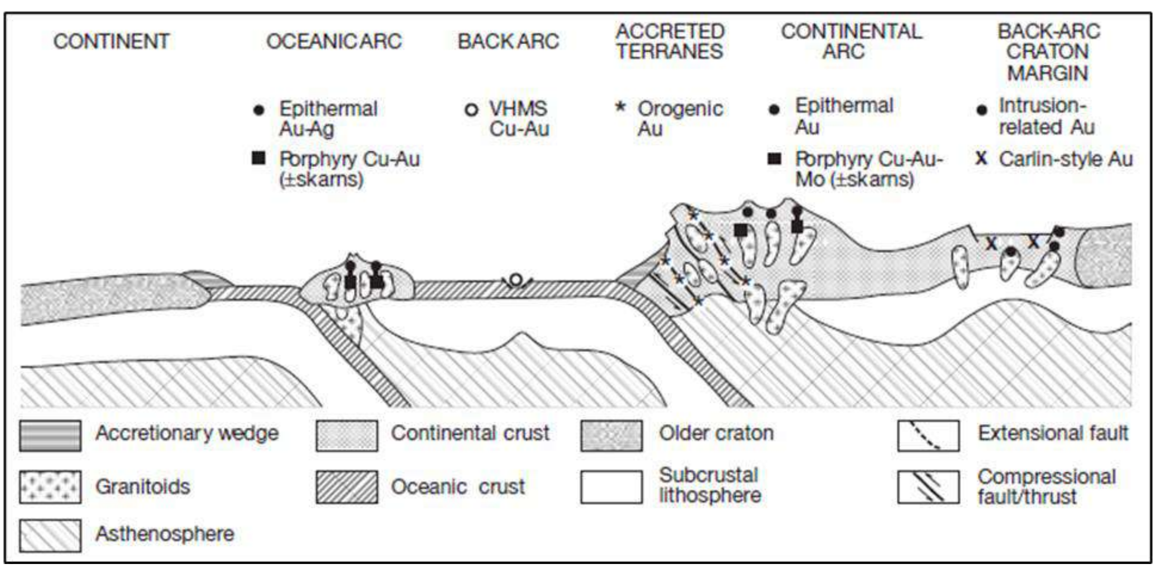
8.1 Mineralization Styles

The Twin Hill and Goudkuppe deposits are broadly considered to be orogenic gold deposits and described in more detail below.

8.1.1 General Characteristics of Orogenic Deposits

Orogenic gold deposits occur in Archaean to Tertiary aged metamorphic belts where accretion or collision has added to or thickened continental crust (Figure 8.1.1). The deposits are generally hosted by volcanic and turbiditic sequences that have been metamorphosed to greenschist or less commonly amphibolite facies. The deposits are generally interpreted to form late in the orogenic cycle from mid- to lower-crustal metamorphic fluids. The gold mineralisation develops syn-kinematically with at least one stage of the major deformation of the country rocks. They inevitably have a strong structural control involving faults or shear zones, folds, and other areas of competency contrasts. The deposits show vertical dimensions up to 1–2 km with strong lateral zonation of wall-rock alteration, normally potassium, arsenic, antimony, large-ion lithophile elements (e.g., K, Rb, Sr), CO2, and sulphur, with additions of sodium or calcium particularly in rocks of amphibolite facies. Proximal wall-rock alteration varies from sericite-carbonate-pyrite at high crustal levels through biotite-carbonate-pyrite, to biotite-amphibolite-pyrrhotite and biotite / phlogopite-diopside-pyrrhotite at deeper crustal levels. Quartz ± carbonate veins are ubiquitous and commonly gold-bearing, although in many systems it is the sulphidized, high iron / iron + magnesium + calcium wall-rocks adjacent to the veins which contain most ore (Groves et al., 2003).

Figure 8.1.1 Tectonic Setting of Gold-Rich Mineral Deposits



Source: Groves et al. (2003)

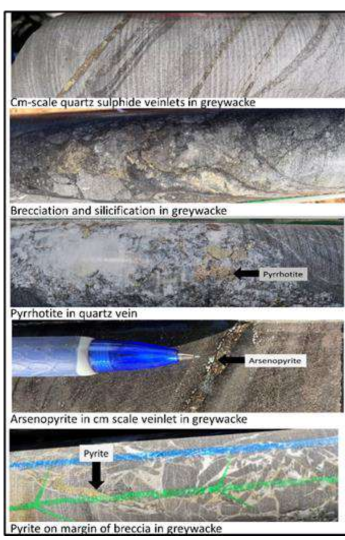
8.1.2 Twin Hills

The gold mineralization style at the Twin Hills Gold Project can be broadly categorized as orogenic, related to the Damaran Orogeny 550–500 Ma. The Twin Hills deposit and associated targets are located along a crustal-scale lineament (KFZ), on the southern margin of a turbidite basin, the Southern Central Zone, folded into a tight syncline during the Damara Orogen (Figure 7.2.1 and Figure 7.2.2). The mineralization in the Twin Hills area has a defined strike extent of 11 km long along the KFZ and associated with splays and second and third-order structures to the south of the KFZ, and forms part of a larger geochemical anomaly with a >20 km strike length. The lithologies at the Kudu and Oryx occurrences are tightly to isoclinally folded and overturned towards the north. The lithologies at Bulge, Twin Hills Central and Clouds are tightly folded and overturned towards the south. In general, the folding becomes more open towards the east.

The priority portion of the Twin Hills area is a structural jog along the KFZ on the margin of the Dobbelsberg anticline. Three splay structures off the KFZ are visible in the magnetic data and are coincident with anomalous gold assays in bedrock and the calcrete cover above the bedrock.

The gold mineralization at Twin Hills is hosted by meta-greywackes which can be divided into interbedded and massive units. At a deposit scale, the mineralization is associated with shearing within the greywackes parallel to the axial plane of the tightly folded package as well as flexural slip along bedding planes between mica-rich and mica-poor units. The gold mineralization is closely associated with arsenopyrite mineralization in millimetre-scale veinlets as well as fine-grained disseminates. Gold is associated to a lesser extent with pyrrhotite which is more pervasive and occurs in units not well mineralized with gold. Selvages to the sulphide-quartz veinlets are characterized by potassic alteration (biotite) and higher-grade zones have often been silicified (Figure 8.1.2).

Figure 8.1.2 Mineralization Styles and Genesis Summary at Twin Hills Central



- Thick package of turbidites and calcareous sediments were buried and deformed during the late Proterozoic Damara orogeny.
- Metal bearing brines were expelled from the deep sedimentary basin and driven towards the southern margin which is defined by a basement cored anticline
- Hydrothermal fluids were channelled upwards in the basin margin fault and out into the lower stress, splay structures
- Gold deposition mainly in shear zones along fold limbs and associated with parasitic folding of interbedded meta-greywacke packages
- Host rocks are a turbiditic sequence which has been metamorphosed into a series of interbedded and massive meta-greywackes
- Gold mineralisation is closely associated with arsenopyrite and to a lesser extent with pyrrhotite
- Pyrite occurs primarily as a late stage alteration overprint associated with calcite and breccia
- Several zones of pervasive alteration and replacement by silica-rich fluids and sulphides have been intersected. These replacement zones appear to host higher gold grades

Source: Osino

8.1.3 Goldkuppe

Goldkuppe is a 3 km long mineralized system with gold occurring in several discontinuous, plunging shoots hosted in (or on the contact of) a brown dolomitic marble unit. The brown colour on the surface of the marble is due to the weathering and oxidation of disseminated sulphides. The sedimentary package, including this brown dolomitic marble, is deformed into a large anticlinal structure which was mapped in detail by Kasch in 2017 (Figure 7.2.3). The dolomitic marble is overlain by grey marble (hanging wall) and underlain by coarse and banded white marble (footwall). These carbonate rocks belong to the Karibib Formation.

Mineralization is associated with secondary fold noses as small-scale saddle reefs and limb faults. Massive or semi-massive sulphide concentrations with annealed textures, comprise coarse-grained aggregates of chalcopyrite-pyrite and lesser pyrrhotite, often with elevated copper and gold grades. In addition, there is low-grade gold mineralization associated with pervasive skarn alteration adjacent to the intrusive bodies around Goldkuppe. The skarns comprise diopside, biotite-phlogopite, and tremolite ± actinolite. Less abundant, reddish-brown garnet is also present. Some of these skarn zones may have a distal weak iron-magnesium carbonate envelope, which is particularly obvious in oxidized older drill core (Figure 8.2.1).

At Oasis to the south of Goldkuppe, gold mineralization is hosted by banded marbles where the banding is created by thin calc-silicate layers. Gold is associated with north-south striking quartz veins with pyrrhotite and arsenopyrite mineralization.

8.2 Conceptual Models

Osino based the district exploration on the broad orogenic gold model which had not been used as a driver for much of the historical exploration in Namibia. The key regional features of the orogenic gold model, and how they relate to the Damara Orogenic Belt setting, are:

- Very large, long-lived fault structures, e.g., Omaruru and Otjohorongo lineaments and the KFZ. These structures were initiated during the rift phase and deposition of the sediments and subsequently re-activated during orogeny as steep reverse and transpressional structures.
- Large sedimentary (schist) basins as a source of fluids and metals.
- Compressional tectonics, required for pumping the fluids out of the basins and through the large structures.
- Zones of structural complexity and remobilization of older structures.
- Multiple associated gold occurrences on second or third-order structures connected to the larger structures.

All Osino's Project areas were selected based on these high-level criteria. The KFZ is regarded as the priority regional, fertile structure in the Twin Hills Project area and based on soil and rock chip sampling, there is evidence of gold mineralization along this fault for more than 50 km (Figure 7 2.1).

Figure 8.2.1 Examples of Goldkuppe Mineralization

OJD013 [102 — 103m]: Au 8.9 g/t, Ag 26g/t, As 2860 ppm, Cu 1190 ppm

OJD 12 [56 — 64m]: Au 5.1 g/t, Cu 1060 ppm

OJD013 [69 – 77m]: Au 0.86g/t, Ag 0.28g/t, As 893 ppm, Cu 28ppm

Top: Sulphide mineralization with high gold and silver grades at the contact between banded marble (above) and dolomitic marble below. Middle: Oxidized massive sulphide mineralization composed of pyrite and chalcopyrite. Bottom: Low-grade gold mineralization associated with skarn alteration of banded marble (tremolite – green, diopside – black).

Source: Osino

9.0 EXPLORATION

The summary of exploration activities and results included in this section includes exploration as described in the previous Technical Report (effective date 6 September 2022) for EPLs 3739, 5196, 5533, 5641, 5649, 5658, 5880, 6167, 6953, 7301 and 7344 as well as the work done since then on these EPLs. EPL 7426 and EPL 7427 (narrow corridors between other EPLs) which were part of the previous Technical Report as separate licenses, were merged with EPL 5196.

EPL 3739 (Otjimbojo property) was explored to some extent in the past by Bafex with most of the focus being on the Goldkuppe prospect and the surrounding area. EPL 5641 has also been explored by various companies historically. The other licences have very little or no exploration history.

9.1 Geochemistry

Osino carried out a series of sampling programs on EPL 3739, which included stream sediment, soil, calcrete, and rock chip sampling.

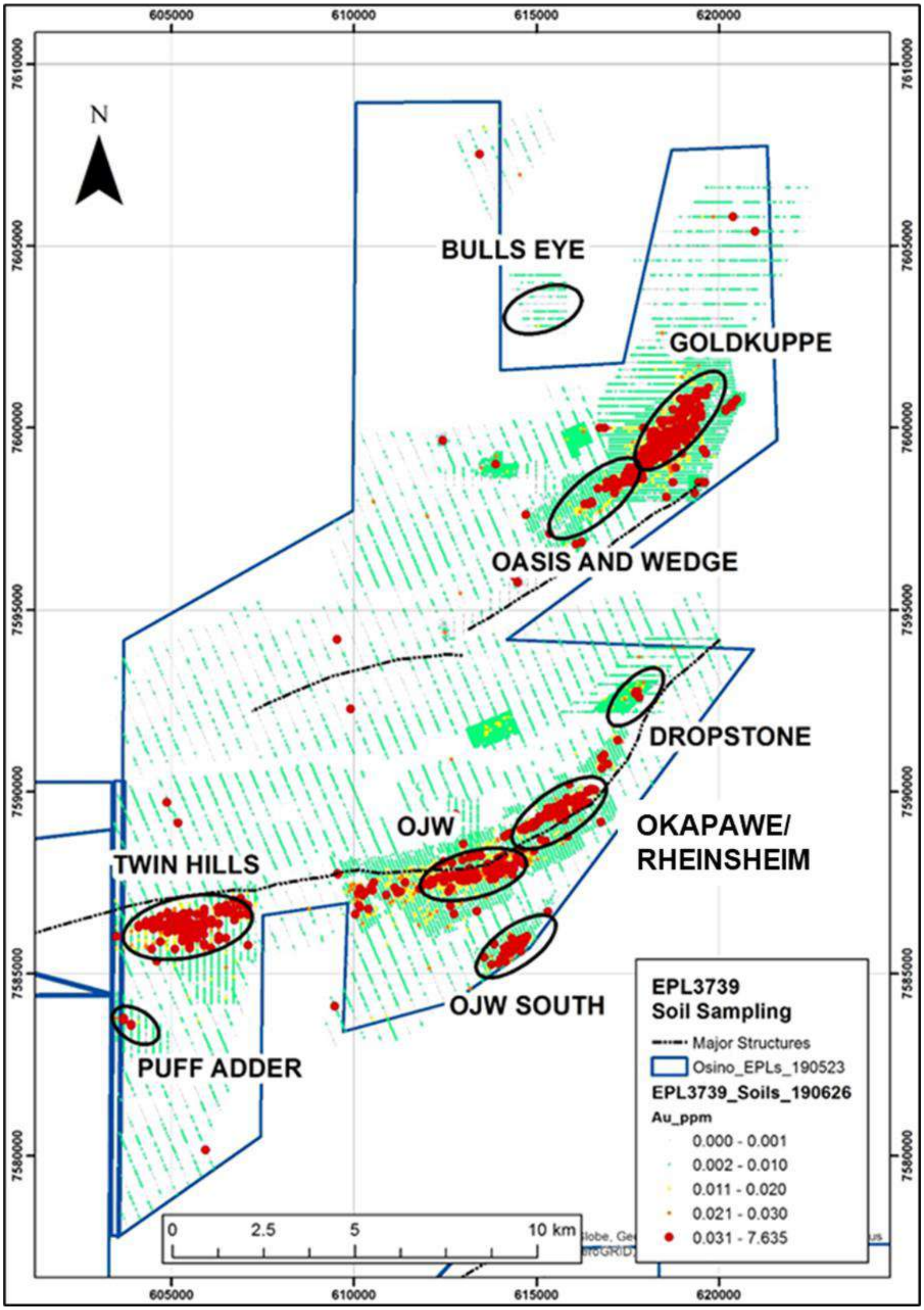
9.1.1 Soil Sampling Surveys

Starting in 2017, Osino carried out extensive regional soil sampling programs covering most of the prospective Damara meta-sedimentary rock units in EPL 3739. The sampling was carried out on 400 m spaced lines with samples taken along the lines at 50 m intervals. The lines were generally orientated north-northwest to south-southeast, which is roughly perpendicular to the regional strike of the sedimentary layering in the area. Most of EPL 3739 is covered by thin residual soils and standardized soil sampling as described below is considered adequate for geochemical assessment and target generation.

During 2017 and 2018, Osino collected 18,521 soil samples within EPL 3739 including the follow-up sample grids. The samples were collected by sieving to the -212 µm fraction in the field and bagging up approximately 100 g sample material in a brown paper sample packet. The packets were submitted to the ALS Global sample preparation laboratory in Swakopmund (Namibia) and then the prepared sample was shipped to the ALS Global Laboratory in Johannesburg, South Africa (ALS Global). Samples were analyzed using the ME ICP61 method, which analyses for a suite of 33 elements, using a four-acid digest followed by inductively coupled plasma with optical emission spectrometry (ICP-OES) finish. Gold is analyzed by the Au-AA24 method which is a fire assay of 50 g with an atomic absorption (AA) finish.

The regional soil sampling results identified numerous areas with above background gold (and associated elements e.g., arsenic and copper in particular). Follow-up soil sampling, covering areas with above background gold (and associated elements) values, was carried out in several areas on 100 m or 50 m line spacing and 50 m or 25 m sample spacing along lines. The regional grids, anomalous sample areas, and identified target areas are shown in Figure 9.1.1.

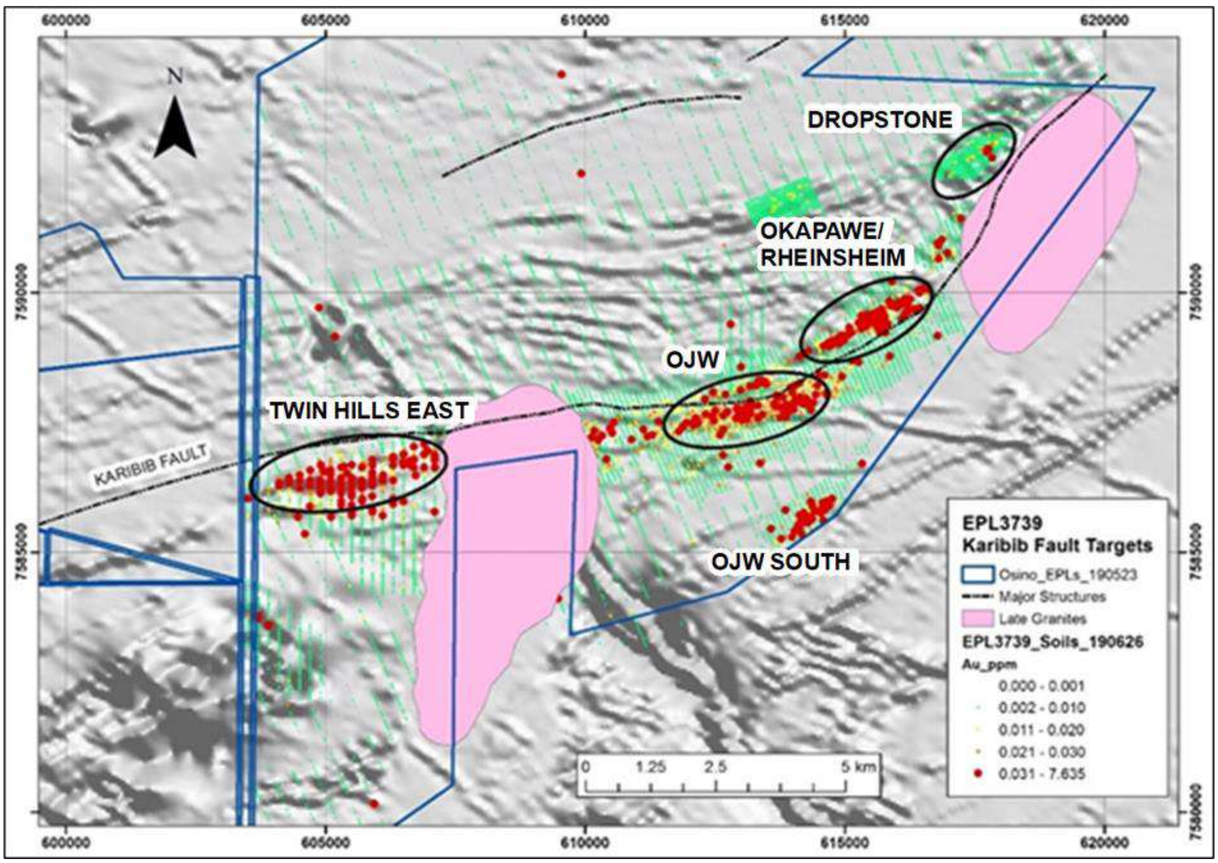
Figure 9.1.1 EPL 3739 – Soil Sampling and Anomalies



Source: Osino

Four new, large-scale gold anomalies were identified (Figure 9.1.2) situated along the KFZ. The most significant of these anomalies is Twin Hills, located mainly to the south of the KFZ. As a result of this soil program, the licences to the west of EPL 3739 (along the south-westerly extension of the KFZ) were secured by Osino, including EPLs 5196, 5658, 6167, 6953, 7344, 7426 and 7427. Other anomalous areas associated with the interpreted position of the KFZ were identified at OJW, Okapawe / Rheinsheim, and Dropstone. In addition, a small anomaly was outlined at OJW South offset to the south of the KFZ.

Figure 9.1.2 EPL 3739 – Geochemical Targets Along the KFZ

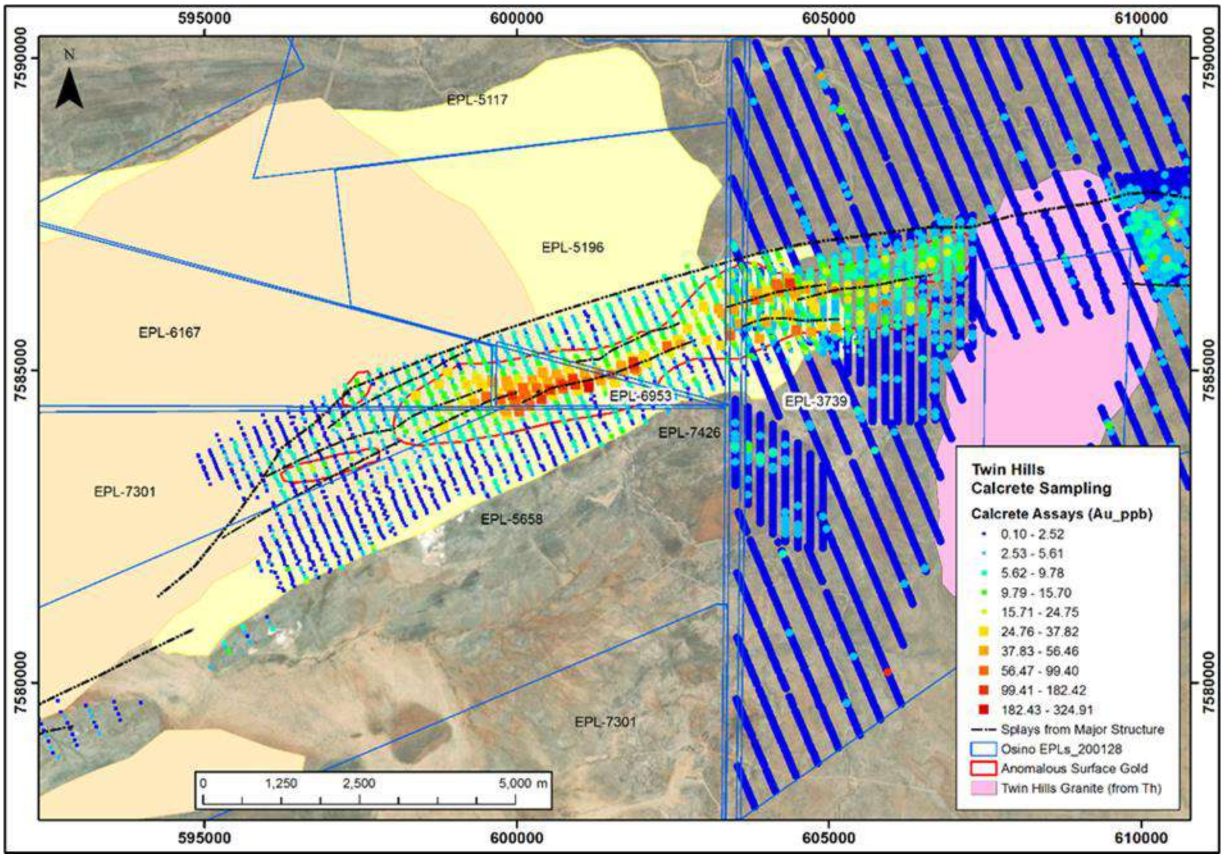


Source: Osino

In May 2018, Osino embarked on a calcrete sampling program to explore the licences to the west of EPL 3739 which are all covered by a thick layer of valley-fill calcrete. After conducting an encouraging orientation study, the KFZ strike was sampled for 8 km to the southwest of Twin Hills on a grid of 400 m x 100 m (Figure 9.1.3). To the southwest the windblown sands become progressively thicker, and pits had to be excavated in these areas to access the calcrete.

The Twin Hills calcrete sampling program resulted in the definition of a high tenor gold anomaly which became known as the Twin Hills target. The gold assays indicated a coherent linear trend following splays off the main Karibib Fault. The results contain 27 assays over 30 ppb Au with a peak value of 145 ppb. The complete Twin Hills gold anomaly is 11 km long and at Twin Hills Central is over 300 m wide (Figure 9.1.3). The gold anomalies coincide with a magnetic anomaly due to the presence of pyrrhotite.

Figure 9.1.3 Calcrete Sampling Southwest of Twin Hills

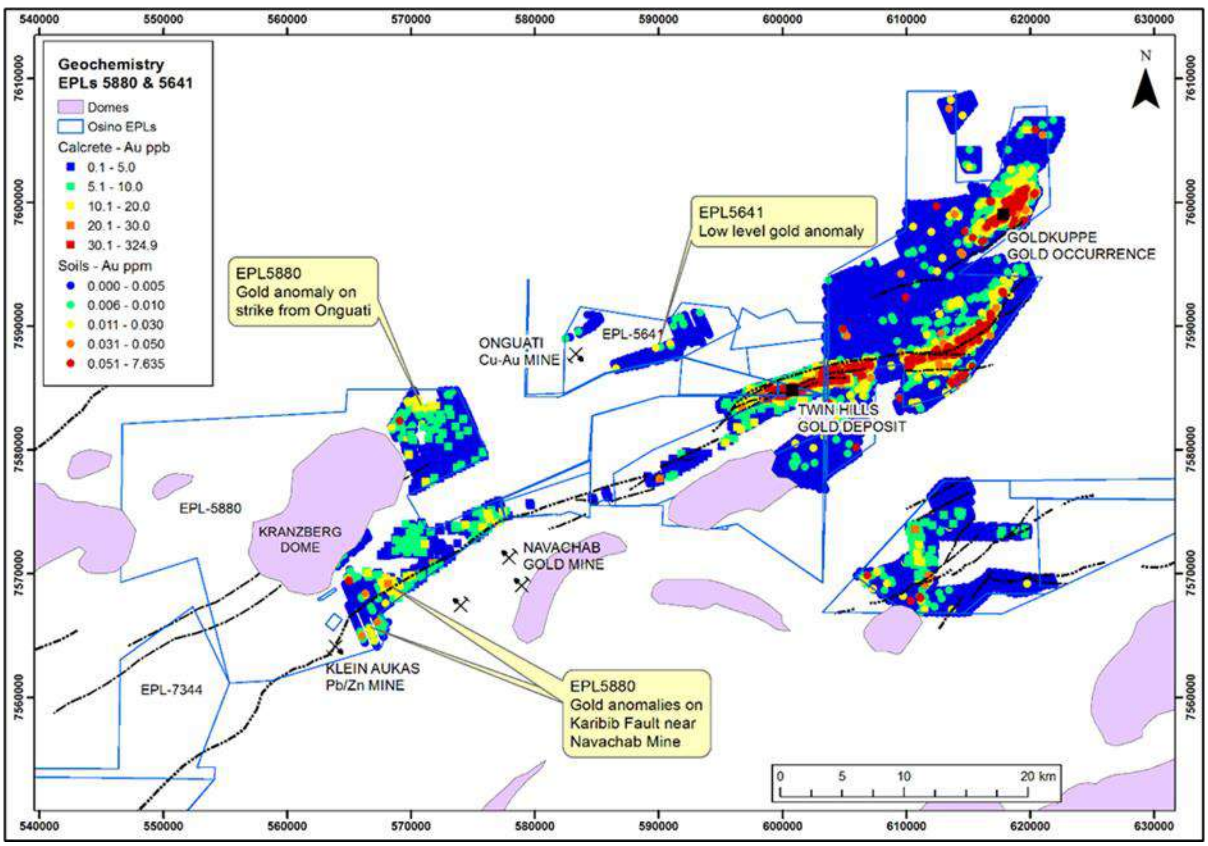


Source: Osino

During Q4 2018, Osino sampled the continuation of the KFZ from the southwest of Twin Hills towards the Navachab mine. This program made use of a percussion drill rig to sample the top of the calcrete layer where it is covered by windblown sand up to 3 m in depth. Vertical holes were drilled on fence lines spaced at 800 m and 100 m hole spacing (see Figure 9.1.4). Several deeper holes were also drilled to determine the regolith thickness along the KFZ, which increases from Twin Hills towards the southwest. Three samples were collected from each hole and submitted for analysis: the first sample above the sand-calcrete contact; the second within the first vertical meter of calcrete; and the third in the next meter of calcrete. In addition, surface calcrete samples were collected along the contact between the schist and marble to the south and southwest of Twin Hills.

In 2020, soil and calcrete sampling were carried out on EPL 5880 and EPL 5641 on the portions considered most prospective in terms of geology and structure. EPL 5880 is centred around the Kranzberg Dome which has a core of Nossob sandstone. The prospective schist formations have been folded and thinned around the margins of the dome in a similar manner to Navachab and Twin Hills. Initial sampling identified an anomaly in soil and calcrete to the northeast of the dome on strike from the historical Onguati copper-gold mine. Sampling to the south of the dome and along KFZ identified two anomalies, one coinciding with the interpreted trace of the main Karibib Fault, and a second anomaly south of the Karibib Fault (potentially a splay of the KFZ) on the boundary of the Navachab exploration licence to the south.

Figure 9.1.4 Sampling of EPL 5880 and EPL 5641

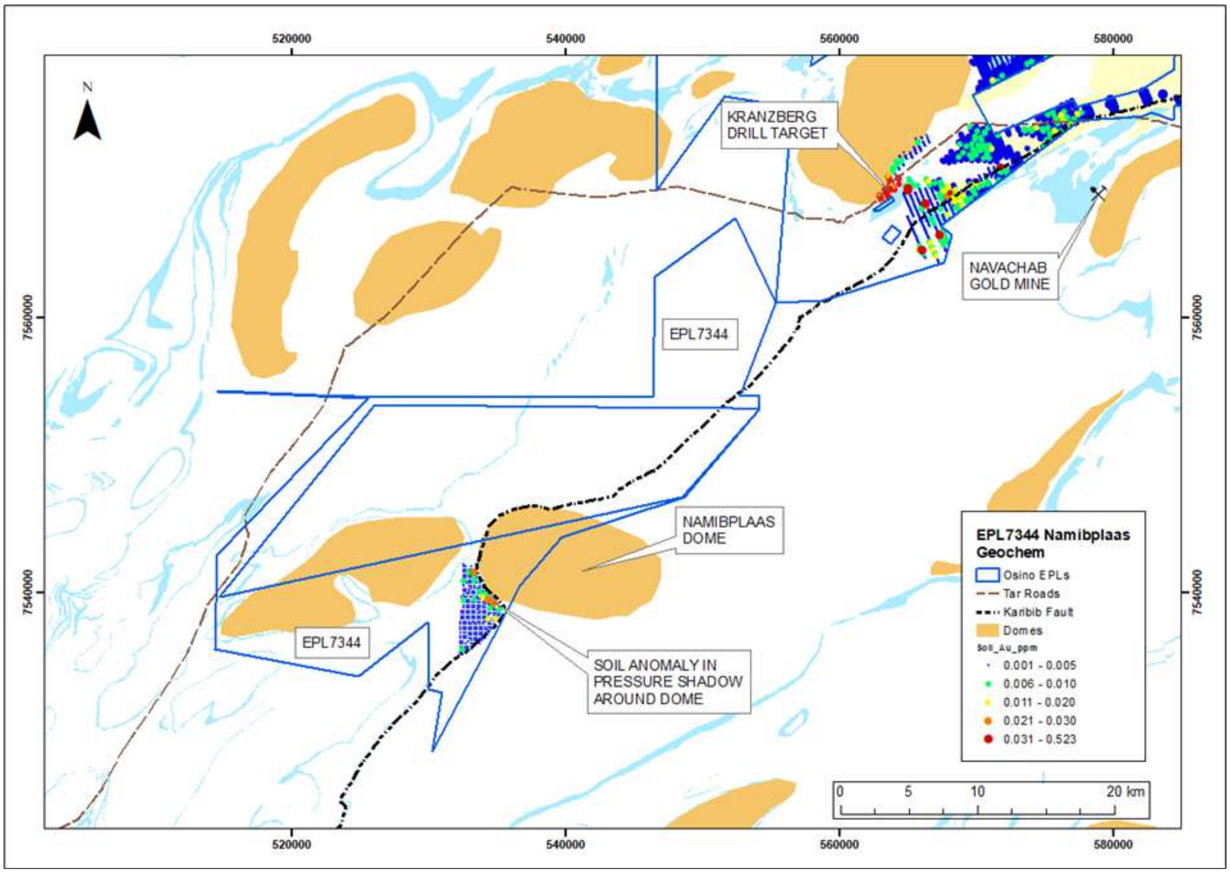


Source: Osino

The central portion of EPL 5641 is underlain by outcropping marble which is not considered prospective for large-scale gold mineralization. Soil sampling was carried out over the schist lithologies to the north and south of the marble and a low-level gold anomaly was detected near the contact between schist and marble.

Work was initiated on EPL 7344 in July 2022 including mapping and initial soil sampling on a high priority structural target along the KFZ, where it deflects around the Namibplaas Dome (Figure 9.1.5). Where a major structure deflects around a rotated dome, a pressure shadow is formed allowing ingress of hydrothermal fluids and represent potentially mineralized areas. The initial 200 x 200m sample grid identified several anomalous soil results in the pressure shadow area which will be followed up.

Figure 9.1.5 Sampling of EPL 7344



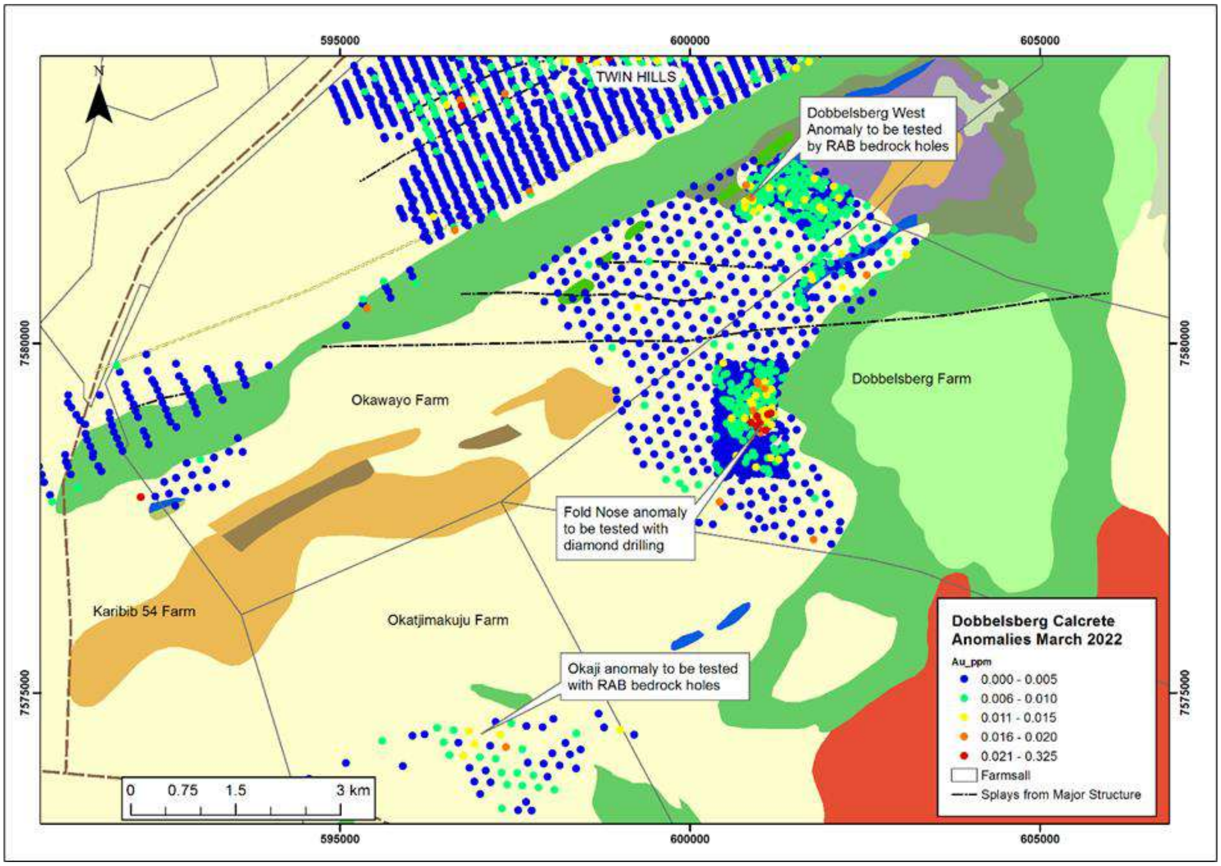
Source: Osino

During H2 of 2021, Osino commenced a soil and calcrete sampling program around the Dobbelsberg Dome on EPL 5658, south of the Twin Hills deposit (Figure 9.1.6). The sampling was focussed on the Arandis Formation (consisting of schist and marble) which hosts the gold mineralization at Navachab, 25 km to the southwest. Most of this formation in the Dobbelsberg area is covered by calcrete as well as a thin layer of wind-blown sand and was therefore sampled by collecting surface calcrete samples or by digging through the sand to the top of calcrete. This is the same highly successful methodology used at Twin Hills. In areas where there is no calcrete, samples were collected of the thin soils present.

To date, a total of 1,843 calcrete; 1,253 soil; and 146 rock chip samples have been collected and assayed. Portions of the farms, Okajimakuyu and Usakos South, are yet to be sampled.

Three gold-in-calcrete anomalies were followed up by RAB drilling for bedrock samples as well as diamond drilling on the highest priority anomaly at Fold Nose on the farm Dobbelsberg (Figure 9.1.6).

Figure 9.1.6 Gold Assay Results for Calcrete Samples at Dobbelsberg with Targets for Follow-up



Source: Osino

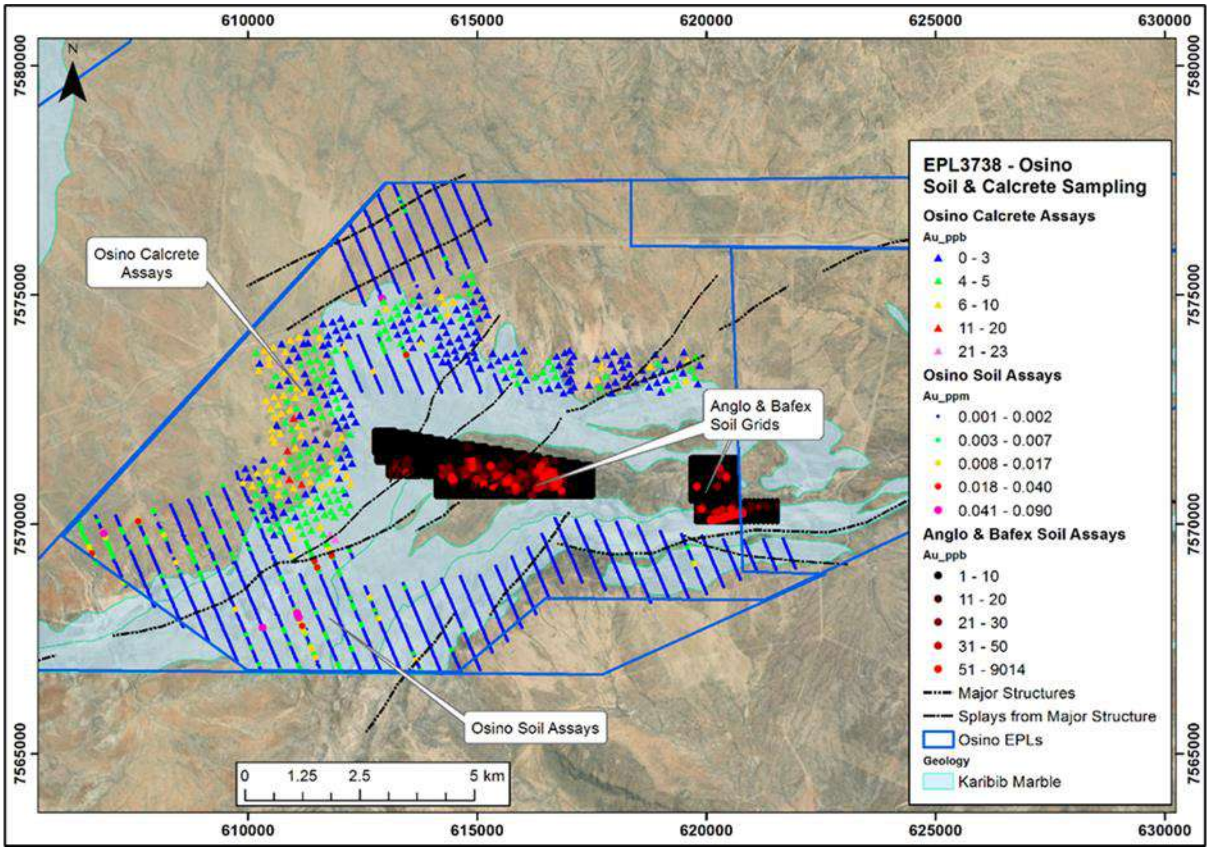
9.1.2 Osino Geochemical Sampling on EPL 5533

This licence area was previously held under the name EPL 3738 which was relinquished in Q1 2022. The currently active licence, EPL 5533, is valid for precious metals, base and rare metals, dimension stone and industrial minerals.

During 2019, Osino carried out soil and calcrete sampling on the areas surrounding the historical soil sampling at Albrechtshöhe (Figure 9.1.7). The soil samples were collected on a grid of 400 m x 50 m with the closely spaced samples perpendicular to the strike of the geology and the calcrete samples were collected at approximately 200 m x 200 m. The areas not sampled are underlain by large granite intrusions and basement rocks which are generally not considered prospective for gold at the Project.

The assay results produced several small-scale anomalies which were checked on the ground. No further work was recommended.

Figure 9.1.7 Osino Soil and Calcrete Assays on EPL 5533 (Previously 3738)

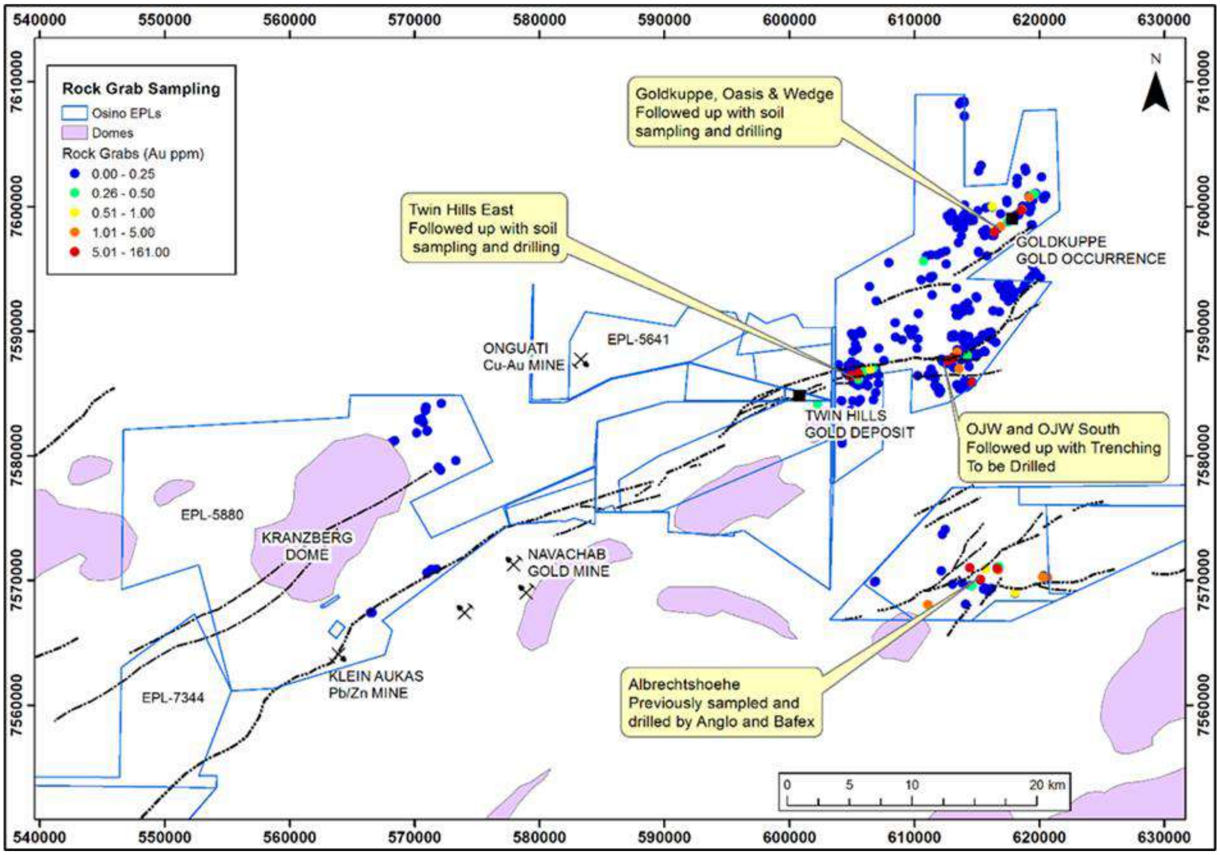


Source: Osino

9.1.3 Rock Chip Sampling

A total of approximately 636 rock samples have been collected on the greater Twin Hills Project to date (Figure 9.1.8). Assay values of greater than 5 g/t Au were obtained from Twin Hills, OJW, Goldkuppe, Wedge, and Albrechtshöhe. High-grade rock chip samples at Twin Hills, Goldkuppe, and Wedge were followed up with drill programs. The high-grade samples from OJW and OJW South were followed up with trench channel sampling in Q4 2019.

Figure 9.1.8 Rock Chip Sampling on EPL 3739



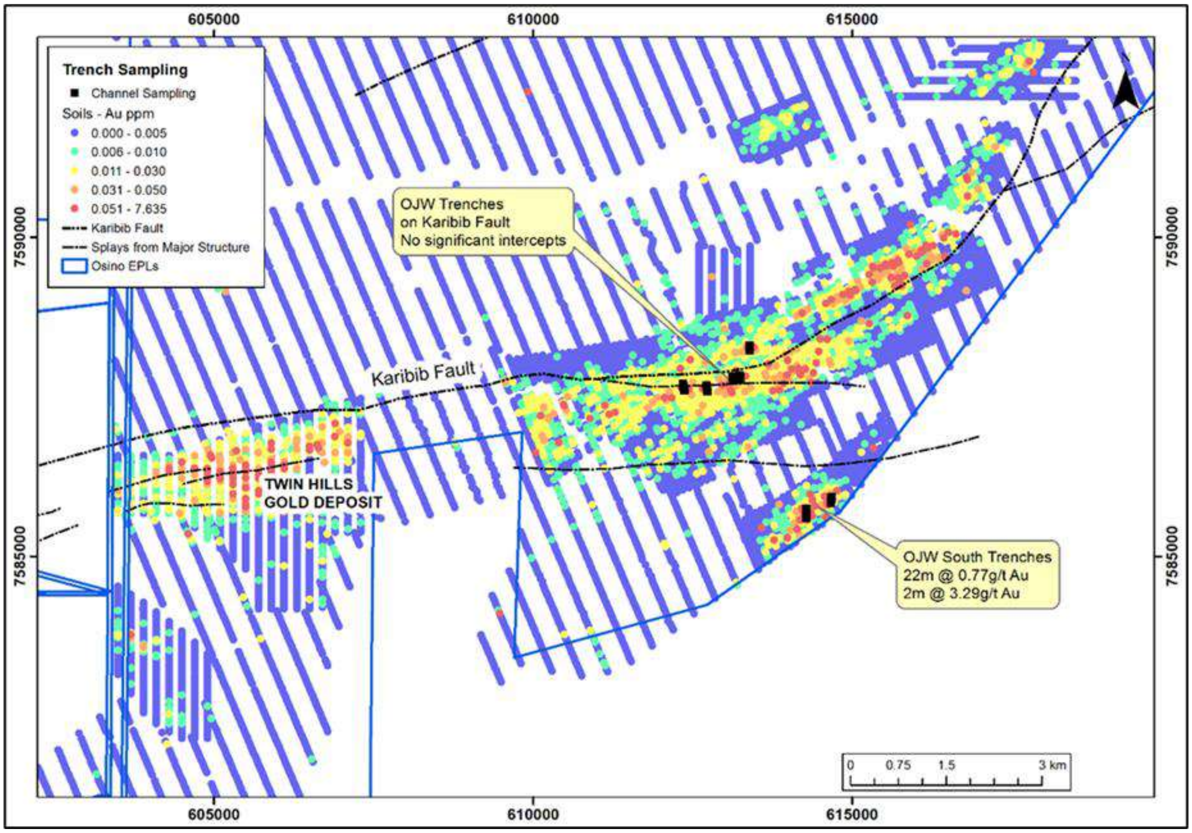
Source: Osino

9.1.4 Trench Channel Sampling

Gold anomalies in soil and rock chip sampling at OJW and OJW South were followed up by excavating trenches and collecting continuous channel samples from the exposed rock (Figure 9.1.9). Five trenches were excavated at OJW for a total of 452 m and two trenches were excavated at OJW South for a total of 265 m. The samples were collected as 2 m composites and submitted for gold fire assay and 36-element ICP analysis. The samples from the OJW South trenches returned assays as follows:

- OWC006: 22 m at 0.77 g/t Au
- OWC007: 2 m at 3.29 g/t Au

Figure 9.1.9 Location of Trenches and Channel Samples within EPL 3739

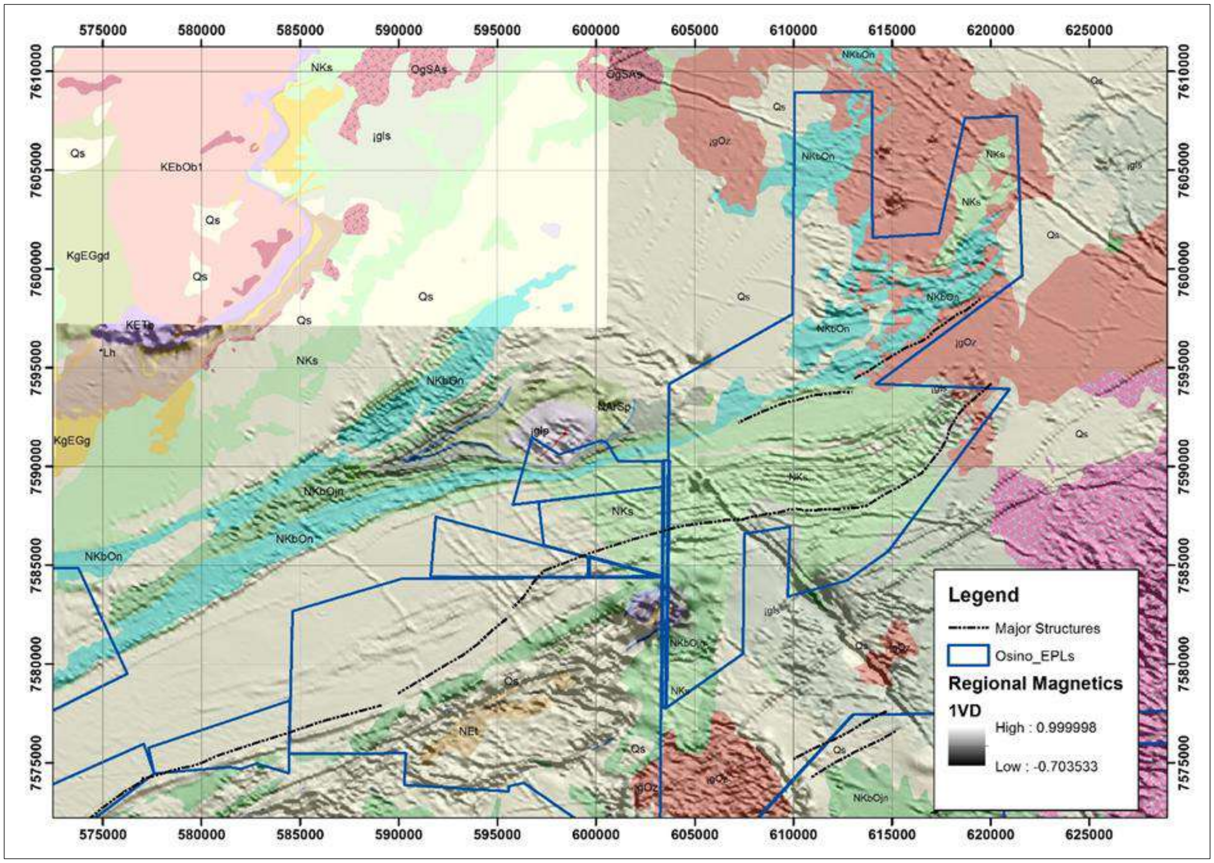


Source: Osino

9.2 Geophysical Surveys

The Twin Hills Project area has been covered by a government aeromagnetic survey, which (in this area) was flown at a line spacing of 200 m. The regional geology draped onto the regional first vertical derivative (1VD) magnetic image, for the general area of Twin Hills (EPLs 3739, 6953, 6167, 5649, 5658, 5117, and 5196) is shown in Figure 9.2.1. Using this data Osino was able to identify and map out the KFZ along the southern margin of the Kuisib Basin which is filled with schists and meta-greywackes of the Kuiseb Formation.

Figure 9.2.1 Regional Magnetics (1VD) Draped onto Geology (See Figure 7.2.1 for Geological Legend)



Source: Osino

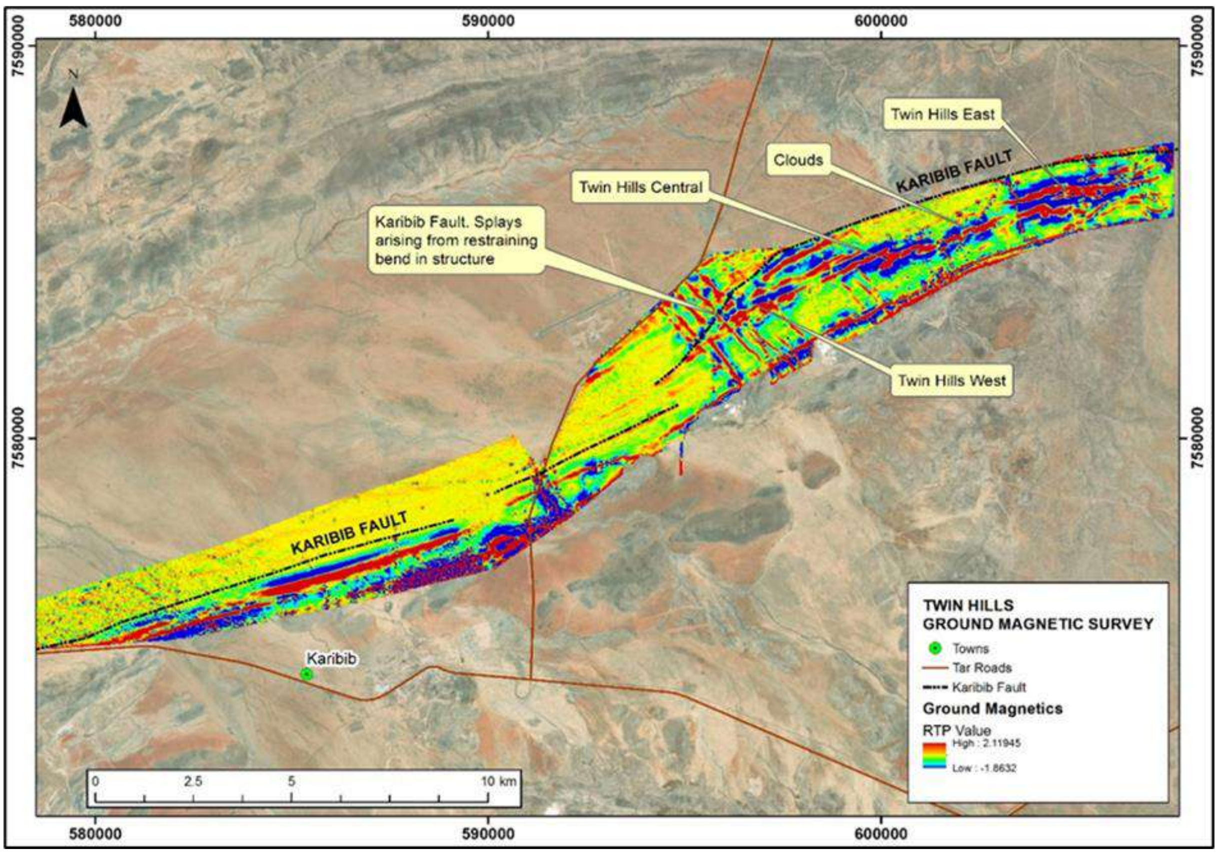
9.2.2 Geophysical Surveys at Twin Hills

In H2 2019, Osino carried out a detailed ground magnetic survey along the KFZ from Twin Hills East on EPL 3739 to the western boundary of EPL 5649, north of the Navachab Mine. The survey was carried out on lines spaced 50 m apart and orientated northwest to southeast. The results of this survey indicated that the gold anomaly at Twin Hills is closely associated with a magnetic anomaly associated with pyrrhotite. In addition, the Karibib Fault, and splay structures (collectively the KFZ) could be better defined and provided further drill targets (Figure 9.2.2).

In addition, three lines of IP were surveyed over The Bulge, Twin Hills Central and Twin Hills East as an orientation exercise. The results indicated that the mineralization at Twin Hills is associated with a conductivity anomaly due to the presence of disseminated sulphides. Several structures of potential interest were also identified in the IP sections.

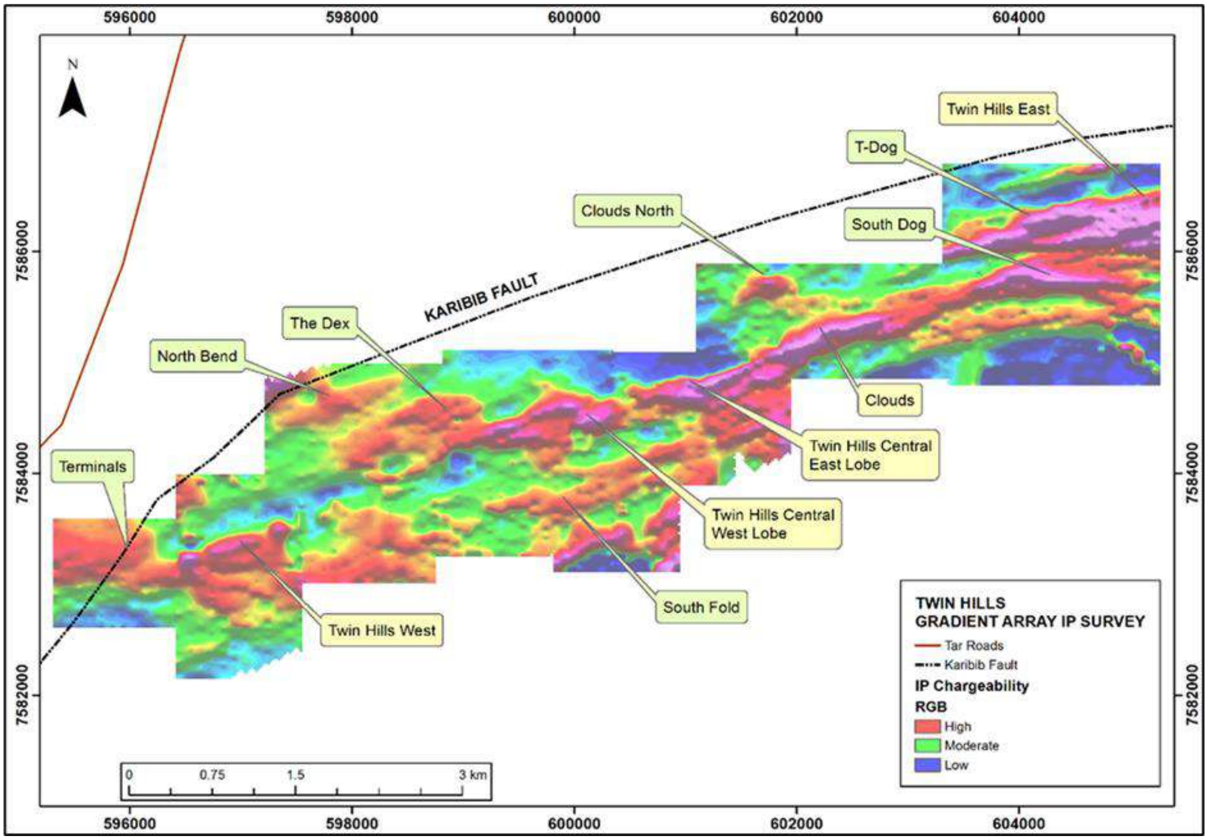
Following the IP orientation survey, a decision was made to cover the Twin Hills area with a geochemical survey and the magnetic anomalies with gradient array IP survey. This latter type of survey is carried out in a series of rectangular blocks which are then stitched together and levelled. This survey was completed in August 2020 and produced prominent chargeability anomalies over the areas of known mineralization (Bulge, Twin Hills Central, Twin Hills East, Twin Hills West – i.e. Kudu and Oryx) as well as highlighting several new target areas (Figure 9.2.3).

Figure 9.2.2 Ground Magnetics Over Twin Hills



Source: Osino

Figure 9.2.3 Gradient Array IP Over Twin Hills



Source: Osino

9.3 Structural Geology

A detailed structural study of the Twin Hills deposit was commissioned by Osino and completed by structural geologist Dr Colin Porter in February 2021. His work included a review of aeromagnetic, IP data, and detailed structural logging of diamond core. This focused on the measurement of bedding, foliation, minor folding, and veining, combined with visual observations. This allowed the facing directions to be established and the geometry of the mineralized fold to be accurately defined. Oriented structural measurements were taken and corrected for downhole deviation using drill hole survey data. A consistent overturned syncline was identified as well as a series of crosscutting faults. Higher-grade shoots were identified in minor parasitic folds.

9.4 Summary of Exploration Prospects

Based on the exploration conducted to data the various prospects and targets within the Project area have been ranked as shown in Table 9.4.1. The work programs indicated are costed in Section 26.1.

Table 9.4.1 Summary of Targets from Geochemical and Geophysical Data

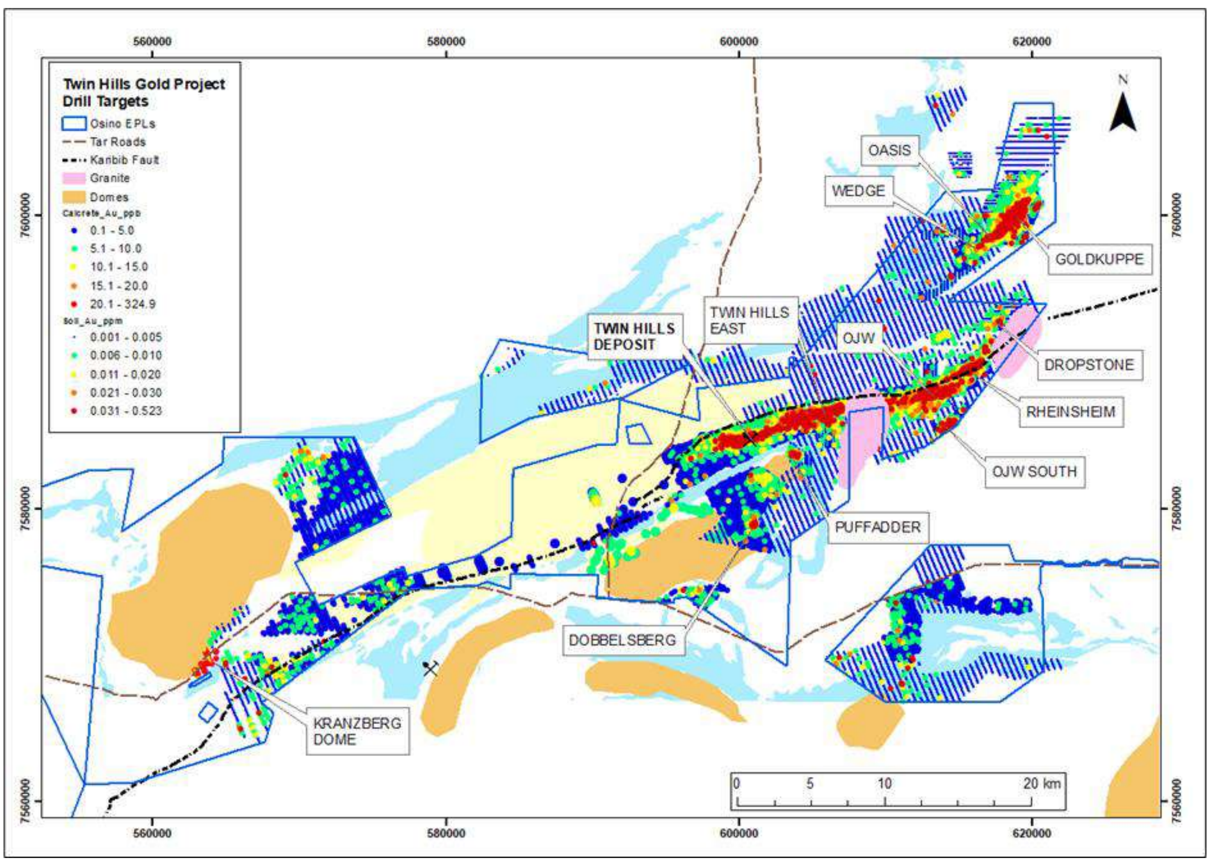
Exploration Stage	Rank	Target	Status	Work program
Discoveries	1	The Bulge, Twin Hills Central and Clouds	Osino discovery with economic potential.	Large-scale drill program for resource estimate; infill drilling for upgrade and feasibility.
	2	Kudu, Oryx, Clouds West and Twin Hills North	Osino discovery with economic potential.	Large-scale drill program for resource estimate; infill drilling for upgrade and feasibility.
	3	Goldkuppe, Oasis	Significant historical and current drilling; potential economic intersections.	Further drilling and modelling in conjunction with Oasis prospect.
Targets	4	Twin Hills East	Significant historical and current drilling; potential economic intersections.	Further drilling.
	5	Eland and Terminals	Gold-in-calcrete and magnetic anomalies on strike from Twin Hills West discovery.	Scout drilling.
	6	Okapawe, Rheinsheim	Gold anomaly in soil sampling.	Scout drilling.
	7	OJW South	Gold anomaly in soil sampling and trenches.	Scout drilling.
	8	OJW Central	Gold anomaly in soil sampling.	Scout drilling.
	9	Dobbelsberg	Gold-in-calcrete anomaly on fold nose and other Arandis targets.	Scout drilling and bedrock sampling.
	10	Puff Adder	Gold anomaly in soil sampling.	Trenching, Scout drilling.
	11	Kranzberg Dome South Margin	Gold anomaly in bedrock sampling, magnetic anomaly.	Follow-up bedrock sampling, scout drilling.
	12	Klein Aukas	Gold anomalies in soil and calcrete sampling.	Extend sampling and mapping, Scout drilling.

10.0 DRILLING

10.1 Summary of Drilling

The major focus of the Osino drilling has been at the Twin Hills discovery, the associated structures and extensions including Twin Hills East, Twin Hills West (Kudu and Oryx), and Barking Dog (Figure 10.1.1 and Table 10.1.1). Before the discovery of Twin Hills, Osino drilled two campaigns of RC and diamond holes at Goldkuppe, Oasis, and Wedge during 2017 and 2018 as well as a short campaign of scout holes at the Okapawe / Rheinsheim and Dropstone targets along the KFZ. Additional hydrological and geotechnical drilling has taken place during 2021 and 2022 to support the feasibility studies. A summary of all drilling carried out to date by Osino is provided in Table 10.1.1.

Figure 10.1.1 Location of Osino Prospects (2017 – 2022)



Source: Osino

Table 10.1.1 Summary of Holes Drilled by Osino

Prospect	Type	No. of Drillholes	Drill Meters	Period
Goldkuppe, Oasis, and Wedge	DD	24	3,856	2017 to 2018
	RC	45	4,902	2017 to 2018
Okapawe / Rheinsheim	RC	6	560	2018
Dropstone	RC	4	415	2017
Twin Hills East	DD	4	408	2018
	RC	19	1,904	2018
South Fold	DD	8	1,608	2021
	RC	12	2,079	2021
Oryx, Kudu, Eland, and Terminals	DD	113	26,056	2019 to February 2023
	RC	122	21,382	2021 to February 2023
North Contact, Rails, and Phantom Granite	DD	8	1,456	2021
	RC	5	884	2019 to 2021
Barking Dog, T-Dog, Moose, and South Dog	DD	22	4,126	2019 to 2021
	RC	10	2,005	2021
DMZ, Dex, The Break, and North Bend	DD	14	2,715	2021
	RC	16	3,168	2019 to July 2022
Twin Hills Central, Bulge, Clouds and Clouds West	DD	334	101,977	2019 to February 2023
	RC	419	60,696	2022 to February 2023
Twin Hills North, and Bulge North	DD	4	616	2022
	RC	8	640	2022
Dobbelsberg	DD	3	603	2022
TOTAL		**1,200**	**242,056**	

Three different drilling techniques were employed by Osino at various stages of exploration across the Project area:

- Diamond drilling using HQ and NQ core diameters to test and develop exploration targets while also providing geological and structural information.

- RC drilling to test and develop exploration targets.

- Percussion drilling to recover geochemical bedrock samples below the calcrete cover and allow for basic geological and regolith assessments.

All exploration drilling (diamond and RC) was oriented approximately perpendicular to the plane of the principal, mineralized structures (usually moderately dipping to the north-northwest) to ensure the optimum angle of intersection. Consequently, holes were generally collared towards 160° at a dip of 60°. The only major variance to this came at Twin Hills West where bedding dips in the opposite direction, hence drill azimuths were set to 340° with 60° dips. Minor scissor holes, drilled in the opposite direction, and vertical holes were also completed to ensure drilling was completed in the most appropriate orientation. All holes were planned using Leapfrog modelling software and collar coordinates were staked in the field using handheld global positioning system (GPS) units (with nominal X and Y precision of 5 m and 20 m in elevation).

10.2 Drilling Techniques

10.2.1 Diamond Drilling

Osino utilized diamond drilling at regional exploration projects as well as the Twin Hills resource drilling campaign. All diamond holes were typically collared in PQ diameter and reduced to HQ diameter once competent (usually at bedrock level) rock was encountered, typically at depths below 20 m downhole. Where the ground was less compact, PQ casing was inserted to keep the hole from collapsing and to ensure optimal flushing of rock cuttings. Drill run lengths were 3 m and wireline drilling methods were employed. Two drilling companies were contracted to supply diamond drilling services. The contractors supplied all the required drilling equipment, trained personnel, and safety equipment.

Kodo Drilling CC supplied and operated four diamond drill rigs – these were:

- Sandvik DE712
- Two Atlas Copco Boyles C6 rigs
- Epiroc Boyles C5.

Günzel Drilling CC supplied and operated four diamond drill rigs – these were:

- Two Atlas Copco CS14 rigs
- Two Atlas Copco CS10 rigs.

All HQ drill core was orientated by using the Reflex ACT II orientation tool. The tool records the orientation of the core barrel before breaking the core free and provides a bottom of hole orientation for each 3 m core run. This is extended along the length of the core by matching broken ends and drawing on the orientation line.

10.2.2 Reverse Circulation Drilling

Osino contracted Hammerstein Mining & Drilling CC ("Hammerstein") to carry out all RC and percussion drilling at the Project. Hammerstein supplied the Project with the following five drill rigs and auxiliary equipment:

- Thor 5000 rig (RC drilling only) with 18-tonne pullback and an Atlas Copco Compressor (24 bar, 1200 CFM) mounted on-board a Powerstar 6x6 truck.
- Thor 5000 Mercedes rig (RC drilling only) with 18-tonne pullback mounted on a Mercedes and a Doosan compressor (24 bar, 1200 CFM) mounted a Volvo truck.
- Superrock 1000 rig (RC and percussion) with 16-tonne pullback mounted on a Peterbuilt and a Kiloskar compression (24 bar, 1200 CFM) mounted on a Samil 100 6x6 truck.
- Superrock 5000 rig (RC and water well drilling) with 28-tonne pullback mounted on a Powerstar truck and an Ingersoll Rand compressor (24 bar, 900 CFM) mounted on Samil 50 4x4 truck.
- Cobra Crawler (RC only) with 16-tonne pullback and a Kiloskar compressor (24 bar, 1200 CFM) mounted on Mercedes 1517 4x4 truck.
    - Hurricane Booster T7 mounted on trailer (69 bar, 1000 CFM)
    - Ingersoll Rand compressor (24 bar, 900 CFM) mounted on MAN 4x6 truck
    - Rods are 4.5 inches (114.3 mm) and run at 6 m lengths. The first two rods behind the hammer were fitted with stabilisers (130 mm outside diameter) to reduce hole deflection
    - Mincon MR 120 hammers were used for RC and percussion drilling.

Steel casing (152 mm outer diameter), that was inserted into the hole upon commencement, was selectively installed down hole to offer stability, improve recovery, and to preserve the drill collars.

Hammerstein used a 5.2-inch (~132 mm) diameter bit on all its rigs. The use of boosters facilitated the collection of dry samples except for a few moist / wet samples during the switch over to booster use. Water strikes were recorded on the drill register.

10.3 Logging Techniques

All drilling, logging, and sampling procedures follow industry standard practices and are documented in Osino's standard operating procedure documents. Geological logging of core and percussion / RC cuttings is based on visual observations of the mineralogy and mineralization.

10.3.1 Diamond Core Logging

Core was logged at the drill rig in a summary format during the drilling of a hole; this included recovery logging and rock quality designation on a run-by-run basis. Core was subsequently transported to the secure core-yard facility in Omaruru for detailed logging and undercover storage. Both summary and detailed geological logs were completed for each hole drilled. Logged observations include lithology, structures, oxidation state, mineralization, and alteration. These were captured in both hard and soft copy format and captured into the project database. Oriented structural measurements were made using a kenometer, 'rocket launcher' and REFLEX IQ-Logger. Logging of these key features is standardized through implementing standardized coding. All diamond core was photographed, and the photos were maintained within the geological database.

10.3.2 Reverse Circulation Logging

RC geological logs were recorded for each hole drilled. Observations include lithology, structures, oxidation state, mineralization, and alteration. These observations were captured on hard and soft copies and then transferred into the geological database. Retained sample material (following primary and duplicate sample generation using a riffle splitter) was wet screened / washed using a 2 mm sieve and the +2 mm sample placed in a labelled chip box. This material was used for detailed geological logging in the field, after which the chip trays were transported to, stored, and catalogued at Osino's secure core yard facility.

10.3.3 Bulk Density

Bulk density data were routinely collected from diamond drill core for all rock types. Bulk density was determined using the hydrostatic immersion method, on solid core pieces, with lengths exceeding 10 cm at a nominal sampling interval of one sample every 5 m downhole. Every tenth sample was repeated as an internal quality control measure.

10.4 Recoveries

Core recovery from the diamond drilling campaign was calculated at 97%. Recoveries for the RC drilling were estimated based on a theoretical sample mass per metre run, expressed as a percentage. RC recovery estimates were done for dry, fresh material only, and moist / wet samples were excluded from the calculation. The RC recovery averages 92%. All recovery data are recorded in the Project database.

10.5 Surveying

10.5.1 Collar Surveying

Drillhole collars were surveyed using a Trimble R2 receiver DGPS with Trimble Centre Point Real Time eXtended (RTX) that provides high-accuracy GSSN positioning services via satellite. The RTX Centre Point signal provided an accuracy of 2–3 cm on X and Y coordinates and 5 cm on Z coordinates. All elevation data was referenced to the Geoid model EGM08-1 (Earth Geoidal Model of 2008). All data was acquired in WGS84 UTM Zone 33S system using the Trimble R2 differential GPS system. Three differential GPS base stations were established on this prospect for future use in all positioning surveys. Surveys were done by an experienced local consultancy, Greg Symons Geophysics.

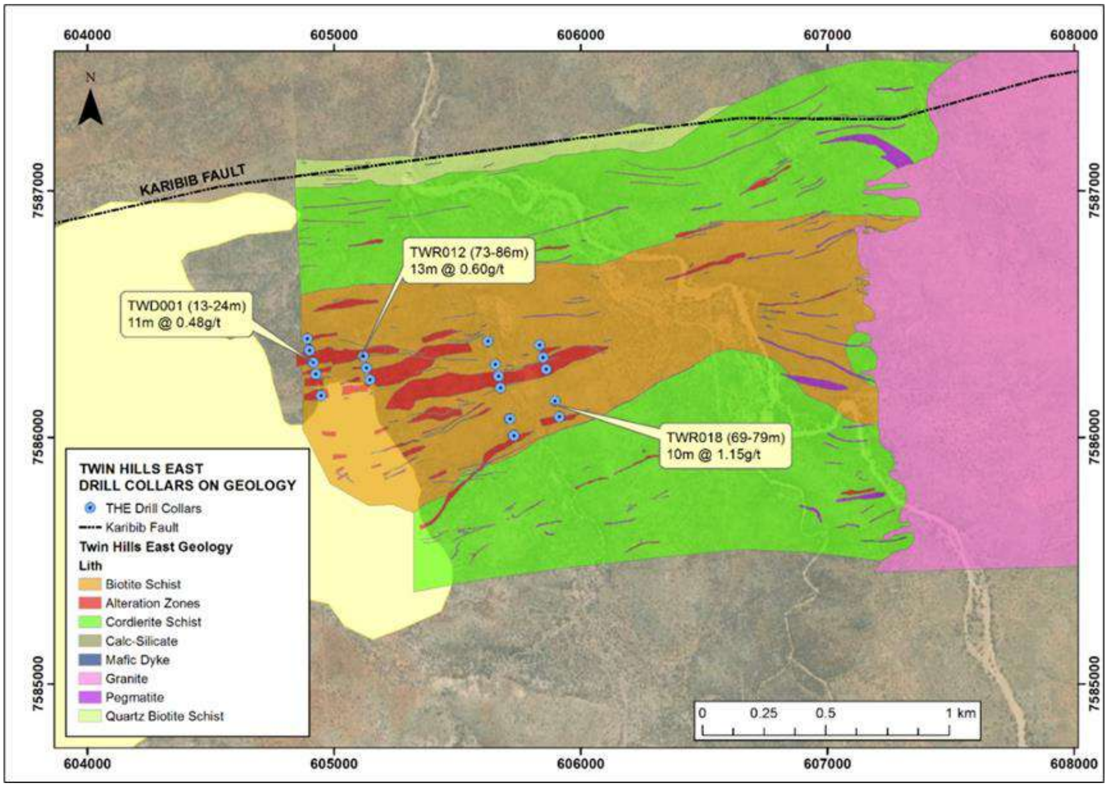
10.5.2 Downhole Surveying

RC and diamond holes were surveyed from the bottom (end of hole) upwards, at 20–30 m intervals. The REFLEX EZ-TRAC downhole survey tool was used by all the drill contractors and produced readings relative to magnetic north; these were corrected using the magnetic declination prior to importing to the database. There is little evidence of magnetic influence from pyrrhotite in the deposit. For the RC holes, surveys were conducted after all rods were tripped from the hole and the final / shallowest shot was taken at least 10 m below the steel casing to avoid any magnetic interference. The diamond drill contractors surveyed by dangling the tool about 10 m below / outside the rod string, while tripping out rods, to avoid any influence from the steel rods. Survey results were reviewed and referenced against planned surveys. If results were anomalous, entire holes would be resurveyed or individual anomalous survey shots would be ignored before importing the data to the geological database.

10.6 Summary of Drilling Results at the Project

The first round of drilling at Twin Hills was carried out in April and May 2018 on the easternmost outcropping portion of the mineralization at Twin Hills East. A total of 19 holes (for 1,904 m) were drilled in altered and mineralized quartz biotite schist covering a strike extent of 1 km (Figure 10.6.1 and a summary of significant intercepts in Table 10.6.1). The drill program returned several mineralized intersections appearing to be the distal portion of a larger gold-bearing hydrothermal system open in all directions as well as down dip. As a result of the initial program, follow-up drilling was planned and subsequently executed.

Figure 10.6.1 Twin Hills East Drill Collars and Geology



Source: Osino

Table 10.6.1 Intercepts (>0.4 g/t Au) for Internal Twin Hills East Drilling Compaign

Hole No.	From m	To m	Width m	Grade g/t Au
TWD001	13	24	11	0.48
TWD003	9	19	6	0.61
TWD004	83	87	4	1.01
TWR002	14	17	3	0.89
	20	21	2	0.85
TWR004	62	69	7	0.40
TWR008	8	12	4	0.48
TWR009	74	79	5	0.77
TWR012	42	44	2	0.52
	73	86	13	0.60
TWR016	91	93	2	0.78
TWR017	14	20	6	0.42

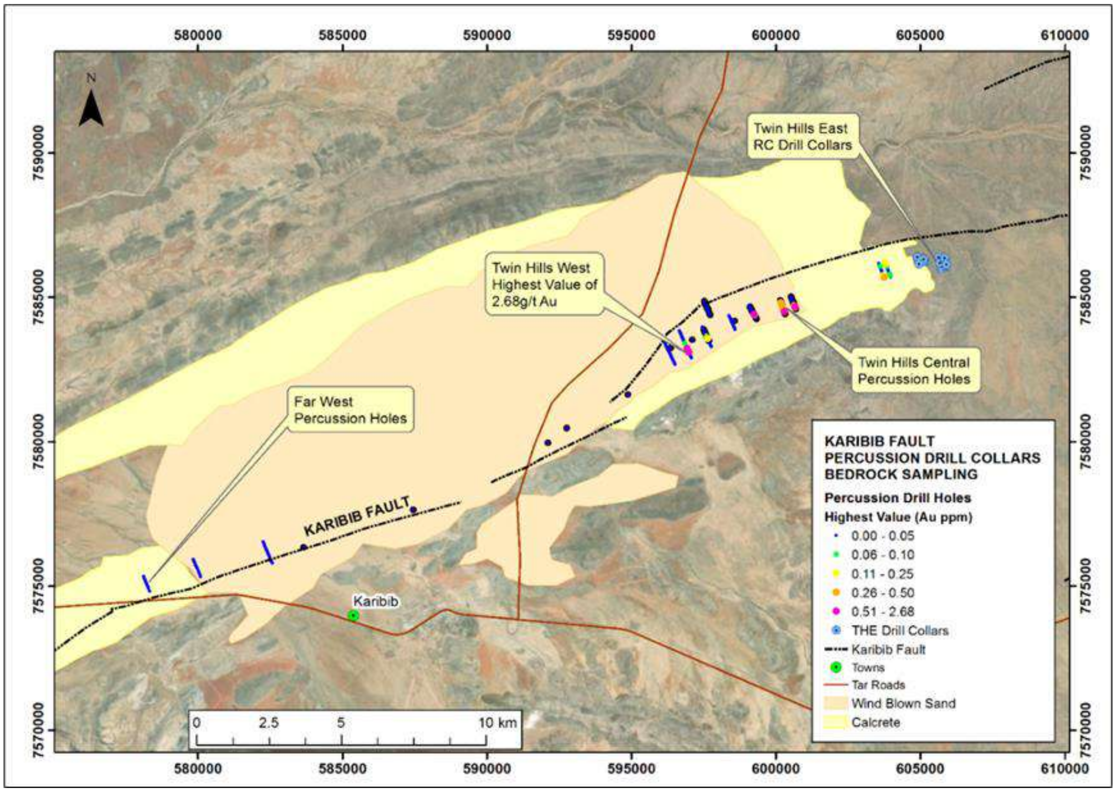
Hole No.	From m	To m	Width m	Grade g/t Au
TWR018	69	79	10	1.15

Note: The Relationship between true thickness and intercept width is unknown.

In Q4 2018, two lines of percussion drillholes were completed over the Twin Hills Central gold-in-calcrete target. This drill program was designed to confirm the relationship between the surface calcrete anomalies and the bedrock beneath. The short program confirmed a coincident bedrock gold anomaly of 400 m in strike length, with values up to 2.25 g/t Au with a median of 0.017 g/t Au and an average of 0.129 g/t Au and open in all directions.

In April to May 2019, approximately 4,660 m of shallow percussion drilling was completed over the rest of the Twin Hills cluster of targets as well as at Far West on the south-western boundary of EPL 5649 just north of the Navachab mine. The percussion holes were drilled vertically through the calcrete cover (which varies in thickness from 3 m at Barking Dog to over 50 m at Far West) to sample the bedrock beneath. Samples were collected and assayed for the first 2 m of bedrock as well as the metre of mixed calcrete / bedrock above. Results of this bedrock sampling program included a maximum grade of 2.68 g/t Au on the western-most line at Twin Hills West. The Twin Hills West target is open to the west and south. Bedrock mineralization was confirmed at all targets within the Twin Hills cluster including Bulge, Twin Hills Central, Twin Hills West, Clouds, and Barking Dog (Figure 10.6.2).

Figure 10.6.2 Percussion Drilling on KFZ for Bedrock Samples Beneath Cover – Highest Value for Each Hole Indicated



Source: Osino

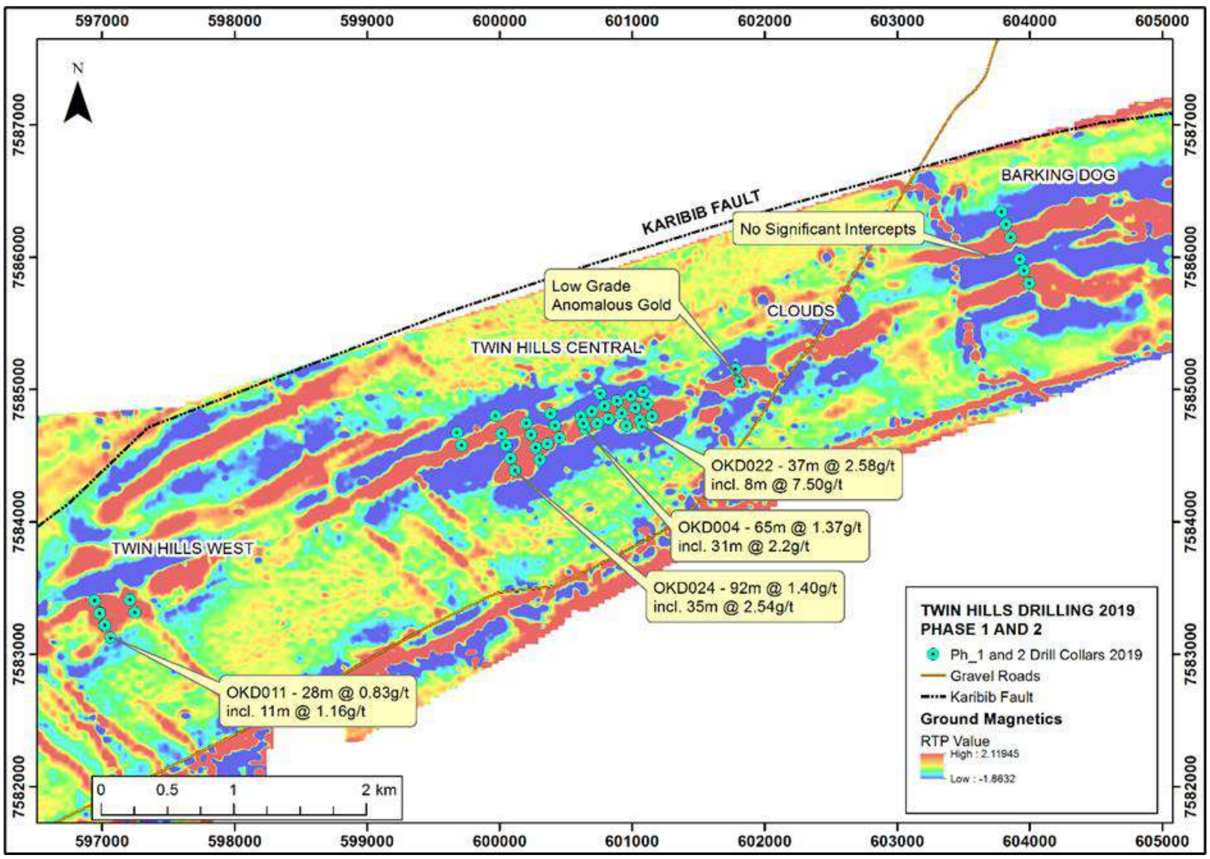
In July–August 2019, Osino completed an initial diamond drill program at The Bulge and Twin Hills Central comprising seven holes for a total of approximately 1,475 m. These holes were laid out on three section lines 400 m apart, covering a total strike length of 1,200 m. The holes were drilled at a declination of 60° on an azimuth of 160° (south-southeast) – perpendicular to the regional lithological strike.

This initial program resulted in the discovery of the Twin Hills gold mineralization, with five of the initial seven holes returning significant gold intercepts including OKD004 with 65 m at 1.37 g/t Au (from 16 m), including 31 m at 2.2 g/t Au. Two other holes (OKD001 and 002) returned intercepts over 100 m wide.

A second drill program was started in October 2019 to follow up on the initial success at The Bulge and Twin Hills Central and test other geochemical anomalies at Twin Hills West, Clouds, and Barking Dog (Figure 10.6.3). This second program extended the strike of confirmed gold mineralization at The Bulge and Twin Hills Central to 1,200 m and down to a depth of over 300 m, open to the east, west, and at depth. The best intercepts included OKD024 with 92 m at 1.40 g/t Au (20–112 m), including 35 m at 2.54 g/t Au and OKD022 with 37 m at 2.58 g/t Au (173–200 m), including 8 m at 7.50 g/t Au. OKD022 was drilled towards the north-northwest (opposite direction to other holes).

At Twin Hills West, four out of eight holes intersected significant gold mineralization including 28 m at 0.83 g/t Au (including 11 m at 1.16 g/t Au) (OKD011) and 11 m at 1.08 g/t Au (OKD019) with grade and width of mineralization appearing to increase to the south and west. The Clouds target returned a low-grade intercept, albeit in the targeted mineralized greywacke horizon. The six-hole fence line drilled at Barking Dog returned no significant intercepts and drilling indicated a more schistose lithology than the greywacke at The Bulge and Twin Hills Central (Figure 10.6.3).

Figure 10.6.3 Phase 1 and Phase 2 Drilling at Twin Hills on Ground Magnetic Image



Source: Osino

10.6.1 Infill and Expansion Drilling (2020 – 2023) for the Mineral Resource Estimate

The objective of the first phase of Mineral Resource definition drilling (drill plan H1-20) at the Twin Hills Gold Project was to infill and expand on known areas of mineralization, especially in and around Bulge and Twin Hills Central discoveries. The drill program included an initial 20,000 m, with inclined holes planned along a 50 m x 50 m grid in support of a targeted Inferred Mineral Resource. Drilling commenced in March 2020 but, due to delays caused by the COVID-19 global pandemic, drilling operations only began in mid-May 2020. The program started with two diamond drill rigs, which on the back of early and continued positive drill results, quickly expanded to five diamond rigs and three RC rigs. The H1-20 drill plan was concluded on 11 October 2020, after completing a total of 28,124 m, of which 18,102 m were drilled by diamond and 10,022 m by RC rigs.

After a short break in drilling operations, allowing for assay results to be returned by the lab, the next phase of Mineral Resource definition drilling commenced on 28 October 2020. The H2-20 drill plan was designed with similar objectives as the H1-20 plan; however, expansion/exploration drilling at Clouds and Clouds West targets were included. The program included five diamond rigs and four RC rigs, drilling six days a week to complete 20,000 m by 25 January 2021. Drilling operations progressed quicker than planned which opened the work schedule up to drill additional meters. Planning of these additional holes was supported by further positive drill results at Clouds and Twin Hills Central. When the H1-21 drill plan commenced on 25 January 2021, a total of 29,147 m (16,766 m RC and 12,381 m diamond) had been drilled.

In early February 2021, the next phase of Mineral Resource infill and expansion drilling commenced at Clouds, Twin Hills Central and Bulge. The drill plan (TH03-21 and TH06-21) included an initial 58,000 m of inclined drilling, following a staggered 50 m x 50 m collar grid spacing. The staggered grid resulted in an inter-hole spacing of roughly 32–34 m, deemed sufficient to support upgrading the Inferred Mineral Resource to Indicated.

The infill and expansion program progressed in parallel with a brownfields exploration program (TH02- 21) aimed at discovering satellite mineralization within close proximity to the main Twin Hills deposits. A discovery was made at the Twin Hills West target (Kudu and Oryx) during Q3 of 2021 and was further supported by encouraging assay results from the Mineral Resource expansion drill program.

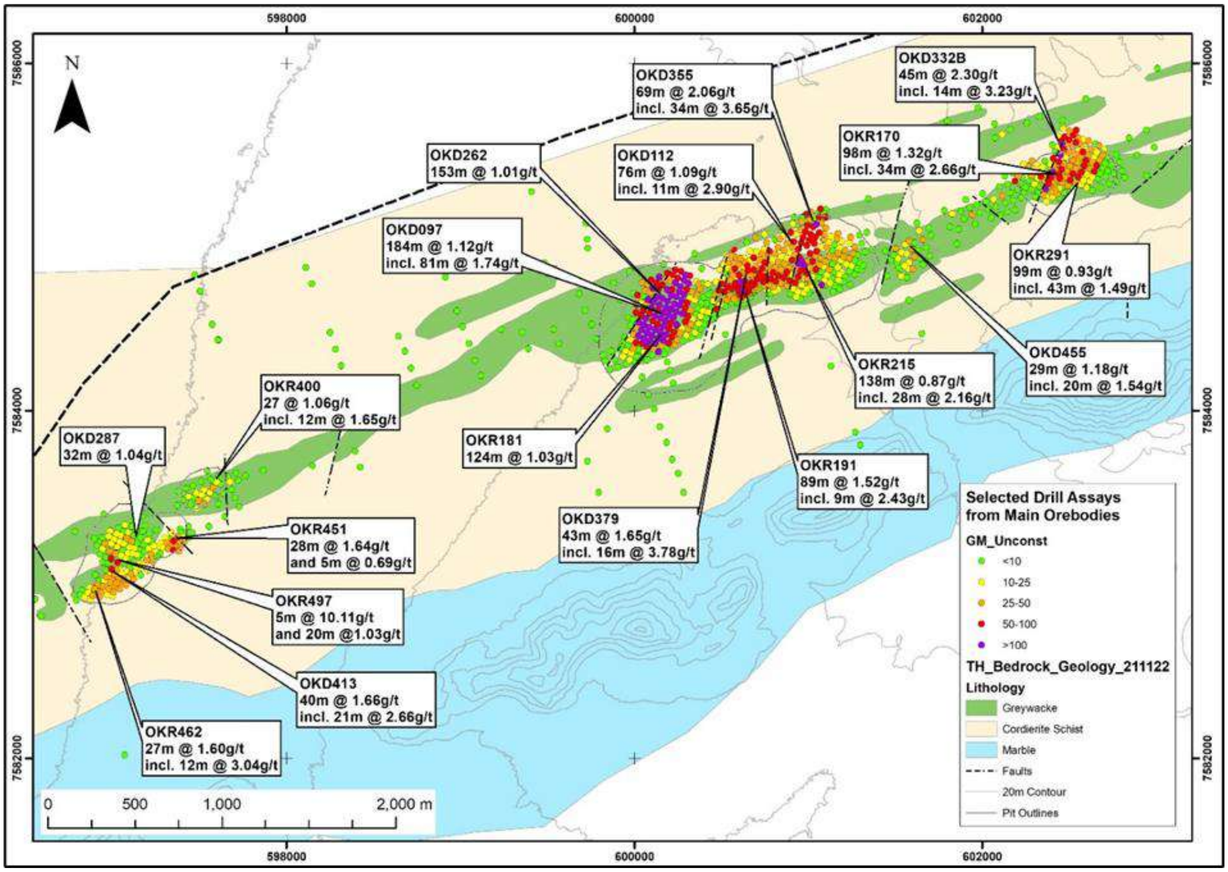
In September 2021, the infill and expansion program (with about 41,000 m of drilling completed) was expanded and fast tracked, with a total of eight diamond and three RC rigs drilling at the Project. Upon conclusion in early February 2022, the 2021–2022 Mineral Resource infill and expansion drill program totalled 70,165 m, comprising 40,566 m DD and 29,599 m RC. The data generated during this and previous drill programs supported the release of the April 2022 MRE.

In March 2022, a subsequent phase of Mineral Resource upgrade and expansion drilling commenced. The campaign was aimed at converting the remaining Inferred Mineral Resources to the Indicated and Measured category for planned Pre-Feasibility Study ('PFS'). The program was concluded in July 2022 with a total of 38,057 m drilled since the April update, including 23,865 m DD and 14,192m RC. In addition to upgrading the Mineral Resource, the program also expanded the Twin Hills West (THW) mineralization significantly down dip and along strike. In addition, high-grade feeder zones were intercepted at Twin Hills Central (THC) and Clouds, indicating the potential for narrow high-grade zones that could be mined from underground.

After a drilling hiatus between August and October 2022, a refined infill and step out drill program was initiated in early November 2022. The program was developed to convert the remaining resources still in the Inferred category, to Indicated and Measured. The additional data generated has been integrated into the current MRE iteration and subsequent Definitive Feasibly Study (DFS) due for release in Q2 2023. The drill program was concluded in February 2023 with a total of 17,006 meters drilled, including 11,015 DD meters from 36 holes and 5,991m RC from 47 holes. Key campaign achievements included the extension of mineralization along strike and down plunge at THW and the expansion of the recently discovered Clouds West deposit.

Drilling has confirmed a combined strike extent for Bulge and Twin Hills Central of at least 1.3 km with mineralization open down-dip and down-plunge. Clouds is located about 1 km east of Twin Hills Central, has a defined strike extent of about 400 m, and is also open at depth. Clouds West is located approximately 300 m from Twin Hills Central and shows potential down-plunge. The Twin Hills West deposits comprise two mineralized lobes, namely Oryx and Kudu. The largest of these, Oryx, has a strike extent of more than 600 m and is open down plunge to the east. Figure 10.6.4 shows the gram meter (gm) values for selected holes drilled at Twin Hills West, Bulge, Twin Hills Central and Clouds. A table of significant intersections from selected cross sections, is provided in Table 10.6.2 for the primary targets and Table 10.6.3 for the satellite targets.

Figure 10.6.4 Gram Meter Values for Drill Intersections at Bluge, Twin Hills Central, Clouds West, Oryx and Kudu



Source: Osino

Table 10.6.2 Significant Intercepts for Representative Sections within the Mineralized Volume at Bulge, Twin Hills Central and Clouds (Refer to Figure 10.6.5 for Section Line Locations)

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
Bulge					
OKD031	23	173	150	0.98	147.00
incl.			11	1.24	
incl.			61	1.51	
OKD074	16	247	231	0.64	147.84
incl.			20	1.50	
incl.			46	1.00	
OKD220	119	131	12	0.47	

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
and	136	143	7	0.54	
and	219	292	73	0.64	46.72
incl.			11	1.17	
incl.			16	0.93	
OKD103	316	318	2	0.58	1.16
OKR035	20	110	90	1.14	102.60
incl.			55	1.37	
OKR038	29	55	26	0.97	25.22
OKR164	57	146	89	1.68	149.52
incl.			72	1.92	
OKR181	18	142	124	1.03	127.10
OKR194	14	200	186	0.79	146.94
incl.			7	1.00	
incl.			6	1.17	
incl.			15	1.04	
incl.			41	1.38	
incl.			15	1.22	
OKR201	20	88	68	1.33	90.44
incl.			41	1.67	
incl.			8	1.98	
Twin Hills Central					
OKD046	20	52	32	1.23	39.36
OKD068	152	257	105	0.70	73.50
incl.			38	1.33	
OKD204	241	302	61	0.88	53.68
incl.			22	1.81	
OKD254	379	399	20	0.75	
incl.			4	1.45	
incl.			6	1.17	
and	416	459	43	0.96	41.28
incl.			32	1.16	
OKD263	204	302	95	0.84	79.80
incl.			13	1.34	
incl.			22	1.34	
incl.			16	1.15	
OKD306	73	76	3	1.89	
and	93	95	2	1.62	

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
and	105	133	28	0.70	
and	169	216	47	1.04	48.88
incl.			7	1.05	
incl.			13	1.03	
incl.			11	2.23	
OKD331	20	23	3	17.01	51.03
and	379	408	29	1.30	
and	418	423	5	1.49	
OKD336	333	384	51	1.05	53.01
incl.			35	1.27	
OKD347	260	352	92	0.75	69.00
incl.			7	2.24	
incl.			27	0.90	
OKR051	14	128	114	0.54	61.56
incl.			13	1.61	
incl.			4	1.06	
OKR068	87	90	3	1.28	
and	101	107	6	0.56	
and	155	214	59	0.94	55.46
incl.			9	2.28	
incl.			11	1.54	
OKR286	12	33	21	0.87	18.27
incl.			3	2.30	
incl.			6	1.10	
OKR302	34	99	65	1.14	74.10
incl.			23	1.20	
incl.			20	1.59	
OKR311	22	48	26	0.65	
incl.			9	1.10	
and	90	141	51	0.78	39.78
incl.			14	1.05	
OKR475	51	53	2	2.94	5.88
OKR516	32	36	4	0.68	2.72
OKR519	24	28	4	0.85	3.40
Clouds					
OKD142	178	251	73	1.42	103.66
incl.			37	2.27	
OKD216	144	152	8	0.57	

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
and	178	218	40	1.27	50.80
incl.			13	1.78	
incl.			6	1.83	
incl.			9	1.68	
OKD229	262	290	28	2.02	56.56
OKD244	117	126	9	0.81	
and	162	194	32	0.81	25.92
incl.			6	1.93	
OKD332	270	354	84	1.08	90.72
incl.			16	1.37	
incl.			7	2.80	
OKD393	367	468	101	0.68	68.68
Incl.			22	1.31	
OKD446	310	380	70	0.90	63.00
Incl.			14	1.94	
Incl.			2	2.05	
OKD437	280	340	60	1.17	70.20
Incl.			29	1.28	
OKR092	31	60	29	1.07	
and	88	138	50	1.75	87.50
OKR148	145	166	21	1.81	38.01
OKR170	65	163	98	1.32	129.36
incl.			2	1.27	
incl.			11	1.20	
incl.			9	2.00	
incl.			34	2.66	
OKR177	29	31	2	6.65	
and	58	106	48	1.86	89.28
incl.			12	5.24	
incl.			22	1.09	
OKR179	24	78	54	2.60	140.40
incl.			20	1.62	
incl.			8	12.70	
OKR232	12	120	108	0.43	46.44
incl.			22	1.15	
incl.			2	1.07	
incl.			3	1.03	
OKR265	22	44	22	1.27	27.94

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
incl.			2	2.71	
incl.			3	6.31	

Notes: Intercepts over 20 gm (grade x meters) or >1 g/t Au over 4 m. All widths are apparent. Only intercepts plotting on sections in Figure 10.6.5 are provided. The relationship between true thickness and intercept length is not known but can be estimated visually on sections.

Table 10.6.3 Significant Mineralized Intercepts at Twin Hills North, Clouds West, Kuda and Oryx

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
Twin Hills North					
OKD329	11	20	9	1.44	
OKD331	20	26	6	8.63	51.8
OKD450	68	76	8	10.19	81.5
Clouds West					
OKD059	154	170	16	1.73	27.7
OKD145	201	206	5	2.13	
OKD304	182	192	10	1.06	
OKD455	172	198	26	1.29	33.5
OKR143	155	269	14	1.03	
OKR264	112	120	8	1.74	
OKR531	111	116	5	1.81	
OKR533	133	150	17	1.11	
OKR535	59	73	14	1.34	
OKR537	16	24	8	4.54	36.32
OKR541	23	40	17	1.56	
OKR543	71	79	8	1.13	
OKR544	109	138	29	0.91	26.4
OKR548	64	79	15	2.24	33.6
Kudu					
OKD264	55	59	4	1.02	
OKD308	244	254	10	1.07	
OKD409	164	194	30	0.76	23.3
OKR251	56	94	38	0.79	30.2
OKR380	126	166	40	0.53	21.0
OKR382	65	70	5	1.11	
OKR388	71	127	56	0.62	35.0
OKR503	38	42	4	1.09	

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
OKR510	54	59	5	1.16	
OKR536	77	116	39	0.64	20.5
OKR542	111	174	63	0.71	25.7
Oryx					
OKD011	142	149	7	1.49	
OKD019	45	56	11	1.08	
OKD037	169	185	16	1.38	22.1
OKD040	45	51	6	1.14	
OKD175	116	129	13	1.80	23.4
and	145	149	4	1.28	
OKD179	217	222	5	1.11	
OKD237	102	112	10	1.31	
OKD243	111	115	4	1.21	
OKD246	97	101	4	1.32	
OKD287	109	115	6	2.60	
and	130	135	5	2.70	
OKD293	70	74	4	1.30	
OKD303	53	68	15	1.96	29.4
OKD311	95	140	45	1.10	49.5
OKD358	157	189	32	1.25	39.9
OKD365	162	167	5	1.21	
and	201	206	5	1.33	
OKD372	223	227	4	2.31	
OKD383	163	196	33	1.02	27.7
OKD388	85	108	23	1.51	24.1
OKD398	134	142	8	1.28	
OKD399	118	144	26	0.86	22.4
and	151	169	18	1.20	21.5
OKD400	153	173	20	1.30	26.1
OKD402	201	224	23	1.03	23.7
OKD403	144	154	10	1.18	
and	170	174	4	2.14	
OKD404	187	200	13	1.33	
and	207	214	7	1.40	
OKD405	164	170	6	1.23	
and	176	180	4	1.31	
and	186	190	4	1.26	
OKD406	163	167	4	1.26	

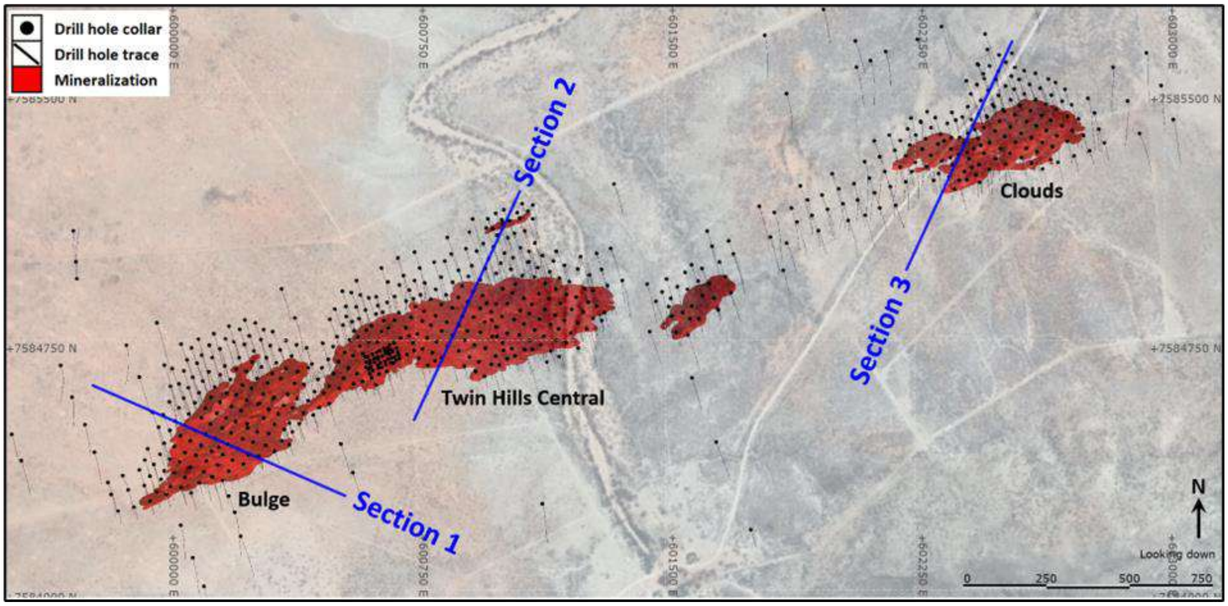
Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
and	272	278	6	1.41	
OKD408	169	176	7	1.15	
OKD410	177	190	13	1.73	22.4
OKD411	96	101	5	1.36	
and	147	157	10	1.08	
OKD413	43	75	32	2.01	64.4
OKD414	135	150	15	1.12	
and	271	275	4	1.20	
OKD415	143	151	8	2.05	
OKD418	174	178	4	2.33	
and	247	260	13	1.15	
OKD419	171	175	4	1.19	
and	196	207	11	1.05	
OKD420	287	296	9	1.49	
OKD421	186	213	27	1.05	28.5
OKD422	149	154	5	2.64	
and	158	162	4	1.34	
OKD423	47	52	5	1.14	
OKD424	170	176	6	1.28	
OKD426	80	89	9	1.08	
OKD427	147	151	4	1.05	
OKD429	191	200	9	1.36	
and	210	214	4	1.80	
OKD430	208	213	5	1.09	
OKD431	70	74	4	1.58	
OKD433	142	155	13	1.42	
and	252	260	8	3.77	30.2
OKD434	75	79	4	1.74	
and	232	237	5	1.67	
OKD435	139	144	5	1.40	
OKD439	163	167	4	1.06	
OKD442	215	250	35	0.91	31.9
OKD444	172	177	5	3.17	
and	191	195	4	1.43	
OKD451	200	212	12	1.30	
and	223	227	4	1.05	
OKD457	167	191	24	0.87	20.8
OKR385	122	144	22	1.62	35.6

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
and	153	159	6	1.03	
OKR387	94	99	5	3.87	
and	105	109	4	1.43	
OKR389	94	99	5	1.08	
OKR392	66	89	23	1.27	29.2
and	208	213	5	1.41	
OKR393	65	69	4	1.29	
and	77	81	4	1.39	
OKR395	99	104	5	1.00	
OKR396	35	48	13	2.48	27.8
OKR398	86	99	13	1.00	
OKR399	31	35	4	1.03	
OKR413	116	139	23	1.19	27.5
OKR422	138	142	4	1.18	
OKR429	64	95	31	0.77	24.0
OKR431	203	208	5	1.23	
OKR439	106	136	30	0.87	26.1
OKR441	156	160	4	1.11	
OKR447	153	178	25	1.33	33.2
OKR450	103	107	4	1.26	
OKR451	103	131	28	1.64	46.0
OKR455	80	111	31	1.14	35.5
OKR456	106	111	5	1.75	
OKR460	103	112	9	1.81	
OKR461	82	89	7	7.94	55.6
and	137	142	5	1.31	
and	159	164	5	1.16	
OKR462	83	97	14	2.65	37.0
and	106	111	5	1.10	
OKR464	74	97	23	1.21	27.9
OKR465	118	143	25	0.96	24.1
OKR466	82	105	23	1.27	29.1
OKR469	43	63	20	1.19	23.9
OKR470	141	164	23	1.54	35.5
OKR476	60	74	14	3.19	44.7
OKR478	141	159	18	1.65	29.6
OKR480	49	63	14	1.03	
OKR483	137	145	8	1.69	

Hole no.	From m	To m	Width m	Grade g/t Au	Grade Metres
OKR487	131	139	8	1.51	
and	158	162	4	2.02	
OKR489	153	160	7	2.09	
OKR491	48	53	5	2.37	
OKR496	50	72	22	0.95	20.1
OKR497	52	56	4	1.20	
and	194	207	13	1.23	
OKR499	83	112	29	1.04	30.0
OKR501	124	143	19	1.32	25.0
and	159	165	6	1.29	
OKR506	52	56	4	1.15	
and	80	85	5	1.35	
OKR508	81	94	13	1.07	
OKR509	85	89	4	1.28	
and	100	111	11	1.36	
OKR511	44	51	7	1.10	
OKR514	75	80	5	1.04	
OKR520	130	134	4	2.07	
OKR527	121	125	4	1.21	

Notes: Intercepts over 20 gm (grade x meters) or >1 g/t Au over 4 m. All widths are apparent. The relationship between true thickness and intercept length is not known but can be estimated visually on sections.

Figure 10.6.5 Representative Cross Section Lines for Significant Intersections (See Table 10.6.2)



10.6.2 Other Drilling

A total of 37 hydrological drillholes for 5,524 m were completed in 2021 and 16 drillholes for 1,587 m in 2022. Geotechnical drilling consisted of three drillholes for 1,054 m in 2021 and a further 12 drillholes in 2022 for 3,583 m.

10.6.3 Drilling at Goldkuppe, Oasis and Wedge

In Q4 2016, Osino drilled 10 diamond holes and 17 RC holes at Goldkuppe to expand and delineate gold mineralization previously intersected by Anglo American and Bafex. Standard diamond (HQ size) and RC drilling methods were used. In general, core recoveries were excellent (.95%), but in a few instances, underground karst cavities were intersected.

Gold intercepts from the 2016 campaign were generally narrow and discontinuous and it became clear that detailed structural work was required to get a better understanding of the controls on mineralization before further drilling.

In December 2017, Osino drilled 32 inclined RC holes (3,309 m) at Oasis and Wedge to the south of Goldkuppe, to expand on historical drilling and anomalous geochemistry at Oasis and to test a new anomaly from soil and rock chip sampling at Wedge. Additional fence lines were drilled over geochemical anomalies at Calidus, Spang and North End to the north of Goldkuppe (Figure 10.6.6). Minor mineralization was intersected at Calidus, North End, and Spang in boudinaged, massive sulphide (pyrrhotite) lenses within dolomitic marble. These sulphide zones generally occur near fold noses and are associated with skarn alteration. Significant intersections are shown in Table 10.6.4. Drilling in these areas was aimed at geochemical and structural targets, which had not been previously tested (Figure 10.6.6).

Table 10.6.4 Significant Intersections for 2017 and 2017 Drilling at Goldkuppe Extensions, Oasis, and Wedge

Hole no.	From m	To m	Width m	Grade Au g/t	Prospect
2017 RC Campaign					
OJR188	33	36	3	1.52	North End
and	39	46	7	0.76	
OJR189	12	16	4	1.03	North End
OJR201	0	3	3	1.09	Calidus
and	9	11	2	2.24	
OJR203	38	40	2	1.42	Calidus
OJR205	82	84	2	0.97	Calidus
OJR206	11	16	5	1.48	Spang
OJR210	75	124	49	0.73	Oasis
including	82	86	4	1.91	
including	121	124	3	3.59	
OJR211	113	114	4	1.38	Oasis
OJR212	38	42	4	1.25	Oasis
and	53	55	2	0.76	
OJR213	18	21	3	0.83	Oasis
OJR215	11	21	10	2	Wedge
2018 DD Campaign					
OJD023	103	105	2	0.97	Oasis
and	127	129	2	0.87	
OJD026	206	209	3	0.59	Oasis
OJD027	173	183	10	0.74	Oasis
OJD028	83	108	25	0.63	Oasis
including	83	89	6	1.74	

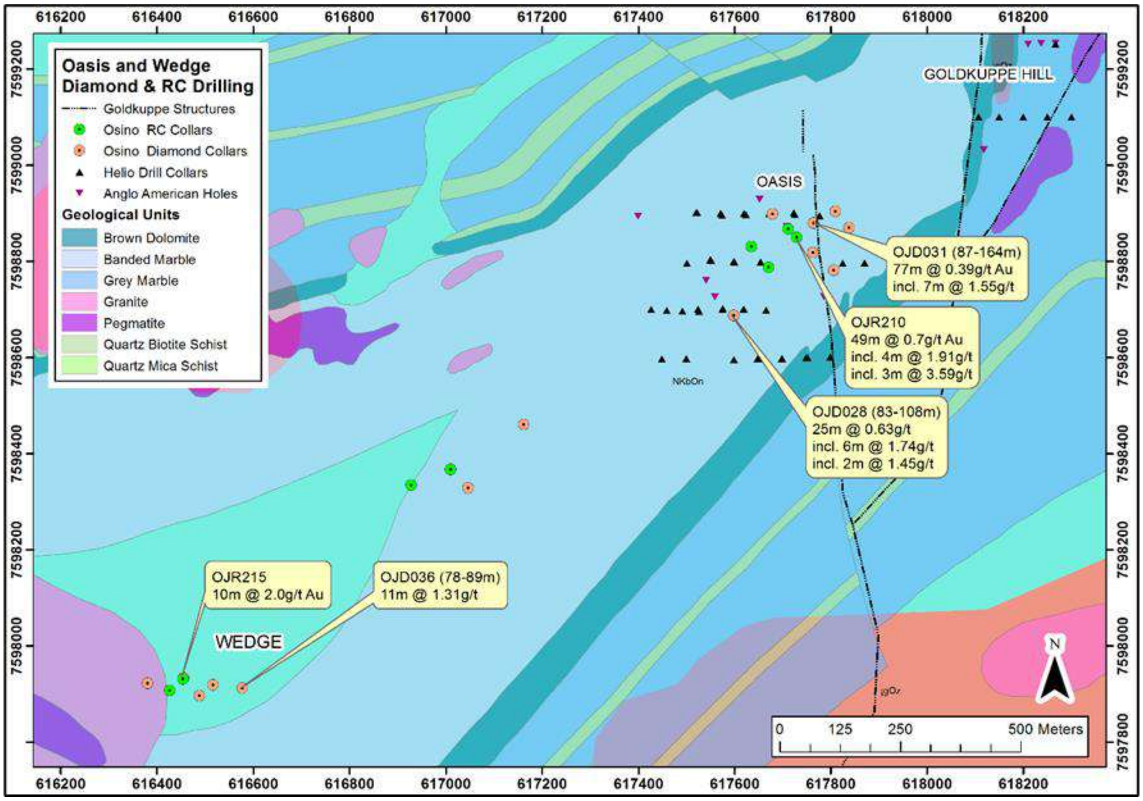
Hole no.	From m	To m	Width m	Grade Au g/t	Prospect
including	106	108	2	1.45	
OJD029	112	114	2	2.27	Oasis
and	128	132	4	0.49	
OJD030	86	91	5	1.12	Oasis
OJD031	87	164	77	0.39	Oasis
including	87	94	7	1.55	
OJD032	31	33	2	1.01	Oasis
and	80	83	3	0.63	
OJD035	67	71	4	0.62	Wedge
OJD036	78	89	11	1.31	Wedge

Notes: The relationship between true thickness and intersection width is not known.

The best hole at Oasis was OJR210, which intersected several high-grade quartz-sulphide veins occurring within or adjacent to narrow calc-silicate layers. Assays of 9.45 g/t Au and 6.95 g/t Au over a metre each are contained within a wide, low-grade halo of 49 m at 0.75 g/t Au. The gold mineralization at Oasis occurs within a broad unit of banded marble (which has been altered to skarn) interbedded with calc-silicate.

At Wedge, four holes were drilled to intercept gold mineralized quartz veins sampled at surface which returned assays of 5.48 g/t and 4.15 g/t Au. These veins occur within biotite schist just below the contact with the marble. The best intercept is in hole OJR215 which returned 10 m at 2.00 g/t Au within intensive (diopside-garnet) skarn altered schist. Soil sampling and mapping indicate that this mineralization continues to the southwest (Figure 10.6.6).

Figure 10.6.6 Location of Diamond and RC Drillholes at Oasis and Wedge



Source: Osino

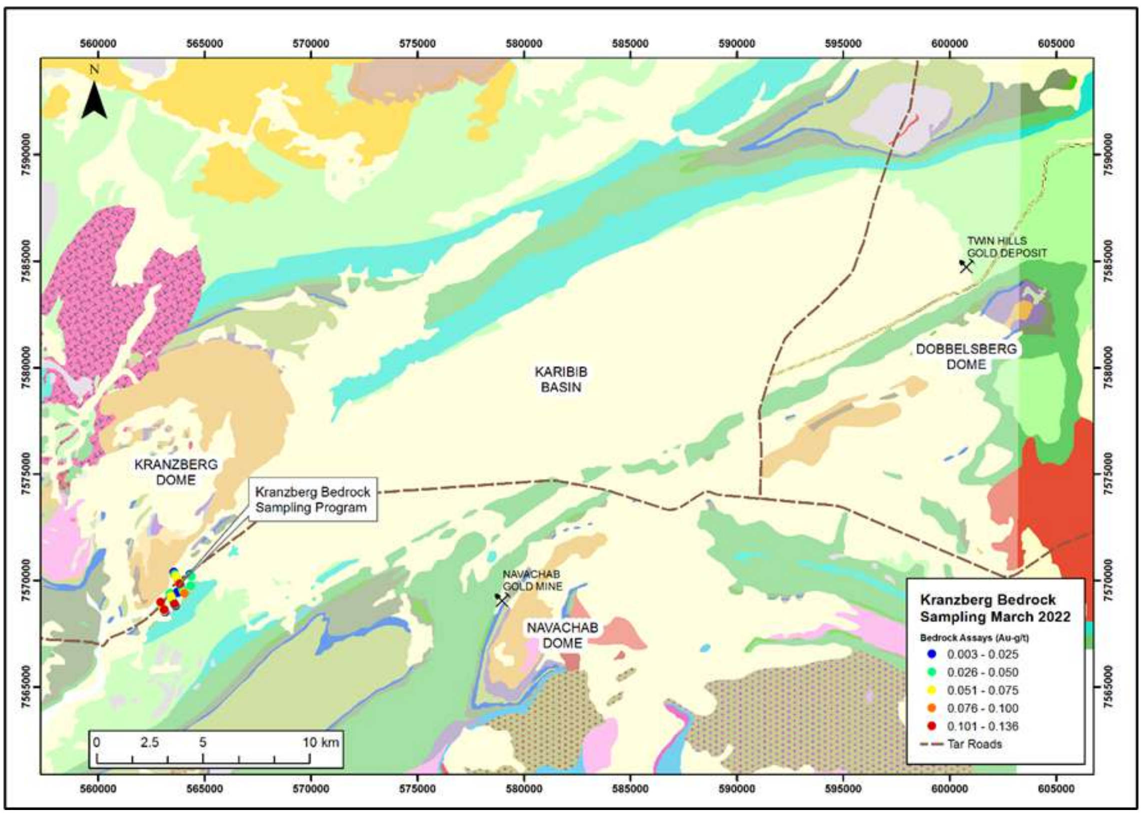
In Q4 2018, a follow-up program of 2,000 m of diamond drilling was carried out to expand on the mineralization discovered in the 2017 RC program, and to obtain geological and structural information.

Wide zones of low-grade gold mineralization were intersected in several holes at Oasis, with best intercepts of 77 m at 0.4 g/t Au (OJD031), 37 m at 0.5 g/t Au (OJD028), and 37 m at 0.4 g/t Au (OJD027). This mineralization is contained within sheeted quartz-pyrite veins associated with faulting and folding in the banded marble host lithology. These sheeted veins, which have a moderately consistent distribution and grade throughout the mineralized package, strike north-south and dip moderately to the east. At Wedge, the best hole returned 11 m at 1.3 g/t Au in OJD035. Significant intersections for Oasis, Wedge, and Goldkuppe Extensions are listed in Table 10.6.4.

10.6.4 Percussion Drilling for Bedrock Samples at Kranzberg

In January 2022, a total of 41 vertical percussion holes were drilled to sample bedrock below alluvial and calcrete cover around the south of the Kranzberg Dome (Figure 10.6.7). A total of 81 bedrock samples were collected at depths ranging from 5 m to 41 m. The area is considered prospective as the schists and marbles within the Arandis Formation are squeezed and steepened around the Kranzberg Dome in an analogous structural setting to the Navachab gold mine on the south side of the Kuiseb Basin 15 km to the east.

Figure 10.6.7 Location of Beadrock Sampling Holes on Southern Margin of Kranzberg Dome (EPL 5880)



The bedrock assays indicate at least two zones of anomalous gold associated with oxides after sulphides striking northeast, parallel to the stratigraphy (Figure 10.6.7). Although this area is primarily covered by thick alluvium, there are also scattered outcrops of leucogranite which appears to have an elongate shape indicating that it may be syn-orogenic. Two of the bedrock anomalies are associated with the schist-granite contact.

These mineralized zones will be followed up with infill bedrock sampling traverses with holes drilled on 25 m spacing and step-out drilling to the southwest where there is a prominent magnetic anomaly and alluvium (Figure 10.6.8).

Figure 10.6.8 Assay Results for Bedrock Sampling on Southern Margin of Kranzberg Dome (EPL 5880)

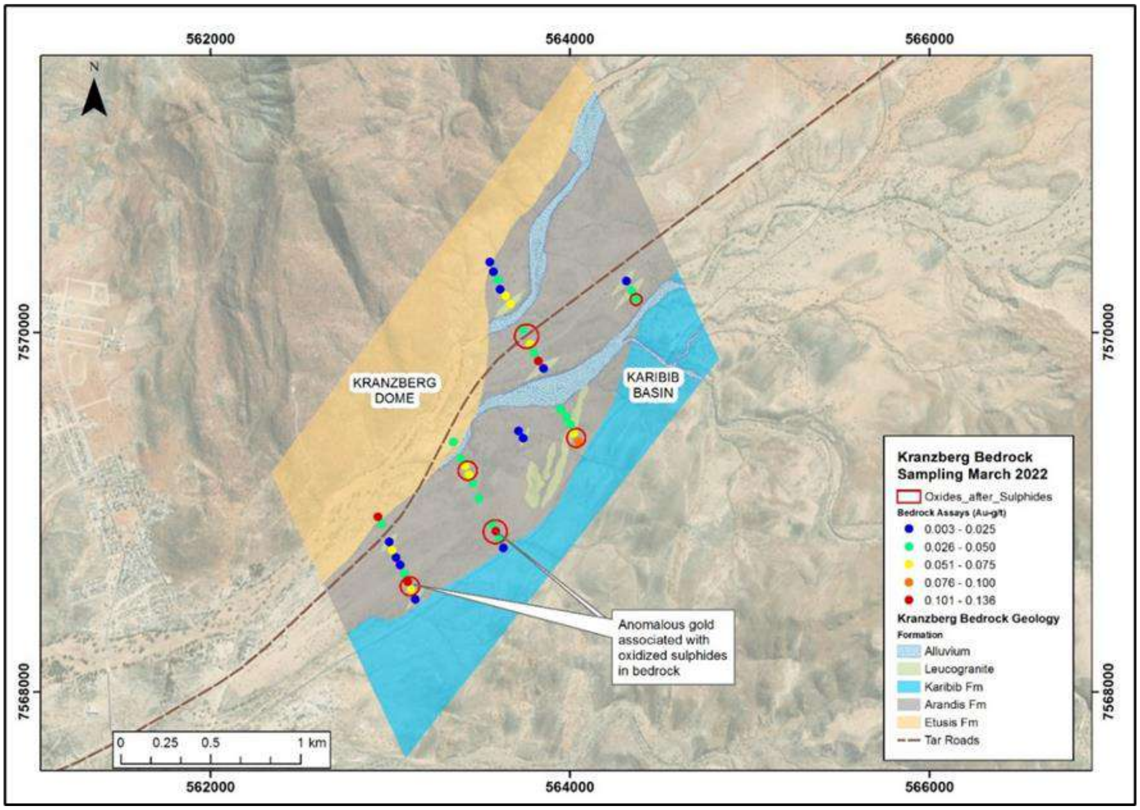
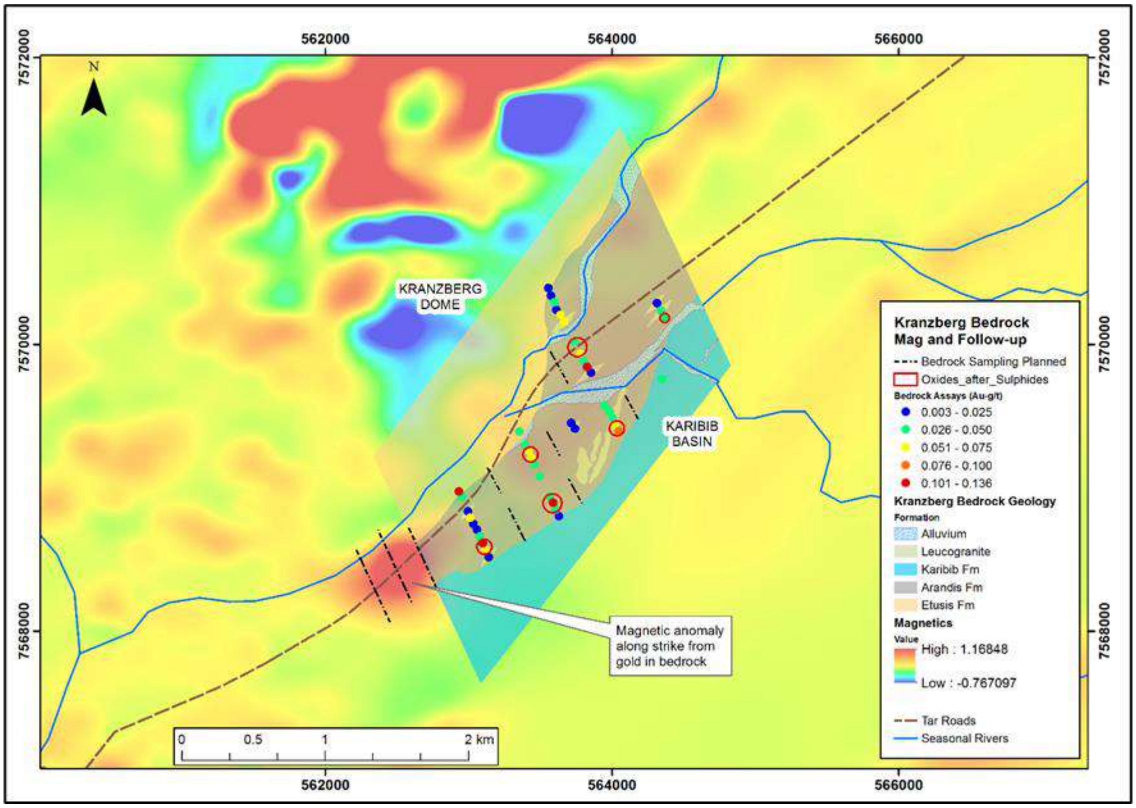


Figure 10.6.9 Bedrock Geology and Magnetics – South Margin of Kranzberg Dome (EPL 5880)



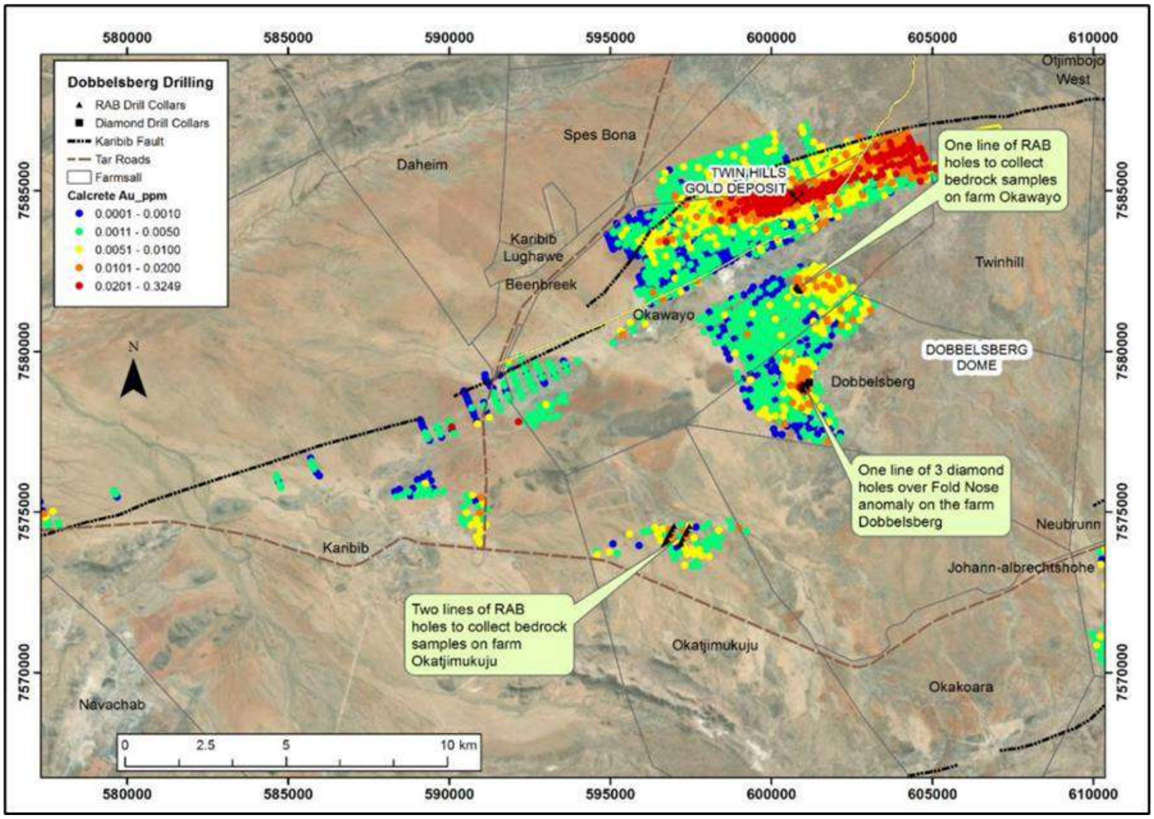
10.6.5 Diamond Drilling and Percussion Drilling for Bedrock Samples at Dobbelsberg

In June 2022, three diamond holes, each approximately 200 m in length, were drilled over the fold nose anomaly (defined by calcrete sampling) on the Dobbelsberg farm. The drilling intersected a succession of schists and marbles with minor interbeds of siltstone and/or interbedded metagreywackes. These sedimentary units are intruded by granitic dykes and veins as well as by pegmatite bodies. The sedimentary units fit into the Oberwasser and Okawayo members of the Arandis Formation, which also host the gold mineralization at Navachab Gold Mine, 25 km along strike to the southwest.

Pyrrhotite and pyrite were found to be associated with skarn alteration and as massive sulphide veins within dark marble units. No gold mineralization was intersected in the initial three scout holes and further drilling is required to discover the causative mineralization for the coherent gold anomaly discovered in the calcrete sampling program.

A total of 242 m of RAB drilling in 28 holes was completed to collect bedrock samples over two gold-in-calcrete anomalies on the farms Okatjimukuju and Okawayo (Figure 10.6.10). No anomalous gold was detected in any of the holes.

Figure 10.6.10 Diamond and RAB Drilling on Gold in Calcrete Anomalies – Dobbelsberg



11.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 Sample Methodology

DD core was split using a water-cooled diamond saw and the top half of the core was dispatched from the core yard to the laboratories as a parent sample. During core cutting, fractured sections would be reconstructed as best possible. Typical core sample lengths were 1 m but could vary from 0.5 m to 1.5 m to accommodate the end of hole, structural, and/or lithological features. Once half cores were cut, they were placed into sequentially labelled, thick plastic bags, and their weights recorded on the sampling sheet. QAQC samples (blanks, certified reference materials (CRMs), and duplicates) were added to the sample batch as indicated by the sampling sheet. QAQC sample insertion to each batch was at random intervals.

RC sample material was routed from the bit and hammer to the drill rods' inner tube and via a hose to a cyclone. Each 1 m sample was collected into a 50 kg capacity plastic bag at the cyclone outlet. Each sample was weighed before splitting on site, allowing for immediate monitoring of sample recovery whilst drilling. Cyclones were cleaned with compressed air at regular intervals, after every 30–50 m of drilling or depending on water strikes. Each sample, typically with a mass of 35–40 kg was split down to a 2.0–3.5 kg representative or parent sample by passing the material through a three-tier riffle splitter with 25 mm wide slots. The splitter and collection bins were cleaned between each sample. The parent sample was collected into a labelled A3-sized plastic sample bag and weighed, before packing batches of five parent samples into larger labelled hessian bags and dispatching these to the laboratory. QAQC samples were inserted into the sample sequence at random intervals.

For both diamond and RC holes, drillholes were sampled continuously in the mineralized units and selectively outside of these.

11.2 Analysis

11.2.1 Sample Routing

Since May 2018, all samples have been submitted to Activation Laboratories Ltd ("Actlabs") for preparation and assay. Samples are transported by Osino from the Omaruru camp to Actlabs' sample preparation facility in Windhoek (Namibia). All prepared pulp samples are then shipped to Actlabs' Kamloops (Canada) laboratory. This Laboratory is ISO 17025 accredited. From October 2020 onwards, due to the increased drilling activity and resulting sample volumes, prepared pulp samples were also sent to Actlabs analytical laboratories in Medellin (Colombia) and Zacatecas (Mexico), both of which are ISO 9001 accredited.

11.2.2 Sample Preparation

All original parent (RC chips, half DD core, and rock grab samples), inclusive of QAQC samples were prepared by Actlabs at their Windhoek-based sample preparation facility. As a routine practice, the entire sample is dried at 60°C, crushed to 80% passing 2 mm (10 mesh), riffle split (single tier) to obtain a representative 250 g subsample, and then pulverized (mild steel) to 95% passing 105 µm (150 mesh). The pulveriser bowl is cleaned with sand after each sample to avoid carry-over contamination. A 65 g pulp sample is scooped from the pulveriser bowl and collected in a labelled zip lock sample bag which is dispatched via DHL to the analytical facilities.

11.2.3 Assay Techniques

Once at the analytical lab, the sample is re-homogenized, and a 30 g pulp sample is collected for analysis. The analytical technique is by fire assay with atomic absorption spectrometry (AAS) finish and automatically re-analyzed with a gravimetric finish if >5 g/t Au. Both methods are ISO 9001-2015 certified. Actlabs' method codes are 1A2 for fire assay with AAS and 1A3-30 for the gravimetric finish. The analytical range for the fire assay with AAS finish method (d) is between 5 ppb and 5,000 ppb and between 0.03 ppm and 10,000 ppm for the gravimetric finish.

Fire assaying is the quantitative analytical technique in which a metal, such as gold, is separated from impurities by fusion processes, producing a precious metal bead which is then dissolved in aqua regia acid and the gold content determined by spectroscopic methods (atomic absorption, AA, in this case).

All samples returning gold values greater than 5 g/t Au (or 5 ppm) were re-assayed by fire assay with a gravimetric finish to ensure accurate values. A gravimetric finish uses nitric acid to separate gold from silver in the fire assay bead, and the resulting gold flake is annealed and weighed on a microbalance.

In addition, metallic screen fire assay (SFA) analyses were carried out on selected samples from the Twin Hills East drill program of 2018 (one RC and two diamond holes) and the Bulge / Twin Hills Central drill program of 2019 (two diamond holes). SFA techniques aim to provide more accurate assays on samples containing coarse gold by using a coarser milling and screening procedure. Allen (2019) assessed and interpreted these SFA results noting that SFA and routine fire assay produced comparable results and routine fire assay was therefore retained as the primary assay methodology. A follow-up investigation was conducted by Allen (2021) on a further eight drillholes. The investigation produced comparable results between the two methods, corroborating the earlier findings. Osino monitors the need for additional SFA on an ongoing basis (primarily through the assessment of the coarse reject duplicate results).

11.2.4 Reporting of Results

Assay results are reported by Actlabs per submitted batch. The results are sent via email attachment in Microsoft Excel and PDF formats. The PDF report is a signed ‘Certificate of Analysis’ document. In addition to the results of the original samples submitted by Osino, both report formats include results of Actlabs’ internal QAQC samples.

11.3 QAQC Protocols and Performance

To monitor the precision and accuracy of the analytical assay data reported by Actlabs, Osino implemented an industry standard QAQC program. The program involves the insertion and performance monitoring of blind CRMs, duplicates, and blank samples randomly inserted into the original sample sequences. QAQC samples make up about 15% of all samples submitted to Actlabs prep and analytical laboratories. Monthly and quarterly QAQC summary reporting was undertaken for all QAQC samples. QAQC data were reviewed and assigned a Pass / Fail mark based on qualitative and quantitative criteria. If the QAQC samples indicate a batch had ‘failed’, the lab was instructed to re-assay the batch (or part thereof) which may include the addition of more CRMs. Osino’s sampling, assay, and QAQC protocols were independently reviewed and assessed by Allen (2018a and 2018b).

Actlabs prescribes to an internal QAQC system that Osino monitors. Samples are processed in batches of 42 samples which contain up to 35 original client samples, plus seven internal quality control samples (two blanks, three sample duplicates, and two CRMs (one high and one low) for at least 20% quality control in each batch. Osino reviews these results as they are reported along with the original samples. Actlabs further supplies a regular PDF document to Osino, reporting on and interpreting their internal QAQC performance over the period.

11.3.1 Blanks

Field blanks were inserted into the sample sequence at random and comprised approximately 5% of the total sample volumes. The coarse blank material was sourced from local river sand. The upper limit was set at five times the lower detection limit of the 1A2 method used, which equates to 0.025 ppm. Based on this threshold, the performance of the blank sample is acceptable and cross-contamination at the prep or analytical lab faculties is not considered a material issue (Table 11.3.1).

Table 11.3.1 Blank Data for the Period 1 September 2021 to 28 February 2023

Std Code	Method	Exp Value	No. of Samples	Mean Au	Mean Bias	No of Failures (>10xLDL)
Khan river sand	FA_AAS	0.01	2323	0.0025	0.00%	0
River sand blanks	FA_AAS	0.01	4954	0.0027	0.00%	0
Riversand	FA_AAS	0.01	902	0.0029	0.00%	0

11.3.2 Certified Reference Materials

To monitor assay accuracy, CRMs were inserted randomly into the sampling stream. Commercially available CRMs were purchased from Geostats Pty Ltd ("Geostats") in Perth. These were delivered as homogeneous pulp material (100% passing 200 mesh) with certified concentrations and expected standard deviations of the elements of interest. CRMs were supplied in heat-sealed, airtight, plastic pulp packets of 50 g not requiring any further sample preparation. CRM pulps utilized were not matrix-matched to the host rock lithologies.

As a rule, three CRMs were inserted into a sample batch (at a rate of 4%), each representing a different gold grade. The high-grade CRMs have certified assay values ranging from 1.2 g/t Au to 1.8 g/t Au, the medium-grade ranges between 0.8 g/t Au and 1.0 g/t Au, and the low-grade CRMs range between 0.4 g/t Au and 0.6 g/t Au. As the limited CRM stockpiles at Geostats were depleted, replacement CRMs were selected by Osino geologists to replace these. Careful consideration was taken of matrix colour and gold grade before selecting a replacement CRM (Table 11.3.2).

Table 11.3.2 Geostats Pty Ltd CRMs used by Osino

CRM ID	Au Certified Value	Standard Deviation	Description	Colour
G306-1	0.41	0.03	Cut-off ore oxide	Greyish-pink
G307-3	0.24	0.02	Milled waste material diorite	Light grey
G307-4	1.40	0.06	Low sulphide diorite	Light grey
G310-4	0.43	0.03	Sub ore milled low sulphide	Light grey
G310-9	3.29	0.14	Low sulphide ore	Light grey
G311-6	0.22	0.02	Milled waste / tailings	Pale red
G312-1	0.88	0.09	Cu/Au sulphide ore	Light grey
G312-2	1.51	0.13	Cu/Au sulphide ore	Grey
G314-10	0.38	0.02	Cut-off oxide ore	Light grey
G314-8	1.03	0.04	Low-grade oxide ore	Pale red
G316-5	0.50	0.02	Cut-off ore	Light grey
G318-1	1.05	0.04	Mine ore composites low sulfide	Light grey
G399-5	0.87	0.05	Fresh rock South West Mineral Field	Brownish-grey
G901-7	1.52	0.06	Sulphide ore-Eastern Goldfields	Light grey
G910-1	1.43	0.06	Minor sulphide ore ex Eastern Goldfields	Light grey
G912-5	0.38	0.02	Milled tail	Light grey
G912-7	0.42	0.02	Cut-off ore low-grade oxide	Pale red
G913-8	4.87	0.16	Low sulphide mine ore	Light grey
G916-2	1.98	0.07	Run of mine ore Eastern Goldfields	Light grey
G916-5	19.92	0.69	High-grade ore Low sulphide	Light grey
G916-9	3.13	0.19	Composite of tail samples	Pale yellowish-brown

CRM ID	Au Certified Value	Standard Deviation	Description	Colour
G917-10	3.33	0.13	Composite run of mine ore	Light grey
G998-3	0.81	0.05	Basalt ore ex Eastern Goldfields	Pale orange
G998-6	0.80	0.06	Oxide ore with kaolin and minor iron	Greyish-orange

The performance of the CRMs is constantly monitored with a report produced every quarter. The analyses of all CRMs indicate acceptable analytical accuracy and precision (Table 11.3.3 and Figure 11.3.1 to Figure 11.3.3). Apart from, what appears to be, incorrectly labelled CRMs as is evidenced by the returned values when outside of expected limits, the performance is acceptable and within expected tolerances.

Table 11.3.3 CRM Performance for the Period 1 September to 28 February 2023

Std Code	Method	Exp Value	No. of Samples	Mean Au	Mean Bias
G307-3	FA_AAS	0.24	241	0.2271	-5.37%
G314-10	FA_AAS	0.38	1868	0.3776	-0.63%
G912-7	FA_AAS	0.42	2	0.4155	-1.07%
G312-1	FA_AAS	0.88	2	0.838	-4.77%
G318-1	FA_AAS	1.05	1436	1.0076	-4.04%
G916-2	FA_AAS	1.98	1209	1.904	-3.84%
G913-8	FA_AAS	4.87	1	4.711	-3.26%

Figure 11.3.1 Performance of Low Grade CRM G314-10 since 1 September 2021

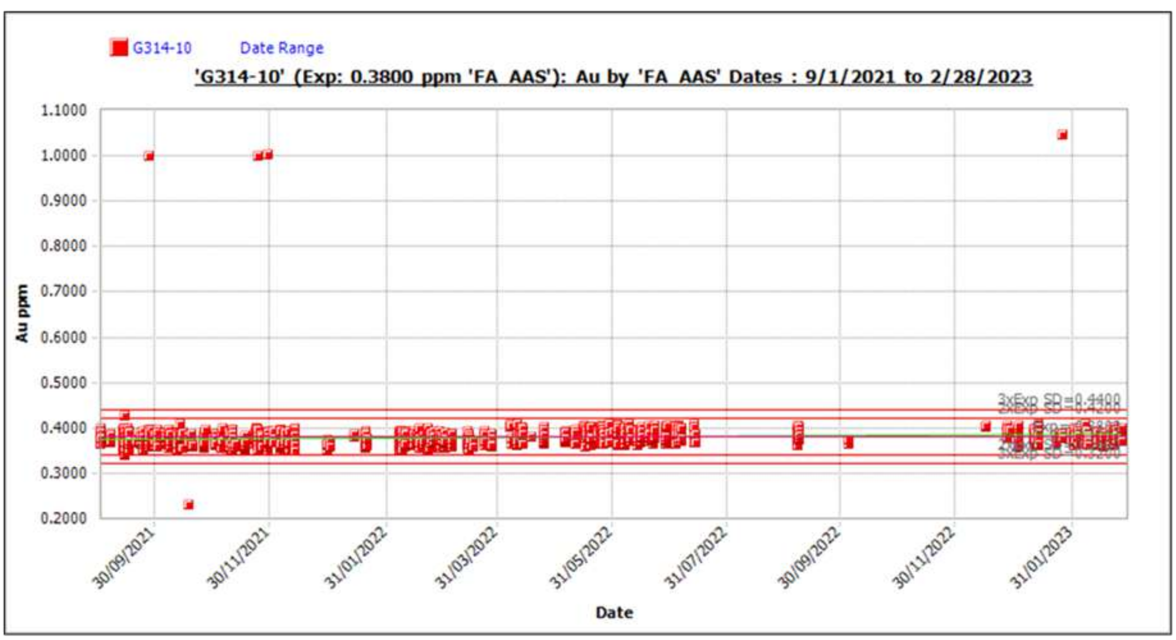


Figure 11.3.2 Performance of High Grade CRM G9316-2 Since September 2021

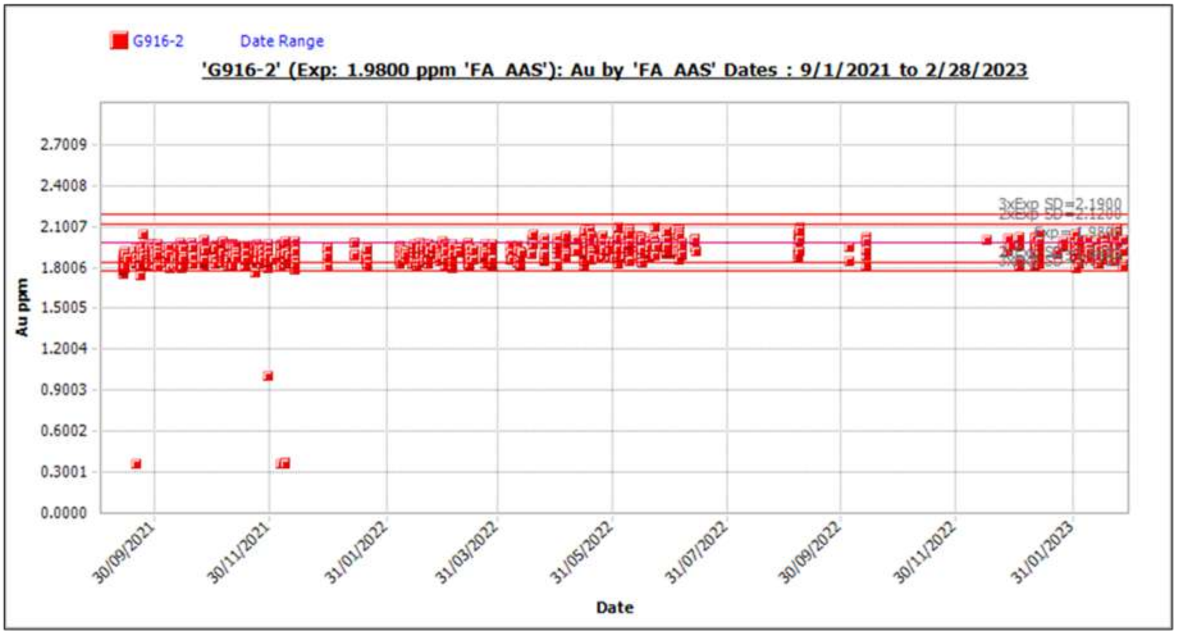
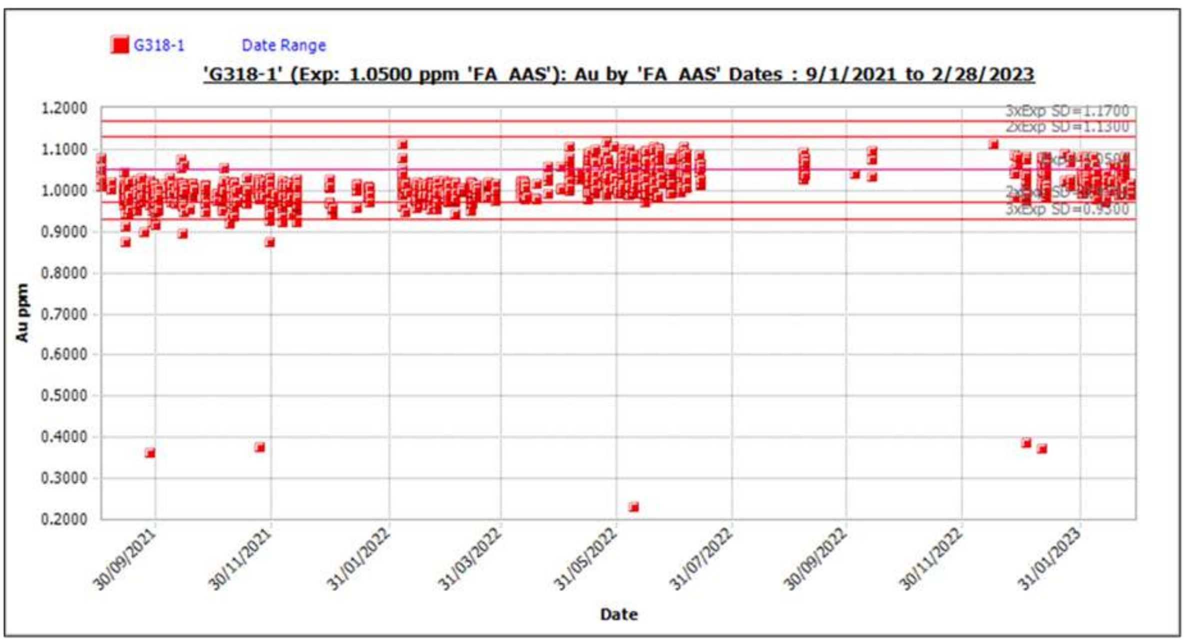


Figure 11.3.3 Performance of Medium Grade CRM G318-1 Since September 2021



11.3.3 Duplicates

Field (DD core), preparation (coarse reject) and pulp duplicates (lab), as well as external checks (umpire), were compared for samples submitted to Actlabs.

The duplicate data were assessed using average coefficients of variation (CVAVR% = standard deviation / average presented as a percentage – also known as relative standard deviation) calculated from individual duplicate pairs and averaged using the RMS (root mean squared) approach (Table 11.3.4). This approach is recommended by Abzalov (2008) as a way of defining a fundamental measure of data precision using duplicate paired data.

Table 11.3.4 Gold Duplicate Data by Type

Hole Type	Type	Best Practice Limits	Acceptable Practice Limits	Pairs total	Count of pairs >10 x DL	$CV_{(AVR)}$ %	Mean Au Orig ppm	Mean Au Dup ppm	Bias
DD	FIELD DUP	20%	30%	9702	4107	41	0.54	0.53	-1%
DD	PULP_DUP	20%	30%	8738	3733	19	0.55	0.55	0%
DD	CRD	20%	30%	2801	1387	7	0.47	0.47	0%
DD	COARSE	20%	30%	1187	571	14	0.53	0.52	-2%

Coarse (Figure 11.3.4) and pulp duplicates as well as external check (umpire) results (Figure 11.3.6) were compared for samples submitted to Actlabs, and external check samples sent to ALS Laboratory. No material bias was observed in the coarse and pulp duplicates.

Field duplicates were also collected from the original DD parent samples (Figure 11.3.5). For DD samples, the duplicate sample is generated by splitting the remaining half core of the initial sample and sampling a quarter-core piece which is then submitted as a duplicate. The precision for Field Duplicates was not acceptable and must be investigated.

Figure 11.3.4 Scatterplot Showing Lab Split Duplicate Results for Actlabs

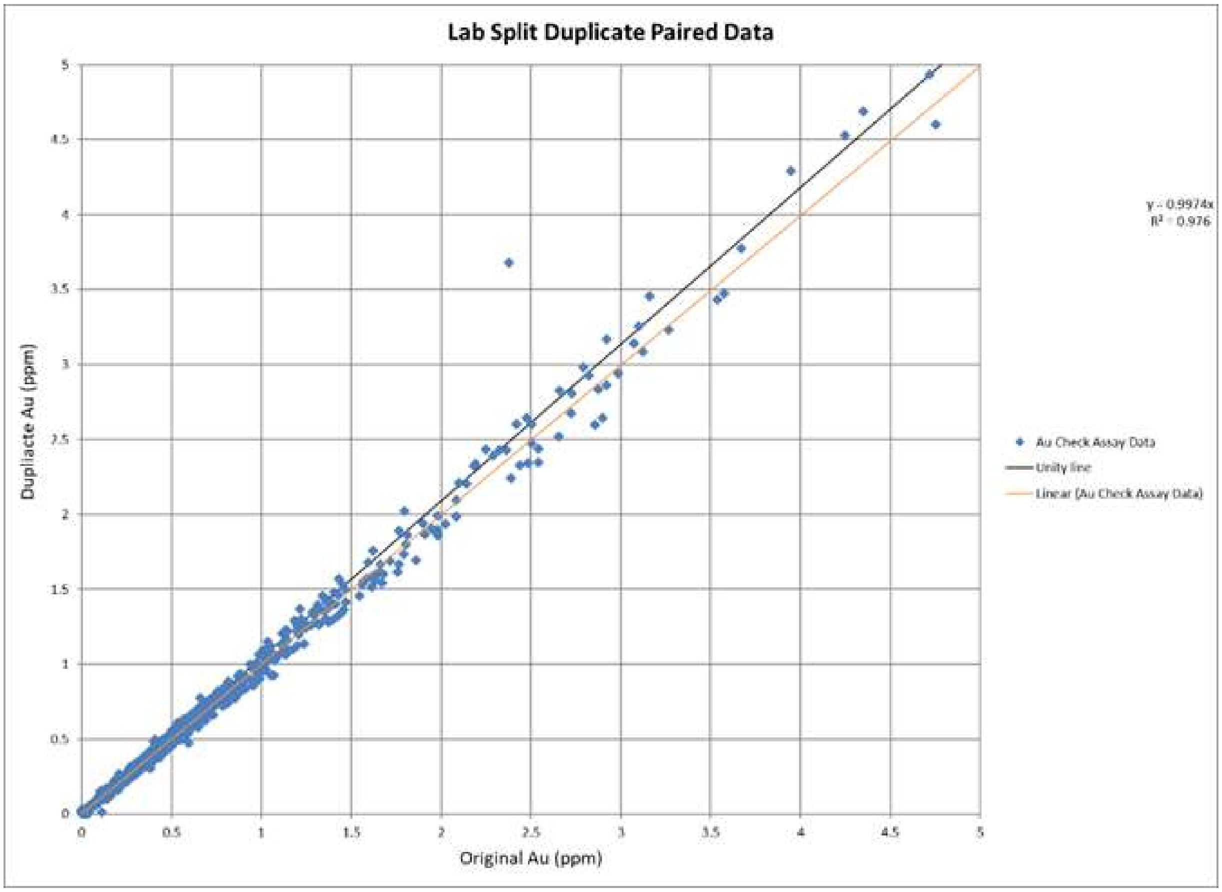


Figure 11.3.5 Scatterplot Showing DD Field Duplicate Results for Actlabs

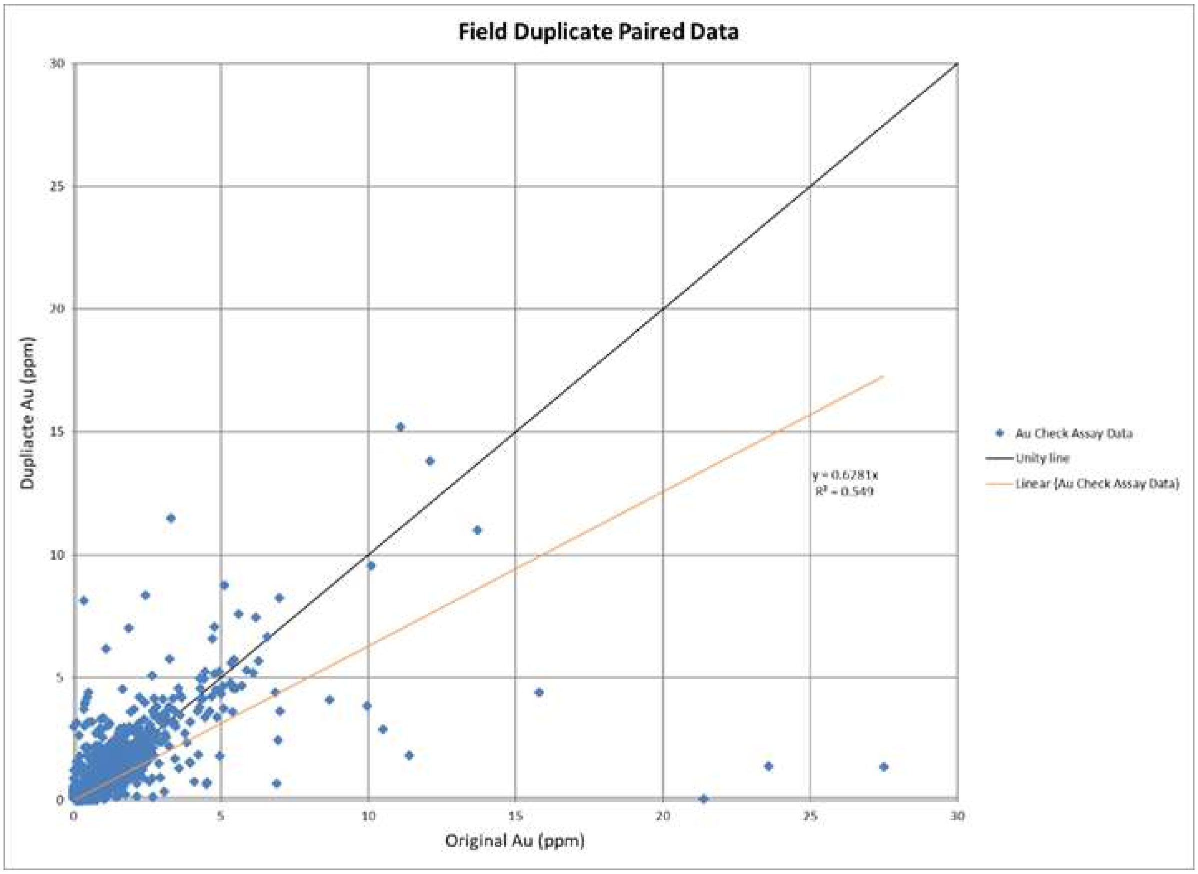
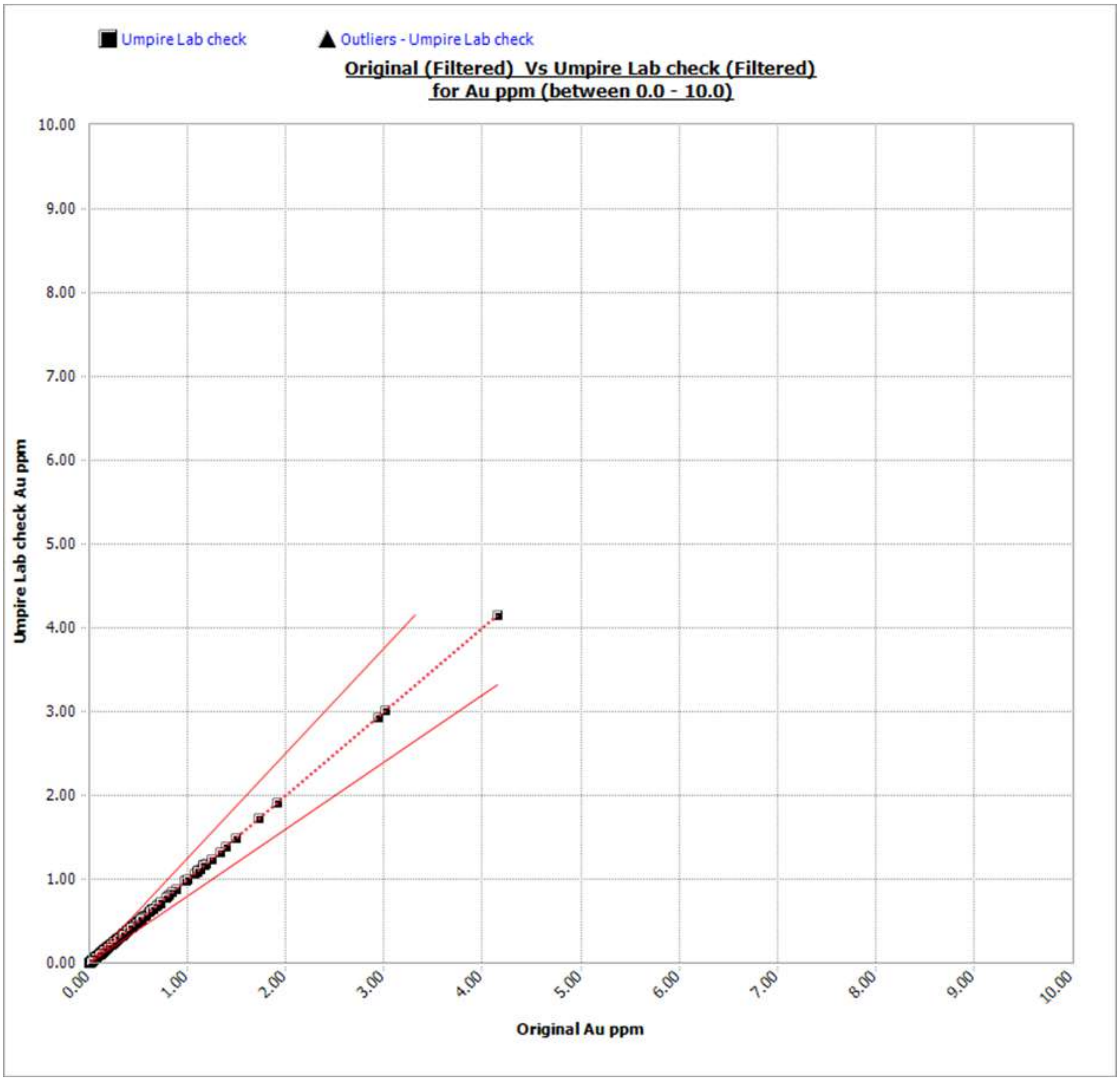


Figure 11.3.6 Umpire Analysis with 10% Error Lines



11.4 Qualified Person's Opinion on Sample Preparation, Security and Analytical Procedures

The following observations are made regarding sample analysis and QAQC performance:

- Sampling and sample preparation methodologies are aligned with standard industry practice.
- Assay methodology is appropriate for the type of mineralization.

- The QAQC protocols employed by Osino are aligned with standard industry practice.
- Blank performance is acceptable.
- CRM performance is acceptable and spans a grade range appropriate for the deposit. Some evidence of bias is present, but this is not systematic (some positive and negative bias observed).
- The umpire laboratory results are acceptable.

The QAQC protocols and performance of QAQC samples is considered acceptable and, in the Qualified Person's opinion, provides confidence in the use of the data for the MRE.

12.0 DATA VERIFICATION

12.1 Mineral Resource Estimate Site Visit

Site visits were conducted by the Qualified Person, Mr. Anton Geldenhuys, from 28 to 31 March 2021 and on 2 February 2022. During the first trip, the following sites were visited:

- Operating RC drill rig in the vicinity of Karibib.
- Core processing facility in Omaruru.
- Actlabs sample preparation facility in Windhoek.
- Osino head office in Windhoek.

12.1.1 Drill Rigs

An operating RC rig was observed in the field drilling OKR296 (Figure 12.1.1), with the crew performing the sample reduction process using a riffle splitter (Figure 12.1.2). The drill rig setup, sampling, sample reduction process, logging, and archiving of drill chips were explained and demonstrated at the rig. All processes were acceptable and would result in the acquisition of data suitable for Mineral Resource estimation and reporting.

Figure 12.1.1 Operating RC Rig Drilling OKR296 with Sample Reduction Area in Foreground

Figure 12.1.2 Riffle Splitter Used for the RC Sample Reduction Process

Collar locations of three drillholes were verified in the field (Figure 12.1.3). These were:

- OKR088
- OKD080
- OKD142

Diamond drill rigs were observed in the field; however, these were not operating due to rig moves.

Figure 12.1.3 Verified Drillhole Collar Locations in the Field

12.1.2 Core Processing Facility

The core processing facility in Omaruru was inspected with regards to core and sample receipt, and the flow of core through the various processing stations.

When core arrives at the facility, it is photographed in core trays with a digital camera mounted on a tripod. The core is then marked, cut, sampled, photographed again (marked-up half-core), logged, and then samples are selected from each tray for density determination using a standard Archimedes-type technique of weighing the core dry and wet. The core is stored undercover in the facility (Figure 12.1.4).

Figure 12.1.4 Core Stored in the Core Processing Facility at Omaruru

Core from three drillholes was examined on the logging tables. All logging data in the original and digital logs were verified by means of cross checks against the two log types and the core.

During the inspection of the three holes, assays contained in the database were checked relative to geological logging and the core for signs of mineralization. Vein-hosted and disseminated mineralization was evident in the core. In all instances, mineralization occurring in the core was evident in the recorded logging and assays.

Geological logs (three) in the database were verified relative to the original logs and drill core. The assays in the database were verified relative to geological logs and visual inspection of the physical core.

12.1.3 Actlabs Sample Preparation Facility

The Actlabs sample preparation facility in Windhoek was inspected with regards to the receipt of sample batches, crushing, milling, and the dispatch of sample pulps to the Actlabs laboratories in Canada or Colombia.

The preparation of all samples appeared to be reasonable with the necessary checks in place to identify any issues that may arise in the process.

12.1.4 Local Database Review at the Head Office in Windhoek

The drilling database was reviewed with regards to the importing, validation, structure, and backup of data. The review took place with the assistance of the Osino Resources Database Geologist.

Data are imported from Microsoft Excel spreadsheets which contain data captured at either the drill rigs or at the core processing facility. The data are manually checked, validated, and corrected before importing into Microsoft Access. A backup of the Microsoft Access database is stored on the server which is located in the office.

12.2 Database Management

The management of the Twin Hills database is done by CSA Global. The QP Mineral Resources (Mr. Anton Geldenhuys) is employed by CSA Global and has direct oversight of the assay certificates, data imports and exports. All laboratory assay certificates have been checked relative to the data contained in the database.

12.3 Laboratory Inspections

Geology and Mineral Resources Site Visits

The Actlabs Kamloops analytical facility was visited by Dr. Luke Longridge (Senior Geologist at CSA Global at the time) on 31 August 2020. The Actlabs Kamloops facility assayed most of the samples at the time of the visit.

During the site visit, laboratory management was interviewed, and the following were inspected:

- Data recording procedures: All data is recorded digitally via a Laboratory Information Management System (LIMS). Each batch of 42 samples has a unique code maintained from sample weighing to AA finish.

- Fire assay sample preparation facilities: Samples are homogenized, 30 g samples weighed, pre-mixed flux and silver nitrate added, and mixed in the crucible using a batch tumbler. The sample preparation area was clean and dust-free. Each batch of 42 samples contains two blanks, two standards, and three weigh duplicates.

- Fire assay: Two gas furnaces are used with two thermocouples per furnace. Batches of 42 samples are loaded (7x6 tray), with copper added to two cupels per batch to cross-check the transfer of samples. Furnace areas were clean and free of dust.

- AA finish: Analysis is carried out using a self-flushing Agilent Technologies 200 Series Atomic Absorption Spectrometer. Each sample is a 15-second run with five seconds of flushing. Calibrations are done routinely before each batch of samples using stock solutions created using single-element standards.

- Quality control: Quality control pass or failure is determined internally by the data department at Actlabs Global Headquarters in Ancaster, Ontario, and is not determined at the Kamloops facility. If a quality control sample fails, all samples between the previous and subsequent quality control passes are re analyzed, and the source of the error will be identified where possible.

Overall, the Kamloops facility was clean, with a digital LIMS, and appropriate quality control procedures. No concerns were noted.

12.4 Mining Geotechnical Site Visits

Data verification took place on two levels, data verification undertaken by SRK staff under direction of the QP, and data verification undertaken by the QP. Data verification undertaken by SRK under direction of the QP consisted of:

- Site visit was conducted by SRK Senior Engineering Geologist Candice Maduray on 22 to 23 February 2021 while the project engineering geologist was on site. During the visit the geotechnical logging was reviewed on holes OKGT001 to OKGT003, this included spot checks of the holes on geotechnical parameters; fracture identification and fracture count, RQD, weathering, joint conditions and intact rock strength. Reliability of the orientation line on the core was checked. Sample selection was undertaken by SRK. The outcomes and observations were relayed to the QP.

- Geotechnical logs were electronically captured, so there was no transcribing from the original source. However, SRK Staff conducted spot checks on the geotechnical logs against the core photographs which included fracture count, RQD and weathering. Limitations exist with core photo checks as one is not able to assess the joint conditions nor the intact rock strength.

- Laboratory test data was checked against test reports prior to analysing the laboratory data.

- Site visit was conducted by SRK Principal Structural Geologist Dr. Christoph Tuitz on 26 and 27 February 2022 where the structural logging of geotechnical drillholes OKGT004 and OKGT009 was evaluated. This included the reliability of the orientation line, the identification of joints, the logging of structural features. A visit was conducted to the active drill rigs where the core orientation, core markup, weathering, and geological structures in OKGT005 was reviewed.

- The outcomes and observations of these assessments were reviewed by the QP.

- SRK QP Robert Armstrong visited the site on 26 February 2022. During the visit the geotechnical logging was reviewed on hole OKGT009, this included spot checks on the geotechnical parameters; fracture identification and fracture count, RQD, weathering, joint conditions, intact rock strength and the logging of structural zones. Reliability of the orientation line on the core was checked. Sample selection was also reviewed.

- The Qualified Person is satisfied that the necessary steps were taken to verify the data used for the Mining Geotechnical Study.

12.5 Mining Reserve Model Data Evaluation

Site Visit

To comply with National Instrument 43-101 guidelines, a site visit to the Twin Hills gold deposit was completed between 2 and 3 of February 2022 by the Qualified Person, Mr. Werner Moeller. The purpose of the site visit was to inspect the property and assess aspects relating to conducting future mining work in the area. He familiarized himself with the site conditions and topography around the potential pit locations. While on-site, he interviewed project personnel regarding the exploration strategy and field exploration procedures.

12.5.1 Mineral Resource Model Data Interrogation

The mineral resource model was received from CSA Global's Qualified Person, Mr. Anton Geldenhuys, in three separate Datamine models with the following file names:

- MD_TH.dm (Bulge & Twin Hills Central)
- MD_THW.dm (Twin Hills West)
- MD_CLD.dm (Clouds)

A handover note describing the different block model fields was received. Furthermore, a presentation tabulating the mineral resource, as reported within a conceptual pit shell determined using a gold price of USD 1,800/oz and conceptual parameters and costs to support assumptions relating to reasonable prospects for eventual economic extraction (RPEEE shell), was obtained. The above mineral resource models were exported to a comma-separated value (.csv) file, and the RPEEE shell content was compared to the above mineral resource table. The relevant mineral resource tonnes, metal content and grade per resource class reconciled flawlessly. The model was also visually constrained and inspected according to the following block model fields i.e., mineral resource classification, weathering, domain, and Au grade.

The Qualified Person undertook a quality control review of the relevant pit optimisation input data and benchmarked the operating costs and relevant productivities to other Namibian mining operations. The mine modifying factors were also scaled and compared to industry practices,

The Qualified Person is satisfied that the necessary steps were taken to verify the data used for the Mineral Reserve declaration.

12.6 Civils Geotechnical Data Evaluation

A site visit was conducted by SRK Principal Engineering Geologist Paul Aucamp (QP for the civil geotechnical evaluation) and Senior Engineering Geologist Hennie Booyens from 8 to 13 June 2023. During this visit SRK inspected the ground profile by excavating some test pits in close proximity to the test pits excavated by Geo-Logic Solutions previously. A summary of confirmatory test pits compared to the previous test pits are shown in Table 12.6.1 below. SRK also inspected 13 rotary core boreholes (OKGTC025 to OKGTC037) to compare the Geo-Logic Solutions borehole logs to the core (Table 12.6.2). In addition, selected samples at the geotechnical laboratory in Windhoek (Namibia Technical Services) (Table 12.6.3) and Specialized Testing Laboratory (STL) was inspected to verify laboratory numbers with sample numbers and to verify that actual materials tested corresponds to what was sampled as described in test pit profiles.

Table 12.6.1 Depth to Refusal in Verification Test Pits Compared to Previous Test Pits

Test Pit Number	2023 Test Pit Findings by Geo-Logic Solutions	2023 SRK Test Pit Confirmation Findings
	Depth to Refusal (m bgl)	**Depth to Refusal (m bgl)**
DR09	1.81	2.00
TP019	0.39	0.70
TP086	0.42-0.64	0.50
TP093	0.52	0.60
TP095	0.55	0.50
TP099	0.55	0.80
TP100	R.55	0.50
TP101	0.80	0.60
TP105	0.35-0.60	0.40
TP106	0.40-0.50	1.20

Table 12.6.2 Rotary Core Borehold Inspection Results

Geo-Logic Solutions		SRK	
Depth	**Rock Quality Designation (RQD)**	**Depth**	**Rock Quality Designation (RQD)**
OKGTC025			
0.45	Fair to Good	0.45	Very Poor to Poor
1.7		1.7	
2.6		2.6	
3.65	Very Poor to Poor	3.66	

<table>
<tr><th colspan="2">Geo-Logic Solutions</th><th colspan="2">SRK</th></tr>
<tr><th>Depth</th><th>Rock Quality Designation (RQD)</th><th>Depth</th><th>Rock Quality Designation (RQD)</th></tr>
<tr><td>4.2</td><td></td><td>4.2</td><td rowspan="10"></td></tr>
<tr><td>5.7</td><td>Fair to Good</td><td>5.6</td></tr>
<tr><td>5.95</td><td rowspan="4">Very Poor to Poor</td><td>5.98</td></tr>
<tr><td>6.41</td><td>6.34</td></tr>
<tr><td>6.91</td><td>6.93</td></tr>
<tr><td>7.2</td><td>7.2</td></tr>
<tr><td>8.1</td><td rowspan="2">Fair to Good</td><td>8.1</td></tr>
<tr><td>8.85</td><td>8.85</td></tr>
<tr><td>9.2</td><td rowspan="2">Very Poor to Poor</td><td>9.2</td></tr>
<tr><td>9.45</td><td>9.46</td></tr>
<tr><td>10.2</td><td>Fair to Good</td><td>10.2</td><td>Fair to Good</td></tr>
<tr><td>10.7</td><td>Very Poor to Poor</td><td>10.7</td><td>Very Poor to Poor</td></tr>
<tr><td>12.1</td><td rowspan="4">Fair to Good</td><td>12.1</td><td>Fair to Good</td></tr>
<tr><td>13.2</td><td>13.2</td><td rowspan="2">Very Poor to Poor</td></tr>
<tr><td>14.6</td><td>14.6</td></tr>
<tr><td>16.2</td><td>16.2</td><td>Fair to Good</td></tr>
<tr><td>17.6</td><td>Very Poor to Poor</td><td>17.6</td><td>Very Good</td></tr>
<tr><td>19.2</td><td>Fair to Good</td><td>19.2</td><td>Fair to Good</td></tr>
<tr><td>20.65</td><td rowspan="2">Very Good</td><td>20.66</td><td>Fair to Good</td></tr>
<tr><td>22.15</td><td>22.15</td><td>Very Good</td></tr>
<tr><th colspan="4">OKGTC027</th></tr>
<tr><td>0.6</td><td rowspan="3">Very Poor to Poor</td><td>0.6</td><td rowspan="3">Very Poor to Poor</td></tr>
<tr><td>0.95</td><td>0.95</td></tr>
<tr><td>1.25</td><td>1.25</td></tr>
<tr><td>2.15</td><td>Fair to Good</td><td>2.15</td><td>Fair to Good</td></tr>
<tr><td>3.58</td><td>Fair to Good</td><td>3.59</td><td rowspan="3">Very Poor to Poor</td></tr>
<tr><td>4.3</td><td>Very Poor to Poor</td><td>4.3</td></tr>
<tr><td>5.8</td><td>Fair to Good</td><td>5.8</td></tr>
<tr><td>7.3</td><td>Fair to Good</td><td>7.3</td><td>Very Good</td></tr>
<tr><td>8.8</td><td>Very Good</td><td>8.8</td><td rowspan="2">Fair to Good</td></tr>
<tr><td>10.3</td><td>Fair to Good</td><td>10.3</td></tr>
<tr><td>11.8</td><td rowspan="2">Very Good</td><td>11.8</td><td>Very Good</td></tr>
<tr><td>12.8</td><td>12.8</td><td rowspan="2">Fair to Good</td></tr>
<tr><td>13.3</td><td>Fair to Good</td><td>13.3</td></tr>
</table>

<table>
<tr><th colspan="2">Geo-Logic Solutions</th><th colspan="2">SRK</th></tr>
<tr><th>Depth</th><th>Rock Quality Designation (RQD)</th><th>Depth</th><th>Rock Quality Designation (RQD)</th></tr>
<tr><th colspan="4">OKGTC029</th></tr>
<tr><td>0.7</td><td>Very Poor to Poor</td><td>0.7</td><td rowspan="2">Very Poor to Poor</td></tr>
<tr><td>1.45</td><td>Fair to Good</td><td>1.45</td></tr>
<tr><td>1.86</td><td rowspan="3">Very Poor to Poor</td><td>1.86</td><td>Fair to Good</td></tr>
<tr><td>2.1</td><td>2.1</td><td rowspan="2">Very Poor to Poor</td></tr>
<tr><td>3.1</td><td>3.1</td></tr>
<tr><td>4.2</td><td rowspan="3">Fair to Good</td><td>4.2</td><td>Fair to Good</td></tr>
<tr><td>5.1</td><td>5.1</td><td>Very Poor to Poor</td></tr>
<tr><td>6.1</td><td>6.1</td><td>Fair to Good</td></tr>
<tr><td>7.2</td><td rowspan="2">Very Good</td><td>7.2</td><td>Very Good</td></tr>
<tr><td>8.72</td><td>8.73</td><td rowspan="4">Fair to Good</td></tr>
<tr><td>10.2</td><td rowspan="3">Fair to Good</td><td>10.2</td></tr>
<tr><td>11.35</td><td>11.35</td></tr>
<tr><td>12.72</td><td>12.72</td></tr>
<tr><td colspan="4">Notes:
Rock Quality:
Very poor to Poor: RQD < 25% to 50%
Fair to good: RQD > 51% to 90%
Very good: RQD > 90%</td></tr>
</table>

Figure 12.6.1 Geotechnical Laboratory Verification

Photo 1: NTS sample verification

Photo 2: NTS sample verification

Photo 3: STL sample verification

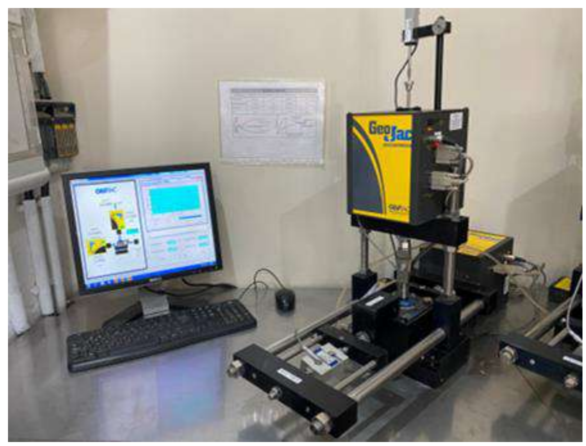


Photo 4: STL sample verification
Shearbox test in consolidation phase in progress

Table 12.6.3 Laboratory Testing Vreification Results (NTS Laboratory in Namibia)

NTS			
Laboratory number	**Corresponding TP**	**Depth**	**Material type**
9492	TP104	200-550	Hardpan calcrete
9494	TP105	100-600	Hardpan calcrete
9496	TP106	0-350	Transported sand
9520	DR01	470-920	Residual and quartzitic sandstone
9522	DR02	210-840	Hardpan calcrete
9528	DR09	110-940	Transported sand

NTS			
Laboratory number	**Corresponding TP**	**Depth**	**Material type**
9505	CM01	220-890	Residual Shist
9506	CM01	890-1120	Shist
9508	CM07	150-1040	Shist
9511	CM08	510-1520	Residual meta-greywacke
9513	CM09	460-770	Hardpan calcrete
9516	CM12	1040-1390	Hardpan calcrete

Based on the work undertaken by the SRK team, the Qualified Person is satisfied that the work conducted by Geo-Logic Solutions accurately describe the observed ground profile of the study area. The following is noted:

- Verification test pit positions and all phase 2 geotechnical borehole positions correspond in the field to the co-ordinates provide for each by Geo-Logic Solutions.

- The depth to refusal of test pits show that the depth to hardpan calcrete (I.e. depth to refusal) undulates significantly in the Processing Plant area and varies over relative short distances. Depth to refusal tend to be consistently relatively shallow over the investigated area. Only in the vicinity of test pit DR09 was deeper soils encountered in an area that is likely to contain a paleo alluvium channel that is infilled with ferrugensed granular materials.

- In terms of foundation conditions for Processing Plant infrastructure, rotary core borehole logs produced by Geo-Logic Solutions correspond to actual core as inspected by SRK although minor discrepancies were observed in measured rock quality designation (RQD) values for the calcretized zones. This may be due to additional disturbance or breaks incurred during transport as SRK logged the core it was transported from site to the core shed in Omaruru.

- Samples inspected at both NTS (Windhoek) and STL (Pretoria) geotechnical laboratories show that lab and sample numbers correspond and that materials correspond to field descriptions of soil profiles.

12.7 Tailings Storage Facility Area - Site Visits and Data Evaluation

A site visit was completed by Veronique Daigle, QP for the Tailings Management Area on 11 November 2022 for the purpose to assess the overall site, general hydrologic and foundation conditions.

The site visit comprised the following site activities:

- Walk over a portion of the TSF area selected during the PFS study for the DFS study to validate generic information from the PFS study.

- Review of the ground and foundation conditions, general topography, potential borrow main areas and hydrologic conditions in order to plan the DFS field studies.

- Overview of the main project infrastructures areas such as the Main Pit and its waste rock dumps, Okawayo catchment area, surrounding existing roads and envisaged relocated access roads.

- Discussion on the integration with other project consultant scope of work.

Foundation characterization was completed through the geotechnical program, geotechnical logs, laboratory tests and photographs taken by competent geologists, peer reviewed, and verified by the QP. The data was verified against previous geotechnical information, and other project areas. Findings were consistent and the DFS program increased the confidence and extent of the site geotechnical characterization.

Geochemical laboratory tests data on the tailings sample material were completed during the PFS phase by Prime Resources, and actual data analysis and key recommendations verified by the QP with reliance on specialist KP geochemists. The QP did not attempt to reproduce the test results and in the author's opinion, the data on which the author relied for this report was acquired using adequate quality control and documentation procedures that generally meet industry best management practices.

Tailings physical characterization and geotechnical assessment were completed by accredited laboratories, reviewed and verified by KP geotechnical engineers and QP. Filtration tests were completed by P&C and FLSmidth as reported by Lycopodium. Information presented in the author's opinion was acquired using adequate quality control and documentation procedures that generally meet industry best management practices for this level of study.

Data and information used in the TSF DFS design is listed in the KP Standard report Twin Hills Tailings Storage Facility Definitive Feasibility Study Summary Report, issued on 16 June 2023.

12.8 Environmental Fieldwork Data

The environmental data presented in Chapter 20 of the NI 43 101 report have undergone rigorous data verification processes to ensure their accuracy and reliability. The qualified environmental expert conducted a comprehensive review of the data collection process, including verifying the physical field measurements and the data collection processes undertaken by field technicians. The qualified environmental expert verified laboratory data by ensuring that laboratory methods and protocols used for data collection and analysis, were done to accredited standards. Electronic data was used from the laboratory thereby reducing potential transcribing errors, the electronic data was compared to the laboratory certificates and compared to relevant Namibian standards. Findings based on the data that was collected in the scope of work have been documented in Chapter 20 of the NI 43 101 report, providing assurance that the environmental data presented in the report are accurate, reliable, and compliant with applicable requirements.

12.9 Hydrogeological Site Visit and Data Verification

A site visit was conducted by the Qualified Person, Diana Duthe from 1 to 2 February 2022. During the trip, the following sites were visited:

- Hydrogeological drilling locations within the mining concession.
- Selected water monitoring locations in terms of collecting appropriate data.
- Water supply boreholes for the Osino and local farmsteads were verified for water levels and pH and TDS field measurements taken to verify the hydrochemical results.
- Selected geotechnical diamond drilling locations and inspection of available core.

Figure 12.9.1 Inspection of Recently Drilled Water Suply Borehole to Verify Water Levels, pH and Electrical Conductivity

Drilling and Test Pumping

An operating Air Percussion RC rig was not observed in the field, but it was verified that the crew are placing chip samples in neat rows for logging.

No drilling with water strikes was encountered during the short site visit, but the QP has received photographic evidence that the drillers were conducting Blow Yield Tests according to procedures provided with the use of V-notch to determine the flow rate.

Test pumping was not taking place at the time of the visit, but the test pumping data has subsequently been received. The data were recorded with automatic level loggers and manually at intervals to confirm at the loggers were recording correctly and then, downloaded on Excel spreadsheets before processing. The data was verified by the QP that it was correctly transcribed and suitable for input to the test pumping analysis.

Core Inspection

Core drilling for exploration was underway and core inspection was undertaken to visualise and reconcile hydraulic properties with the geology intersected particularly in the vicinity of the pit. The calc silicate hills as the main recharge zone to the marble aquifer being exploited for the mine water supply wellfields was examined in the field.

Figure 12.9.2 Hanging Wall Schists Inspected to Verify Hydraulic Properties with Test Pumping Results

Figure 12.9.3 Calc Silicate Hills Where Main Recharge to Marble Aquifer Occuring

Database Review

The drilling database was reviewed with regards to the importing, validation, structure, and backup of data. Data are imported from Microsoft Excel spreadsheets which contain data captured at the drill rigs, including collar information, well construction, lithology, and water strikes. The data are manually checked and compared to the chip samples and chip sample photographs by a qualified hydrogeologist. A backup of the data is stored on the Knight Piesold server which is located in the Sandton Office.

Aquifer Testing

Various methods for aquifer testing were undertaken during all phases of the hydrogeological investigation, including Falling Head Tests, Step tests followed by Constant Discharge Tests, and Constant Head Tests. All aquifer testing was conducted according to the SANS10299-4 2003 regulations.

The test pumping data was captured on-site on a pre-printed and approved template, that was later captured into an Excel spreadsheet. The data were verified by the Senior Hydrogeologist and then by the QP by cross-checking the data entered onto the spreadsheets against the automatic data collected by the loggers.

The data was analysed by curve matching in Aqtesolv Pro, for interpretation of hydraulic properties and determination of the sustainable borehole yields and checked by the QP that the best fit curves were selected, and hydraulic parameters collected were within expected range for the rock types encountered.

Water Chemistry

Water samples were taken according to the SANS5667-11 from the boreholes that were being pump tested. The samples were analysed by accredited laboratories and the QP has verified that the laboratory certificates are correctly input into one Excel spreadsheet for spatial and temporal trend analysis. Water chemistry certificates were provided from the labs in PDF and Excel format and were verified by a Qualified Hydrogeologist.

The diagnostic plots of the water chemistry have been verified by the QP that the data match the field measurements as collected by the QP on the site visit, that the data has been correctly captured in the database by checking random analytical certificates, that the ionic balances are within acceptable range (5-10%) and the interpretations are acceptable for the hydrogeological assessment.

Conclusion

The Qualified Person is satisfied that the necessary steps were taken to verify the data used for the hydrogeological assessment of the Twin Hills mine site.

12.10 Metallurgical Testing Site Visit and Data Verification

As part of the pre-feasibility study, series of site visits were conducted by Lycopodium lead and senior Metallurgical engineers Glenn Bezuidenhout and John Shannon to the Maelgwyn laboratory meeting with the test program lead Sonestie Janse van Rensburg, and QP Olav Mejia took additional steps to subsequently verify as described further below. The site visits schedule is presented below:

On 15 October 2021, John Shannon inspected the consignment of samples. From 22 October 2021 on a weekly basis John Shannon visited Maelgwyn laboratory for the weekly progress meetings until January 2022 and to observe and follow the test program progress.

On 27 October 2021, Glenn Bezuidenhout visited the Maelgwyn laboratory for the Twin Hills Gravity Circuit discussion meeting and to inspect the samples and discuss the gravity and flotation tests.

On 10 January 2022 Glenn Bezuidenhout visited Maelgwyn to observe the Leach and Aachen Leach tests, confirm activated carbon quality, and discuss cyanide detox work.

On 1 June 2022 Glenn Bezuidenhout visited Maelgwyn to inspect samples transported from Roodepoort to new Maelgwyn Offices in North Riding and discuss variability testwork.

On 4 July 2022 Glenn Bezuidenhout visited Maelgwyn to inspect Ondundu Core samples and discuss gravity procedures to be followed.

On 1 August 2022 Glenn Bezuidenhout visited Maelgwyn for the Arsenic precipitation testwork observations and discussions

On 9 September 2022 Glenn Bezuidenhout visited Maelgwyn for the Maelgwyn Open Day at the new laboratory.

The QP received the assay certificates from Maelgwyn Laboratory. The QP checked the assay values against the assays reported by Maelqwyn in section 13 Mineral Processing and Metallurgical Testing sub-section 13.2 Testwork.

Further to that as part of the feasibility study work the QP Olav Mejia reviewed and confirmed the data verification work conducted during the pre-feasibility study. He conducted various meetings with the Maelqwyn laboratory in specifics with the test program lead Sonestie Janse van Rensburg. He reviewed the laboratory certificates related to the tests that has been used directly in the process design work, and reviewed and confirmed the recovery calculations. The values from the laboratory certificates were compared with the data used for development of the process design for the feasibility study and it was concluded that the data has been used properly with the correct conclusions and approach to the process design work.

12.11 Conclusion

The Qualified Persons are satisfied that the necessary steps were taken to verify the data used for the various sections of this report.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

Osino Resources Corporation commissioned Lycopodium in October 2021 to undertake metallurgical test work at Maelgwyn South Africa as part of the Twin Hills Pre-Feasibility Study. Previous metallurgical test work had been carried out in 2020 by SGS South Africa on samples extracted from the Twin Hills ore body before Lycopodium's involvement with the 2020-2021 PEA test work campaign at Maelgwyn South Africa.

13.1 SGS South Africa (Pty) Ltd (2020) Testwork

In June 2020, SGS South Africa (Pty) Ltd published a report (SGS, 2020) on metallurgical tests that they had completed for Osino Resources Corporation on Twin Hills mineralization samples. The objective of the metallurgical test work was to determine the gold dissolution via direct cyanidation leaching of 10 composites samples selected, prepared, and provided by Osino Resources.

Gold recovery from direct cyanidation of the mineralization is represented by these samples.

- In one case, >94% gold dissolution was achieved in 24 hours (h) of cyanidation, following pre-oxidation of the sample for one hour.
- In three other cases, >90% gold dissolution was achieved at a fine grind.
- The arithmetic average gold dissolution was 89%, at an average grind size of P93% passing (P_{93}) 75 micron (µm) and it was noticeable that the results were variable.

The test work concluded that the samples were amenable to cyanide leaching and the average dissolution of gold was 89%.

13.2 Lycopodium / Maelgwyn PEA Testwork (2020 to 2021)

13.2.1 Overview

Lycopodium was commissioned by Osino Resources Corporation in August 2020 to initiate and oversee the PEA metallurgical test work on samples from the Twin Hills gold deposit. The PEA test work was carried out by Maelgwyn South Africa in Johannesburg.

Samples received were from core drilling and included Oxide and Fresh samples from Twin Hills West and Twin Hills East. Four composites of these mineralisation types as well as a blend of Fresh West and Fresh East were prepared. The PEA test work results are summarised.

Comminution

The BBWi figures of 10 kWh/t are indicative of a qualitative 'soft' to 'medium' hardness classification.

BRWi test results of 16.3 kWh/t, indicate a 'hard' classification for fresh material.

A relatively consistent ratio of 1.6 Rod to Ball Mill work index was recorded for each of the mineralization types.

The A x b value for the Fresh Composites was <30 and a 40 A x b value for the Oxide Composites.

Orway Mineral Consultants (OMC) modelled a 3-stage crush, ball mill circuit and determined that it was more power efficient than a SABC circuit.

Mineralogy – Bulk Modal Mineralogical Composition of Test Samples

The minor mineral phases showed some differences, and the 10 samples could be grouped into three main categories as follows:

- Group 1 - concentration of sulphides, dominated by pyrrhotite (1.7–2.8%), with smaller quantities of pyrite (0.7–1.8%) and arsenopyrite (0.5–1.3%).
- Group 2 - pyrite is the dominant sulphide (0.9–1.3%) with some arsenopyrite (0.14–0.44%) and pyrrhotite (0.1–0.3%).
- Group 3 - high concentrations of pyrite (1.7–2.6%) with some arsenopyrite (0.3–0.5%) and traces of pyrrhotite (0.07–0.16%).

Gravity Recovery of Gold

Preliminary gravity gold test work on the three main composites of Oxide, Fresh West and Fresh East produced overall GRG values of 50.0%, 38.5% and 44.9% respectively. The ore has gravity recoverable gold.

Grind vs. Gold Recovery

Grind versus gold recovery tests indicated that slightly more gold dissolution was possible by grinding to a finer 38 µm grind finer than P_{80} 75 µm. All the tests were done as whole ore leaches without gold extraction with gravity concentration.

Cyanide Leach Configuration and Retention Time

Pre-oxidation ahead of cyanidation was demonstrated to significantly improve gold dissolution from all mineralization types followed by gold leaching for between 24 h and 48 h. Based on the baseline leach test results, and the provisional average additional recoveries achieved by pre-oxidation per mineralization type, at a grind of P_{80} 75 µm, the following recoveries from different mineralization types were derived:

- Oxide: 84.2% Au recovery.
- Fresh West: 81.35% Au recovery.
- Fresh East: 90.1% Au recovery.

An additional benefit of the pre-oxidation step was the reduction in cyanide consumption. All the tests were done as whole ore leaches without gold extraction with gravity concentration.

Tailings Filtration

The tailings thickening flux rates are within the standard ranges of 0.87 to 1.32 $t/m^2/h$ which were also applicable to the pre-leach thickening. Tailings filtration test work was not done.

Heap Leach Tests

Bottle roll tests were conducted at P_{90} 10 mm and P_{80} 5 mm. The results showed partial leaching and were inconclusive.

13.3 Summary of Lycopodium / Maelgwyn PEA Interim Testwork (2020 to 2021)

Following the PEA test work and the development of the PEA flowsheet additional test work was initiated to confirm and expand some key design parameters. A particular focus of the test work was to determine the effect of pre-oxidation at natural pH vs pre-oxidation at an adjusted pH of 10.5, confirm the increased Au recovery obtainable by pre-oxidation and investigate the effect of a finer grind (P_{80} of 53 µm) on gold recovery.

Kinetic leach “sighter” tests (at a grind P_{80} of 75 µm) on samples from a new ore body, namely Clouds, were conducted as part of the test work program.

Samples were received from core drilling and included Oxide, Fresh West, and Fresh East material from the deposit as selected and designated by the Geologist from Osino Resources. These were:

- 5 x Fresh West High Grade samples.

- 5 x Fresh West Low Grade samples.
- 5 x Fresh East High Grade samples.
- 5 x Fresh East Low Grade samples.
- 5 x Oxide samples (3 x West, 2 x East).
- 5 x Cloud samples (2 x Oxide, 3 x Fresh).

Mineralogy

There was significantly more pyrrhotite and less pyrite in these interim Fresh samples compared to the initial PEA test work Fresh samples.

Arsenopyrite was also evident in the interim Fresh samples.

The Oxide samples had very low concentrations of sulphides present.

Gravity Recoverable Gold

The results from this set of test work had an average of nearly 40% of the gold being recovered.

Oxygen Uptake Tests

The oxygen uptake rate in the oxide samples was high at around 0.36 mg/l/min compared to the Fresh samples average of 0.13 mg/l/min.

The oxygen uptake tests showed that oxygen is being consumed extensively over the leaching period and that rate of consumption did not diminish over the six-hour duration of the test. The average cyanide consumptions for the 25 Fresh West, Fresh West and Oxide samples in the interim test work were approximately double those reported in the initial PEA pre-oxidation kinetic leach tests, for which the pyrrhotite levels in the Fresh samples were lower.

Diagnostic Leaching Tests

The standard diagnostic leach tests for Fresh ore averaged 76.38% gold recovery in the CIL step. The oxide samples averaged 89.3% gold recovery in the CIL step.

16.77 % of gold in the Fresh samples was liberated during the standard hydrochloric acid leach step.

Leaching and Pre-oxidation Results

An extended leach from 24 to 48 hours appeared to increase gold recovery by an average of 1.6%.

At the PEA design grind (P_{80} of 75 µm) with pre-oxidation and a 48-hour leaching time, the average gold recoveries from the interim tests were 88.3% for Fresh West, 82.4% for Fresh East and 88.6% for the Oxide samples.

Grinding to P_{80} of 53 µm compared to the PEA design of P_{80} of 75 µm increased the gold extraction significantly across all samples tested, and by an average of 5.3% across all the ore types.

Cloud Samples

Initial pre-oxidation and leaching results at a grind P_{80} of 75 µm gave gold recoveries in the region of 70 – 74% from the Cloud Fresh samples. Clouds Oxide samples showed gold recoveries of over 90%.

13.4 Summary of Lycopodium / Maelgwyn Pre-Feasibility Study Testwork (2021 to 2022)

Following the completion of the PEA report in 2021, Lycopodium Minerals Africa (Pty) Ltd (LMA) was contracted by Osino Resources Corp. to initiate and oversee further metallurgical test work on samples from the Twin Hills gold deposit in Namibia. These results would be used to design, size, and cost a flowsheet for use in a Preliminary Feasibility Study of the project.

New designations were given to the pits after the PEA. Twin Hills East was changed to Twin Hills Central and Twin Hills West was changed to Bulge. Samples received were from core drilling and included Twin Hills Central (THC), Bulge, Clouds (a new deposit) and Transition material from the deposit as selected and designated by Osino's Geologist. The samples for the PFS test work program were received by Maelgwyn South Africa on 14 October 2021 and the test work was completed on 12 March 2022.

It is noted that the drilling of the Twin Hills West (THW) satellite target was taking place at the same time the PEA Twin Hills West area was renamed 'Bulge'. The PEA metallurgical samples for Bulge were despatched to Maelgwyn South Africa under the Twin Hills West name and were not named Bulge. The Twin Hills West designation for Bulge had previously been used in the PEA for resource estimates and in the press release.

Samples of the Twin Hills West satellite deposit were received at Maelgwyn South Africa on 5 March 2022 and the test work results have been reported as an Addendum to the PFS test work. The test program on the Twin Hills West was arranged by Osino Resources as individual testing of the core samples and not as a composited sample of each ore source as was done in the original PFS test work. The Twin Hills West test work was overseen by Lycopodium Minerals Africa.

Additional metallurgical test work took place from March to August 2022 which entailed arsenic precipitation, HPGR comminution tests and dynamic thickening for pipe loop pumping tests.

Samples for the Heap Leach test work were received by Melgwyn South Africa on 17 June 2021. The test work program was done in accordance with Kappes Cassiday and was completed on 25 February 2022.

13.4.1 PFS Testwork Conducted

Comminution and Metallurgical testwork was conducted on Twin Hills samples as below:

- Comminution testwork on 37 individual core samples.
  - Bond Crusher Work Index (CWi) – 9 samples
  - Bond Rod Mill Work Index (BRWi) – 28 samples
  - Bond Ball Mill Work Index at 106 µm CSS (BBWi) – 37 samples
  - Bond Ball Mill Work Index at 63 µm CSS (BBWi) – 28 samples
  - Abrasion Index (Ai) – 31 samples
  - SMC tests – 37 samples.
- Metallurgical Recovery Testwork at Maelgwyn South Africa on composite samples of Twin Hills Central (THC), Bulge, Clouds and Transition material included the following tests:
  - Composite Sample Gold Head Analysis by SFA and BLEG
  - Composite Sample Head Analysis – full suite ICP, Carbon and Sulphur
  - Diagnostic leach on each composite
  - Mineralogy on each composite
  - Gold Deportment by Size
  - Gravity Recoverable Gold (eGRG) Test-work
  - Gravity tests to produce gravity tails samples for leach test work (including gravity concentrate upgrade)
  - Grind vs Gold Recovery test work at 106 µm, 75 µm, 63 µm and 53 µm

  - 48-hour CIL tests at 75 µm, 63 µm and 53 µm
  - Pre-oxidation optimization test work
  - Reagent optimization test work at the optimum grind
  - Repeatability tests using the optimum leach conditions
  - Whole ore leach tests
  - Leach tests using site water
  - Twin Hills West gold recovery test work on individual core samples as an Addendum to the PFS test work done by Maelgwyn South Africa
  - Heap Leach test work by Maelgwyn South Africa as an Addendum to the PFS test work done by Maelgwyn South Africa.
- Other Test-work included:
  - Flotation test work and the leaching of the rougher concentrates
  - Settling and dewatering tests
  - Filtration tests
  - Viscosity tests
  - Site water quality tests
  - Oxygen uptake tests
  - Continuous cyanide detoxification test
  - High-rate thickening and paste dynamic thickening test work
  - Pipe loop pumping tests with paste slurry
  - Preliminary Arsenic precipitation test work
  - HPGR comminution tests.

13.4.2 Testwork Results and Discussion

Comminution Testwork

The Fresh and Transition results were presented separately by OMC to facilitate future additional modelling when the final mine plan and schedule are available. Ore parameters representing the 85th percentile of the energy demand are typically selected by OMC for design to ensure sufficient energy is available for the design duty.

Table 13.4.1 Comminution Test Results – Fresh Ore

Sample ID	CWi kWh/t	Ai	RWi kWh/t	BWi, kWh/t @ Closing Screen			RWi: BWi	SMC Axb	ta	SG
				106 µm	63 µm	ΔBWi				
Average	15.0	0.1778	15.9	10.9	13.2	2.0	1.21	31.3	0.29	2.78
Max.	19.9	0.296	19.0	14.3	15.4	3.6	1.57	39.7	0.37	2.80
Min.	9.6	0.093	12.1	8.29	10.8	0.5	0.86	26.0	0.24	2.73
Std Deviation	3.8	0.052	1.91	1.33	1.08	0.9	0.16	3.4	0.03	0.02
Coefficient of Variation	25.5	28.9	12.0	12.2	8.2	43.7	13.6	10.8	10.9	0.66
85th/15th Percentile	18.9	0.224	17.7	12.3	14.1	2.9	1.33	27.9	0.26	2.80

The comparison of Transition ore parameters with the Fresh ore dataset shows lower energy required when compared to the Fresh ore only. This is due to the Transition ore being softer. Consequently, the 85th percentile parameters representing the Fresh ore were selected for design in the study.

Table 13.4.2 Comminution Test Results – Transition Ore

Sample ID	CWi kWh/t	Ai	RWi kWh/t	BWi, kWh/t @ Closing Screen			RWi: BWi	SMC Axb	ta	SG
				106 µm	63 µm	ΔBWi				
Average	-	0.095	11.4	8.02	11.6	3.2	1.02	59.8	0.59	2.63
Max.	-	0.153	15.4	10.1	14.0	4.7	1.39	103.8	1.06	2.71
Min.	-	0.049	6.63	5.92	7.97	1.3	0.57	31.8	0.31	2.53
Std Deviation	-	0.041	3.20	1.86	2.32	1.5	0.35	30.1	0.31	0.06
Coefficient of Variation	3.7	43.3	28.1	23.2	20.1	45.7	34.2	50.4	52.5	2.4
85th/15th Percentile	-	0.133	13.7	9.90	13.5	4.3	1.37	32.3	0.31	2.69

Metallurgical Recovery Testwork Samples and Compositing

Composites of Bulge, Twin Hills Central, Clouds and Transition material were tested.

Composites Gold Head Assays

Gold Fire assay, gold screen fire assay (SFA) and bulk leach extractable gold (BLEG) were the analytical methods used to check the gold head grades of the composites. Gold assay by size was also done on each of the composites as an additional comparison.

Table 13.4.3 Composite Head Grade Gold Results

Sample	Fire Assay Ave. Au g/t	Screen Fire Assay Calc. Au g/t	BLEG Result Calc. Au g/t	Assay by Size Calc. Au g/t
Transition	1.02	1.12	1.09	1.07
Bulge	1.36	2.07	1.37	1.84
Central	1.12	1.23	1.12	1.62
Clouds	1.47	2.72	1.54	2.22

Composite Chemical Analysis

Silver Results

The silver values of each composite were either equal to, or lower than, the gold value in the composites, indicating that silver will not impact on the performance of the CIL circuit.

Mercury Results

The composite samples contained low concentrations of mercury. The mercury levels were less than 0.5 ppm and adsorption onto the carbon should not be harmful to health in carbon regeneration or smelting of the electro-winning sludge.

Sulphur Speciation Results

The lower sulphide sulphur in the Transition composite sample was indicative of the oxidation of this ore zone. Twin Hills Central had the lowest sulphide sulphur content (1.1%) of the Fresh composite samples and the Clouds composite sample had the highest sulphide sulphur content (1.73%). This variability of sulphide sulphur content in the Fresh composites affected the gold dissolution in each of these composites. The >1% sulphide sulphur content in the Fresh composites should be conducive to flotation recovery of gold and sulphur.

Carbon Speciation Results

All the composite samples recorded an organic carbon content of <0.05%, which will have a minor preg-robbing effect in the process plant.

Major Elements Results

The iron (Fe) levels of about 4% in all the composites samples were noted due to their potential influence on cyanide consumption.

Minor Elements Results

The Bulge and Clouds composite samples recorded 5000 ppm Arsenic, the Twin Hills Central and Transition composites contained less than 3000 ppm. All the composites contained low levels of the cyanide consuming elements Co, Ni, Cu and Zn.

Mineralogical Evaluation

All composite samples were submitted for quantitative or semi-quantitative XRD, Bulk Modal QEMSCAN and Geochemical analysis to identify major and minor mineral phases and their relative proportions.

There was a good correlation between the XRD and bulk modal mineralogical composition data of the four Twin Hills samples. However, the sulphide content of the samples is typically underestimated by XRD. The XRD data should thus be viewed as only indicative.

The QEMSCAN bulk modal analyses clearly distinguished between the Fresh and Oxide Ores. The Fresh Ores were characterised by relatively high concentrations of sulphides. The sulphides were dominated by pyrrhotite, with lesser arsenopyrite and pyrite. Pyrrhotite was an oxygen consumer, and its presence could therefore affect the cyanidation process negatively.

The Oxide Ore was characterised by very low sulphides. Only traces of pyrrhotite, arsenopyrite and pyrite were present. Different to the Fresh Ores, the Oxide Ore contained significant Fe-oxide, kaolinite, and jarosite content. Distinct As-bearing phases could usually not be detected in the oxide ores, as the arsenic released during the oxidation of the arsenopyrite was adsorbed onto secondary Fe-oxides / hydroxides and clays, resulting in anomalous arsenic values detected by the chemical assays. However, in this case, the Oxide Ore contained traces of distinct secondary As-bearing phases (i.e. arsenosiderite and associated scorodite).

Gravity Recoverable Gold (GRG)

The PEA testwork which showed gravity recoverable gold of 38-45% on Fresh material, a decision was made to conduct all leach testwork on gravity tailings material for the PFS. The extraction of gravity gold typically reduces the gold feed grade to the CIL to a constant grade value for consistent carbon loadings. The separate intensive treatment of the coarse gravity concentrate in this case could increase gold dissolution to >95%, short circuiting the processing of this proportion of recovered gold to doré production. The primary objective for the inclusion of a gravity circuit is to improve the overall gold recovery. The definitive GRG test work is an industry-standard and the modelling applied to the gravity data must typically conclude a minimum GRG recovery of ≥20% for an overall gold recovery benefit.

GRG Testwork for Gravity Tailings Leach Test

The GRG tests were conducted on five samples that had been ground to P_{80} 106 µm. The test unit used was a Knelson MD3. The results reported gravity gold recoveries of 23% to 31.5% for the Fresh composite samples. These results are lower than the PEA test work gravity gold recoveries. In the PEA testwork the 1% gravity concentrate mass had not been upgraded to 0.1% on a Gemini shaking table to simulate plant conditions and derated the gold recoveries.

The decision to conduct all PFS leach testwork on gravity tailings was verified and a gravity concentration circuit was included in the PFS flowsheet.

eGRG Testwork

The extended gravity recoverable gold, eGRG testwork, was conducted at Maelgwyn South Africa according to the Gravity Concentrators Africa (GCA) testwork procedure developed by Dr Andre LePlante of McGill University of Canada and the results were used to estimate actual plant recovery by mathematical modelling. The results were further modelled by GCA to predict actual plant performance.

Modelling of the Twin Hills Project plant gravity circuit indicates probable gravity recovery of 27.8% of ore head under design conditions. Minor recovery increase is possible with high gravity feed tonnage.

Predicted recovery is somewhat lower than E-GRG value of 42%, mainly because of relatively fine GRG distribution in the ore. The E-GRG report indicates that about 30% of available GRG occurs below 38µm where it is a difficult target for gravity recovery. Additionally, over-grinding and loss of GRG occur in any grinding circuit.

Maximizing Gravity Recovery

Usual options to maximize gravity recovery are as follows:

- Maximize tonnage directed to gravity devices.

- Optimize / minimize the plant grind. The Twin Hills design grind of 63 µm is uncommonly fine and is not optimal for gravity recovery. Although it is required to achieve liberation and overall higher recovery in the CIL circuit.

The primary option available in this case is the variation of gravity plant tonnage. Gravity tonnage has been modelled from the project design level of 562 tph, for 2 KC-QS48 machines rated at a comfortable feed flow of 280 tph each. Thereafter options at 600 tph and in increments of 300 tph (one additional machine per increment, operating at a comfortable feed rate of 300 tph) show marginal gains in recovery according to the model. The mill circuit water balance will need to be carefully checked if consideration is given to higher gravity circuit tonnage.

Leach Testwork

A testwork 'Roadmap' was compiled by Lycopodium to cover all aspects of the leaching tests required for a PFS report. This Roadmap can be summarized as follows:

- Diagnostic leach on whole ore composites.
- Confirmation of optimum grind and residence time.
  - P_{80} 106 µm, 75 µm, 63 µm and 53 µm grind sizes chosen with direct cyanidation
  - Direct cyanidation kinetic 48-hour tests at sample intervals of 2, 4, 8, 12, 24, 36 and 48h.
- 48-hour CIL test at optimum grind conditions.
- Optimization of Pre-oxidation conditions with 48-hour direct cyanidation kinetic tests.
  - 4 hour Pre-oxidation tests with oxygen on all grind sizes
  - 4 hour Pre-oxidation test with oxygen at selected grind at 500 ppm PbNO3 addition
  - 2 pass shear reactor test at the optimal grind.
- Reagent Optimization at optimum grind and residence time at 48 hour direct cyanidation kinetic tests.
- Optimize lead nitrate ($PbNO_3$) addition.
- Optimize cyanide (CN) addition.
- Carbon loading tests.

- CIL Whole Ore (no gravity step) tests at optimal conditions and grind.
- Leach tests using site water to determine detrimental elements in the site water.
- Repeatability CIL tests on each composite with the flow sheet leaching conditions.

As mentioned earlier in this report, all the above tests were to be conducted on gravity tailings composite samples.

Diagnostic Leach

Standard Diagnostic Leaches were conducted on all the composites without gravity separation step and pre-oxidation. The Whole ore leaches were conducted on samples ground to - 80% <75 µm.

The Twin Hills Central CIL gold recovery was greater than 90% indicating that finer grinding than P_{80} 75 µm was not required to improve recovery.

The Bulge CIL gold recovery was less than 90%, with 5.1% gold recovery in the HCl leach step indicating the requirement for pre-oxidation treatment of the Pyrrohotite. The 4.5% gold recovery in the HNO3 leach step (arsenopyrite) and 6.2% unliberated gold indicated a requirement for finer grinding.

The Clouds diagnostic leach results were similar to Bulge but the 10% gold recovery in the HNO3 leach showed that the ore was semi refractory, requiring finer grinding than Bulge.

The Transition CIL gold recovery was greater than 90%, with a 4.8% gold recovery in the HCl Leach also indicating the need for pre-oxidation treatment for Pyrrhotite.

Originally it was planned to conduct Diagnostic leaches on residue samples from the leaches but as residue grades of less than 0.1g/t Au were achieved in the later leaches, this was unnecessary for this project.

Optimum Grind and Leach Residence Time

The grind sizes to be tested to determine the optimum one for all the composites were P_{80} 106 µm, 75 µm, 63 µm and 53 µm. PEA testwork had shown that a grind of P_{80} 53 µm gave an incremental increase in recovery so an intermediate grind of P_{80} 63 µm was chosen with the objective of reducing the process plant capital and operating costs. The 106 µm and 75 µm grind sizes were base case comparisons to the commonly used grind sizes used for gold ore leaching.

Each test was conducted using the following conditions:

- 45% solids.
- 4 hours pre-oxidation step using 99% oxygen addition and dissolved oxygen (DO) levels monitored throughout the test.
- 0.5 kg/t NaCN addition and cyanide controlled at 0.5 kg/t throughout the test.
- pH of 10.5.
- Kinetic test sample times were 2, 4, 8, 12, 24, 36 and 48 hours.
- Direct cyanidation i.e. no carbon addition.

Twin Hills Central Grind Leach Results

The optimum conditions for Twin Hills Central determined are a grind of 63 µm and a leaching time of 48 hours resulting in an overall gold recovery of 92.26% with a final residue of 0.097 g/t.

Tailings samples at 0.1 g/t Au have gold fire assay accuracy of +/- 15% and it is possible the 53 µm grind size produced a similar result to the 63 µm grind size. Based on this possibility, the 63 µm grind size would be accepted for economic reasons.

Under these conditions the DO levels were maintained above 20 mg/l (ranging between 20.33 and 28.46 mg/l), pH levels of about 10.5 and cyanide consumption of 0.48 kg/t. The test accountability at 48 hours was 96%.

Bulge Grind Leach Results

The optimum conditions for Bulge determined are a grind of 63 µm and a leaching time of 48 hours resulting in an overall gold recovery of 92.07% with a final residue of 0.111g/t.

Tailings samples at 0.1 g/t Au have gold fire assay accuracy of +/- 15% and it is possible the 53 µm grind size produced a similar result to the 63µm grind size. Based on this possibility, the 63 µm grind size would be accepted for economic reasons.

Under these conditions the DO levels were maintained above 20 mg/l (ranging between 23.33 and 30.12 mg/l), pH levels of about 10.5 and cyanide consumption of 0.53 kg/t. The test accountability at 48h was 105%.

Clouds Grind Leach Results

Recoveries from the Clouds deposit are lower than for Twin Hills Central and Bulge at the 63 µm grind size. The optimum conditions for Clouds were marginally better at the finer grind of 53 µm and a leach time of 48 hours resulting in an overall gold recovery of 87.03% with a final residue of 0.201 g/t.

Under these conditions the DO levels were maintained above 20 mg/l (ranging between 25.49 and 32.41 mg/l), pH levels of about 10.5 and cyanide consumption of 0.45 kg/t. The test accountability at 48h was 104.4%.

Transition Grind Leach Results

Recoveries from the Transition material are similar to those for Twin Hills Central and Bulge at a grind of 75 µm after 48 hours resulting in an overall gold recovery of 92.47% with a final residue of 0.076g/t.

Tailings samples at <0.1 g/t Au have gold fire assay accuracy of +/- 15 and the 53 µm grind size has produced a similar result to the 75µm grind size. The softer competency of Transition ore blended with the more competent hard ore will grind finer than the 63 µm grind size and leach at an optimal grind of 53 µm.

Under these conditions the DO levels were maintained above 20 mg/l (ranging between 21.99 and 26.44 mg/l), pH levels of about 10.5 and cyanide consumption of 0.76 kg/t. The test accountability at 48h was an acceptable 95%.

Carbon-in-Leach Tests (CIL)

48h CIL Tests were conducted at the three finer grinds (previous tests showing that the P_{80} 106 µm was not viable). No kinetic samples were taken during the tests. The same leaching conditions were used for grind leach tests with 20 g/l of activated carbon.

Twin Hills Central CIL Results

For Twin Hills Central the gold recovery difference between direct cyanidation and CIL was marginal at about 1% for all grind sizes. Based on the limits of tailings gold assay accuracy the 63 µm and 53 µm CIL recoveries are rated as similar at 93%.

Bulge CIL Results

For Bulge, CIL at 63 µm achieved the best result at 92.7% recovery with a 0.10 g/t Au residue.

Clouds CIL Results

The Clouds CIL results gave spurious results compared to the Twin Hills Central and Bulge results with all CIL residues being higher than the direct cyanidation results. Even the 53 µm repeat test gave the same result. Direct cyanidation at 53 µm achieved the best result at 87% recovery and 0.19 g/t Au residue.

Leach Tests with Lead Nitrate (PbNO3) Addition

48-hour Kinetic Tests were conducted at a grind of 63 µm with the addition of 500 ppm PbNO3 to the pre-oxidation stage. All other test conditions were as the original kinetic leach tests.

The addition of 500 ppm Lead Nitrate to pre-oxidation produced a significant improvement in the gold extractions in the case of all composites, especially at the 24 hours and 36 hours kinetic leach periods. These results indicated that the 48 hours leach time can be reduced to 36 hours for the plant design.

The addition of 500ppm Lead Nitrate had little effect on the consumption of cyanide during the leach. Lime addition increased for the Twin Hills Central and Bulge tests and marginally decreased for Clouds.

Lead Nitrate (PbNO3) Reagent Optimization

48-hour Kinetic Tests were conducted at a grind of 63 µm and at the lower addition of 250 ppm PbNO3 to the pre-oxidation stage. All other test conditions were as the original kinetic leach tests.

Reducing the PbNO3 addition to 250 ppm resulted in a drop in Au recovery of about 2% in all cases at the 24-hour and 36-hour leach periods.

Leach Tests with a Shear Reactor

The Shear Reactor tests were conducted in the laboratory scale Aachen test rig at Maelgwyn South Africa.

The results confirmed that the 2-pass shear reactor pre-oxidation tests followed by a 24-hour leach produced higher gold recoveries than the 48-hours direct leach and the 36 hours leach with a pre-oxidation of 500ppm Lead Nitrate. The addition of a shear reactor to the circuit design will significantly reduce the leach tankage required with the added benefit of increased gold dissolution.

The shear reactor pre-oxidation technology had a significant effect on the cyanide and lime reagent consumptions. Cyanide consumption decreased by 21% for Twin Hills Central, 38% for Bulge and 46% for Clouds. Lime consumption increased slightly for Twin Hills Central but reduced by 27% and 38% for Bulge and Clouds respectively.

The trade-off study determined that the Oxygen / Aachen reactor pre-oxidation option had a low capital cost, low operating cost and high revenue versus the Lead Nitrate pre-oxidation which has a high capital cost, high operating cost, and no increase in revenue. Lead Nitrate has over three times the operating cost of Oxygen / Aachen option. Lead Nitrate option requires four times the upfront capital cost than Oxygen / Aachen.

Cyanide Reagent Optimization

A series of tests were conducted with the initial addition of 100 ppm cyanide at the original leach conditions and maintained at that level. Controlling the leach at 100 ppm cyanide produced inadequate leaching results. There was a 10% drop in gold recovery for Bulge and Twin Hills Central and a 3% recovery reduction for Clouds for all cases at 24-hours and 48-hours retention time. The cyanide consumptions for Bulge, Twin Hills Central and Clouds was 0.20 kg/t, 0.19 kg/t and 0.16 kg/t respectively. Lead Nitrate was not used in the pre-oxidation due to not having tested its effect at this stage of the test work.

A further series of tests were conducted with the initial addition of 500 ppm, controlling the cyanide to 200 ppm to 12h of leaching and then allowing the cyanide to drift until the end of the leach. Lead Nitrate at 500 ppm was added to the pre-oxidation.

The 200 ppm cyanide control tests were conducted with the addition of 500 ppm Lead Nitrate and the comparable recoveries are between 3.5% and 5% lower after 24-hours leaching when compared to the 500 ppm cyanide addition tests with 500 ppm Lead Nitrate addition to the pre-oxidation. Cyanide consumption was 0.55 kg/t, 0.50 kg/t and 0.42 kg/t for Twin Hills Central, Bulge and Clouds respectively which was similar to the 500 ppm cyanide controlled addition tests.

Leaches using Site Water

Borehole water is the primary source of water to be utilized for the Twin Hills project, the results indicated that the site water has no detrimental effect on the leach recoveries.

Whole Ore Leach Tests

Leach tests were conducted on each of the composites without any Gravity Concentration as was done in the PEA test work. The leaching conditions were at a grind size of 63 µm with 500 ppm cyanide controlled addition and 500 ppm Lead Nitrate pre-oxidation.

For the Twin Hills Central, Bulge and Clouds composites the overall WOL gold recoveries were 9%, 13% and 4% lower respectively than the comparable Gravity Tailings leach with the lead nitrate addition after the 24-hour leach period. This confirms the removal of coarse gold during the Gravity Recovery step has a significant benefit to the overall gold recovery.

The Transition composite showed a 1% WOL gold recovery increase after the 24-hours leach period, but the Transition comprises<15% of the ore body.

Cyanide consumption for the WOL leach was 0.52 kg/t, 0.59 kg/t, 0.42 kg/t and 0.82 kg/t for Twin Hills Central, Bulge, Clouds and Transition respectively. Twin Hill Central and Clouds was comparable to the gravity tails cyanide consumption with Bulge and Transition being 0.09 kg/t and 0.20 kg/t higher respectively.

Oxygen Uptake Tests (OUT)

An oxygen uptake test was conducted on the Twin Hills Central sample with and without a Shear Reactor pre-oxidation step. The Aachen shear reactor oxidation reduced the oxygen consumption by 20% to 25% in the first two cycles and by 33% from cycle 3 to cycle 6, there is about a 50% reduction in oxygen during the last 18 hours of the leach.

Cyanide Detox Tests

The Cyanide Detox test was conducted on the residue from the Twin Hills Central 200ppm cyanide control test. The SO2/Air process requires a minimum of 3.66 grams of SMBS per gram of CNWAD for complete oxidation to occur. This is defined as stochiometric equivalents, 1 EQ in Maelgwyn South Africa terms.

3 EQ of SMBS per mole CN WAD reached the desired outcomes with 24.6 ppm CN WAD after a full two-hour test run. Copper is required in solution at levels between 20 and 50 ppm to catalyse the oxidation reaction.

Whilst there could be slight reagent consumption potential targeting 40 ppm WAD cyanide, this should be seen as further optimization of the plant operation.

Repeatability Leach Tests at the Optimal Leaching Conditions

The repeatability leach tests were done to determine the PFS gold recoveries on the design flow sheet for the Twin Hills gold plant. The metallurgical PFS test work established an optimal leaching grind of 80% -63µm, four hours of oxygen pre-oxidation with a 2-pass shear reactor, and 500ppm controlled cyanide addition for 24-hours leaching of a gravity tail.

The Repeat 1 and Repeat 2 Fresh residue values for each of the composites have no quantifiable variation. The average gold leach tailings values for Twin Hills Central, Bulge and Clouds were 0.06 g/t, 0.08 g/t and 0.14 g/t respectively. There is a 2% leach extraction variation in the Transition Repeat tests with the average gold leach tailings value of 0.07 g/t Au. These residue values will be used for overall gold recovery derivation for the PFS.

Flotation Testwork

Scouting flotation testwork was conducted on all three Fresh composites at grinds of P_{80} 106 µm and 75 µm. No gravity concentration step was conducted before the Flotation tests however, one test was conducted on the Twin Hills Central sample with a pre-gravity concentration step.

Twin Hills Central rougher kinetic tests at the grind size of 106 µm and 75 µm achieved 19%% rougher mass pull for both tests. The 75 µm rougher float test had a higher rougher gold recovery of 95.35% and a sulphur recovery of 98.99%.

Bulge rougher kinetic tests at the grind size of 106 µm and 75 µm achieved 17% and 18% respective rougher mass pulls. The 75 µm rougher float test had a higher rougher gold recovery of 89.43% and a sulphur recovery of 98.91%.

Clouds rougher kinetic tests at the grind size of 106 µm and 75 µm achieved 24% and 21% respective rougher mass pulls. The 75 µm rougher float test had a higher rougher gold recovery of 94.30% and a sulphur recovery of 99.23%.

Flotation Concentrate Leaches

A bulk flotation concentrate was produced for each composite. The concentrate was then leached at three different grinds – 'as is', P_{80} 38 µm and P_{80} 25 µm with sampling kinetic points of 24, 36 and 48 hours.

The 25 µm concentrate grind was the optimal grind for the concentrate leaches of each of the Fresh composites. On the ROM flotation samples, overall gold recoveries of 85.2%, 82.2% and 82.4% were achieved on the concentrate milled to P_{80} 25 µm for Twin Hills Central, Bulge and Clouds respectively. Lower recoveries were achieved at the coarser grinds.

On the flotation of the gravity tailings sample for Twin Hills Central, removing gravity gold before flotation increased the comparative gold dissolution by 4.5% at the 25 µm concentrate grind.

The trade-off study determined that the ROM CIL option had a lower operating and capital cost in comparison to the ROM flotation conc CIL option.

Settling and Dewatering Tests by Mac-One Technologies

Settling and Dewatering tests were conducted by Mac-One Technologies. Polymer screening and dosage / density matrix tests were conducted on all of the four Twin Hills composite samples at grinds of P_{80} 53 µm, P_{80} 63 µm and P_{80} 75 µm. Rand water was used to slurry the samples and the tests were conducted with the addition of lime to a pH of 10.4.

A summary of the results obtained for the selected 63 µm grind is shown in Table 13.4.4 below.

Table 13.4.4 Settling and Dewatering

Twin Hills Settling and Dewatering Results Summary				
	CENTRAL 63µm	**BULDGE 63µm**	**CLOUDS 63µm**	**TRANSITION 63µm**
Optimal Feedwell Density	12.25%	10.00%	10.00%	8.00%
Underflow Densities Achieved	60.8-64.1%	62.2-64.0%	58.9-63.4%	59.1-62.6%
Overflow Turbidity	70-130NTU	84-192NTU	43-170NTU	23-250NTU
Flocculant Recommended	Senfloc 5530 and 5310	Senfloc 5330 and 5310	Senfloc 5330 and 5310	Senfloc 5330
Thickener Area Required	1.2 m^2/t/hr	1.35 m^2/t/hr	1.4 m^2/t/hr	2.2 m^2/t/hr
Flocculant Addition	15g/t	16g/t	16g/t	16g/t

Filtration Tests by Roytec

Filtration testwork was conducted by Roytec Global Separation Solutions, who although an equipment supplier, were paid to conduct the work.

For VBF filtration, the expected moisture for Transition and Bulge composites were measured to be 21 – 25.5% and 20.5-25% respectively. Lower moisture content was achieved with pressure filtration with the formation moisture content for Trans and bulge composites measured to be 18.6 and 14.6% respectively. Air blow conducted at 3 bar and for a three minute duration had a measured cake moisture content for the Trans and Bulge composites of 13.6 and 8.8% respectively. The back calculated filtration flux for pressure filtration was 70 kg/h.m2 compared to 191 kg/h.m2 for vacuum filtration.

Conclusions by Lycopodium

A trade-off study report on vacuum belt filtration versus pressure filtration concluded that vacuum belt filtration should be specified for the PFS with recommended actions to be followed up in the DFS.

Viscosity Tests

The viscosity of the four composite samples at all grinds was measured using the Brookfield DVE Viscometer. The results for the other composites and the other grind sizes are very similar.

Paterson and Cooke Slurry Tests

Dynamic Thickening Tests

The optimum solids loading rate was 0.7t/h/m^2 and 70% w/w mass solids concentrations can be achieved for a high rate and paste thickener at a flocculant consumption of 60 g/t. The continuous semi-pilot paste thickening shows that 70% w/w mass solids concentration can be achieved by paste thickening on a continuous basis.

This result will be used in the DFS to size the pre-leach and tailings high-rate thickeners.

Pipe Loop Tests
The laminar flow was analysed by applying the Bingham Plastic Model. The data indicated that a small increase in mass solids concentration results in a significant increase in yield stress and plastic over the concentration range tested. The non-Newtonian Reynolds number Fanning friction factor results showed that the pipeline will likely operate in the laminar flow region above mass solids concentrations of 70% w/w.

Preliminary Arsenic Precipitation Tests

A composite tails solution from the Twin Hills West leach tests had a 50ppm Arsenic level. A Ferric Sulphate dosage ratio of 10:1 was required to reduce the Arsenic level to less than <1ppm the equivalent of 2.5 kg/t dosage at plant scale.

13.4.3 PFS Gold Recovery Assessment

The assessment of the overall gold recovery for each of the composites representing the Bulge, Twin Hills Central and Clouds pits is based on the PFS test work report by Maelgwyn South Africa and applies the feed gold grades from the August 2022 Osino Twin Hills Enhanced Mining Schedule provided by Osino.

The method to calculate the overall gold recovery for each source follows the test work procedure of gravity gold recovery to provide a gravity tail for gold leaching. The gold recovery formula is as follows:

- Mill feed gold head grade of each ore source x (1-gravity gold recovery percentage) = CIL feed gold grade.
- CIL feed gold grade – leach tails gold head grade / CIL leach feed gold grade = CIL gold recovery percentage.
- Overall gold recovery percentage for each ore source = gravity gold recovery percentage + CIL gold recovery percentage.

The above overall gold recovery method is applied to the Twin Hills West source as the test work results done on individual core samples and from this a gold head and tail grade relationship is established and reported in the PFS Testwork Addendum.

Gravity Gold Recovery

Refer to Table 13.4.5 below for a summary of the gravity gold recoveries used for the gravity concentration circuit.

Table 13.4.5 Gravity Gold Recoveries for Recovery Assessment

Material	Pit	Gravity Recovery	Information Source
Transition	Bulge	17.8%	Maelgwyn PFS Test Report
	TH Central	17.8%	Maelgwyn PFS Test Report
	Clouds	17.8%	Maelgwyn PFS Test Report
Fresh	Bulge	28.3%	GRG Modelling Report
	TH Central	28.3%	GRG Modelling Report
	Clouds	31.5%	Maelgwyn PFS Test Report
	Twin Hills west	22.6%	Maelgwyn Test Report

The gravity gold recoveries in Table 13.4.5 are applied to the feed gold grades of each ore source to calculate the gold head grade for the CIL circuit.

CIL Gold Recoveries

Refer to Table 13.4.6 below for a summary of the CIL circuit final tails grades used for the CIL circuit gold recovery. The tails gold grades are referenced specifically from the repeatability test work on the flowsheet and processing parameters established in the PFS test work program.

Table 13.4.6 CIL Gold Recoveries for Recovery Assessment

Material	Pit	CIL Tails g/t Au	Information Source
Fresh	Bulge	0.08	Maelgwyn PFS Test Report
	TH Central	0.06	Maelgwyn PFS Test Report
	Clouds	0.14	Maelgwyn PFS Test Report
	TH West	0.13	Maelgwyn Test Report
Transition	Bulge	0.07	Maelgwyn PFS Test Report
	TH Central	0.07	Maelgwyn PFS Test Report

Material	Pit	CIL Tails g/t Au	Information Source
	Clouds	0.07	Maelgwyn PFS Test Report

Overall Circuit Gold Recoveries for each Ore Source

Refer to Table 13.4.7 below for the overall circuit gold recoveries calculated from the LOM and 6 Years mill feed gold grades using the testwork results.

Table 13.4.7 Overall Circuit Gold Recoveries Calculated

Material	Pit	LOM %	6 Years %
Trans	Bulge	93.4	94.0
	TH Central	93.4	94.0
	Clouds	93.4	94.0
	TH West	93.4	
Fresh		%	%
	Bulge	91.7	94.1
	TH Central	94.5	94.6
	Clouds	88.6	90.2
	TH West	88.7	

The following recovery discounts have been applied to the overall recoveries in Table 13.4.7:

- CIL carbon fines losses of 30g carbon per ton milled at a grade of 100g/t as per the expected eluted carbon value.
- Solution gold losses based on 49% solids in the CIL tailings stream and 0.01 g/l Au in solution.

The above recovery discounts are applied as a 0.66% reduction to the overall gold recoveries for each ore source, in the Twin Hills Gold Project, as illustrated in Table 13.4.8 below.

Table 13.4.8 Overall Circuit Discounted Gold Recoveries

Material	Pit	LOM %	6 Years %
Trans	Bulge	92.7	93.3
	TH Central	92.7	93.3
	Clouds	92.7	93.3
	TH West	92.7	93.3
Fresh		%	%
	Bulge	91.0	93.4
	TH Central	93.9	94.0
	Clouds	88.0	89.6
	TH West	88.0	

The weighted overall gold recovery from the tonnage of each ore source and feed gold grade is 93.2% for the first six years and a life of mine average gold recovery of 92.0%.

13.4.4 PFS Addendum Testwork

Heap Leach Test Work

The column residue of 0.71g/t Au indicates 16.83% of the gold leached in the column after 39 days of column leaching from a feed grade of 0.85g/t Au.

Twin Hills West Gold Recovery Tests on Individual Core Samples

Individual half core Twin Hills West samples were tested.

Gold Head Assays of Individual Core Samples

Standard Fire Assay, AAS analysis results with a detection limit of 0.01g/t Au are shown in Table 13.4.9.

Table 13.4.9 Twin Hills West Gold Assay Analysis

Sample Name	Unit	Au	Au Dup	Au Trip	Repeat
Trans 01	g/t	0.42	0.48	0.55	
Trans 02	g/t	0.98	0.90	0.95	
Trans 03	g/t	1.06	1.11	1.04	
Trans 04	g/t	1.80	1.88	1.85	
Fresh 01	g/t	0.52	0.46	0.48	

Sample Name	Unit	Au	Au Dup	Au Trip	Repeat
Fresh 02	g/t	0.35	0.37	0.39	
Fresh 03	g/t	1.04	1.08	1.12	
Fresh 04	g/t	0.69	0.75	0.73	
Fresh 05	g/t	0.52	0.84	0.61	0.77
Fresh 06	g/t	0.76	0.82	0.84	
Fresh 07	g/t	1.04	1.15	1.09	
Fresh 08	g/t	0.85	0.88	0.90	
Fresh 09	g/t	2.78	2.53	2.22	
Fresh 10	g/t	1.60	1.54	1.50	

Chemical Analysis of Individual Core Samples

Silver Analysis

The majority of the silver values of each composite were either equal to, or lower than, the measured gold value, with the exception of samples Fresh 02, Fresh 05 and Fresh 07 where the silver to gold ratio was 2:1. This is still a low silver to gold ratio indicating that silver will not impact on the performance of the CIL circuit.

Arsenic Analysis

The Arsenic results show significant amounts of Arsenic in the individual core samples of the Transition and Fresh ranging to 8109 ppm and 9436 ppm, respectively.

Mercury Analysis

The mercury levels were less than 0.5 ppm and co-adsorption onto the carbon should not be harmful to health in carbon regeneration or smelting of the electro-winning sludge.

Major Elements Results

The iron (Fe) levels of about 4% in all the samples were noted due to their potential influence on cyanide consumption.

Minor Elements Results

The samples contained low levels of the cyanide consuming elements Co, Ni, Cu and Zn.

Sulphur Speciation Analysis

The lower sulphide sulphur in the Transition samples of <0.5% was indicative of the oxidation of this ore zone. The Twin Hills West Fresh samples have an average sulphide sulphur content (1.58%) that is comparable the Clouds Fresh composite sulphide sulphur content (1.73%). The similar sulphide sulphur contents in the Twin Hills West samples and Clouds composite samples will produce similar gold dissolution results. The >1% sulphide sulphur content in the Fresh samples are conducive to the flotation recovery of gold and sulphur.

Carbon Speciation Analysis

All the samples recorded an organic carbon content of <0.05% which will have a minor preg-robbing effect in the process plant.

Gravity Recoverable Gold (GRG) Testwork

The GRG test results reported gravity gold recoveries of 8.4% to 20.1% for the Transition samples and 16.4% to 34.2% for the Fresh samples. The average gravity gold recoveries for the Twin Hills West Transition samples were lower at 13.6% in comparison to the 17.8% gravity gold recovery of the Transition Composite. The average gravity gold recoveries for the Twin Hills West Fresh samples were lower 22.6% in comparison to the gravity gold recovery of 28.3% for the Bulge and Twin Hills Central Composites.

Leach Testwork

The average CIL gold recovery for the Twin Hills West Transition samples was 88.3% compared to the 91.7% CIL gold recovery of the Transition Composite sample.

The average CIL gold recovery for the Twin Hills West Fresh samples was 85.7% and was higher than the 83.0% CIL gold recovery of the Clouds Composite sample but was lower than the CIL gold recoveries of 87.6% and 92.3% respectively for the Bulge composite and the Twin Hills Central composite. The Twin Hills samples Fresh 9 and Fresh 10 had CIL gold recoveries of <80% with respective gold head grade values of 2.92g/t Au and 1.49g/t Au.

The average testwork overall gold recoveries for the Twin Hills West samples was 89.9% for the Transition samples and 88.8% for the Fresh samples.

Diagnostic Leach Test on Twin Hills Fresh Tails

Following on from the low CIL gold recoveries for samples Fresh 9 and Fresh 10 diagnostic leach tests were done on the CIL tails samples.

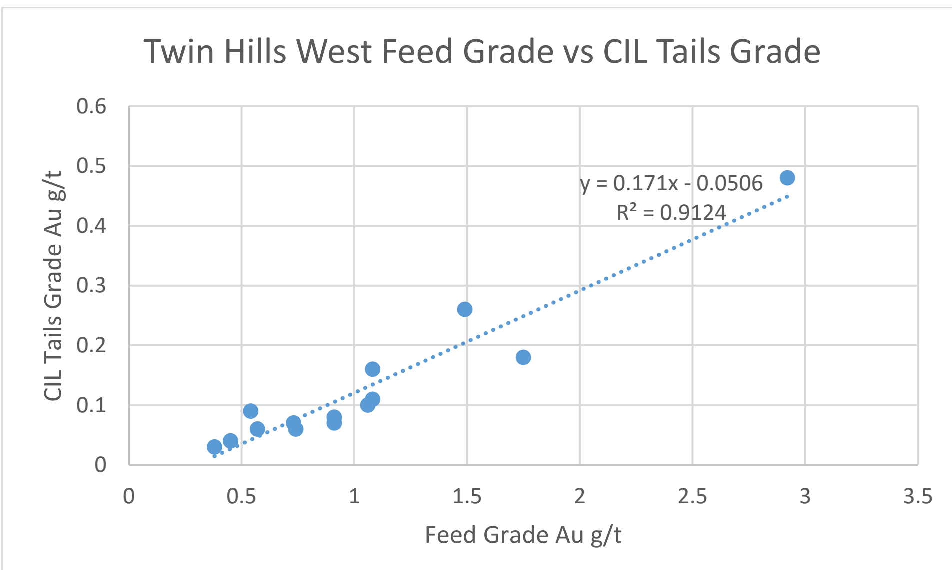
Most of the gold losses in the Fresh 9 CIL tails sample was due to the refractory arsenopyrite mineral (46%) and locked in silica (46%).

Most of the gold losses in the Fresh 10 CIL tails sample was due to the refractory arsenopyrite mineral (27%) and locked in silica (60%).

Assessment of Gold Recovery for Twin Hills West Individual Core Samples

The CIL tails gold grade values for the fourteen individual core samples were plotted against the corresponding Feed grade values. Figure 13.4.1 presents a strong Feed grade to CIL tail grade relationship and can be used to derive the overall gold recovery at various feed grades using the two-product recovery formula. The CIL tail gold values of the four Transition samples had the same corresponding trend of higher tails values to the relatively higher feed gold grades of the ten Fresh sample tails values and were included in Feed grade vs CIL tails grade relationship.

Figure 13.4.1 Twin Hills West Feed Grade vs CIL Tails Grade Relationship



The following recovery discounts are applied to the calculated overall gold recovery of the Fresh feed grade of Twin Hills West feed grade in the PFS mining schedule:

- CIL carbon fines losses of 30g carbon per ton milled at a grade of 100g/t as per the expected eluted carbon value.
- Solution gold losses based on 49% solids in the CIL tailings stream and 0.01 g/l Au in solution.

The above gold recovery discounts of 0.66% is subtracted from the calculated overall gold recovery.

HPGR Test Work

From the point of the measured HPGR performance, Twin Hills material is well suited for grinding in an HPGR. Despite the high amount of fine material in the feed, the HPGR was still able to perform well in terms of throughput and fines production. The abrasiveness test indicated medium abrasiveness for the Twin Hill material. The specific throughput rate is high and will result in good throughput rates for production sized machines.

The fines production was relatively consistent for the pressing forces used for these specific tests. This means that Twin Hills material produces a fine product already at relatively low operating pressures. The optimum pressing force is estimated at a relatively low 2.5 N/mm^2, which provides a fine product and reasonable crushing forces on the studs and autogenous layer.

Feed moisture showed an effect on the throughput performance of the HPGR. This can however be attributed to poor material flow properties of this sample because of the high amount of fines in the feed.

Based on the size reduction, throughput, abrasiveness, and energy consumption results achieved with the Twin Hills material, it is concluded that the material is very amenable to processing using HPGR technology.

13.5 Lycopodium / Maelgwyn Variability Testwork (2022)

During and after finalisation of the Pre-Feasibility Study conducted by Lycopodium Mineral Canada Ltd (LMCL), Lycopodium Minerals Africa (Pty) Ltd (LMA) was contracted by Osino Resources Corp. to initiate and oversee further variability metallurgical test work on samples from the Twin Hills gold deposit in Namibia. These results would be used to design, size, and cost a flowsheet for use in a Definitive Feasibility Study of the project.

A total of 40 variability samples were tested during the variability testwork program, consisting of:

- 15 off Bulge Fresh Individual Samples.
- 15 off Twin Hill Central Fresh Individual Samples.
- 10 off Clouds Fresh Individual Samples.

All samples were tested on the optimal flowsheet selected during the PFS testwork program consisting of:

- Jaw Crushing.
- Cone Crushing.

- Milling 80% 106 µm.
- Gravity.
- Milling 80% 63 µm.
- Aachen High Shear Pre-Oxidation.
- 24-hour CIL Leach.

Additional metallurgical test work conducted by Maelgwyn South Africa entailed arsenic precipitation and recovery confirmation tests at 50% w/w leach solids concentration.

The arsenic evaluation followed the same flowsheet as mentioned above with the addition of:

- SMBS Detox.
- Arsenic precipitation (slurry).
- Arsenic precipitation (filtered solution).

At conclusion of the Maelgwyn test work the tailings samples of the various deposits were combined and sent the Patterson & Cooke, FLS, and Bokela to establish the transportable moisture limit to inform conveying and tailings storage facility designs as well as the filtration capabilities of pressure filtration, vacuum belt filtration, and vacuum disc filtration. The testwork was carried out at the design grind size of P_{80} 63 µm and at a polishing grind size of P_{80} 53 µm.

13.5.1 Variability Testwork Results and Discussion

The Variability test work is done by Maelgwyn South Africa.

Samples Gold Head Assays

The samples used for the variability evaluation with the triplicate fire assay gold head grade analysis is given below in Tables 13.5.1, 13.5.2, and 13.5.3.

Table 13.5.1 Fifteen Bulge Variability Samples

OKD Number	Sample Name	Feed Grade g/t	Feed Grade g/t	Feed Grade g/t	Average Feed Grade g/t
OKD034	Bulge Leach FR 01	1.66	1.58	1.74	1.66
OKD077	Bulge Leach FR 02	1.60	1.74	1.55	1.63

OKD Number	Sample Name	Feed Grade g/t	Feed Grade g/t	Feed Grade g/t	Average Feed Grade g/t
OKD020	Bulge Leach FR 03	1.78	2.08	1.72	1.86
OKD012	Bulge Leach FR 04	0.79	0.82	0.83	0.81
OKD118	Bulge Leach FR 05	1.06	0.94	0.93	0.98
OKD149	Bulge Leach FR 06	3.15	3.69	3.48	3.44
OKD049	Bulge Leach FR 07	1.25	3.08	1.46	1.93
OKD041	Bulge Leach FR 08	0.82	0.79	0.83	0.81
OKD137	Bulge Leach FR 09	2.74	2.19	2.40	2.44
OKD083	Bulge Leach FR 10	1.07	0.82	0.78	0.89
OKD119	Bulge Leach FR 11	1.88	1.97	2.10	1.98
OKD119	Bulge Leach FR 12	1.62	1.52	1.58	1.57
OKD091	Bulge Leach FR 13	1.25	1.44	1.42	1.37
OKD099	Bulge Leach FR 14	1.17	1.13	1.11	1.14
OKD169	Bulge Leach FR 15	1.33	1.37	1.38	1.36

Table 13.5.2 Fifteen THC Variability Samples

OKD Number	Sample Name	Feed Grade (g/t)	Feed Grade (g/t)	Feed Grade (g/t)	Average Feed Grade (g/t)
OKD130	THC Leach FR 01	1.56	1.43	1.49	1.49
OKD003	THC Leach FR 02	1.25	1.47	1.12	1.28
OKD104	THC Leach FR 03	1.09	1.07	1.03	1.06
OKD143	THC Leach FR 04	0.81	0.95	0.75	0.84
OKD200	THC Leach FR 05	1.31	1.22	1.28	1.27
OKD146	THC Leach FR 06	1.04	0.92	0.88	0.95
OKD136	THC Leach FR 07	0.88	0.91	0.85	0.88
OKD007	THC Leach FR 08	2.87	2.54	2.93	2.78
OKD193	THC Leach FR 09	0.86	0.90	0.84	0.87
OKD126	THC Leach FR 10	1.83	1.78	1.76	1.79
OKD080	THC Leach FR 11	0.51	0.64	0.61	0.59
OKD085	THC Leach FR 12	1.04	1.10	1.15	1.10
OKD115	THC Leach FR 13	1.29	1.25	1.22	1.25
OKD106	THC Leach FR 14	1.62	1.54	1.59	1.58
OKD070	THC Leach FR 15	1.20	1.18	1.19	1.19

Table 13.5.3 Ten Clouds Variability Samples

OKD Number	Sample Name	Feed Grade (g/t)	Feed Grade (g/t)	Feed Grade (g/t)	Average Feed Grade (g/t)
OKD129	Clouds Leach FR 01	1.60	1.72	1.65	1.66
OKD142	Clouds Leach FR 02	5.82	5.48	5.07	5.46
OKD134	Clouds Leach FR 03	0.95	1.05	0.98	0.99
OKD198	Clouds Leach FR 04	2.23	2.17	2.55	2.32
OKD124	Clouds Leach FR 05	0.88	0.94	0.90	0.91
OKD093	Clouds Leach FR 06	1.09	0.85	1.12	1.02
OKD202	Clouds Leach FR 07	0.99	0.94	0.98	0.97
OKD140	Clouds Leach FR 08	1.04	0.97	1.02	1.01
OKD186	Clouds Leach FR 09	1.01	1.18	1.23	1.14
OKD096	Clouds Leach FR 10	1.85	0.94	1.12	1.30

Gravity Recovery

The first step in the process flowsheet is to mill the samples to P_{80} 106 µm, produce a first pass gravity concentrate mass utilizing a Knelson MD3 test unit where after the concentrate is further upgraded on a Gemini shaking table to derate the gold recoveries to simulate plant conditions.

Table 13.5.4 Variability Gravity Recovery Summary

OKD Number	Sample Name	Feed Grade g/t	Feed Grade g/t	Feed Grade g/t	Average Feed Grade g/t	Gravity Recovery at P_{80} 106 µm %
OKD034	Bulge Leach FR 01	1.66	1.58	1.74	1.66	45.52
OKD077	Bulge Leach FR 02	1.60	1.74	1.55	1.63	52.33
OKD020	Bulge Leach FR 03	1.78	2.08	1.72	1.86	31.90
OKD012	Bulge Leach FR 04	0.79	0.82	0.83	0.81	21.39
OKD118	Bulge Leach FR 05	1.06	0.94	0.93	0.98	15.70
OKD149	Bulge Leach FR 06	3.15	3.69	3.48	3.44	24.05
OKD049	Bulge Leach FR 07	1.25	3.08	1.46	1.93	27.91
OKD041	Bulge Leach FR 08	0.82	0.79	0.83	0.81	22.42
OKD137	Bulge Leach FR 09	2.74	2.19	2.40	2.44	14.20
OKD083	Bulge Leach FR 10	1.07	0.82	0.78	0.89	19.04
OKD119	Bulge Leach FR 11	1.88	1.97	2.10	1.98	51.05
OKD119	Bulge Leach FR 12	1.62	1.52	1.58	1.57	33.05
OKD091	Bulge Leach FR 13	1.25	1.44	1.42	1.37	26.19
OKD099	Bulge Leach FR 14	1.17	1.13	1.11	1.14	22.94
OKD169	Bulge Leach FR 15	1.33	1.37	1.38	1.36	32.22

OKD Number	Sample Name	Feed Grade g/t	Feed Grade g/t	Feed Grade g/t	Average Feed Grade g/t	Gravity Recovery at P_{80} 106 µm %
OKD130	THC Leach FR 01	1.56	1.43	1.49	1.49	48.28
OKD003	THC Leach FR 02	1.25	1.47	1.12	1.28	46.65
OKD104	THC Leach FR 03	1.09	1.07	1.03	1.06	59.04
OKD143	THC Leach FR 04	0.81	0.95	0.75	0.84	41.33
OKD200	THC Leach FR 05	1.31	1.22	1.28	1.27	29.09
OKD146	THC Leach FR 06	1.04	0.92	0.88	0.95	24.89
OKD136	THC Leach FR 07	0.88	0.91	0.85	0.88	32.87
OKD007	THC Leach FR 08	2.87	2.54	2.93	2.78	50.79
OKD193	THC Leach FR 09	0.86	0.90	0.84	0.87	26.60
OKD126	THC Leach FR 10	1.83	1.78	1.76	1.79	23.80
OKD080	THC Leach FR 11	0.51	0.64	0.61	0.59	27.51
OKD085	THC Leach FR 12	1.04	1.10	1.15	1.10	17.29
OKD115	THC Leach FR 13	1.29	1.25	1.22	1.25	25.38
OKD106	THC Leach FR 14	1.62	1.54	1.59	1.58	28.18
OKD070	THC Leach FR 15	1.20	1.18	1.19	1.19	18.35
OKD129	Clouds Leach FR 01	1.60	1.72	1.65	1.66	40.27
OKD142	Clouds Leach FR 02	5.82	5.48	5.07	5.46	39.08
OKD134	Clouds Leach FR 03	0.95	1.05	0.98	0.99	22.43
OKD198	Clouds Leach FR 04	2.23	2.17	2.55	2.32	63.90
OKD124	Clouds Leach FR 05	0.88	0.94	0.90	0.91	38.46
OKD093	Clouds Leach FR 06	1.09	0.85	1.12	1.02	30.77
OKD202	Clouds Leach FR 07	0.99	0.94	0.98	0.97	14.80
OKD140	Clouds Leach FR 08	1.04	0.97	1.02	1.01	26.25
OKD186	Clouds Leach FR 09	1.01	1.18	1.23	1.14	41.46
OKD096	Clouds Leach FR 10	1.85	0.94	1.12	1.30	26.68

In Table 13.5.4 above, the gravity recovery for all variability samples are given. Gravity recovery for the fifteen Bulge samples ranged from 14.2% to 52.3%, the fifteen Twin Hill Central samples ranged from 17.3% to 59.0%, and the ten Clouds samples ranged from 14.8% to 63.9%.

The average recoveries for each ore body were better than the established recoveries from the PFS, with Bulge and Twin Hills Central averaging 29.3% and 33.3% respectively compared to the PFS value of 28.3% and Clouds averaging 34.4% compared to the PFS value of 31.5%

Leach Recovery

After completion of the gravity concentration stage the tailings from each sample was milled again and submitted to leach evaluation using the following leach conditions:

- Grind of P_{80} 63 µm.
- 45% w/w Solids.
- Two pass Aachen followed by 4 h pre-oxidation with oxygen.
- Oxygen sparging throughout the leach.
- 20 g/L Carbon addition.
- 500 ppm NaCN maintained throughout the leach.
- pH 10.5.
- 24 h Leach.

Table 13.5.5 Bulge Leach Recovery Summary

Sample Name	Average Feed Grade g/t	Gravity Recovery at P80 106 µm %	CIL Leach Recovery from Gravity Tails P80 63 µm %	24 hour Leached Residue g/t	Calculated Overall Gold Recovery %	Lime Consumption kg/t	Cyanide Consumption kg/t
Bulge Leach FR 01	1.66	45.52	85.39	0.13	92.04	1.01	0.28
Bulge Leach FR 02	1.63	52.33	86.90	0.11	93.76	1.06	0.31
Bulge Leach FR 03	1.86	31.90	88.11	0.17	91.90	1.03	0.34
Bulge Leach FR 04	0.81	21.39	88.46	0.09	90.93	1.06	0.34
Bulge Leach FR 05	0.98	15.70	83.15	0.15	85.79	1.04	0.28
Bulge Leach FR 06	3.44	24.05	95.17	0.14	96.33	1.03	0.22
Bulge Leach FR 07	1.93	27.91	89.36	0.10	92.33	1.07	0.31
Bulge Leach FR 08	0.81	22.42	90.28	0.07	92.46	1.03	0.34
Bulge Leach FR 09	2.44	14.20	98.18	0.04	98.44	1.09	0.31
Bulge Leach FR 10	0.89	19.04	94.81	0.04	95.79	1.09	0.27
Bulge Leach FR 11	1.98	51.05	95.37	0.05	97.73	1.07	0.26
Bulge Leach FR 12	1.57	33.05	95.45	0.05	96.96	1.08	0.27
Bulge Leach FR 13	1.37	26.19	90.00	0.09	92.62	1.03	0.28

Sample Name	Average Feed Grade g/t	Gravity Recovery at P80 106 µm %	CIL Leach Recovery from Gravity Tails P80 63 µm %	24 hour Leached Residue g/t	Calculated Overall Gold Recovery %	Lime Consumption kg/t	Cyanide Consumption kg/t
Bulge Leach FR 14	1.14	22.94	90.53	0.09	92.70	1.05	0.28
Bulge Leach FR 15	1.36	32.22	92.77	0.06	95.10	1.02	0.23
Ave	1.59	29.33	90.93	0.09	93.66	1.05	0.29
Std Dev	0.68	11.56	4.12	0.04	3.10	0.02	0.04
Max	3.44	52.33	98.18	0.17	98.44	1.09	0.34
Min	0.81	14.20	83.15	0.04	85.79	1.01	0.22

In Table 13.5.5, the Bulge variability recovery compared well with the PFS with the average overall recovery of 93.7% and solid residue of 0.09g/t compared to the PFS values of 94.1% and 0.08 g/t respectively. Average lime consumption for the Bulge deposit compares well with the PFS testwork value, 1.05 kg/t versus 1.15 kg/t as well as the average cyanide consumption versus the PFS testwork value of 0.29 kg/t versus 0.32 kg/t.

Table 13.5.6 Central Leach Recovery Summary

Sample Name	Average Feed Grade g/t	Gravity Recovery at P80 106 µm %	CIL Leach Recovery from Gravity Tails P80 63 µm %	24 hour Leached Residue g/t	Calculated Overall Gold Recovery %	Lime Consumption kg/t	Cyanide Consumption kg/t
THC Leach FR 01	1.49	48.28	93.06	0.05	96.41	1.15	0.38
THC Leach FR 02	1.28	46.65	90.00	0.07	94.66	1.19	0.40
THC Leach FR 03	1.06	59.04	93.33	0.03	97.27	1.15	0.34
THC Leach FR 04	0.84	41.33	91.67	0.04	95.11	1.14	0.34
THC Leach FR 05	1.27	29.09	94.05	0.05	95.78	1.15	0.33
THC Leach FR 06	0.95	24.89	92.65	0.05	94.48	1.16	0.34
THC Leach FR 07	0.88	32.87	88.33	0.07	92.17	1.17	0.37
THC Leach FR 08	2.78	50.79	88.43	0.14	94.31	1.14	0.36
THC Leach FR 09	0.87	26.60	94.12	0.04	95.68	1.15	0.31
THC Leach FR 10	1.79	23.80	86.78	0.16	89.92	1.16	0.34
THC Leach FR 11	0.59	27.51	93.02	0.03	94.94	1.18	0.33
THC Leach FR 12	1.10	17.29	90.00	0.11	91.73	1.18	0.33
THC Leach FR 13	1.25	25.38	92.22	0.07	94.20	1.19	0.31
THC Leach FR 14	1.58	28.18	93.55	0.06	95.37	1.18	0.31
THC Leach FR 15	1.19	18.35	95.37	0.05	96.22	1.17	0.32

Sample Name	Average Feed Grade g/t	Gravity Recovery at P80 106 µm %	CIL Leach Recovery from Gravity Tails P80 63 µm %	24 hour Leached Residue g/t	Calculated Overall Gold Recovery %	Lime Consumption kg/t	Cyanide Consumption kg/t
Ave	1.26	33.34	91.77	0.07	94.55	1.16	0.34
Std Dev	0.51	12.28	2.42	0.04	1.88	0.02	0.03
Max	2.78	59.04	95.37	0.16	97.27	1.19	0.40
Min	0.59	17.29	86.78	0.03	89.92	1.14	0.31

In Table 13.5.6, the Central variability recovery compared well with the PFS with the average overall recovery of 94.6% and solid residue of 0.07g/t compared to the PFS values of 94.6% and 0.06 g/t respectively. Average lime consumption for the Central deposit compares well with the PFS testwork value, 1.16 kg/t versus 1.18 kg/t as well as the average cyanide consumption versus the PFS testwork value of 0.34 kg/t versus 0.38 kg/t.

Table 13.5.7 Clouds Leach Recovery Summary

Sample Name	Average Feed Grade g/t	Gravity Recovery at P80 106 µm %	CIL Leach Recovery from Gravity Tails P80 63 µm %	24 hour Leached Residue g/t	Calculated Overall Gold Recovery %	Lime Consumption kg/t	Cyanide Consumption kg/t
Clouds Leach FR 01	1.66	40.27	76.00	0.24	85.66	1.19	0.30
Clouds Leach FR 02	5.46	39.08	86.84	0.45	91.98	1.14	0.29
Clouds Leach FR 03	0.99	22.43	83.54	0.13	87.23	1.09	0.26
Clouds Leach FR 04	2.32	63.90	76.67	0.21	91.58	1.24	0.34
Clouds Leach FR 05	0.91	38.46	77.53	0.20	86.17	1.16	0.30
Clouds Leach FR 06	1.02	30.77	86.76	0.09	90.84	1.16	0.29
Clouds Leach FR 07	0.97	14.80	90.00	0.09	91.48	1.15	0.35
Clouds Leach FR 08	1.01	26.25	92.75	0.05	94.66	1.16	0.33
Clouds Leach FR 09	1.14	41.46	88.57	0.08	93.31	1.12	0.32
Clouds Leach FR 10	1.30	26.68	88.89	0.10	91.85	1.17	0.29
Ave	1.68	34.41	84.76	0.16	90.48	1.16	0.31
Std Dev	1.33	12.88	5.72	0.11	2.90	0.04	0.03
Max	5.46	63.90	92.75	0.45	94.66	1.24	0.35
Min	0.91	14.80	76.00	0.05	85.66	1.09	0.26

In Table 13.5.7, the Clouds variability recovery compared well with the PFS with the average overall recovery of 90.5% and solid residue of 0.16g/t compared to the PFS values of 90.2% and 0.14 g/t respectively. Average lime consumption for the Clouds deposit compares well with the PFS testwork value, 1.16 kg/t versus 1.13 kg/t as well as the average cyanide consumption versus the PFS testwork value of 0.31 kg/t versus 0.24 kg/t.

Leach Density

As the circuit design caters to leach at 50% solids and all preceding testwork was conducted at 45% solids, confirmatory testwork was undertaken with gravity tails samples of Bulge, Central and Clouds with the same leach parameters as the variability leach tests at varying percent solids.

Table 13.5.8 Leach Density Recovery Summary

Twin Hills	Dissolved Oxygen	pH	Reagent Addition		Pregnant Solution	
	DO	pH	NaCN	CaO	NaCN	Au
	mg/L	pH	g/t	kg/t	ppm	ppm
Central 50% Solids	28.46	10.67	1500	1.00	305	0.001
Central 45% Solids	29.55	10.63	1500	1.25	238	0.001
Bulge 50% Solids	26.54	10.74	1500	1.00	199	0.001
Bulge 45% Solids	25.33	10.70	1500	1.25	89	0.001
Clouds 50% Solids	29.54	10.55	1500	1.00	262	0.001
Clouds 45% Solids	29.63	10.54	1500	1.25	200	0.001
Twin Hills	**Average Head Grade**	**Leach Residue Ave**	**Carbon**	**Reagent Consumption**	**Dissolution**	**Account**
	Assayed	**Assayed**	**Au**	**NaCN**	**Solid**	**Au**
	Au (g/t)	**Au (g/t)**	**g/t**	**kg/t**	**Au %**	**%**
Central 50% Solids	0.94	0.08	44	1.20	91.49	102.23
Central 45% Solids	0.94	0.08	34	1.21	91.49	99.07
Bulge 50% Solids	1.05	0.11	48	1.30	89.52	102.00
Bulge 45% Solids	1.05	0.10	39	1.39	90.48	102.50
Clouds 50% Solids	1.10	0.28	42	1.24	74.55	101.93
Clouds 45% Solids	1.10	0.26	34	1.26	76.36	101.02

In Table 13.5.8 it can be seen similar leach results were achieved between 45% and 50% solids.

13.5.2 Arsenic Evaluation

The Arsenic precipitation test work is done by Maelgwyn South Africa.

Test samples

The samples used comprised of the final leached slurries from the variability project which were composited and is given below in Table 13.5.9.

Table 13.5.9 Arsenic Evaluation Samples

Area	OKD Number	Sample ID	Maelgwyn Confirmed Weight kg	PFS Comp kg	Variability Study kg	Twin Hills Variability Study - PROJECT 22-051	Arsenic Study - PROJECT 22-092
Bulge	OKD034	Bulge Leach FR 01	22.9	8	14.9	**1**	**Leached Slurries Composited - Arsenic Bulge Composite**
Bulge	OKD077	Bulge Leach FR 02	25.4	8	17.4	**2**	
Bulge	OKD020	Bulge Leach FR 03	25.7	8	17.7	**3**	
Bulge	OKD012	Bulge Leach FR 04	23.8	8	15.8	**4**	
Bulge	OKD118	Bulge Leach FR 05	23.5	8	15.5	**5**	
Bulge	OKD149	Bulge Leach FR 06	21.3	8	13.3	**6**	
Bulge	OKD049	Bulge Leach FR 07	26.7	8	18.7	**7**	
Bulge	OKD041	Bulge Leach FR 08	29.4	8	21.4	**8**	
Bulge	OKD137	Bulge Leach FR 09	22.7	8	14.7	**9**	
Bulge	OKD083	Bulge Leach FR 10	23.3	8	15.3	**10**	
Bulge	OKD119	Bulge Leach FR 11	28.8	8	20.8	**11**	
Bulge	OKD119	Bulge Leach FR 12	29.3	8	21.3	**12**	
Bulge	OKD091	Bulge Leach FR 13	23.7	8	15.7	**13**	
Bulge	OKD099	Bulge Leach FR 14	24.2	8	16.2	**14**	
Bulge	OKD169	Bulge Leach FR 15	27.2	8	19.2	**15**	
THC	OKD130	THC Leach FR 01	22.6	8	14.6	**16**	**Leached Slurries Composited - Arsenic Central Composite**
THC	OKD003	THC Leach FR 02	25.4	8	17.4	**17**	
THC	OKD104	THC Leach FR 03	29.0	8	21.0	**18**	
THC	OKD143	THC Leach FR 04	22.8	8	14.8	**19**	
THC	OKD200	THC Leach FR 05	26.9	8	18.9	**20**	
THC	OKD146	THC Leach FR 06	21.5	8	13.5	**21**	
THC	OKD136	THC Leach FR 07	23.9	8	15.9	**22**	
THC	OKD007	THC Leach FR 08	24.3	8	16.3	**23**	
THC	OKD193	THC Leach FR 09	25.4	8	17.4	**24**	
THC	OKD126	THC Leach FR 10	19.4	8	11.4	**25**	
THC	OKD080	THC Leach FR 11	24.1	8	16.1	**26**	
THC	OKD085	THC Leach FR 12	23.5	8	15.5	**27**	
THC	OKD115	THC Leach FR 13	24.8	8	16.8	**28**	
THC	OKD106	THC Leach FR 14	23.6	8	15.6	**29**	
THC	OKD070	THC Leach FR 15	23.4	8	15.4	**30**	

Area	OKD Number	Sample ID	Maelgwyn Confirmed Weight kg	PFS Comp kg	Variability Study kg	Twin Hills Variability Study - PROJECT 22-051	Arsenic Study - PROJECT 22-092
Clouds	OKD129	Clouds Leach FR 01	27.8	10	17.8	**31**	**Leached Slurries Composited - Arsenic Cloud Composite**
Clouds	OKD142	Clouds Leach FR 02	27.3	10	17.3	**32**	
Clouds	OKD134	Clouds Leach FR 03	20.9	10	10.9	**33**	
Clouds	OKD198	Clouds Leach FR 04	20.1	10	10.1	**34**	
Clouds	OKD124	Clouds Leach FR 05	25.5	10	15.5	**35**	
Clouds	OKD093	Clouds Leach FR 06	25.3	10	15.3	**36**	
Clouds	OKD202	Clouds Leach FR 07	24.4	10	14.4	**37**	
Clouds	OKD140	Clouds Leach FR 08	24.1	10	14.1	**38**	
Clouds	OKD186	Clouds Leach FR 09	39.7	10	29.7	**39**	
Clouds	OKD096	Clouds Leach FR 10	31.2	10	21.2	**40**	

Cyanide Detoxification

The conditions for these tests were based on the outcomes of the PFS testwork in Section 13.4, but the SMBS and Copper Sulphate additions were adjusted due to the cyanide control differences between the PFS- and Variability testwork in order to achieve the target WAD concentration of < 50 ppm.

The results obtained for the Bulge-, Central-, and Clouds composites are shown in Table 13.5.10, Table 13.5.11, and Table 13.5.12 respectively. The final detox slurries were submitted for arsenic analysis and precipitation testwork.

Table 13.5.10 Bulge Composite Detox

Bulge Composite Detox			
Slurry Volume	L	4.00	
Slurry Flow	mL/min	66.67	
Solids Flow	g/min	46.56	
Solution Flow	mL/min	49.40	mg/min
CN^- Free	ppm	208.40	10.29
CN WAD	ppm	288.00	14.23
NaCN	ppm	392.75	
Stable Results after 2 hours			
CN^- Free	ppm	22.80	
CN WAD	ppm	47.40	
Reagents Required			
	Addition	mg/min	kg/hr
SMBS	4 EQ	207.88	12.47
Cu	30 ppm	5.83	0.35

Table 13.5.11 Central Composite Detox

Central Composite Detox			
Slurry Volume	L	4.00	
Slurry Flow	mL/min	66.67	
Solids Flow	g/min	46.56	
Solution Flow	mL/min	49.40	mg/min
CN^- Free	ppm	215.40	10.64
CN WAD	ppm	249.00	12.30
NaCN	ppm	405.95	
Stable Results after 2 hours			
CN^- Free	ppm	19.50	
CN WAD	ppm	31.20	
Reagents Required			
	Addition	mg/min	kg/hr
SMBS	4 EQ	179.73	10.78
Cu	30 ppm	5.83	0.35

Table 13.5.12 Clouds Composite Detox

Clouds Composite Detox			
Slurry Volume	L	4.00	
Slurry Flow	mL/min	66.67	
Solids Flow	g/min	46.56	
Solution Flow	mL/min	49.40	mg/min
CN^- Free	ppm	235.00	11.61
CN WAD	ppm	294.00	14.52
NaCN	ppm	442.88	
Stable Results after 2 hours			
CN^- Free	ppm	10.50	
CN WAD	ppm	16.30	
Reagents Required			
	Addition	mg/min	kg/hr
SMBS	4.5 EQ	238.74	14.32
Cu	40 ppm	7.78	0.47

Arsenic Evaluation

The cyanide detox slurry was spilt into two portions; one portion was used as a slurry and the other was filtered and the filtrate was used for the arsenic evaluation.

Table 13.5.13 Arsenic Results - Bulge Composite

Sample	Arsenic (ppm)
Bulge Feed (Solid)	5 990
Gravity Concentrate (Solid)	47 410 (0.1% mass)
Gravity Tails (Solid)	5 530
Leached Residue (Solid)	5 470

Sample	Arsenic (ppm)	
Leach Filtrate (Solution)	26	
CN Detoxed Residue (Solid)	5 410 (99.9% mass)	
CN Detoxed Filtrate (before As ppt) (Solution)	15	
Arsenic Precipitation - Slurry		
Fe2(SO4)3	Filtrate for Analysis (ppm) (Solution)	Filtered Solids Analysis (ppm) (Solid)
0	15	5 410
1 : 3	15	5 411
1 : 4	7	5 410
1 : 6	5	5 409
1 : 10	6	5 411
Arsenic Precipitation - Filtrate		
Fe2(SO4)3	Filtrate (ppm) (Solution)	
0	15	
1 : 3	9	
1 : 4	3	
1 : 6	1	
1 : 10	Below Detection	
** Detection limit 0.001 ppm As		

Table 13.5.14 Arsenic Results - Central Composite

Sample	Arsenic (ppm)	
Central Feed (Solid)	3 440	
Gravity Concentrate (Solid)	37 140 (0.1% mass)	
Gravity Tails (Solid)	3 360	
Leached Residue (Solid)	3 170	
Leach Filtrate (Solution)	28	
CN Detoxed Residue (Solid)	3 168 (99.9% mass)	
CN Detoxed Filtrate (before As ppt) (Solution)	9	
Arsenic Precipitation - Slurry		
Fe2(SO4)3	Filtrate for Analysis (ppm) (Solution)	Filtered Solids Analysis (ppm) (Solid)
0	9	3 169
1 : 3	5	3 170

Sample	Arsenic (ppm)	
1 : 4	0.5	3 168
1 : 6	Below Detection	3 167
1 : 10	Below Detection	3 167
Arsenic Precipitation - Filtrate		
Fe2(SO4)3	Filtrate (ppm) (Solution)	
0	9	
1 : 3	1	
1 : 4	Below Detection	
1 : 6	Below Detection	
1 : 10	Below Detection	
** Detection limit 0.001 ppm As		

Table 13.5.15 Arsenic Results - Clouds Composite

Sample	Arsenic (ppm)	
Clouds Feed (Solid)	4 970	
Gravity Concentrate (Solid)	43 620 (0.1% mass)	
Gravity Tails (Solid)	4 850	
Leached Residue (Solid)	4 820	
Leach Filtrate (Solution)	25	
CN Detoxed Residue (Solid)	4 800 (99.9% mass)	
CN Detoxed Filtrate (before As ppt) (Solution)	11	
Arsenic Precipitation - Slurry		
Fe2(SO4)3	Filtrate for Analysis (ppm) (Solution)	Filtered Solids Analysis (ppm) (Solid)
0	11	4 801
1 : 3	10	4 802
1 : 4	6	4 800
1 : 6	0.7	4 801
1 : 10	Below Detection	4 800
Arsenic Precipitation - Filtrate		
Fe2(SO4)3	Filtrate (ppm) (Solution)	
0	11	
1 : 3	7	
1 : 4	2	
1 : 6	Below Detection	

Sample	Arsenic (ppm)
1 : 10	Below Detection
** Detection limit 0.001 ppm As	

In Table 13.5.13, Table 13.5.14, and Table 13.5.15 it can be seen that from the scouting tests that for most of the slurry and filtrate samples the Arsenic could be effectively precipitated with only the Bulge detoxed unfiltered slurry needing a higher than 1:10 Ferric Sulphate addition. It should be noted that roughly 93% of the arsenic in the feed reported to the final tails solids stream and was found to be stable during processing.

13.5.3 Filtration and Conveyability Testwork

Sample Selection

An inventory of remaining sample at Maelgwyn after the DFS variability leach tests indicated that a total of 92 kg of filtered tailings sample were still available. The sample were split as follow:

- 37 kg Twin Hills Central (represents 33% of total ore resource).
- 37 kg Bulge (represents 54% of total ore resource).
- 17 kg Clouds (represents 13% of total ore resource).

As all the samples has comparable lithologies it was decided to combine all the samples into a single master composite with 50% of the material kept at the plant design grind size of P_{80} 63 µm and the other 50% a polishing grind performed to P_{80} 53 µm.

Filtration and Conveyability Tests by Paterson & Cooke (P&C)

P&C was selected in the DFS as the independent testwork consultant to establish the conveyability moisture limit and confirm filtration capabilities of vacuum belt filtration, pressure filtration, and disc filtration.

<u>Material Properties</u>

Table 13.5.16 P&C Material Properties

Parameter	80% Passing 53 µm	80% Passing 63 µm
Solids density (kg/m^3)	2748	
d80 particle size (µm)	54	71
d50 particle size (µm)	31	41
Average slurry pH	7.9	7.9

Parameter	80% Passing 53 µm	80% Passing 63 µm
Average slurry conductivity (mS/cm)	0.648	0.620
Freely settled bed packing concentration	44.0%v (68.6%m)	44.6%v (68.6%m)
Maximum bed packing concentration	51.8%v (74.9%m)	52.4%v (75.0%m)

Horizontal Belt Filtration Tests

Table 13.5.17 P&C 80% Passing 53 µm - Horizontal Belt Filtration Test Results

Parameter	Test 1	Test 2	Test 3	Test 4	Test 5
Feed concentration and vacuum	**45wt% solids at 75 kPa**				
Form time (sec)	13	19	25	19	19
Dry time (sec)	130	190	250	95	19
Form/Dry time ratio	1/10	1/10	1/10	1/5	1/1
Cake thickness (mm)	8	11	13	11	11
Cake mass concentration (%m)	80.5	82.7	83.2	81.4	79.1
Wet cake density (kg/m³)	1250	1273	1328	1311	1290
Solids in filtrate (%m)	0.20	0.27	0.26	0.31	0.34
Feed concentration and vacuum	**55wt% solids at 75 kPa**				
Form time (sec)	13	18	24	18	18
Dry time (sec)	130	180	240	90	18
Form/Dry time ratio	1/10	1/10	1/10	1/5	1/1
Cake thickness (mm)	11	14	17	14	14
Cake mass concentration (%m)	84.0	85.1	85.5	83.4	80.2
Wet cake density (kg/m³)	1349	1338	1399	1381	1408
Solids in filtrate (%m)	0.41	0.42	0.37	0.47	0.37
Feed concentration and vacuum	**65wt% solids at 75 kPa**				
Form time (sec)	7	9	13	9	9
Dry time (sec)	70	90	130	45	9
Form/Dry time ratio	1/10	1/10	1/10	1/5	1/1
Cake thickness (mm)	9	13	17	13	13
Cake mass concentration (%m)	83.4	84.0	84.6	82.6	80.2
Wet cake density (kg/m³)	1446	1360	1425	1402	1412
Solids in filtrate (%m)	0.66	0.51	0.47	0.64	0.67

Table 13.5.18 P&C 80% Passing 63 µm - Horizontal Belt Filtration Test Results

Parameter	Test 1	Test 2	Test 3	Test 4	Test 5
Feed concentration and vacuum	**45wt% solids at 75 kPa**				

Parameter	**Test 1**	**Test 2**	**Test 3**	**Test 4**	**Test 5**
Form time (sec)	16	19	25	25	25
Dry time (sec)	160	190	250	125	25
Form/Dry time ratio	1/10	1/10	1/10	1/5	1/1
Cake thickness (mm)	7	10	12	10	10
Cake mass concentration (%m)	76.8	78.1	80.6	77.5	77.1
Wet cake density (kg/m³)	1407	1305	1283	1321	1367
Solids in filtrate (%m)	0.49	0.44	0.34	0.35	0.38
Feed concentration and vacuum	**55wt% solids at 75 kPa**				
Form time (sec)	11	15	20	15	15
Dry time (sec)	110	150	200	75	15
Form/Dry time ratio	1/10	1/10	1/10	1/5	1/1
Cake thickness (mm)	10	13	16	13	14
Cake mass concentration (%m)	83.3	84.4	84.9	83.0	80.8
Wet cake density (kg/m³)	1379	1428	1512	1448	1347
Solids in filtrate (%m)	0.50	0.41	0.34	0.39	0.41
Feed concentration and vacuum	**65wt% solids at 75 kPa**				
Form time (sec)	5	8	10	10	10
Dry time (sec)	50	80	100	50	10
Form/Dry time ratio	1/10	1/10	1/10	1/5	1/1
Cake thickness (mm)	8	11	16	16	16
Cake mass concentration (%m)	83.3	84.2	85.0	83.5	81.9
Wet cake density (kg/m³)	1558	1519	1482	1465	1489
Solids in filtrate (%m)	0.71	0.22	0.54	0.56	0.49

Belt filtration tests for both, the P_{80} 53 µm and 63 µm material, produced consistent results for feed solids concentrations of 45, 55 and 65%m. For cake thicknesses of 7 to 16 mm, form times of 7 to 25 seconds can be expected. Form versus dry time ratios and filter cake solids concentrations indicate that both materials dry rapidly. Filter cakes achieved solids concentrations of ~77 to ~86%m and wet cake densities of 1250 to 1558 kg/m^3, respectively. Solids concentrations in the filtrate measured between 0.20 and 0.71%m.

Disc Filtration Tests

Table 13.5.19 P&C 80% Passing 53 µm - Disc Filtration Test Results

Parameter	**Test 1**	**Test 2**	**Test 3**	**Test 4**	**Test 5**
Feed concentration and vacuum	**45wt% solids at 75 kPa**				
Form time (sec)	13	19	25	19	-

Parameter	Test 1	Test 2	Test 3	Test 4	Test 5
Dry time (sec)	26	38	50	28	-
Form/Dry time ratio	1/2	1/2	1/2	1/1.5	-
Cake thickness (mm)	2	3	3	3	-
Cake mass concentration (%m)	71.1	71.4	72.4	71.2	-
Wet cake density (kg/m³)	1149	920	900	718	-
Solids in filtrate (%m)	62.00	0.55	0.63	0.63	-
Feed concentration and vacuum	**55wt% solids at 75 kPa**				
Form time (sec)	13	18	24	18	18
Dry time (sec)	26	36	48	27	18
Form/Dry time ratio	1/2	1/2	1/2	1/1.5	1/1
Cake thickness (mm)	6	9	10	9	9
Cake mass concentration (%m)	76.5	75.9	76.2	76.1	75.8
Wet cake density (kg/m³)	1310	1046	1076	1122	1068
Solids in filtrate (%m)	0.63	0.51	0.51	0.54	0.57
Feed concentration and vacuum	**65wt% solids at 75 kPa**				
Form time (sec)	7	9	13	9	9
Dry time (sec)	14	18	36	14	9
Form/Dry time ratio	1/2	1/2	1/2	1/1.5	1/1
Cake thickness (mm)	17	19	22	18	19
Cake mass concentration (%m)	82.6	82.0	80.3	79.6	77.9
Wet cake density (kg/m³)	1227	1192	1274	1155	1070
Solids in filtrate (%m)	0.73	0.74	0.57	0.85	0.90

Table 13.5.20 P&C 80% Passing 63 µm - Disc Filtration Test Results

Parameter	Test 1	Test 2	Test 3	Test 4	Test 5
Feed concentration and vacuum	**45wt% solids at 75 kPa**				
Form time (sec)	16	19	25	19	19
Dry time (sec)	32	38	50	28	19
Form/Dry time ratio	1/2	1/2	1/2	1/1.5	1/1
Cake thickness (mm)	2	2	2	2	2
Cake mass concentration (%m)	65.1	69.8	71.6	70.9	70.6
Wet cake density (kg/m³)	613	611	676	683	660
Solids in filtrate (%m)	0.51	0.52	0.61	0.60	0.41
Feed concentration and vacuum	**55wt% solids at 75 kPa**				
Form time (sec)	11	15	20	20	20
Dry time (sec)	22	30	40	30	20

Parameter	Test 1	Test 2	Test 3	Test 4	Test 5
Form/Dry time ratio	1/2	1/2	1/2	1/1.5	1/1
Cake thickness (mm)	4	6	6	6	6
Cake mass concentration (%m)	74.3	74.5	73.2	69.1	73.6
Wet cake density (kg/m³)	943	697	820	742	861
Solids in filtrate (%m)	0.53	0.67	0.61	0.63	0.59
Feed concentration and vacuum	**65wt% solids at 75 kPa**				
Form time (sec)	5	8	10	8	8
Dry time (sec)	10	16	20	12	8
Form/Dry time ratio	1/2	1/2	1/2	1/1.5	1/1
Cake thickness (mm)	14	18	20	18	18
Cake mass concentration (%m)	81.4	81.8	81.6	81.9	81.4
Wet cake density (kg/m³)	1319	1272	1200	1221	1278
Solids in filtrate (%m)	0.68	0.64	0.59	0.64	0.61

Results for disc filtration tests were not as consistent as for belt filtration tests. The results indicate that the material struggle to build cake thickness at 45 and 55 wt% solids feed concentration. At a feed solids concentration of 65 wt%, cake thickness of 14 to 22 mm can be achieved at form times between 5 to 13 seconds. Filter cakes achieved solids concentrations of ~78 to ~83 wt% and wet cake densities of 1070 to 1319 kg/m^3, respectively. Solids concentrations in the filtrate measured between 0.57 and 0.90 wt% solids.

Pressure Filtration Tests

Table 13.5.21 P&C 80% Passing 53 µm – Pressure Filtration Test Results

Feed Mass Solids Concentration	45wt% solids			55wt% solids			65wt% solids		
Pressure (kPa)	600			600			600		
Equivalent chamber size (mm)	16	24	34	24	34	46	28	42	56
Cake thickness (mm)	8	12	17	12	17	23	14	21	28
Form time (sec)	10	12	15	6	10	12	6	8	10
Cake mass solids concentration at form time (%m)	75.5	73.0	67.8	80.9	80.7	74.8	84.0	79.2	79.3
Blow time (sec)	180	180	180	180	180	180	180	180	180
Final cake mass solids concentration (%m)	83.2	87.7	86.3	89.7	88.7	88.1	92.1	89.7	88.1
Wet cake density (kg/m³)	1696	1724	1692	1524	1667	1683	1630	1654	1673
Filtrate solids concentration (%m)	0.07	0.09	0.10	0.10	0.09	0.08	0.06	0.05	0.06

Table 13.5.22 P&C 80% Passing 63 µm – Pressure Filtration Test Results

Feed Mass Solids Concentration	**45wt% solids**			**55wt% solids**			**65wt% solids**		
Pressure (kPa)	600			600			600		
Equivalent chamber size (mm)	16	26	32	24	34	44	28	40	56
Cake thickness (mm)	8	13	16	12	17	22	14	20	28
Form time (sec)	14	20	28	9	13	15	7	10	13
Cake mass solids concentration at form time (%m)	72.8	73.1	62.7	73.4	72.5	73.9	79.1	80.6	75.1
Blow time (sec)	180	180	180	180	180	180	180	180	180
Final cake mass solids concentration (%m)	83.8	84.8	83.9	89.6	88.1	86.2	90.0	88.5	87.9
Wet cake density (kg/m³)	1622	1551	1734	1584	1657	1722	1700	1761	1681
Filtrate solids concentration (%m)	0.12	0.12	0.09	0.11	0.12	0.18	0.10	0.09	0.12

Pressure filtration tests for both the P_{80} 53 µm and 63 µm material produced consistent results for feed solids concentrations of 45, 55 and 65 wt% solids. The materials achieved filter cake moisture concentrations between ~8 to ~17 wt%. Higher feed concentrations resulted in lower filter cake moisture concentrations. Solids in the filtrate was below 0.18 wt% solids for all tests. Wet filter cake densities were measured to be between 1524 and 1761 kg/m^3.

Conveyability Tests

Uncompacted bulk density for the P_{80} 53 and 63 µm samples measured as 1114 and 1117 kg/m^3, respectively.

The maximum dry density (MDD) and optimum moisture content (OMC) recorded for the P_{80} 53 and 63 µm materials samples was 1724 kg/m^3 at 13.3 wt% and 1781 kg/m^3 at 13.6 wt%, respectively.

The flow moisture point (FMP) and transportable moisture limit (TML) measured were 19.8 wt% (80.2 wt% solids) and 17.9 wt% (82.1 wt% solids) respectively, for the P_{80} 53 µm and 17.9 wt% (82.1 wt% solids) and 16.1% (83.9%m) respectively, for the P_{80} 63 µm samples, respectively. Based on this data, pressure filters will most likely be required to produce filter cakes with mass concentrations higher than the TML.

Filtration Tests by FLS

FLSmidth was selected in the DFS to perform additional confirmatory testwork to confirm filtration capabilities of vacuum belt filtration, pressure filtration, and disc filtration.

Vacuum Filtration

Vacuum filtration test was conducted by simulating Belt and Disc filters with 60 wt% feed solids concentration at vacuum pressure of -70 kPa using cloth POPR-873. FLSmidth laboratory site is at elevation of 1583 m above sea level with barometric pressure of 84 kPa.

Table 13.5.23 FLS 80% Passing 53 µm – Vacuum Filtration Test Results

Test	Feed Volume mL	Form time sec	Drying time sec	Cake thickness mm	Moisture content %	Dry cake weight kg/m²	Dry solids Flux kg/m²/hr	Filtrate TS mg/L
T17	52.4	4.10	0	5	24.78	5.83	5118	<5000
T18	52.4	3.47	15	5	18.41	5.94	1158	<6000
T19	52.4	4.06	30	5	14.80	6.2	655	<4000
T20	52.4	4.44	60	5	15.23	5.99	335	<4000
T21	98.2	5.57	0	10	26.63	11.84	7650	<3000
T22	98.2	6.00	15	10	18.41	11.51	1972	<3000
T23	98.2	5.69	30	10	18.00	11.89	1200	<1000
T24	98.2	6.50	60	10	15.28	11.71	634	<3000
T25	144.0	10.69	0	15	26.52	17.42	5865	<3000
T26	144.0	9.38	15	15	21.01	17.24	2545	<1000
T27	144.0	12.75	30	15	21.20	17.35	1461	<1000
T28	144.0	10.75	60	15	16.84	17.25	878	<1000
T29	196.3	13.90	0	20	26.58	23.73	6146	<2000
T30	196.3	14.66	15	20	22.86	23.81	2890	<1000
T31	196.3	14.97	30	20	21.03	23.65	1893	<1000
T32	196.3	15.81	60	20	19.28	23.59	1120	<1000

Table 13.5.24 FLS 80% Passing 63 µm – Vacuum Filtration Test Results

Test	Feed Volume mL	Form time sec	Drying time sec	Cake thickness mm	Moisture content %	Dry cake weight kg/m²	Dry solids Flux kg/m²/hr	Filtrate TSS mg/L
T1	52.4	4.01	0	5	26.36	5.25	4712	<2000
T2	52.4	4.12	15	5	15.17	5.87	1105	<3000
T3	52.4	4.12	30	5	15.87	6.08	641	<2000
T4	52.4	3.50	60	5	11.76	6.22	352	<3000
T5	98.2	6.12	0	10	26.65	11.67	6865	<2000
T6	98.2	5.53	15	10	18.90	11.85	2078	<2000
T7	98.2	5.44	30	10	16.16	11.89	1208	<2000
T8	98.2	6.10	60	10	14.61	11.86	646	<2000
T9	144.0	8.09	0	15	25.93	16.73	7443	<3000
T10	144.0	7.87	15	15	20.30	17.51	2757	<2000
T11	144.0	9.94	30	15	18.34	17.4	1569	<2000
T12	144.0	10.01	60	15	16.12	17.46	897	<1000

Test	Feed Volume mL	Form time sec	Drying time sec	Cake thickness mm	Moisture content %	Dry cake weight kg/m²	Dry solids Flux kg/m²/hr	Filtrate TSS mg/L
T13	196.3	12.28	0	20	26.11	23.41	6863	<1000
T14	196.3	16.03	15	20	22.99	23.51	2727	<2000
T15	196.3	13.47	30	20	20.14	23.72	1964	<2000
T16	196.3	12.68	60	20	17.62	23.58	1168	<2000

Cake moistures of 26-27 wt% can be achieved without drying, and 15-23 wt% can be achieved with drying for the -53µm sample. Cake moistures of 25-27 wt% can be achieved without drying, and 12-23 wt% can be achieved with drying for the -63µm sample.

Pressure Filtration

Pressure filtration test was conducted by simulating AFP with 60 wt% feed solids concentration using cloth NY 206/10. The sized chamber of 25mm was used for the samples with P80 of -53 µm and -63µm.

The filter cake moistures ranging from 8-25 wt% was achievable at total cycle time range of 9-11 minutes as shown in Table 13.5.25.

Table 13.5.25 FLS Pressure Filtration Test Results

Test No.	**T1**	**T2**	**T1**	**T2**
Sample P_{80} (µm)	-53	-53	-63	-63
Blowing Pressure (bar)	7.00	7.00	7.00	7.00
Feeding Pressure (bar)	12.00	12.00	12.00	12.00
Cake Thickness (mm)	25	25	25	25
De-Water Time (min)	5.00	5.00	5.00	5.00
Drying Time (min)	-	2.00	-	1.50
Mechanical Time	4.37	4.37	4.37	4.37
Filtrate TSS (mg/L)	<5000	<5000	<5000	<5000
Moisture Content (wt.%)	24.49	8.62	24.53	8.09
Time for Total Cycle (min)	9.37	11.37	9.37	10.87
Cycles per Hour	6.40	5.28	6.40	5.52
Dry Output (kg/m².hr)	101.33	83.68	102.32	88.92

The filter cake moistures achieved were ranging between 24-25 wt% without air blowing, and 8-9 wt% with air blowing at cake thickness of 25 mm when feeding the filter at 60 wt% solids concentration at a feeding pressure of 12 bar and blowing pressure of 7 bar. The filtrate collected was very cloudy with lots of fines and the TSS achieved was < 5000 mg/L for both -53 µm and -63 µm samples.

Fingerprint Tests by BOKELA

BOKELA was selected in the DFS as they were seen as a leader in disc filtration technology to confirm the filtration capabilities of vacuum disc filtration.

Disc Filtration

Fingerprint tests with a representative tailings sample of P_{80} 63 µm was used to determine solids throughput, cake moisture and required filter size. The feed properties were 60 wt% solids, 10.5 pH, Temperature range of 35 - 40ºC. The plant elevation was given as 1200 masl equating to 87 kPa ambient pressure, with the standard vacuum pump option at -60 kPa and special vacuum pump option at -70 kPa being evaluated.

Figure 13.5.1 BOKELA Moisture Content vs Solids Flux (53 µm)

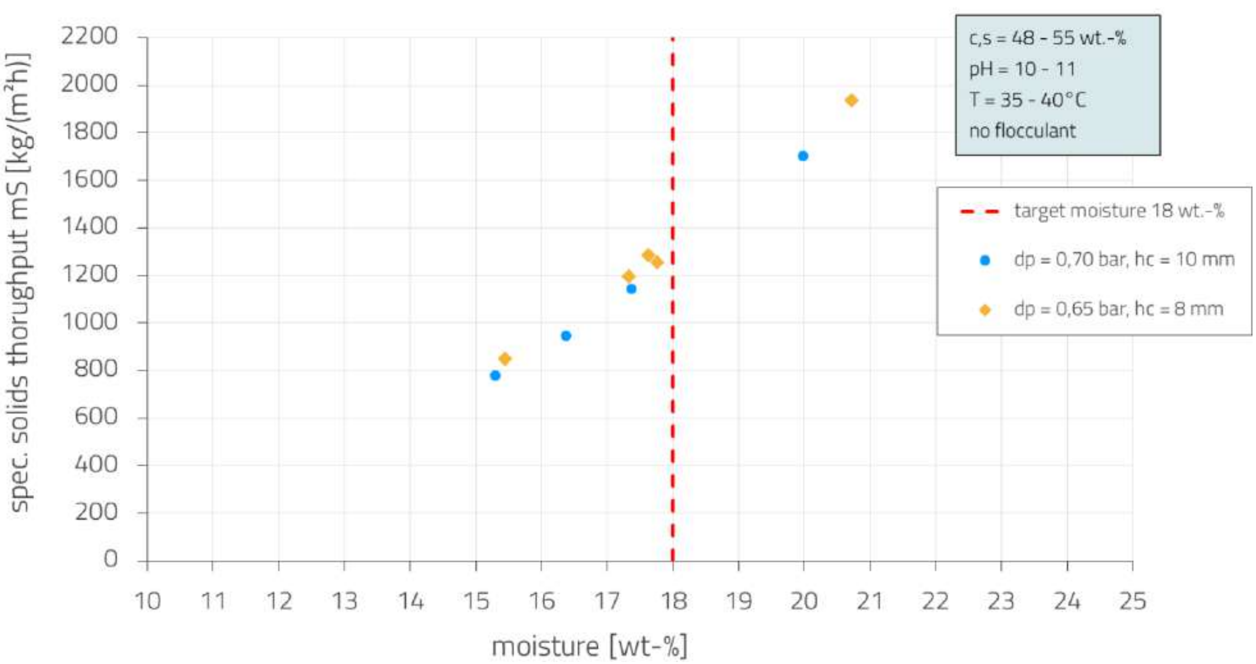


Figure 13.5.2 BOKELA Moisture Content vs Air Consumption (53 µm)

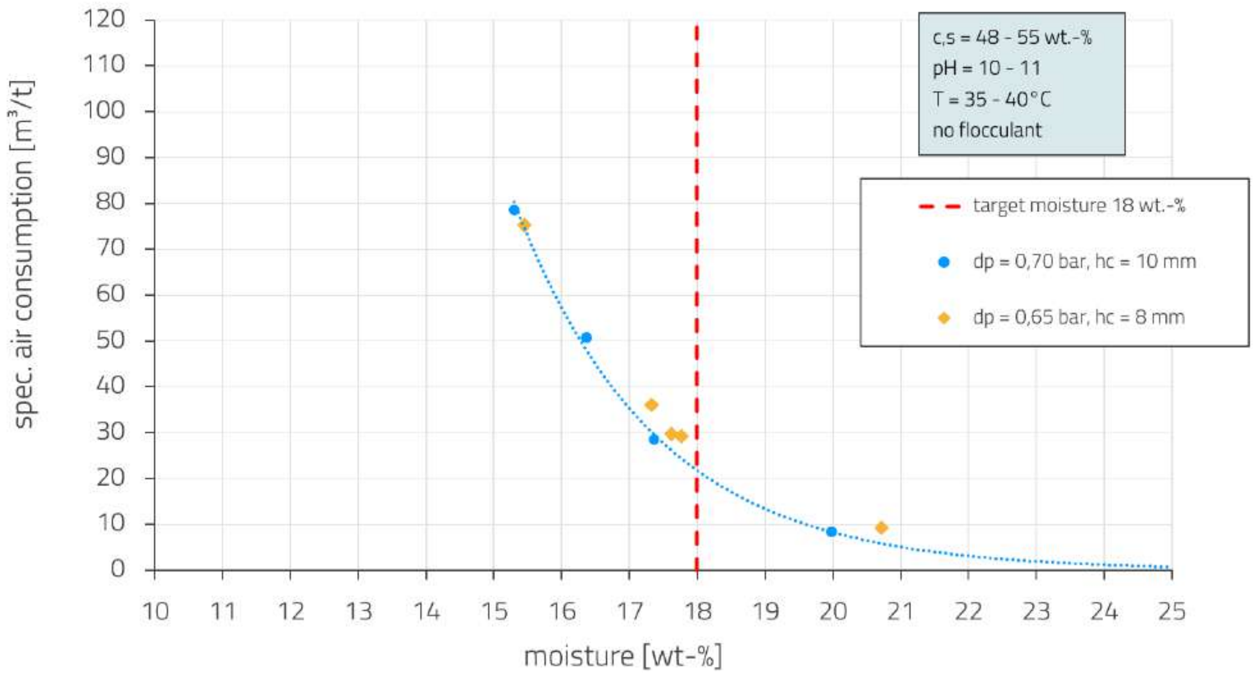


Figure 13.5.3 BOKELA Moisture Content vs Solids Flux (63 µm)

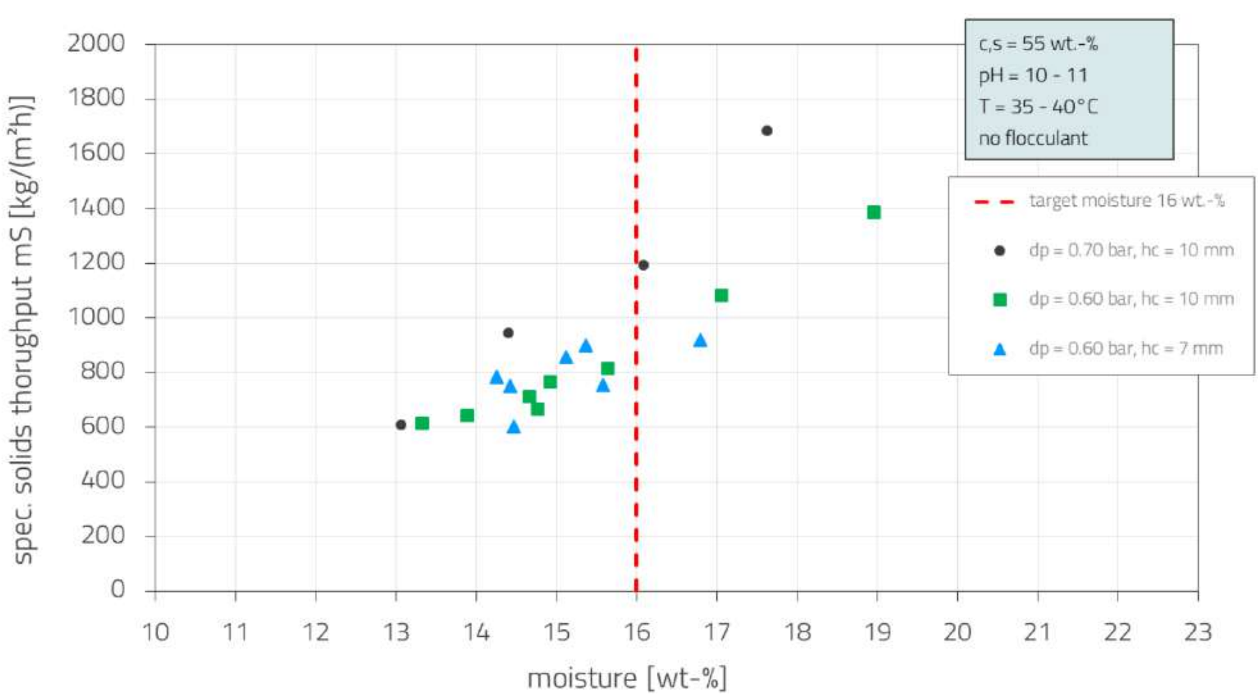
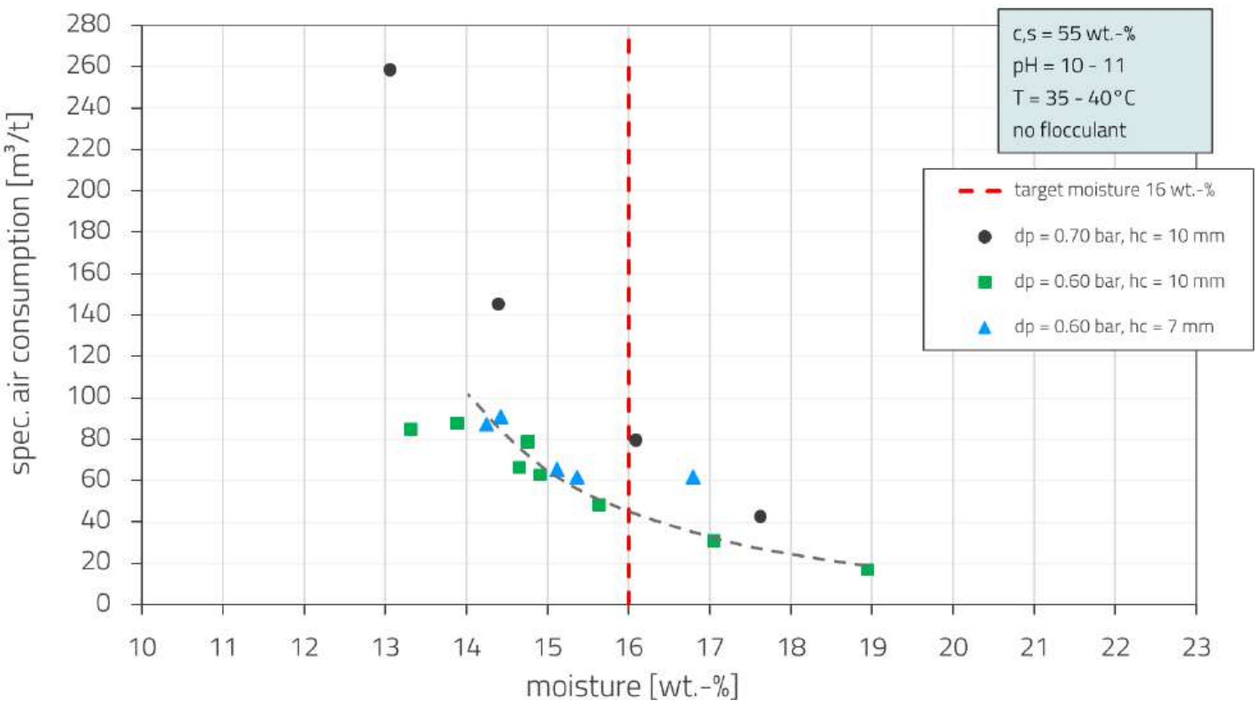


Figure 13.5.4 BOKELA Moisture Content vs Air Consumption (63 µm)



In Figures 13.5.1, 13.5.2, 13.5.3, and 13.5.4 it can be seen that with decreasing moisture content the air consumption exponentially increases. It was further noted in the report that the use of flocculant increases the product moisture content.

13.5.4 DFS Metallurgical Recoveries and Reagent Consumption

Gold Recovery Assessment

The assessment of the overall gold recovery for each of the composites representing the Bulge, Twin Hills Central and Clouds pits is based on the PFS and DFS test work reports by Maelgwyn South Africa and applies the feed gold grades from the August 2022 Osino Twin Hills Enhanced Mining Schedule provided by Osino.

Plant Feed Gold Grades from Life of Mine Mining Schedule

Refer to Table 13.5.26 below for the plant feed gold grades from a summary of the mining schedule for the Twin Hills Gold Project per ore source for the life of mine and first 5 years.

Table 13.5.26 Plant Feed Gold Grades per Source and Ore Type

Source	Transitional		Fresh		Total	
	LOM	5 Years	LOM	5 Years	LOM	5 Years

Bulge	1.06	1.19	0.96	0.95		
TH Central	1.06	1.19	1.10	1.13		
Clouds	1.06	1.19	1.23	1.23		
TH West	1.06		1.15			
Combined	**1.06**	**1.19**	**1.04**	**1.07**	**1.04**	**1.09**

From Table 13.5.26, Transition contributes to 16.5% of the material to be mined in the first 5 years, whilst 13.1% of the LOM plan consists of Transition material.

The life-of-mine feed grade of 1.04 g/t Au for Fresh and Transition combined was from the plant feed gold grades in the mining schedule and the 1.09 g/t Au feed grade for the first 5 years. Overall gold recoveries are calculated for the Fresh material composites from each ore source. The Transitional composite material represents the Bulge, Twins Hills Central and Clouds pits and from this an overall gold recovery is calculated.

The method to calculate the overall gold recovery for each source follows the test work procedure of gravity gold recovery to provide a gravity tail for gold leaching. The gold recovery formula is as follows:

- Mill feed gold head grade of each ore source x (1-gravity gold recovery percentage) = CIL feed gold grade.
- CIL feed gold grade – leach tails gold head grade / CIL leach feed gold grade = CIL gold recovery percentage.
- Overall gold recovery percentage for each ore source = gravity gold recovery percentage + CIL gold recovery percentage.

<u>Gravity Gold Recovery</u>

Refer to Table 13.5.27 below for a summary of the gravity gold recoveries used for the gravity concentration circuit.

Table 13.5.27 Gravity Gold Recoveries for Recovery Assessment

Material	Pit	Gravity Recovery	Information Source
Transition	Bulge	17.8%	Maelgwyn PFS Test Report
	TH Central	17.8%	Maelgwyn PFS Test Report
	Clouds	17.8%	Maelgwyn PFS Test Report
	TH West	13.6%	Maelgwyn THW Test Report
Fresh	Bulge	28.3%	GRG Modelling Report
	TH Central	28.3%	GRG Modelling Report
	Clouds	31.5%	Maelgwyn PFS Test Report
	TH West	22.6%	Maelgwyn Test Report

The gravity gold recoveries in Table 13.5.27 are applied to the feed gold grades of each ore source to calculate the gold head grade for the CIL circuit.

CIL Gold Recoveries

Refer to Table 13.5.28 below for a summary of the CIL circuit final tails grades used for the CIL circuit gold recovery. The tails gold grades are referenced specifically from the repeatability test work on the flowsheet and processing parameters established in the DFS, PFS and THW test work programs.

Table 13.5.28 CIL Gold Recoveries for Recovery Assessment

Material	Pit	CIL Tails	Information Source
		g/t Au	
Fresh	Bulge	0.09	Maelgwyn DFS Test Report
	TH Central	0.07	Maelgwyn DFS Test Report
	Clouds	0.13	Maelgwyn DFS Test Report
	TH West	0.13	Maelgwyn THW Test Report
Transition	Bulge	0.07	Maelgwyn PFS Test Report
	TH Central	0.07	Maelgwyn PFS Test Report
	Clouds	0.07	Maelgwyn PFS Test Report
	TH West	0.11	Maelgwyn THW Test Report

Overall Circuit Gold Recoveries for each Ore Source

Refer to Table 13.5.29 below for the overall circuit gold recoveries calculated from the LOM and 5 Years mill feed gold grades using the testwork results.

Table 13.5.29 Overall Circuit Gold Recoveries Calculated

Material	Pit	LOM	5 Years
		%	%
Trans	Bulge	93.4	94.1
	TH Central	93.4	94.1
	Clouds	93.4	94.1
	TH West	89.6	
		%	%
Fresh	Bulge	90.4	90.3
	TH Central	93.8	94.0
	Clouds	89.1	89.1
	TH West	88.7	

The following recovery discounts have been applied to the overall recoveries in Table 13.5.29:

- CIL carbon fines losses of 30g carbon per ton milled at a grade of 100g/t as per the expected eluted carbon value.
- Solution gold losses based on 85% solids in the final tailings stream and 0.015 g/l Au in solution.

The above recovery discounts are applied as a 0.54% reduction to the overall gold recoveries for each ore source, in the Twin Hills Gold Project, as illustrated in Table 13.5.30 below.

Table 13.5.30 Overall Circuit Discounted Gold Recoveries

Material	Pit	LOM	5 Years
		%	%
Trans	Bulge	92.9	93.6
	TH Central	92.9	93.6
	Clouds	92.9	93.6
	TH West	89.1	
		%	%
Fresh	Bulge	89.9	89.8
	TH Central	93.3	93.4
	Clouds	88.5	88.5
	TH West	88.2	

The weighted overall gold recovery from the tonnage of each ore source and feed gold grade is 91.6% for the first 5 years and a life of mine average gold recovery of 91.7%.

Reagent Consumption

The variability testwork dataset provides a good basis for determining the reagent consumption rates to be used for engineering design and the operating cost estimate inputs.

The average reagent consumptions for the variability testwork compares well with historic testwork and is used for the operating cost estimates.

Cyanide usage includes an allowance for free cyanide residual (100 mg/L NaCN) in the CIL tails taking no credit for cyanide recovery as the CIL tails is treated in an SO_2/Air Cyanide destruction circuit. Additional allowances for cyanide usage in elution and for the intensive cyanidation reactor will be made.

Cyanide leaching reagent consumption including the residual at 50 w/w% solids used in the engineering design and operating cost estimate is 0.46 kg/t.

Lime demand to maintain a pH of 10.5 utilizes the average consumption determined in the variability dataset as it was similar between all ore deposits. The testwork utilized hydrated lime at 75% CaO and the maximum average consumption of 1.16 kg/t is used in the engineering design and operating cost estimate.

The SO_2/Air process requires a minimum of 3.66 grams of SMBS per gram of CNWAD for complete oxidation to occur. This is defined as stochiometric equivalents, 1 EQ in Maelgwyn South Africa terms.

3 EQ of SMBS per mole CN WAD reached the desired outcomes with 24.6 ppm CN WAD after a full two-hour test run. Copper is required in solution at levels between 20 and 50 ppm to catalyse the oxidation reaction.

Whilst there could be slight reduction potential targeting 40 ppm this should be seen as plant based further optimization.

The cyanide destruction reagent consumptions used in the engineering design and operating costs estimate is 415 g/t Sodium Metabisulphite (SMBS) and 111 g/t Copper Sulphate ($CuSO_4$).

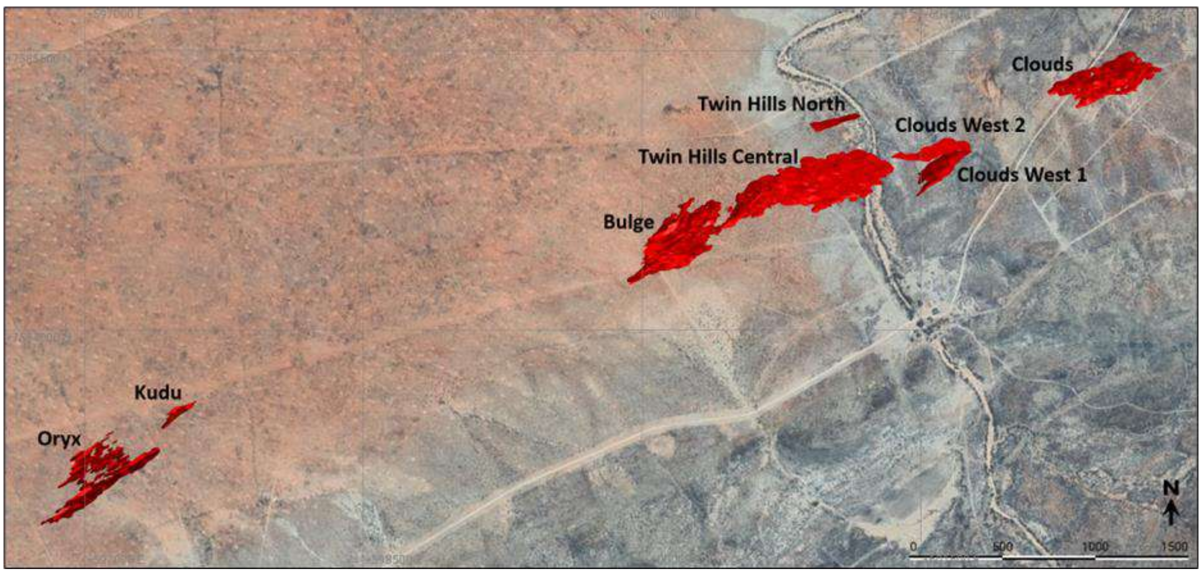
Other reagent and consumable usage rates are estimated in the operating cost build-up, Section 21.

14.0 MINERAL RESOURCE ESTIMATE

14.1 Introduction

The Mineral Resource was estimated for the Twin Hills deposit which includes several target areas. Additional drilling data acquired since the previous Mineral Resource estimate (effective July 2022) include deep drill holes at Twin Hills Central (THC) and Clouds, and infill drilling at Clouds West and Oryx (Figure 14.1.1).

Figure 14.1.1 Plan View of the Twin Hills Area Showing the Mineralization Domains



All work was carried out using:

- Leapfrog Geo version 2021.2.4.
- Datamine Studio RM version 1.7.100.0.
- Supervisor version 8.14.
- JMP version 16.0.0.
- Isatis version 2018.5.
- Microsoft Office 365.

The database was established by the collection, validation, recording, storing, and processing of data and forms the foundation for the MRE. Standard operating procedures were established to govern the collection of all data, while a rigorous QAQC program is in place to support the database.

The Mineral Resource meets the minimum requirement of reasonable prospects for eventual economic extraction (RPEEE) as defined by 'CIM Definition Standards - For Mineral Resources and Mineral Reserves'.

The Mineral Resource is based on geological premises, facts, interpretations, and technical information, and used appropriate estimation methods, parameters, and criteria for the deposit under consideration.

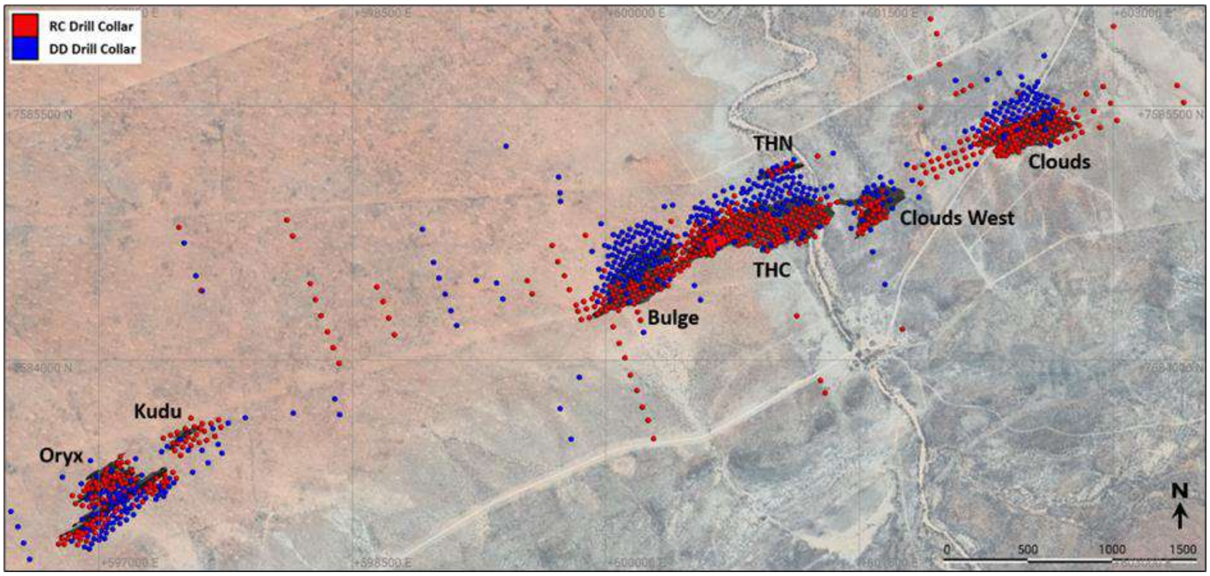
The Qualified Person is unaware of any legal, political, environmental, or other risks that could materially affect the potential development of the Mineral Resource.

14.2 Drillhole Database

A total of 225,574 m of drilling from 1,069 holes (135,980 m of diamond core from 482 holes and 89,594 m of reverse circulation from 586 holes) was completed at Twin Hills since 2019 (Figure 14 2.1).

Diamond drillholes (DD) range from 63.13 m to 555.03 m in depth, while reverse circulation (RC) holes range from 30 m to 260 m in depth. The average drilled depth for DD and RC holes is 282 m and 153 m, respectively. DD holes generally targeted deeper mineralization while RC holes targeted shallower mineralization. This is evident in Figure 14.2.1 where most diamond collars are north of the RC collars. Most of the drillholes were oriented at 160° azimuth and 60° dip, except at Oryx and Kudu where the holes were drilled at 340° azimuth and 60° dip.

Figure 14.2.1 Plan View of The Twin Hills Area with Drill Collar Locations and Mineralization Domains



Both DD and RC holes were sampled at 1 m intervals at the Osino core yard in Omaruru and at the drill rigs, respectively. A subsampling process using a riffle splitter was used at the RC drill rig to reduce sample mass. This process was observed in the field by the QP and was deemed to be a reasonable and robust method for reducing sample mass and producing a representative subsample.

The relevant drilling data, hosted by CSA Global for Osino Resources in Maxgeo Datashed 4, was supplied to the QP as Excel exports on 15 March 2023:

- Collar_2300315.csv.
- Survey_2300315.csv.
- Assay_2300315.csv.
- Lith_2300315.csv.
- Twin Hills_Specific Gravity.xlsx.

Drillholes were named according to drilling type, such that DD holes have the prefix OKD and RC holes have the prefix OKR. The DD holes range from OKD001 to OKD503 and include three holes with the prefix OKRD. RC holes range from OKR001 to OKR595 and include 36 holes with the prefix OKRG. Not all holes in the sequence were drilled at the Twin Hills Project, therefore some holes in the sequence were not included in the supplied data.

Downhole survey data were recorded and captured below the collar position. The planned azimuth and dip were captured at the collar position (0 m depth).

For DD holes up to and including OKD077, an extensive suite of elements was assayed: Ag, Al, As, Au, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Hg, Ga, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sc, Sr, Te, Th, Ti, Tl, U, V, W, Zn, Y, Zr. For DD holes from OKD078 onwards, and all RC holes, only gold was assayed.

Lithological data included rock type with typical description fields for colour, texture, and grain size. The main rock types logged were interbedded meta greywacke, meta greywacke, cordierite meta-greywacke, calcrete, cordierite schist, and biotite schist. These six rock types account for 98% of the logged metres at Twin Hills. Included with the lithological data was an interpretation of the state of oxidation, which ranged from very highly oxidized to fresh.

Bulk density was determined using the hydrostatic immersion technique on core samples. The dry and wet weights, repeat checks, and final bulk density determination values were all supplied. A total of 23,931 bulk density determinations were carried out on core.

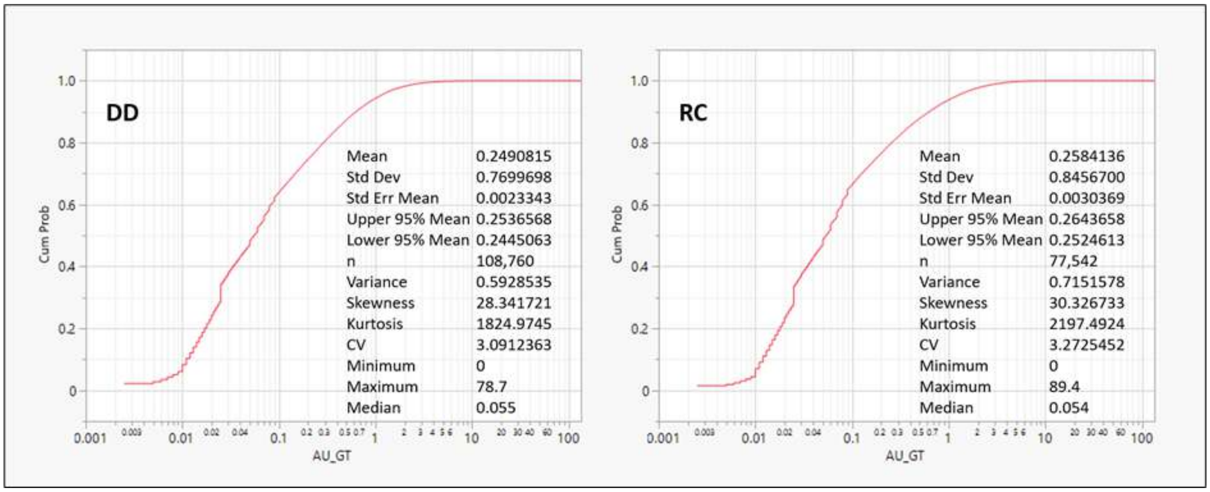
14.3 Database Validation

The data were reviewed and validated, with minor changes required for use in Mineral Resource estimation.

Assay and bulk density data were reviewed relative to expected values. The assay data contained no unexpected values. The bulk density data contained 20 unexpected low or high values. These were addressed when working with the bulk density data (detailed in Section 14.8).

Drillholes were mostly assayed from the base of calcrete to end-of-hole. Assay data were compared by drilling type using statistics in Q4 2022 (Figure 14.3.1), with the mean of the DD data at 0.249 g/t Au and the RC data at 0.258 g/t Au, with the conclusion that the diamond and RC assay data are generally overall comparable.

Figure 14.3.1 Cumulative Distribution Function for Gold by Drilling Type

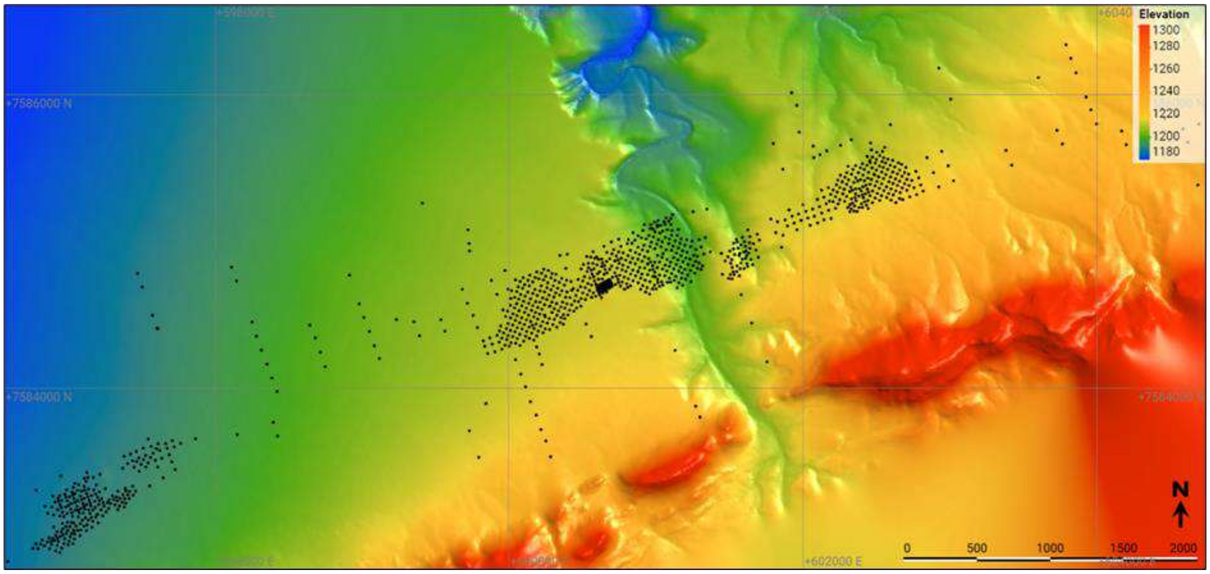


When comparing the DD and RC data within the mineralized volumes, the DD data are generally lower grade (1.01 g/t Au) compared to the RC data (1.19 g/t Au). This is possibly due to DD holes intersecting mineralisation at depth (200-500 m below surface) relative to the shallow RC holes (0-200 m below surface), with the conclusion that gold grade decreases with depth – note the collar locations for drilling type in Figure 14.4.1. The other possibility, although less likely, is that larger RC samples are more representative of the in-situ grade, relative to smaller DD samples. Unfortunately, a sizable area was not drilled using both techniques to do a more detailed comparison, however the QP deems any risk to be acceptable for the purposes of Mineral Resource estimation.

14.4 Topography

A topographic digital terrain model (DTM) was constructed from surface elevation data acquired during an aerial drone survey of the Twin Hills area (Figure 14.4.1). The drillhole collar locations were plotted relative to the DTM and their elevations checked against the DTM. The collar elevations were close to the elevation of the DTM in all instances. All collars were projected onto the DTM in Leapfrog Geo for further work.

Figure 14.4.1 Plan View of the Topographic DTM Showing Surface Elevation Relative to Collar Locations

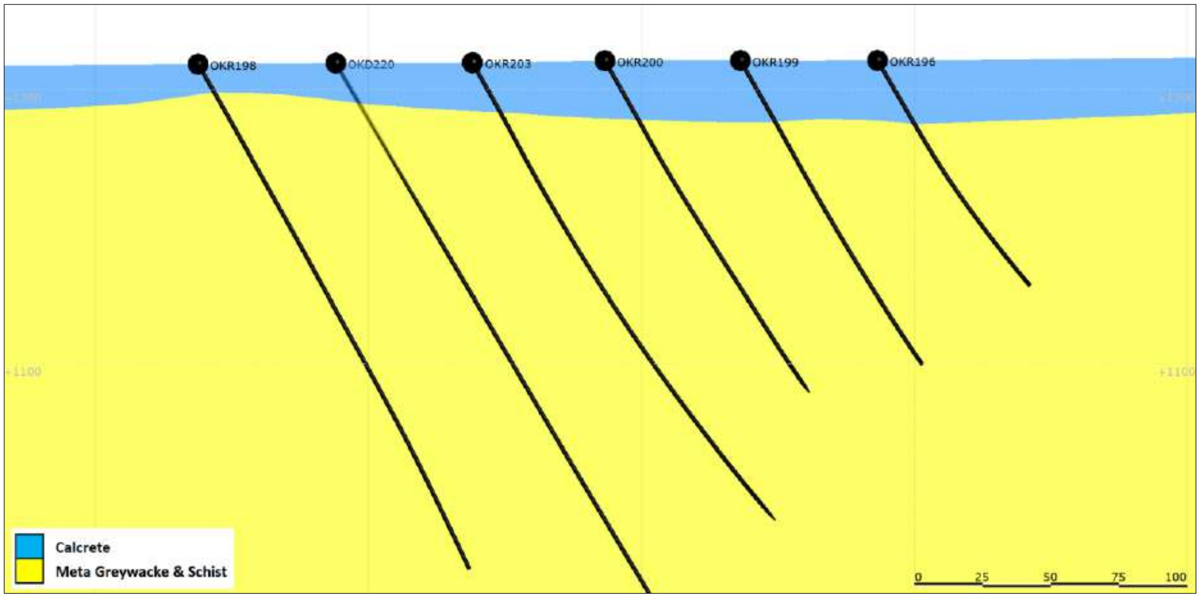


14.5 Geological Interpretation

The host lithology and country rock are, in the most part, some form of meta-greywacke. There is no discernible distinction between the lithology that hosts mineralization, and the lithology that does not. Due to this, no detailed lithology model was interpreted and constructed for this MRE.

The calcrete layer which overlays the meta-greywacke units was however interpreted and modelled (Figure 14.5.1), due to its barren nature and distinctly different physical and chemical properties. The modelled calcrete layer varies in vertical thickness from 0 m to 40 m, with the general trend that it thickens from east to west.

Figure 14.5.1 Cross Section Looking East Showing the Modelled Calcrete Layer Relative to the Meta Greywacke and Schist



14.5.2 Oxidation

The oxidation state was logged into one of five categories. In order from most to least oxidized, these are:

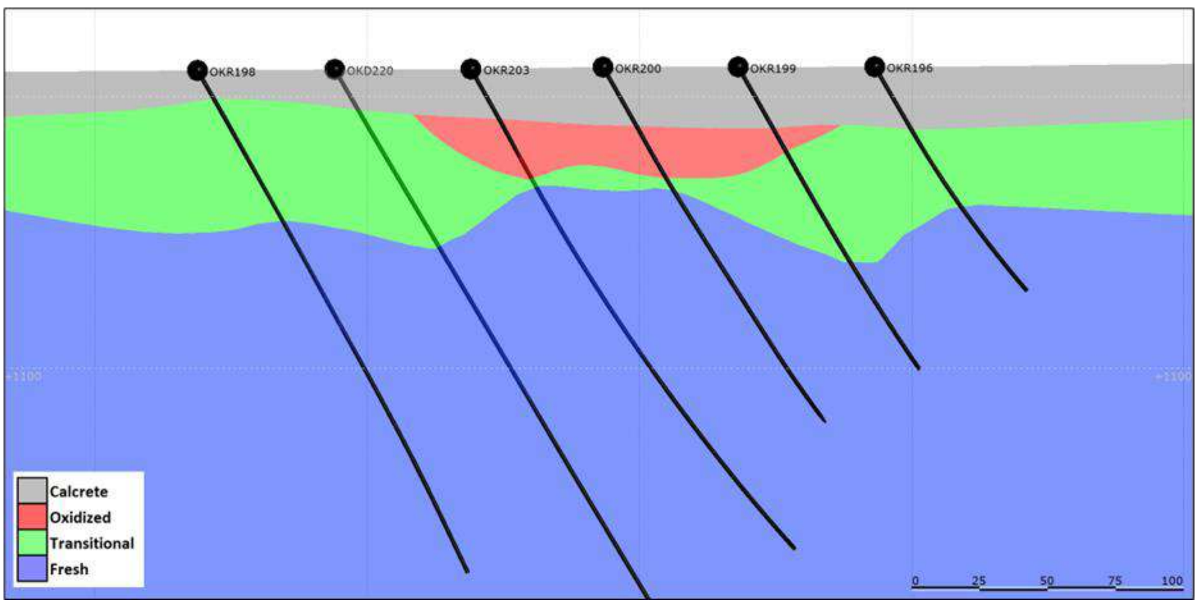
- Very highly oxidized.
- Highly oxidized.
- Moderately oxidized.
- Slightly oxidized.
- Fresh.

Due to the variable nature of logging, and the spatial location of the categories, modelling the five categories individually proved problematic. The oxidation categories were therefore simplified for modelling purposes (Table 14.5.1 and Figure 14.5.1).

Table 14.5.1 Simplification of the Oxidation Logging Categories for Modelling

Logged oxidation state	Simplified category for modelling
Very highly oxidized Highly Oxidized	Oxidized
Moderately oxidized Slightly oxidized	Transitional
Fresh	Fresh

Figure 14.5.2 Corss Section Looking East Showing the Modelled Ozidation State



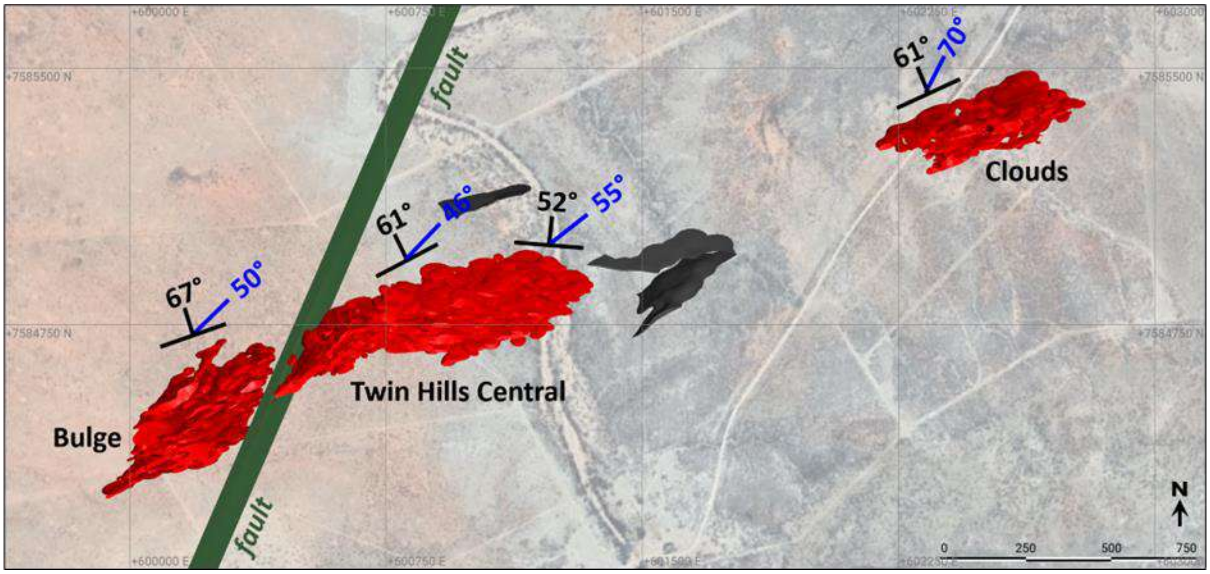
It is evident that the depth of oxidation and transitional material is highly variable. This is likely due to the ability of meteoric water to permeate downwards along geological structures.

14.5.3 Mineralization

Bulge, Twin Hills Central, and Clouds

The primary domains at Twin Hills were modelled in Leapfrog Geo using a 0.4 g/t Au threshold from drillholes spaced at 35 m x 35 m on surface. The geometry of the mineralization was guided by local trends and extrapolated no more than 50 m past the last mineralized intersections. The mineralization between Bulge and Twin Hills Central is interpreted to be separated by a fault (Figure 14.5.3). The mineralization appears to be closed off along strike, as is evidenced by drilling and sampling, however the mineralization is open at depth at all three domains.

Figure 14.5.3 Plan View of Mineralization at The Primary Domains Showing Average Strike, Dip (Black) And Plunge (Blue)



Twin Hills North, Clouds West, Kudu, and Oryx

The smaller domains at Twin Hills were modelled in Leapfrog Geo using a 0.4 g/t Au threshold (0.3 g/t Au at Twin Hills North for continuity purposes) from infill drilling spaced at 35 m x 35 m on surface. The geometry of the mineralization was guided by local trends and extrapolated no more than 50 m past the last mineralized intersections. All domains have the potential to be extended along strike and down dip with additional drilling (Figure 14.5.4). The mineralization at Kudu and Oryx (collectively referred to as Twin Hills West) dips in the opposing direction relative to the mineralization in the east (Figure 14.5.5).

Figure 14.5.4 Plan View of Mineralization at the Smaller Domains

Figure 14.5.5 Plan View Showing Mineralization at the Primary Domains with Orientation of Sections Lines

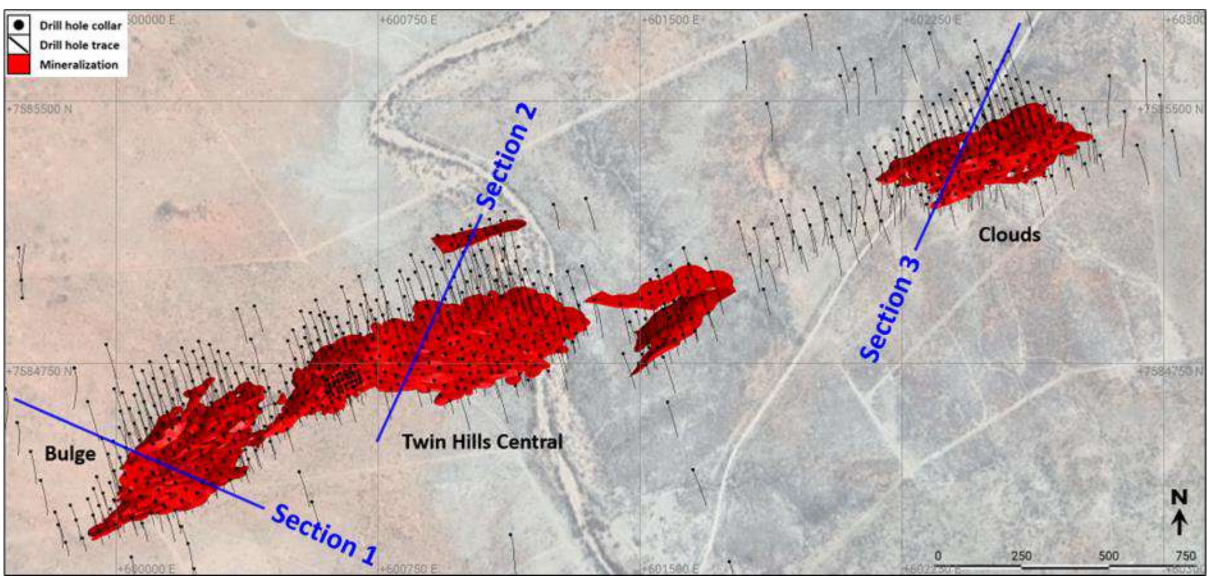


Figure 14.5.6 Bulge Section 1 Looking Northeast Showing Mineralization and Drill Assays Relative to the Reporting Pit Shell

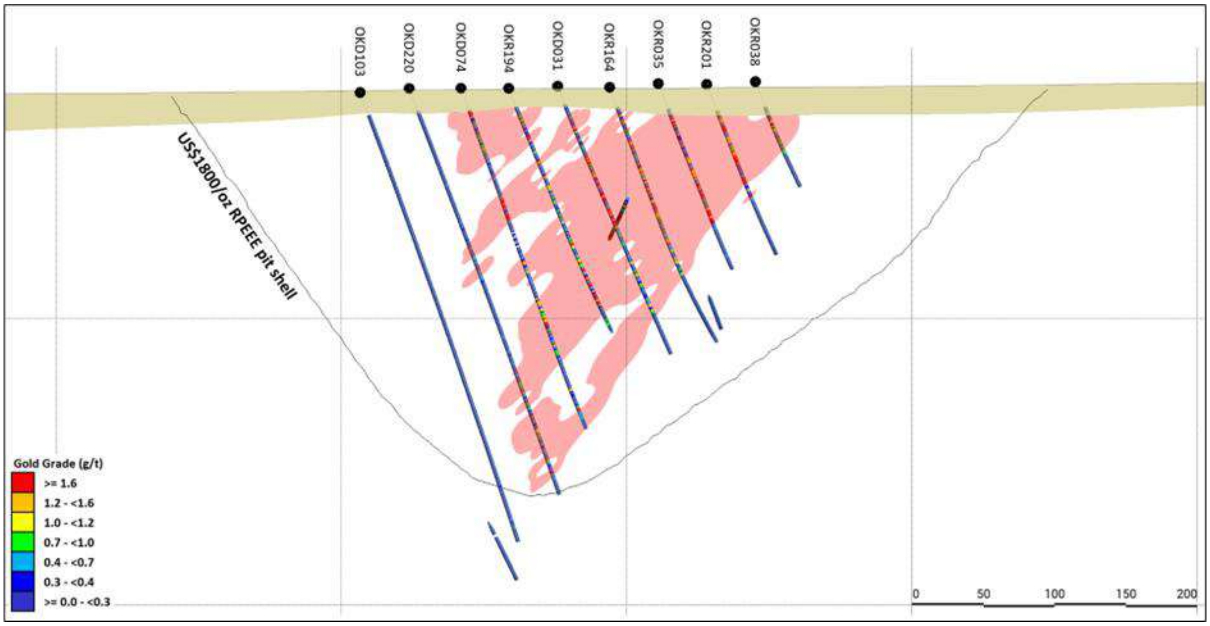


Figure 14.5.7 Twin Hills Central Section 2 Looking Southeast Showing Mineralization and Drill Assays Relative to the Reporting Pit Shell

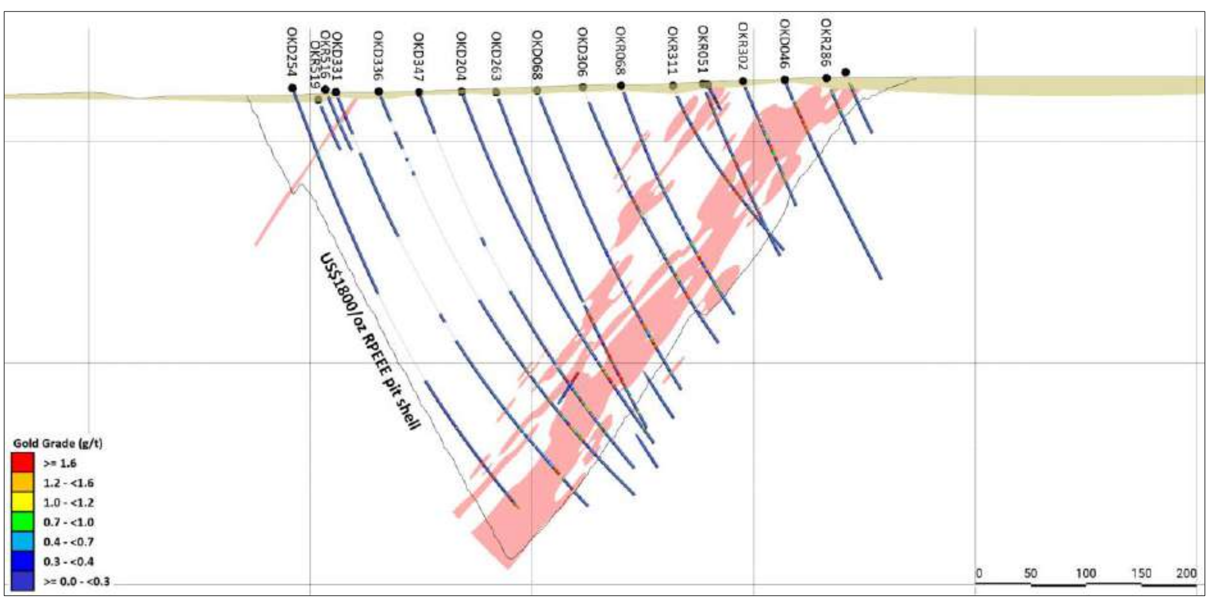
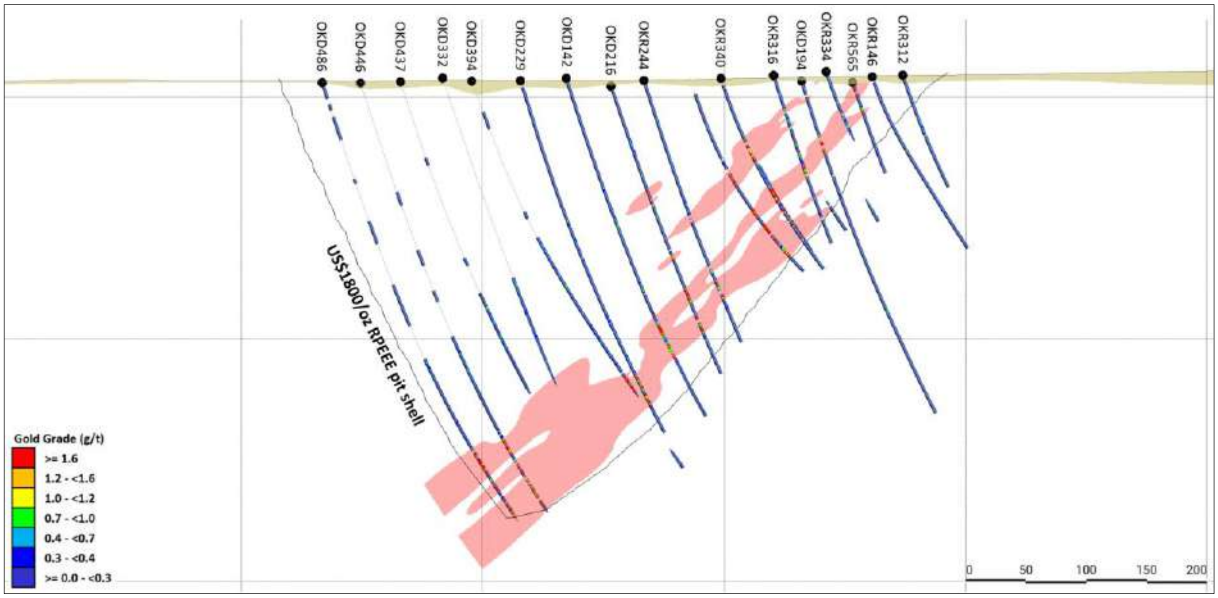


Figure 14.5.8 Clouds Section 3 Looking Southeast Showing Mineralization and Drill Assays



14.6 Sample Coding and Length

14.6.1 Domain Coding

Samples were flagged and coded according to the geological interpretation of lithology and oxidation (Table 14.6.1), and mineralization volume by area (Table 14.6.2).

Table 14.6.1 Lithology and Oxidation Sample Coding

Lithology and Oxidation Model	Sample code WEATH
Calcrete	1
Oxidized	2
Transitional	3
Fresh	4

Table 14.6.2 Mineralizaton Sample Coding by Area

Description of Mineralization Domain	Sample code (ZONE)
Calcrete	1
Country Rock (unmineralized)	2

Description of Mineralization Domain	Sample code (ZONE)
Bulge (≥0.4 g/t Au mineralization)	100
Twin Hills Central (≥0.4 g/t Au mineralization)	200
Clouds (≥0.4 g/t Au mineralization)	300
Twin Hills North (≥0.3 g/t Au mineralization)	400
Clouds West 1 (≥0.4 g/t Au mineralization)	500
Clouds West 2 (≥0.4 g/t Au mineralization)	501
Kudu (≥0.4 g/t Au mineralization)	600
Oryx (≥0.4 g/t Au mineralization)	700

14.6.2 Sample Length Analyses

DD and RC holes were sampled at 1 m intervals at the core-yard in Omaruru and at the drill rigs, respectively. A subsampling process using a riffle splitter was used at the RC drill rig to reduce sample mass. This process was observed in the field by the Qualified Person and was deemed to be a reasonable and robust method for reducing sample mass and producing a representative subsample.

14.7 Geostatistical Analysis

14.7.1 Summary Statistics

Length-weighted summary statistics were compiled for gold assay samples by mineralization domain (Table 14.7.1).

Table 14.7.1 Length-Weighted Summary Statistics by Mineralization Domain

Domain	Count	Mean g/t Au	Maximum g/t Au	Coefficient of Variation
Bulge	12,507	0.97	52.00	1.38
Twin Hills Central	10,556	1.17	52.10	1.25
Clouds	3,815	1.26	89.40	1.81
Twin Hills North	51	3.40	78.70	3.69
Clouds West 1	486	1.19	10.50	1.10
Clouds West 2	89	0.57	2.51	0.84
Kudu	336	0.69	3.49	0.65
Oryx	3,385	1.03	51.00	1.55

14.7.2 Compositing

The Qualified Person investigated a compositing strategy for use in estimation in 2021. The investigation showed that a 2 m composite length was well suited for use in estimation. Summary statistics were compiled for gold assay composites by mineralization domain (Table 14.7.2). The statistics show that mean values per domain remained similar while the coefficient of variation (CV) was reduced.

Table 14.7.2 Summary Statistics for 2 m Composites

Domain	Count	Mean (g/t Au)	Maximum (g/t Au)	Coefficient of variation
Bulge	6,602	0.96	27.34	1.02
Twin Hills Central	5,745	1.16	26.33	0.98
Clouds	2,026	1.25	45.12	1.36
Twin Hills North	29	3.12	39.41	2.67
Clouds West 1	254	1.19	8.20	0.90
Clouds West 2	48	0.56	2.00	0.70
Kudu	178	0.69	2.05	0.48
Oryx	1,791	1.03	29.56	1.18

14.7.3 Top Cut Analysis

Grade cutting (top cutting) is generally applied to data used for grade estimation to reduce the local high grading effect of anomalous high-grade composites. In cases where isolated high-grade composites would unduly influence the grade estimates of surrounding blocks, without the support of other high-grade composites, top cuts are applied. These top cuts are quantified according to the statistical distribution of the composite population.

The 2 m composites were investigated for any top cutting requirements and implemented where required (Table 14.7.3). No top cutting was required for Bulge, Clouds West and Kudu.

Table 14.7.3 Summary Statistics for 2 m Composites Following Top Cutting

Domain	Count	Uncut Mean	Uncut CV	Top Cut	No. of Composites Cut	Value of cut Composites	Cut Mean	Cut CV
Bulge	6,599	0.96	1.02	-	-	-	-	-
Twin Hills Central	5,746	1.16	0.98	20	2	26.33, 22.2	1.16	0.95
Clouds	2,026	1.25	1.36	20	2	45.12, 25.7	1.23	1.14
Twin Hills North	29	3.12	2.67	6	2	25.25; 39.41	1.30	1.11
Clouds West 1	254	1.19	0.90	-	-	-	-	-
Clouds West 2	48	0.56	0.70	-	-	-	-	-
Kudu	156	0.71	0.47	-	-	-	-	-
Oryx	1,791	1.21	1.17	20	1	29.56	1.10	1.07

14.7.4 Variography

Normal score semi-variograms (variograms) were calculated and modelled for Bulge, Twin Hills Central, Clouds and Oryx. The normalised variograms were sufficiently stable to model and use in estimation (example for Twin Hills Central in Figure 14.7.1). The nugget and sill values of the variogram models for domains estimated using LUC were re-scaled using the proportions of the Supervisor normalised version so that the total variance equated to the variance of the domain with OK kriging weights applied (Table 14.7.4 and Table 14.7.5).

Due to the lower number of composites available to model variograms at Twin Hills North and Clouds West, the Twin Hills Central variogram model was applied to Twin Hills North and Clouds West. It is reasonable to expect that the statistical characteristics and orientation of the mineralization at Twin Hills North and Clouds West is similar to that of Twin Hills Central, since the mineralization originates from the same system, is hosted by the same lithologies, and is found along structures of similar orientations to that of the variogram model applied.

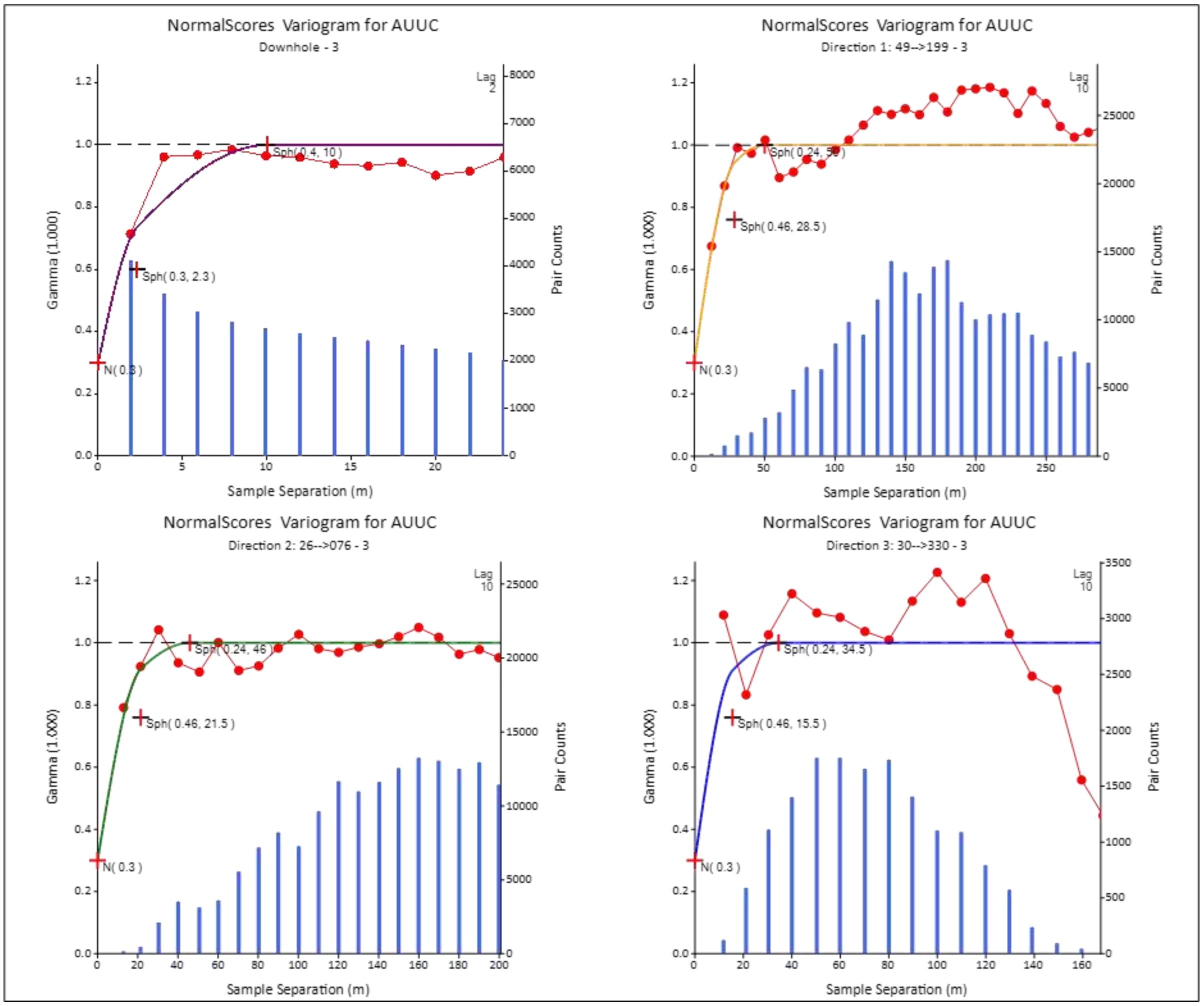
Table 14.7.4 Variogram Model (Datamine) Orientations Applied for Estimation

Domain	VANGLE1	VANGLE2	VANGLE3	VAXIS1	VAXIS2	VAXIS3
Bulge	-30	60	120	3	1	3
Twin Hills Central	-30	60	120	3	1	3
Clouds	-30	60	120	3	1	3
Twin Hills North	-20	67	45	3	1	3
Clouds West	-20	67	45	3	1	3
Kudu	157	75	60	3	1	3
Oryx	157	75	60	3	1	3

Table 14.7.5 Variogram Model Parameters Applied for Estimation

Domain	Nugget	ST1PAR1	ST1PAR2	ST1PAR3	Sill 1	ST2PAR1	ST1PAR2	ST2PAR3	Sill 2
Bulge	0.56	27.0	35.5	20.0	0.24	53.0	50.0	45.0	0.20
Twin Hills Central	0.42	24.5	20.0	22.5	0.43	50.0	39.0	40.0	0.15
Clouds	0.53	11.5	27.0	23.0	0.22	40.0	35.0	32.0	0.26
Twin Hills North	0.45	8.9	12.3	9.1	0.01	22.1	31.6	12.8	0.54
Clouds West	0.45	8.9	12.3	9.1	0.01	22.1	31.6	12.8	0.54
Kudu	0.66	70.5	56.5	30	0.42	100	82	86	0.19
Oryx	0.66	70.5	56.5	30	0.42	100	82	86	0.19

Figure 14.7.1 Normal Scores Variogram Model for Twin Hills Central



14.8 Bulk Density

Bulk density data were examined relative to the geological logging of lithology in 2021 (Table 14.8.1). It was observed that the bulk density values were in the most part similar, with the major lithology types ranging from 2.74 t/m^3 to 2.77 t/m^3.

Table 14.8.1 Bulk Density Statistics by Lithology During 2021 Investigation

Lithology	Count	Mean bulk density (t/m^3)
Interbedded Meta Greywacke	9,769	2.76
Meta Greywacke	4,346	2.74
Cordierite Meta Greywacke	1,203	2.76
Cordierite Schist	359	2.77
Biotite Schist	207	2.77
Quartz Vein	78	2.69
Pegmatite	71	2.69
Quartz Biotite Schist	40	2.75
Calc Silicate Unit	31	2.80
Graphitic Unit	27	2.75
absent	16	2.76
Graphitic Schist	7	2.73
Quartz Calcite Vein	2	-
Calcite Vein	1	-

As a lithology model was not interpreted nor constructed, such that bulk density values could be assigned to the model based on rock type, bulk density was further investigated relative to the weathering / oxidation state (and calcrete) using the latest available data. To derive robust bulk density estimates, outlier values were removed, and mean values computed (Table 14.8.2). These values were assigned to the model (for tonnage calculations).

Table 14.8.2 Bulk Density Statistics by Oxidation State (outliers removed)

Lithology	Count	Mean bulk density (t/m^3)
Calcrete	1,279	2.24
Oxidized	227	2.57
Transitional	2,906	2.65
Fresh	18,817	2.76

14.9 Block Model

14.9.1 Ordinary Kriging

A block model was constructed in Datamine that used the modelled wireframes as contacts. The block model covered the entire Twin Hills Project area (Table 14.9.1) and was coded according to lithology / weathering and mineralization (estimation) domain (Table 14.9.2). These codes aligned with the coding in the drillholes.

Table 14.9.1 Block Model Parameters (ordinary kriging)

	Minimum	Maximum	Range	Block Size	Block no.	Sub-Cell Size
X	596,580	603,340	6,760	20	338	5
Y	7,582,780	7,585,940	3,160	20	158	5
Z	600	1,400	800	5	160	1

Table 14.9.2 Block Model Coding

Field	Code	Description
ZONE	1	Calcrete
	2	Country Rock (waste)
	100	Bulge (≥0.4 g/t Au mineralization)
	200	Twin Hills Central (≥0.4 g/t Au mineralization)
	300	Clouds (≥0.4 g/t Au mineralization)
	400	Twin Hills North (≥0.3 g/t Au mineralization)
	500	Clouds West 1 (≥0.4 g/t Au mineralization)
	501	Clouds West 2 (≥0.4 g/t Au mineralization)
	600	Kudu (≥0.4 g/t Au mineralization)
	700	Oryx (≥0.4 g/t Au mineralization)
WEATH	1	Calcrete
	2	Oxide
	3	Transitional
	4	Fresh

14.9.2 Localized Uniform Conditioning

Grids were constructed in Isatis that represented panels and selective mining units (SMU). The grids covered the entire Twin Hills Project area (Table 14.9.3).

Table 14.9.3 Block Model Parameters (Localized Uniform Conditioning)

	Minimum	Maximum	Range	Panel Size	Panel Number	SMU Size
X	596,580	603,340	6,760	60	113	5
Y	7,582,780	7,585,940	3,160	60	53	5
Z	600	1,400	800	5	160	5

14.10 Grade Estimation

14.10.1 Ordinary Kriging

Grade was estimated into the coded block model from 2 m composites by ordinary kriging (OK). All contacts were treated as hard boundaries for estimation into 20 m x 20 m x 5 m parent cells. While all mineralized domains were estimated by OK, only the Twin Hills North and Clouds West OK estimates were used for Mineral Resource reporting. Bulge, Twin Hills Central, Clouds and Twin Hills West were reported from localized uniform conditioning estimates.

Search ellipses were set up based on the modelled variogram directions and ranges to locate 2 m composites for OK estimation. The Twin Hills Central variogram model and estimation parameters were applied for Twin Hills North and Clouds West. A minimum of 10 and maximum of 20 composites were required for a block to be estimated, with no more than 5 composites used from a single drillhole (search volume 1). If the minimum 10 composites were not located in the search ellipse, the dimensions of the ellipse were doubled and the search re-run (search volume 2). If the minimum composites were still not located, the original search ellipse was expanded such that all remaining un-estimated blocks were estimated (search volume 3) (Table 14.10.1 and Table 14.10.2).

Table 14.10.1 Search Parameters for Ordinary Kriging – Distance and Orientation

Domain	SDIST1	SDIST2	SDIST3	SANGLE1	SANGLE2	SANGLE3	SAXIS1	SAXIS2	SAXIS3
Bulge	30	75	30	-20	67	45	3	1	3
Twin Hills Central	78.5	46	34.5	-30	60	120	3	1	3
Clouds	48.5	50.5	32	-30	60	120	3	1	3
Twin Hills North	78.5	46	34.5	-30	60	120	3	1	3
Clouds West 1	76	65	45	-30	60	120	3	1	3

Domain	SDIST1	SDIST2	SDIST3	SANGLE1	SANGLE2	SANGLE3	SAXIS1	SAXIS2	SAXIS3
Clouds West 2	76	65	45	-30	60	120	3	1	3
Kudu	76	82	86	-30	60	120	3	1	3
Oryx	100	82	86	-30	60	120	3	1	3

Table 14.10.2 Search Parameters for Ordinary Kriging – Samples and Volumes

Domain	MINNUM1	MAXNUM1	SVOLFAC2	MINNUM2	MAXNUM2	SVOLFAC3	MINNUM3	MAXNUM3	MAXKEY
Bulge	10	20	2	10	20	3	10	20	5
Twin Hills Central	10	20	2	10	20	3	10	20	5
Clouds	10	20	2	10	20	3	10	20	5
Twin Hills North	10	20	2	10	20	3	10	20	5
Clouds West 1	10	20	2	10	20	3	10	20	5
Clouds West 2	10	20	2	10	20	3	10	20	5
Kudu	10	20	2	10	20	3	10	20	5
Oryx	10	20	2	10	20	3	10	20	5

14.10.2 Localized Uniform Conditioning

Bulge, Twin Hills Central, Clouds and Twin Hills West (Oryx + Kudu) were estimated using localized uniform conditioning (LUC) in Isatis. Composites from Oryx and Kudu were combined for LUC estimation.

The workflow was as follows:

- Import composites and block model grids from Datamine Studio RM.
- Variogram model fitting with re-scaled nuggets and sills.
- OK estimation of panels.
- Support correction.
- Uniform conditioning (UC).
- OK estimation from composites into SMU grid for SMU ranking.

- Localised uniform conditioning (LUC).
- Validation.

Estimation parameters

Grades were estimated into 60 m x 60 m x 5 m (XYZ) panels using OK. Sample search neighbourhoods were purposefully designed to be large to ensure a smoothed panel estimate for use in UC. For the ranking of SMUs, the maximum number of samples were decreased to ensure representative local estimates. Search neighbourhoods were isotropic (Table 14.10.3) however sample weighting for estimation utilized the variogram model.

Table 14.10.3 Search Parameters Applied for LUC

Grid	Size	SDIST1	SDIST2	SDIST3	MINNUM	MAXNUM
Panel	60 x 60 x 5	200	200	200	10	100
SMU	5 x 5 x 5	200	200	200	10	30

Support Correction

Anamorphosis modelling of the composites is the initial step for support correction. OK kriging weights were applied to the input composite dataset for point anamorphosis, and 80 polynomials were used in the modelling.

The block anamorphosis uses the point anamorphosis as an input along with the variogram for each domain. The block anamorphosis is calculated for the SMU grid (5 x 5 x 5 m) using an information effect of 12.5 m x 12.5 m x 1 m (proposed grade control drill density).

Block support correction values for each of the domains range from 0.60 to 0.78 (Table 14.10.4).

Table 14.10.4 Change of Support Calculations

Domain	Real Block Support Correction r	Kriged Block Support Correction s
Bulge	0.75	0.64
Twin Hills Central	0.78	0.73
Clouds	0.74	0.68
Oryx + Kudu	0.77	0.71

Uniform Conditioning

Estimation of recoverable resources was completed using uniform conditioning (UC). The ordinary kriged panels were used as inputs into the process, with resulting grade-tonnage curves for each panel at the SMU scale for gold grade. For a discretized grade-tonnage curve, 86 cut-offs were applied (to ensure sufficient discretization in the grade tonnage curves of the SMU) and 5 iso-frequency classes. The dispersion variance estimated through OK was used alongside the panel grade per domain.

Localization

The UC grade (M) and tonnage (T) factors of the panel were proportioned based on the domain SMU in the panel to estimate metal (Q), tonnage (T) and grade (M) in the domain.

To provide a block model for use in mine planning, SMU grades were estimated by OK and the resultant SMUs ranked from highest to lowest grade, with the grades being discarded and only the ranking retained. SMU grade values were then taken from the panel grade-tonnage curve and assigned based on ranking, through a process called localization. The result is the assignment of a grade value to each SMU, such that the SMUs in each panel equate to the grade-tonnage estimate of the panel.

Process Validation

Validation of the UC and LUC processes was performed by comparisons of:

- UC and OK panel estimates (Figure 14.10.1, left).
- Mean LUC grade within the panel and mean panel grade (Figure 14.10.1, right).
- UC and LUC grade tonnage curves (Figure 14.10.2).

Figure 14.10.1 Scatterplots Showing UC Panel Grade (x-axis) Versus OK Panel Grade (y-axis) (right) and Mean LUC Grade of SMUs (x-axis) Versus UC Grade (y-axis) (left) for Twin Hills Central

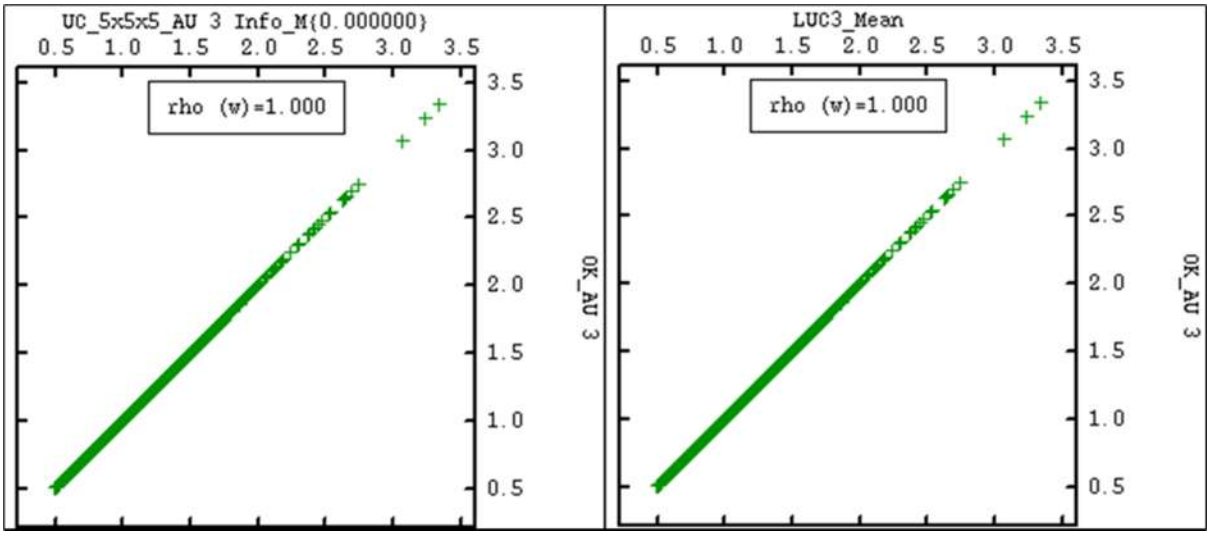
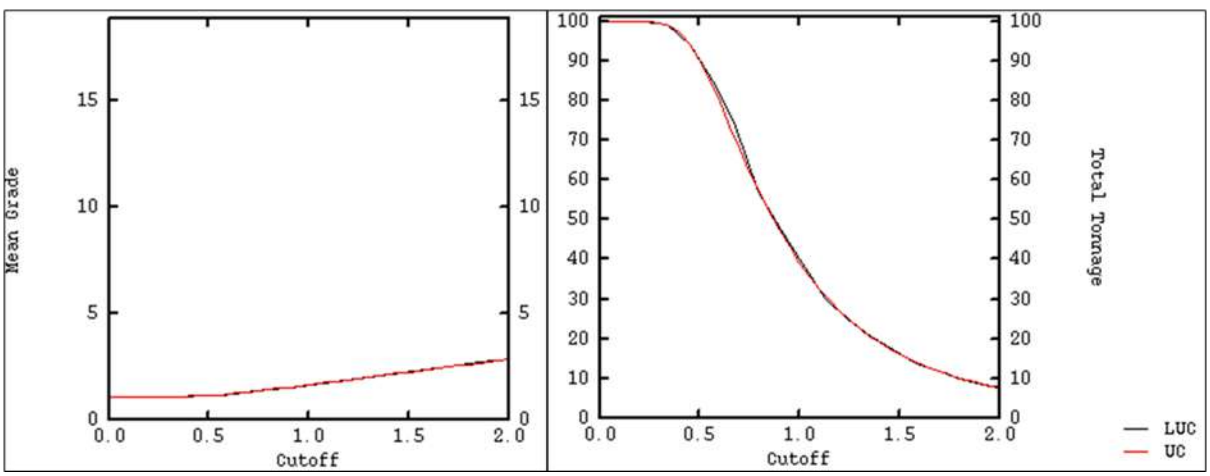


Figure 14.10.2 Grade (left) and Tonnage Curves (right) for Twin Hills Central



14.11 Validation of the Estimates

The final block model estimates were validated by:

- Global statistics.
- Swath analysis.

- Localized visual validation.

14.11.1 Global Statistics

Global mean values were calculated for the input composites and output estimates (Table 14.11.1). These were compared to assess the global representivity of the model vs the composites, and the reliability of the OK grades underpinning the UC/LUC estimate.

Table 14.11.1 Global Mean Values of Input Composites and Output Estimates

Mineralization Domain	Zone	Estimation Method	Input Composites mean g/t Au	Output Estimate mean g/t Au	Relative Difference %	OK Check Estimate mean g/t Au
Bulge	100	LUC	0.96	0.99	2.4	0.97
Twin Hills Central	200	LUC	1.16	1.12	-3.7	1.10
Clouds	300	LUC	1.23	1.26	2.2	1.22
Twin Hills North	400	OK	1.30	1.34	3.4	-
Clouds West 1	500	OK	1.19	1.15	-3.1	-
Clouds West 2	501	OK	0.56	0.57	0.2	-
Kudu	600	LUC	0.69	0.69	-0.3	0.69
Oryx	700	LUC	1.02	1.05	2.3	1.03

The comparison validates the global representivity of the model, with relative differences within 4% for all domains. The OK check estimates align with the LUC estimates.

14.11.2 Swath Analysis

A swath plots were compiled to validate estimates on a semi-local scale. This entailed comparing the mean of the input composites to the mean of the output estimates in 50 m wide north-south corridors and plotting these against each other (Figure 14.11.1 shows an example for Kudu). The swath plots show a reasonable and acceptable level of validation between the input composites and output estimates.

14.11.3 Localized Visual Validation

Cross sections were examined to compare the assay data against the estimated block model. This process validates the model on a local scale when comparing the estimated blocks in the vicinity of the input composites (Figure 14.11.2). The process showed a reasonable correlation between composites and estimates.

14.11.4 Summary

The model validated well, both globally and locally. The QP deems the model to be an acceptable representation of the input data, with the result that the model is suitable for Mineral Resource disclosure according to NI 43-101 standards.

LUC estimation uses post-processing of OK panel estimates to produce a recoverable Mineral Resource by using uniform and localized conditioning algorithms (UC/LUC). This method provides SMU scale block estimates that honour the theoretical grade-tonnage relationship determined from discrete Gaussian change of support. UC results for the OK panels are transferred to SMUs using LUC. Grades and locations of individual SMUs are not reliable and should only be considered on the basis of the size of the panel in which they are located. Mine planning studies should give due consideration of risk associated with grade estimates at the SMU scale.

Figure 14.11.1 Swath Analysis Plot for the Kudu Including Mean Values for Composites and Model

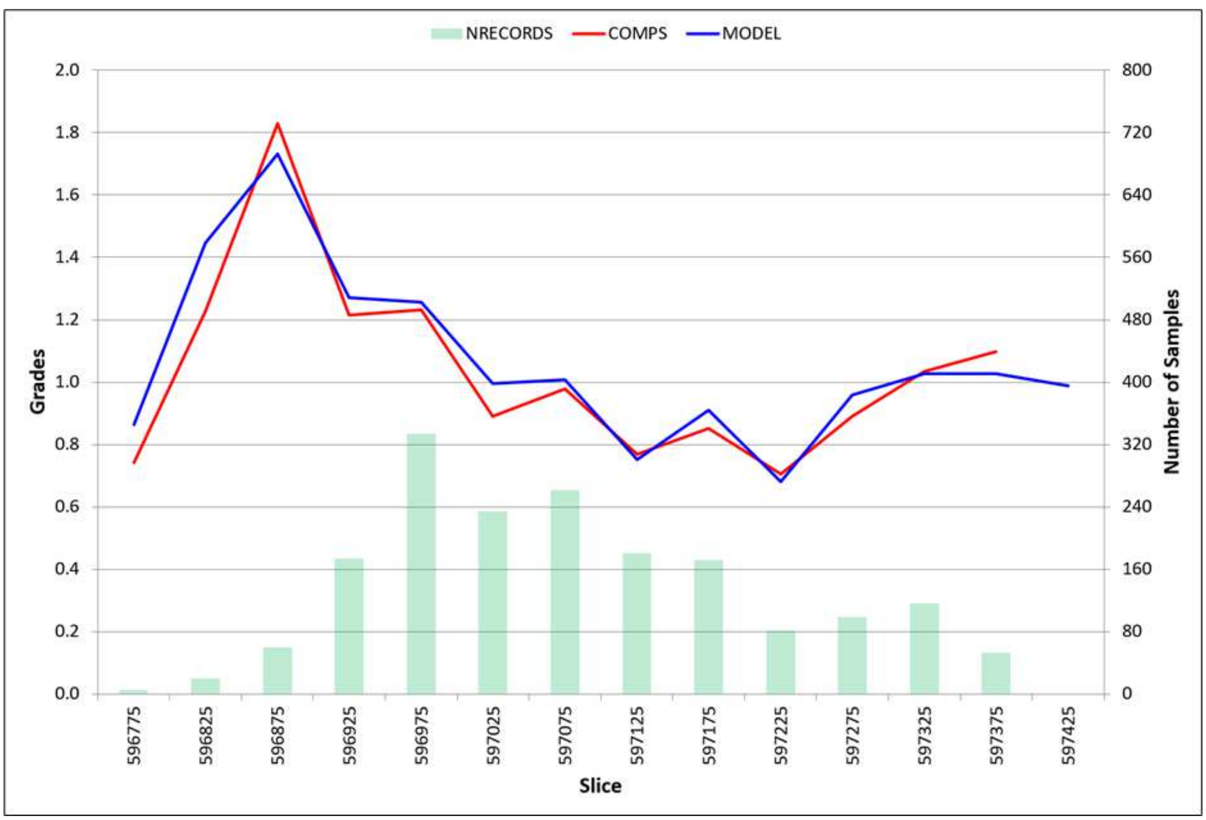
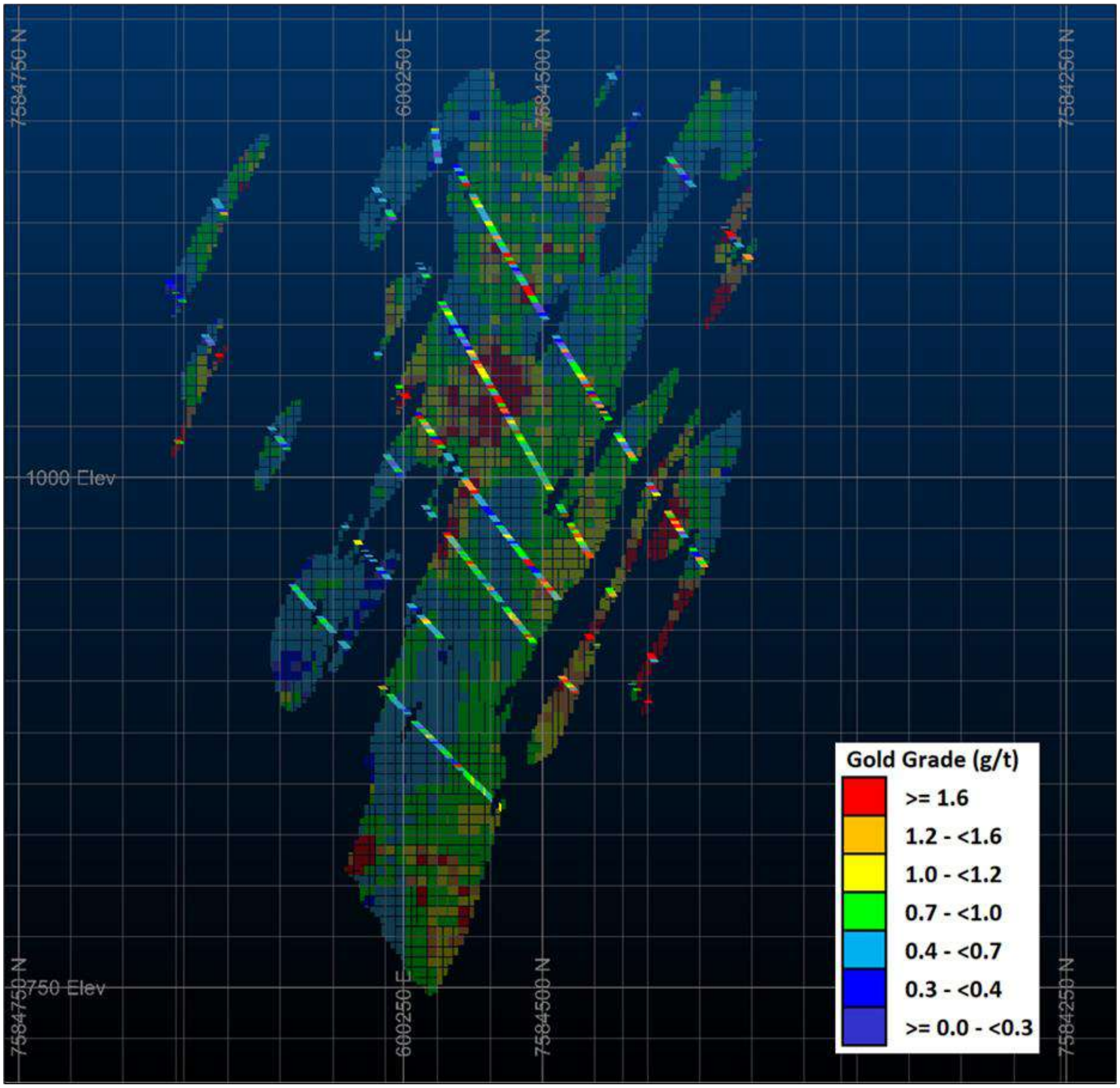


Figure 14.11.2 Cross Section Looking East at Bulge Showing the Visual Validation Between Gold Grade of the Composites and the Model



14.12 Reasonable Prospects for Eventual Economic Extraction (RPEEE)

A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade, or quality and quantity that there are RPEEE. To satisfy the requirement of RPEEE by open pit mining, reporting pit shells were determined based on conceptual parameters and costs supplied by Osino and reviewed for reasonableness by CSA Global (Table 14.12.1). Gold recovery would likely be achieved using a conventional crushing, milling, gravity, pre-oxidation, and CIL circuit.

A long-term gold price of US$1,800/oz was selected for the determination of RPEEE; however, conceptual pit shells were also calculated at prices of US$1,600/oz, US$1,700/oz, US$1,800/oz, US$1,900/oz, US$2,000/oz, US$2,200/oz and US$2,500/oz to assess the sensitivity of gold price. It was observed in most cases that the conceptual pit shells were similar, with increasing gold prices showing minor incremental increases in tonnage and gold content. Other than described in this report, there are no other known environmental, permitting, legal, title, taxation, socio-economic, marketing political or other factors which would materially affect the MRE provided herein.

Table 14.12.1 Conceptual Parameters Applied for the Determination of RPEEE

Parameter	Value	Unit
Gold price	1,800	US$/oz
Government royalty (3%) + Export levy (1%)	4.00	%
Selling costs – gold refining costs	0.55	US$/oz
Process plant recovery	90	%
Selling costs – gold transport costs	2.20	US$/oz
Weathered material – overall slope angle excluding ramps (toe to toe)	48	°
Fresh material – overall slope angle excluding ramps (toe to toe)	55	°
Mining costs – Mineralized material at pit rim	2.00	US$/t rock
Mining costs – Waste at pit rim	1.85	US$/t rock
Mining costs – Mineralization – elevation dependent	0.03	US$/t/10 m
Mining costs – waste – elevation dependent	0.03	US$/t/10 m
Process Plant costs – based on ROM material to the Plant	8.00	US$/t ROM ore
Process Plant costs – based on ROM material to the Plant including rehandling and grade control	0.15	US$/t ROM ore
General and administration cost	4.00	US$/t ROM ore

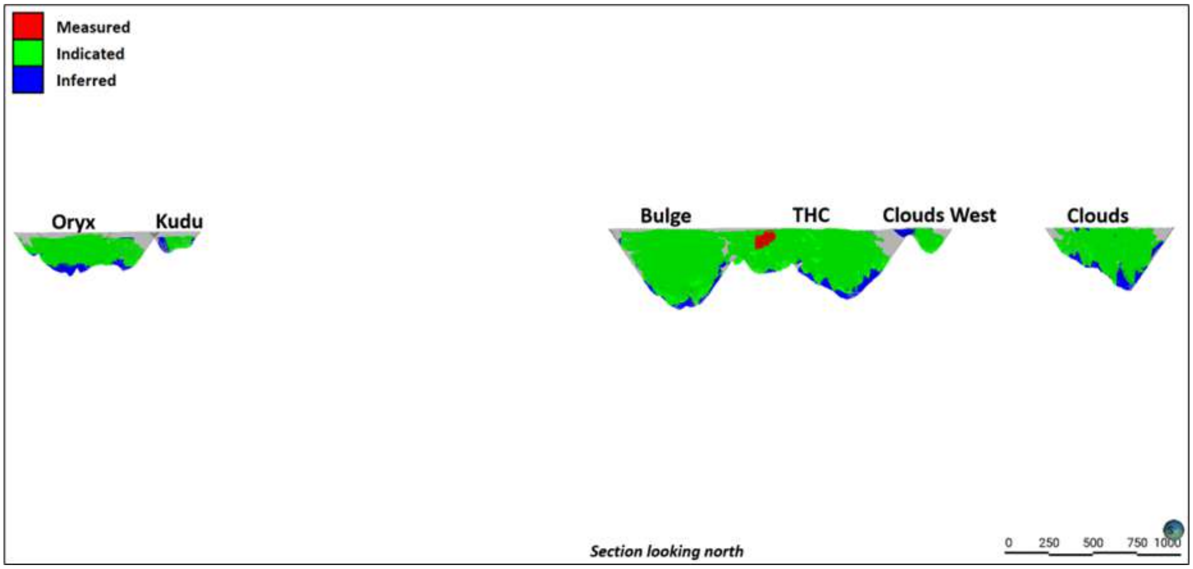
14.13 Mineral Resource Classification

The portion of the block model that satisfied RPEEE criteria was classified according to Mineral Resource confidence categories defined in CIM Definition Standards for Mineral Resources and Mineral Reserves. Data quality and quantity, geological and grade continuity, and confidence in the grade and density estimates, were considered when classifying the Mineral Resource.

Mineral Resources were classified as either Inferred, Indicated or Measured (Figure 14.13.1 and Figure 14.13.2). Measured Mineral Resources were classified where the modelled mineralization and grade estimates were supported by infill drilling spaced on a 12.5m x 12.5m grid on surface. Indicated Mineral Resources have generally been classified where the mineralization and estimation are supported by infill drilling at a spacing of 35m x 35m on surface. Inferred Mineral Resources are classified up to a drill spacing of 50m x 50m and no more than 50 m beyond drilling data. It is reasonable to expect that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued infill drilling.

Figure 14.13.1 Plan View Showing the Mineral Resource Classification Relative to the US$1,800/oz RPEEE Pit Shells

Figure 14.13.2 Cross Section Looking North Showing the Mineral Resource Classification Relative to the US$1,800/oz RPEEE Pit Shells



14.14 Mineral Resource Statement

The Mineral Resource is that material within the conceptual RPEEE pit shell above a 0.3 g/t Au cut-off grade (Figure 14.14.1). The Mineral Resource has an effective date of 15 March 2023 (Table 14.14.1).

Figure 14.14.1 Plan View Showing Mineral Resource in the US$1800/oz Reporting Pit Shell Above 0.3 g/t Au

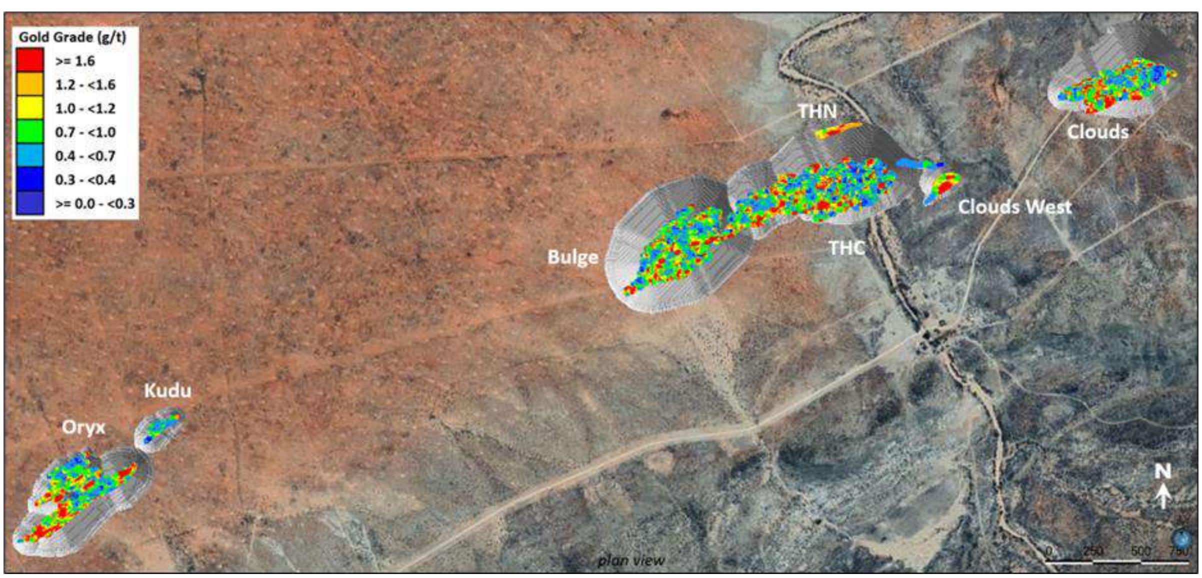


Table 14.14.1 Mineral Resource for the Twin Hills Gold Project at a 0.3 g/t Au cut-off as at 25 July 2022

Mineral Resource Category	Tonnes Mt	Grade g/t Au	Troy ounces Moz
Measured	0.7	1.48	0.03
Indicated	83.6	1.08	2.91
Measured + Indicated	**84.3**	**1.08**	**2.94**
Inferred	7.0	1.10	0.25

Notes:

- **Figures have been rounded to the appropriate level of precision for the reporting of Mineral Resources.**
- **Mineral Resources are stated as in situ dry tonnes; figures are reported in metric tonnes.**
- **The Mineral Resource has been classified under the guidelines of the CIM Definition Standards for Mineral Resources and Mineral Reserves and adopted by the CIM Council, and procedures for classifying the reported Mineral Resources were undertaken within the context of the Canadian Securities Administrators NI 43-101.**
- **The Mineral Resource is reported within a conceptual pit shell determined using a gold price of US$1,800/oz and conceptual parameters and costs to support assumptions relating to reasonable prospects for eventual economic extraction.**
- **Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.**

The MRE was carried out by Mr. Anton Geldenhuys (MEng), a registered Professional Natural Scientist (SACNASP, membership number 400313/04) of CSA Global, who is an independent Qualified Person as defined by CIM Definition Standards for Mineral Resources and Mineral Reserves in accordance with NI 43-101. Mr. Geldenhuys is a geoscientist, is qualified as a geologist (Honours) and engineer (Masters) and has over 22 years of relevant industry experience. Mr. Geldenhuys is member in good standing of the South African Council for Natural Scientific Professions (SACNASP) and has sufficient experience relevant to the commodity, style of mineralization and activity which he is undertaking to qualify as a Qualified Person under NI 43-101.

The Mineral Resource was also subdivided by domain (Table 14.14.2).

Table 14.14.2 Mineral Resource for the Twin Hills Gold Project at a 0.3 g/t Au cut-off by Domain, as at 15 March 2023

Domain	Measured & Indicated			Inferred		
	Tonnes Mt	Grade g/t Au	Troy Ounces Moz	Tonnes Mt	Grade g/t Au	Troy Ounces Moz
Bulge	38.5	0.99	1.22	2.3	1.04	0.08
Twin Hills Central	27.8	1.15	1.03	2.2	1.03	0.07
Clouds	9.9	1.29	0.41	1.8	1.26	0.07
Twin Hills North	0.1	1.37	0.004	0.0	1.20	0.000

Domain	Measured & Indicated			Inferred		
	Tonnes Mt	Grade g/t Au	Troy Ounces Moz	Tonnes Mt	Grade g/t Au	Troy Ounces Moz
Clouds West	0.6	1.23	002	0.1	0.65	0.002
Kudu	0.6	0.70	0.01	0.2	0.82	0.004
Oryx	6.8	1.10	0.24	0.6	1.24	0.02
Total	**84.3**	**1.08**	**2.94**	**7.0**	**1.10**	**0.25**

The estimated block model has been tabulated at various cut-off grades (Table 14.14.3). This tabulation does not represent a Mineral Resource in any way and only serves to illustrate the nature of the mineralization and sensitivity to various cut-offs.

Table 14.14.3 Classified Block Model within the Conceptual RPEEE Pit Shell at Various Cut-off Grades

Cut-off grade g/t Au	Measured & Indicated			Inferred		
	Tonnes Mt	Grade g/t Au	Troy Ounces Moz	Tonnes Mt	Grade g/t Au	Troy Ounces Moz
0.3	**84.3**	**1.08**	**2.94**	**7.0**	**1.10**	**0.25**
0.4	82.5	1.10	2.92	6.9	1.11	0.25
0.5	77.7	1.14	2.85	6.5	1.15	0.24
0.6	70.0	1.21	2.71	5.8	1.22	0.23
0.7	60.5	1.29	2.51	5.0	1.31	0.21
0.8	51.0	1.39	2.29	4.3	1.41	0.19
0.9	42.5	1.50	2.05	3.6	1.51	0.18

14.15 Previous Mineral Resource Estimate

The previous Mineral Resource was reported as of 25 July 2022 using a 0.3 g/t Au cut-off and US$1800/oz gold price (Table 14.15.1).

Table 14.15.1 Mineral Resource for the Twin Hills Gold Project at a 0.3 g/t Au Cut-off as of 25 July 2022

Mineral Resource Category	Tonnes Mt	Grade g/t Au	Troy ounces Moz
Indicated	81.3	1.08	2.83
Inferred	7.2	1.05	0.24

Notes:

- **Figures have been rounded to the appropriate level of precision for the reporting of Mineral Resources.**
- **Mineral Resources are stated as in situ dry tonnes; figures are reported in metric tonnes.**

- **The Mineral Resource has been classified under the guidelines of the CIM Definition Standards for Mineral Resources and Mineral Reserves and adopted by the CIM Council, and procedures for classifying the reported Mineral Resources were undertaken within the context of the Canadian Securities Administrators NI 43-101.**
- **The Mineral Resource is reported within a conceptual pit shell determined using a gold price of US$1,700/oz and conceptual parameters and costs to support assumptions relating to reasonable prospects for eventual economic extraction.**
- **Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.**

The Mineral Resource is not materially different to the previous Mineral Resource as relatively few additional data were available for the update.

15.0 MINERAL RESERVE ESTIMATES

15.1 Introduction

Qubeka Mining Consultants CC (Qubeka) was appointed by Osino Gold Exploration and Mining (Pty) Ltd (Osino Gold Exploration and Mining) to conduct the Mining Study (Project) of the Twin Hills Gold Project Feasibility Study (DFS). Osino Gold Exploration and Mining is the Namibian subsidiary of Osino Resources Corp. (Osino), a Canadian gold exploration and development company focused on the fast-tracked development of their Twin Hills Gold Project (Twin Hills) in central Namibia.

The DFS was prepared by Lycopodium Minerals Africa (Pty) Ltd. (Lycopodium) in accordance with Canadian National Instrument 43-101 - Standards of Disclosure for Mineral Projects (NI 43-101) and contemplates a low-risk, technically simple open-pit mine utilizing contract mining and feeding a conventional carbon-in-leach (CIL) metallurgical plant processing five million tonnes of mineralized material per annum (Mtpa). The scope of work that formed the basis of the DFS mining study comprised the following mine planning cycle as depicted in Figure 15.1.1.

- Pit Optimization: The position and shape of the final pit boundary is optimized given the geological and economic parameters of the deposit as well as the mining, processing, and market parameters.

- Mine Design: The optimal pit shell generated during pit optimization is further refined by a detailed pit design which incorporates access ramps, bench configurations and detailed mining constraints.

- Mine Production Schedule: The material contained within the designed pit shell is then scheduled according to feasible tonnage and processing plant targets.

- Equipment Requirements: The mobile equipment requirements are based on the mining schedule.

- Mining OPEX and CAPEX: The mining operating and capital cost estimate for the study.

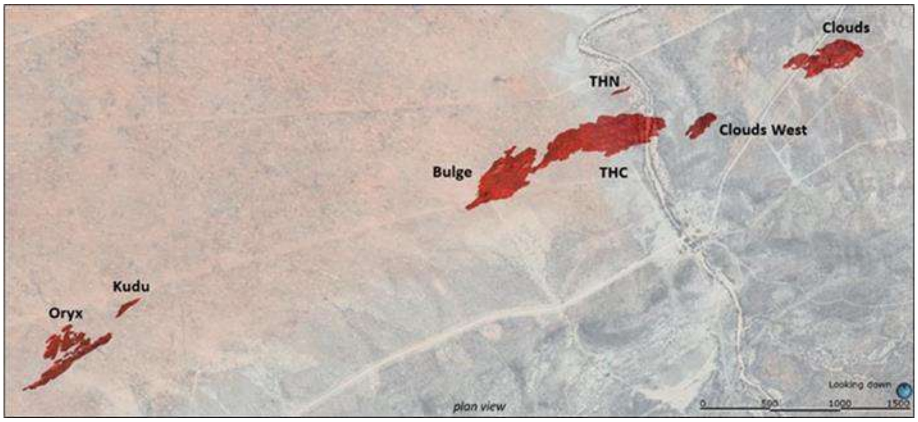
Figure 15.1.1 Mine Planning Process

This study has been conducted using the March 2023 Mineral Resource for the Twin Hills Gold Project conducted by CSA Global Mining Industry Consultants ('CSA'). A total of 225,574 m of drilling from 1,069 holes (135,980 m of diamond core from 482 holes and 89,594 m of RC drilling from 586 holes) has been completed towards completing a resource estimate at Twin Hills since 2019.

The project mineral resource consists of the following mineralized domains, as depicted Figure 15.1.2.

- The Main Pit consists of the Twin Hills Central (THC), Bulge and Twin Hills North (THN) mineralized targets.
- The surrounding Satellite Pits comprise of the Clouds, Clouds West, and Twin Hills West (THW) (also known as Oryx and Kudu) mineralized targets.

Figure 15.1.2 Twin Hills Mineralized Domains (CSA, 2022)



15.2 Input Assumptions and Broad Mining Strategy

15.2.1 Inferred Resource Strategy

The Canadian Institute of Mining, Metallurgy and Petroleum (CIM) considers the confidence in inferred mineral resources insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure. Inferred resources were excluded from the Twin Hills pit optimization runs and the Mineral Reserves estimate and were classified as waste during the life of mine (LOM) production schedule runs. The current reserve pit design contains less than 1.0 % Inferred classified ore tonnes. There is reasonable confidence that the majority of these Inferred tonnes will be converted to the indicated resource category by additional in-fill drilling over the LOM and this is seen as an upside to the project.

15.2.2 Input Assumptions

Table 15.1.1 shows the major assumptions used to generate the Twin Hills Gold Project DFS Mineral Reserve Estimate.

Table 15.2.1 Major DFS Mineral Reserve Input Parameters

Parameter	Units	Values
Base Currency		USD (US$)
Base Date		Q1 of 2023
Exchange Rate – Real	NAD:USD	17.50
Discount Rate (for NPV Calculation)	%	5.00
Base Gold (Au) Price – Real	**USD /oz**	**1,700**
Government Royalty (3%) + Export Levy (1%)	%	4.00

Parameter	Units	Values
Metal Credit	%	99.90
Net Gold Price	**USD /oz**	**1,630.23**
Selling Costs – Gold Refining Costs	USD /oz	0.55
Selling Costs – Gold Transport Costs	USD /oz	2.20
SMU Block Size	X (m) x Y (m) x Z (m)	10 x 5 x 2.5
Mining Dilution	%	11.0
Mining Losses	%	-3.0
Plant Throughput	**Mtpa**	**5.00**
Average Process Plant Recovery	%	92.92
Average Mining Costs	USD /t Rock	2.73
Process Plant Costs – Incl ROM Rehandling Costs	USD /t RoM Ore	9.32
Whittle Total Fixed / Period Cost (SG&A Cost)	M USD /annum	23.39

15.2.3 Mining Method and Equipment Strategy

The orebody will be mined as a conventional shovel and truck operation, with bulk mining augmented by more selective mining in areas with narrow ore zones. For the purpose of the Twin Hills Gold Project DFS, it has been assumed that mining will take place by conventional open pit methods as shown in Figure 15.2.1 and that the whole mining operation, except for the mine technical services function, will be outsourced to a reputable mining contractor company (Contractor). The Contractor's scope includes drilling, blasting, loading, and hauling of ore and waste material. The merits of contract mining include:

- Contractors can quickly deploy equipment and specialist work force addressing skills, staffing and equipment shortages,
- Junior mining companies can increase their scale of operations without making significant investments in capital and labour,
- Under-capitalized mining companies are provided with the means to develop their mines more rapidly and cheaply than if they had relied on conventional sources of finance; and
- Reputable contract mining companies provide mines with improved operational and best practices, cost efficiency, and effective performance and safety management systems.

The Contractor will be responsible for supplying all materials, equipment, facilities and services, supervision, and labour necessary to carry out the mining operations according to the mining contract specifications. This contract will include the following elements:

- Generally, the contract involves the drilling, blasting, loading and haulage of waste and ore material from the mining area to specific waste rock dumps and ore stockpile locations in the project's mining area. The contract includes providing support services to allow safe and efficient performance.

- On a routine basis, the contract requires mining selected ore zones, loading, hauling, and stockpiling together with the waste stripping required to expose the ore.

- Grade control stockpiles and ROM stockpile re-handling operation.

- Mobilization and establishment of personnel, equipment, and infrastructure.

- Construction of new roads and maintenance of all roads including dust suppression necessary for the performance of the project.

- Construction and maintenance of all necessary bunds, drains and ore stockpile pads.

- Stripping and placing overburden and waste material on waste rock dumps and the shaping thereof.

- Production, trim, and pre-split drilling and blasting of all material.

- Loading and hauling of ore material to a stockpile or directly into the tipping arrangement, as instructed by mine management.

- Creating and maintaining the ore stockpiles at the designated area.

- Supplying all equipment to perform the activities required.

- Mining, hauling, and stockpiling of ores and mineralised waste at the crusher or nominated stockpiling areas, including any drilling, and blasting as necessary.

- Mining, hauling, and waste dumping at nominated dumping areas, including any drilling and blasting as necessary.

- Secondary breakage of oversized rocks in pit and at the crusher or stockpile (as necessary).

- Minor dewatering works including the excavation of sumps, pumping and provision of drains in and around the pit to direct water to locations where it may be handled by the Contractor's main dewatering facilities.

- Maintenance of waste dumps and ore stockpiles.

- Provision of an approved all weather in pit and ex pit haul road surface to be made from suitable materials found in pit or as nominated by the Contractor from another source approved by mine management.
- Regular periodic maintenance of the site haul roads within the BCM rates.
- In-pit water handling.
- Establishment, re-instalment and maintenance of access ramps and haul roads on site.
- Maintenance of own equipment.
- Logging of mining data as required by mine management for performance management.

Figure 15.2.1 Typical Open Pit Mining Method

The height of the mining benches is usually determined according to the physical characteristics of the mineralization, the ore body, the distribution thereof in the host rock and the size of the mining equipment. Drilling and blasting will be performed on 5.0 m benches for ore and selective waste material; and 10.0 m benches for bulk waste material. The entire waste benches will be excavated in a bulk mining fashion with excavators on two 5.0 m bench flitches. In contrast, the mineralised benches will be selectively loaded in two 2.5 m flitches to minimise dilution. The truck and shovel match on the ore and waste benches have been considered and are planned as follows:

- A fleet of 200-t hydraulic backhoe excavators will be employed for selective ore and waste loading, including bulk loading for entire waste benches.

- 100-t capacity, off-highway rigid haul trucks will be used, and standard open-pit drilling equipment will be required.

Due to the large-scale mining envisaged, the backhoe excavator would be the preferred loader choice. The remainder of the mining production fleet consists of support equipment, including graders, track and wheel dozers, front-end loaders, rock breakers, and utility excavators. Diesel-powered truck and shovel operations, combined with an effective drill and blast plan, are well understood, highly flexible and have significant manufacturer support, due to the population of equipment worldwide compared to electric-powered mining equipment. At this project stage, a standard drill, blast, truck shovel operation would be considered the lowest operating risk mining method, in terms of cost and productivity. As such, the diesel-powered truck shovel operation has been selected as the preferred case for this study.

It is assumed that the Contractor will operate 361 days per annum (allowing for three lost days for public holidays and five lost days for weather downtime) on a 24-hour basis with shifts rotating on three- by eight-hour duration. Due to the anticipated unavailability of local skills, the technical services (geology, mine planning and surveying departments) owner mining team will include an expatriate contingent to ensure operation start-up is safe and ramp-up targets are met.

An approved localisation plan will be established to train and equip the Namibian workforce sufficiently to enable and ensure a seamless transition of responsibilities over time. The bulk of the equipment operators are expected to be unskilled (approximately 80 %) and will require training from a basic level. The start-up strategy for the contract mining operations takes account of this requirement.

The pit with interim pushbacks will be mined to allow for the deferring of waste stripping as far as possible. Most of the higher-grade feed ore is situated in the deeper areas within the pit; therefore, access to these areas is crucial. The pushback stages were designed to provide access to the shallower portions of the orebody.

Scheduling waste stripping and ore mining within the various pushbacks will optimize the plant feed grade while ensuring ROM stockpile capacity as far as possible. The stockpile strategy is to maintain at least two months of ROM ore on finger stockpiles to allow for flexibility in blending to optimize recovery and plant throughput. The two months are considered optimal and sufficient to manage the risk of model variability, allowing for stripping and eliminating the possibility of inherent ore supply disruptions from the pits. After mining stops, the processing plant will continue running on low-grade stockpiles as long as the gold produced returns a positive cash flow.

15.3 Geotechnical Study

15.3.1 Introduction

Following the completion of the Prefeasibility Study (PFS), Osino requested SRK Consulting (South Africa) (Pty) Ltd ('SRK') to conduct a Feasibility Study (DFS) investigation of the pit slope stability on the Twin Hills Gold Project. SRK initially evaluated the geotechnical parameters of the slope design in all pit areas due to be mined during the Twin Hills project's life of mine.

The evaluation focused on the following:

- Updating the drillhole database with the DFS geotechnical holes.
- Investigating the BISH unit with the weak and highly jointed zones.
- Kinematic analysis to estimate the limitations of the slope design recommendations.
- Developing a new foliation model.
- Evaluation of hydrological data for pore water pressure.
- Analyzing stability of the slope design parameters using RocScience software.

The work carried out in the Feasibility Study continues from the pre-feasibility mining geotechnical study carried out by SRK in October 2022. A report outlining the PFS work carried out was submitted to Osino by SRK (SRK Report 569657: Mining Geotechnical Prefeasibility Study for Twin Hills Gold Project), with the addition of structural data from two drillholes and updates to the structural database and groundwater model. Items flagged as potential risks in the PFS were also investigated and more detailed analysis carried out on areas where bench scale structurally controlled failure was identified as a risk. The outcome of this study was to confirm the slope design parameters to a DFS level as well as the details of the work carried out are included in the body of the report. Due to the overlap in scope of work for the PFS and DFS studies it is important that this report be read in conjunction with the PFS report to understand the work carried out to define the slope design parameters presented in this report.

The work programme of the study is summarized as follows:

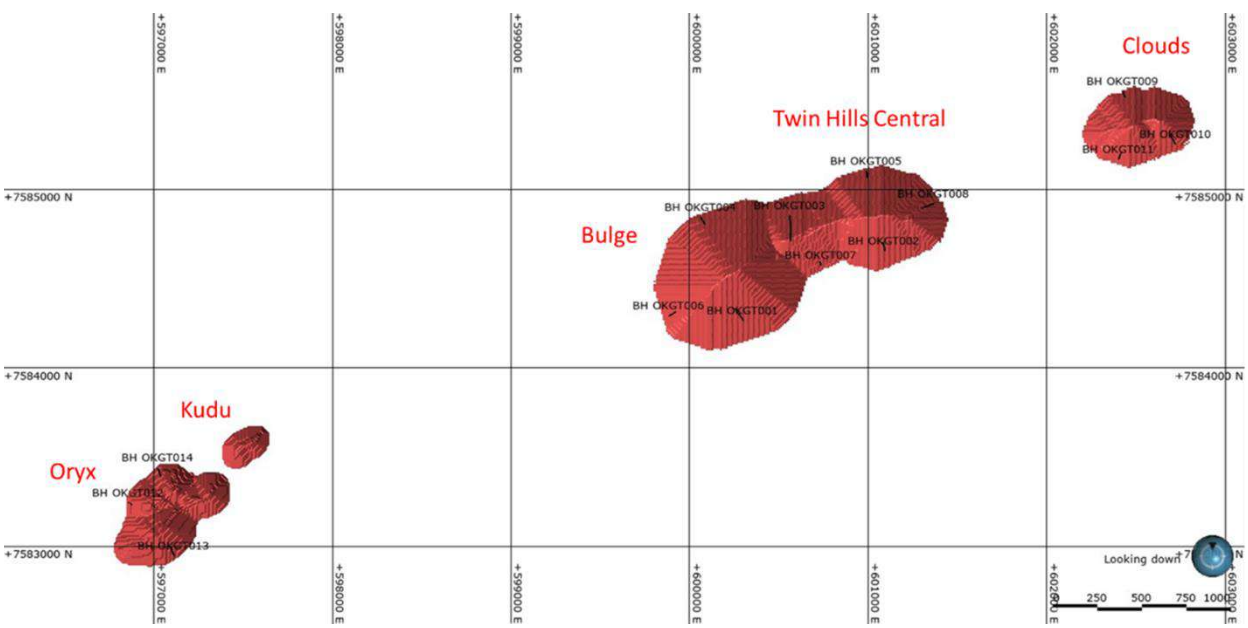
- Review and updating of the geotechnical model from the PEA and PFS studies, using additional geotechnical drillhole data. This includes updates of the:
  - Rock mass model
  - Hydrogeological model

 - Structural model
 - Geological model.

- Carrying out a slope stability analysis for representative sections across the planned pits including:
  - Limit equilibrium and finite element analysis of overall and inter-ramp faces
  - Kinematic analysis for benches and inter-ramp faces
  - Probabilistic limit equilibrium analysis on bench scale wedge failures.
- Provision of slope design recommendations based on results of slope stability analysis.

The location of geotechnical drillholes in relation to the pit shells is shown below.

Figure 15.3.1 Drillhole Location in Relation to the Pit Optimization Shells



15.3.2 Geological Model

A geological model comprising wireframes of major lithologies, weathering boundaries and large structures was confirmed during the PFS and was used again for the DFS without any changes.

Four major lithologies were identified and modelled:

- Calcrete
- Cordierite Schist
- Biotite Schist; and
- Metagreywacke.

Weathering zones included:

- Moderately Weathered (MW)
- Slightly Weathered (SW); and
- Unweathered (UW).

The major lithologies contain various rock types that are common in the Central Damara Belt, however the complexity is unknown as these individual rock types have not been modelled discretely to date. For the purpose of the study, geotechnical data was extracted per major lithology and weathering zone as per the geological model.

15.3.3 Structural Model

- Pit Scale Structural Model

Before the PFS a structural study was carried out by TECT Geological Consulting (April 2020), and a PowerPoint presentation provided detailing the outcomes of the study was provided to SRK as well as wireframes of the modelled brittle faults. Structurally, the ore body is located in NNW dipping limb of a large fold structure. The study looked at bedding, shear planes as well as late-stage brittle faults. Brittle faults include three sub-parallel, sub-vertical SW-NE trending faults (Middle, South Dipping and North Faults) as well as a moderately dipping SSW-NNE trending fault (NE Fault 1), all of which cut across the THC and Bulge pits. There is no data available to suggest that these faults extend and intersect the THW and Clouds pits.

Data suggests that the stratigraphy is overturned and has several direction reversals that are spatially coincident with internal parasitic folding. Two primary fabrics were identified in the study, including the S0/S1 which represented the bedding which is typically steeply dipping to the NNW/SSE; however, evidence of internal folding has been identified in SRK defect analysis, which shows a swing in the bedding orientation to the east and flattening of the bedding in some areas of the pit. The S2 which represents the Axial Planar Cleavage is steeply dipping to the NNW.

- Structural Defect Analysis

A structural defect analysis was carried out during the PFS based on all data obtained from structural logging of the geotechnical holes, as well as existing data from previous studies. The structural data was analysed spatially across the study area, in three dimensions, to identify any structural trends and three major structural domains were identified in the THC and Bulge Pit, four in the Clouds Pit and the three holes drilled in the THW pit showed little variability and as such was grouped into a single structural domain as shown in Figure 15.3.2 and Figure 15.3.3. Two primary fabrics were identified in the studies, including the S0/S1 which represented the foliation which is typically steeply dipping to the NNW/SSE.

The foliation identified from the drillholes correlated well with the S0/S1 however some evidence of internal folding was identified in SRK's defect analysis in the PFS, which shows a swing in the bedding orientation to the east and flattening of the bedding in some areas of the pit. Both studies identified the S2 fabric which represents the Axial Planar Cleavage which dips steeply to the NNW. It must be noted that only two drillholes (OKGT006 and OKGT008) were drilled roughly NE-SW and both holes identified a joint set steeply dipping to the NW-SE trending set that was not observed in the other holes, or in previous studies.

Figure 15.3.2 Sterographic Projections of Drillhole Data for the THW Pit

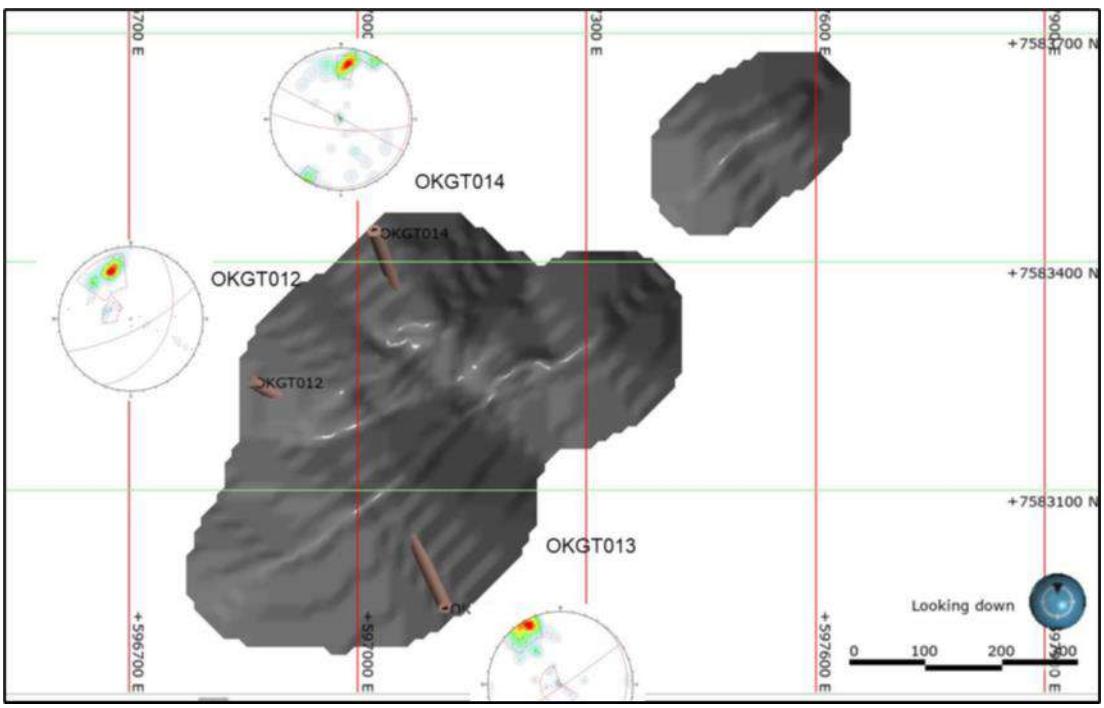
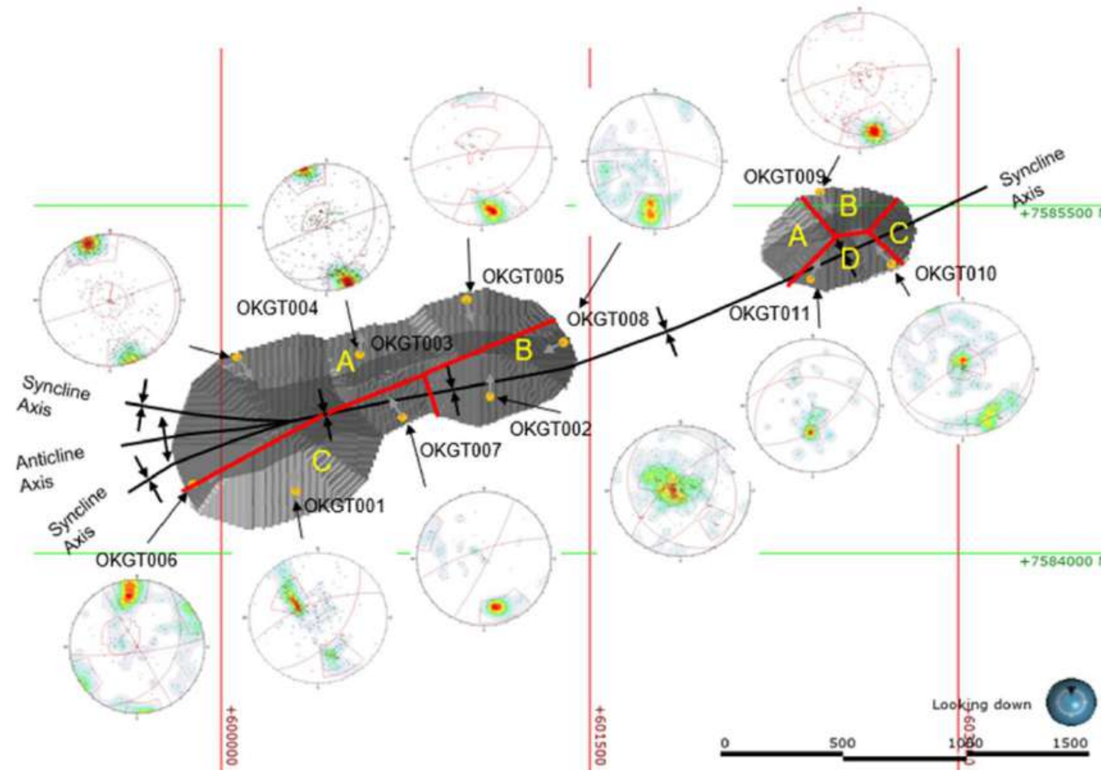


Figure 15.3.3 Stereographic Projectsions of Drillhole Data and Structural Domains Identified for the THC and Bulge and Clouds Pit



A summary of the major joint sets that were identified for each structural domain, and their orientations are presented in Table 15.3.1. The naming convention is kept constant in all the domains, where J1 is the foliation, J2 is the flat, generally SSE dipping set and J3 is the NW-SE trending set.

The structural domains, and the dominant joint set orientations identified per domain were used as a basis to determine the risk of structurally controlled failures across the study area.

Foliation Model

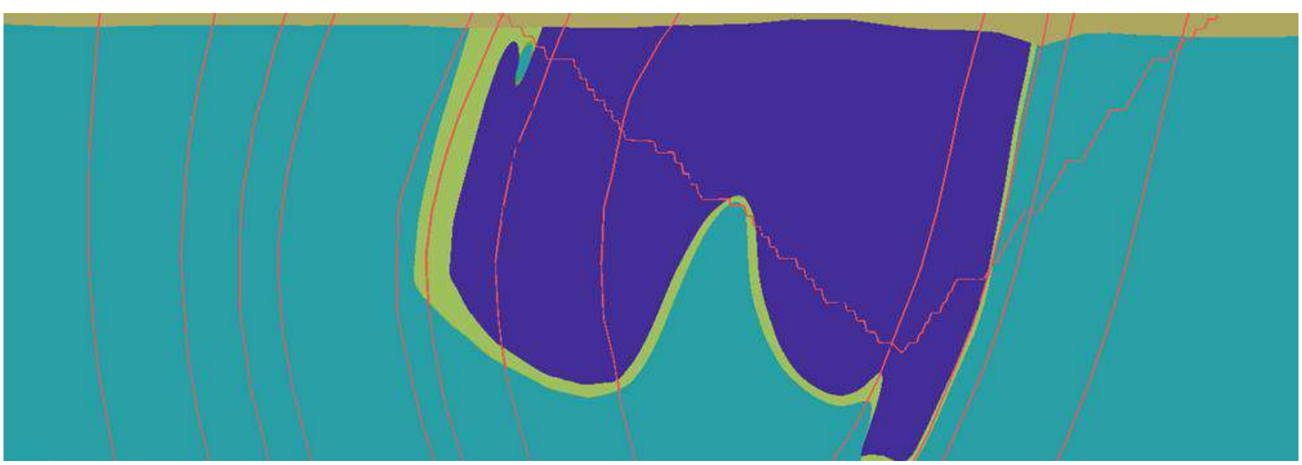
In addition to the structural model from the PFS, a foliation model was required to better understand the trends of the foliation and where the foliation could cause instability issues in combination with faults and mine design. Downhole foliation measurements were not aligning with the orientation of the contacts in the large -scale geological model, making it necessary to create a foliation model modelled from foliation measurements downhole. In creating the foliation model, multiple sections through the pits along with geotechnical and exploration drilling foliation measurements were analysed and foliation trends digitised. The exercise concluded that overall, the foliation still followed the idea of large-scale isoclinal synform. Although currently there is no data which supports / indicates a presence of a fold hinge at depth, there is also no data which rejects this assumption.

Table 15.3.1 Summary of Major Joint Sets Per Domain and their Orientations

	Set 1			Set 2			Set 3			Other		
Domain	Dip (°)	Dip Dir (°)	Fischers K	Dip (°)	Dip Dir (°)	Fischers K	Dip (°)	Dip Dir (°)	Fischers K	Dip (°)	Dip Dir (°)	Fischers K
THC&B A	89	342	23	25	126	14	89	56	15	-	-	-
THC&B A OKGT006 & OKGT008	89	178	14	24	80	14	88	243	29	-	-	-
THC&B B	73	2	24	17	41	20	62	64	17	48	114	45
	-	-	-	-	-	-	-	-	-	30	242	51
THC&B C	71	342	25	41	123	16	85	242	21	-	-	-
Clouds A and B	78	345	46	16	221	18	-	-	-	-	-	-
Clouds C and D	79	327	20	14	169	24	67	87	19	31	1	21
THW	76	156	17	19	119	15	-	-	-	-	-	-

Throughout the three pits, the overall dip of the northern and the southern foliation trends are observed to be largely similar, but it was still decided to estimate a separate trend for the north and the south slope to be used in the stability analyses. Figure 15.3.4 shows an example of the foliation interpretation through the centre of TH Bulge pit with the corresponding sections for each pit area.

Figure 15.3.4 Cross-Section NNW-SSE 1 Showing Foliation



Joint Strength Parameters

Joint strength characterisation was carried out, making use of the logged joint descriptors as well joint shear strength laboratory testing carried out. The Barton-Bandis method was used to estimate the discontinuity strength. This is explained more fully in SRK's report 569657 of May 2023.

The structural measurements for each domain were plotted and assessed, in order to gain an understanding of the prevalent joint conditions for each domain. Joint conditions for each set in each domain was evaluated and the following general observations can be made. Joint conditions are fairly regular across the domain and pits, where the foliation is more frequently described as planar than the remaining joints. In THC and Bulge, foliation is predominantly smooth planar, with a lot more scatter in the remaining joint sets, but dominantly smooth undulating. Most of the joints have no infill, with a minority showing some infill, more prevalent in the sets other than foliation. These trends remain constant for the Clouds and Twin Hills West pits.

Two assessments were undertaken for THC and Bulge Sec A, one for all the drillholes that are present in the domain, but due to drilling orientation bias, these holes do not adequately sample the NW-SE trending Set 3. A second plot is presented from Drillholes OKGT006 and OKGT008, which have representation of Set 3, due to further drill orientation bias, both holes are required to get the full representation of Set 3. A summary of the joint condition assessment is presented from Figure 15.3.5 to Figure 15.3.8, including histograms for the infill, joint micro-roughness and the joint roughness for the foliation / Set 1.

Figure 15.3.5 Summary of Joint Conditions for THC and Bulge Domain A

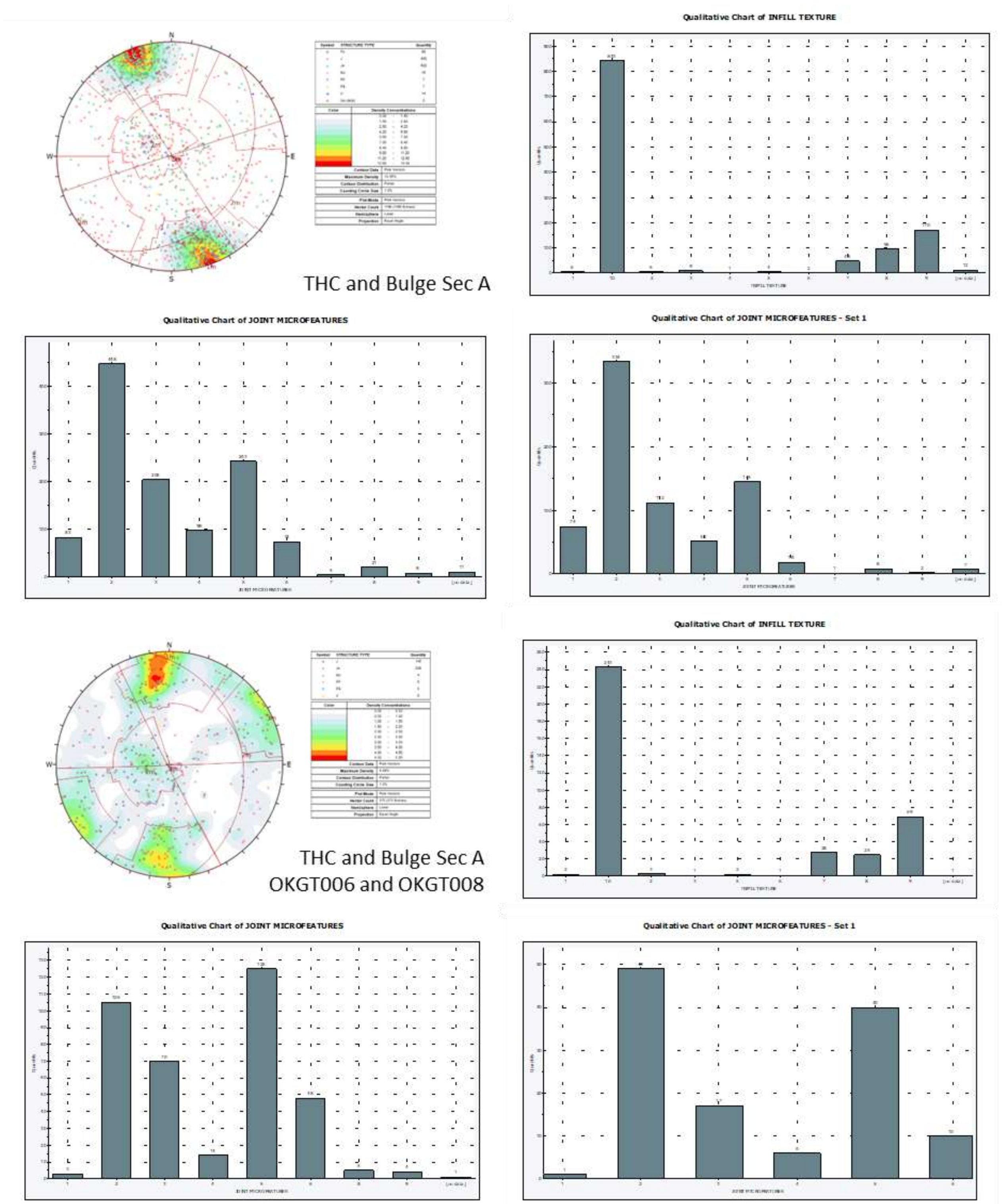


Figure 15.3.6 Summary of Joint Conditions for THC and Bulge Domains B and C

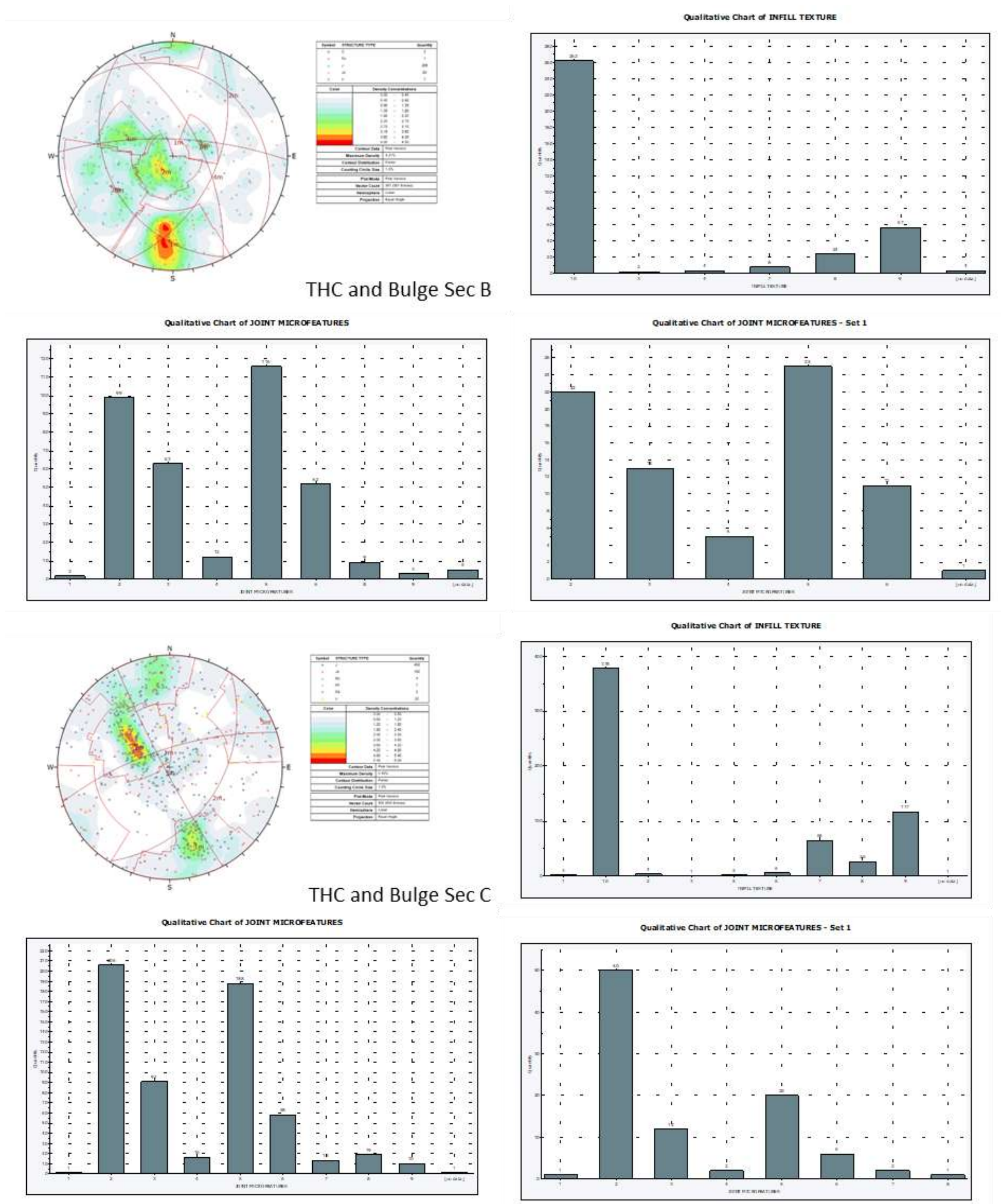


Figure 15.3.7 Summary of Joint Conditions for Clouds

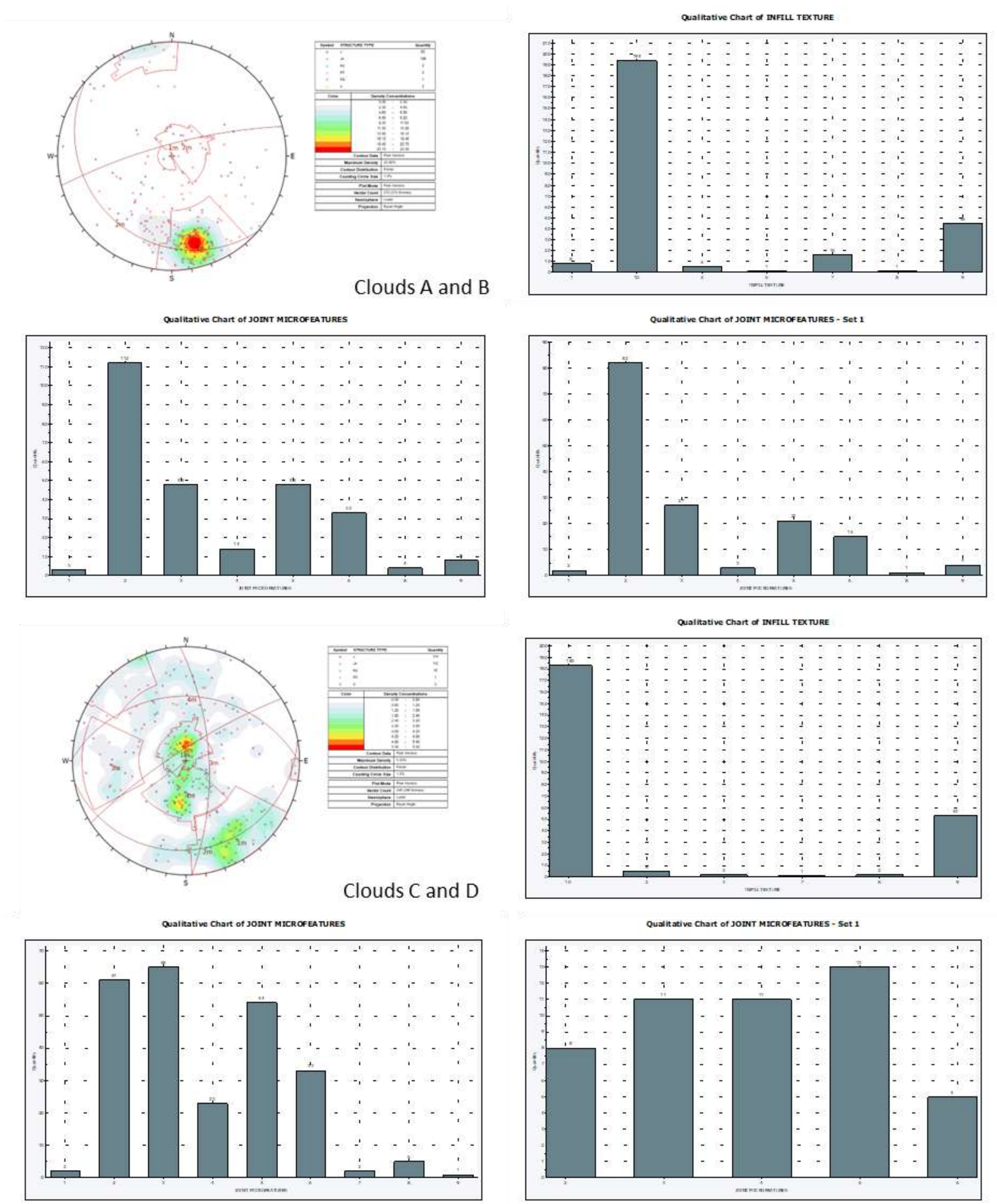
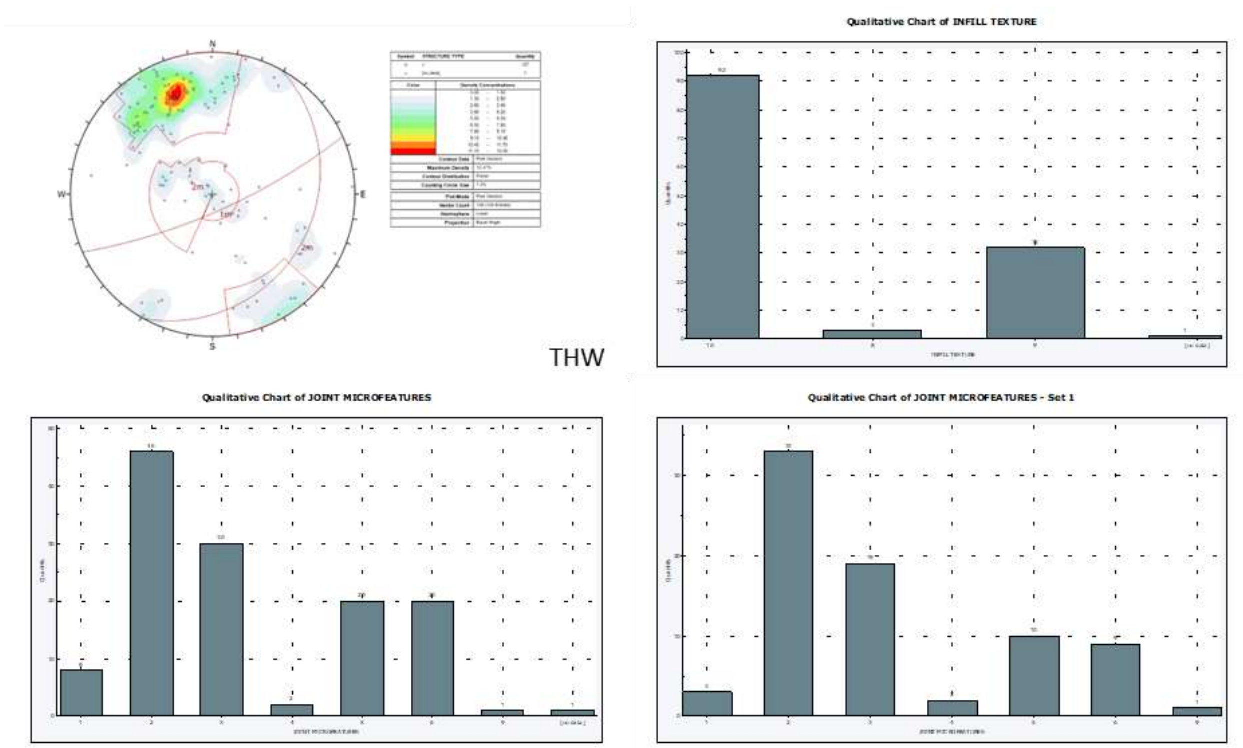


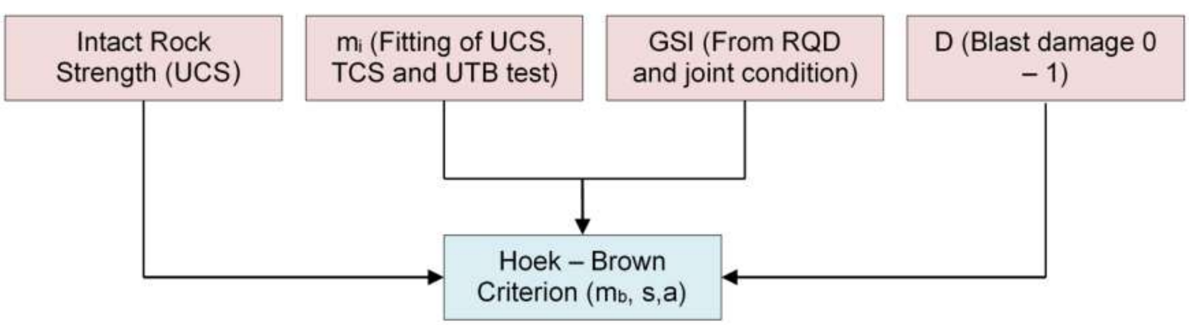
Figure 15.3.8 Summary of Joint Conditions for Twin Hills West



Rock Mass Model

The rock mass strength is based on the inputs of the Generalized Hoek-Brown Criterion and their statistical distribution, their inputs are summarized in Figure 15.3.9. These parameters have been derived from the geotechnical logging and laboratory testing database.

Figure 15.3.9 Methodology for the Estimation of Rock Mass Strength Parameters



All data used to define the rock mass model was available during the PFS study and includes all geotechnical logging and well as laboratory testing data. As no additional data was available, no changes have been made to the rock mass model from the PFS study, and details on the rock mass strength parameters are provided in the PFS report. A summary of the parameters used in the study per geotechnical domain is presented in Table 15.3.2.

Calcrete strength parameters were defined based on triaxial testing data and experience mining in similar material. Joint and foliation strength parameters were calculated using the Barton – Bandis method, which is based on logging of joint conditions and base friction angles derived from joint shear tests.

Table 15.3.2 Summary of Rock Mass Strength Properties

Lithology	m_i	GSI	UCS (MPa)	Density (g/cm^3)
CDSH MW	12	43	16	2.65
CDSH SW	12	50	30	2.71
CDSH UW	12	65	90	2.76
MGWK HW to MW	15	55	35	2.63
MGWK SW	15	55	45	2.67
MGWK UW	15	65	120	2.75
BISH HW to MW	10	55	35	2.7
BISH SW	10	60	35	2.7
BISH UW	10	65	70	2.7

15.3.4 Weak Zone Investigation

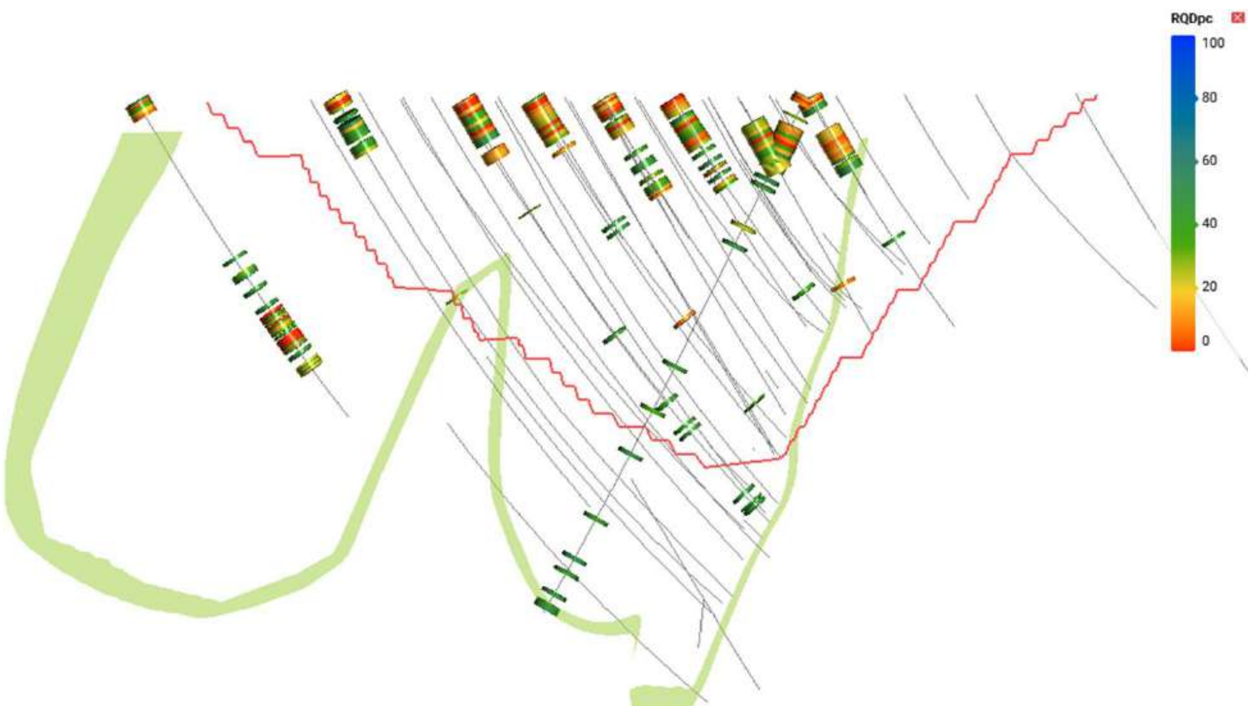
In the PFS, a weak, altered / weathered highly jointed zone was identified in some drillholes and appeared to be associated with the BISH unit, a possible weak contact. Discussions with the Osino geology team indicated that the original biotite schist unit was modelled in the weathered rock mass when biotite was identified in the core, and it was assumed to be continuous at depth. However, this assumption has since been disproven, the modelled late-stage large-scale steep structures that cut across the pit account for some of the weak zones in the core, but more zones are present.

As such, these zones required further investigation during the DFS. All the drillhole data available to SRK and recent geotechnical holes were used to investigate a possible trend and extent of the weak zone/s. The drillhole data was filtered for each RMR class of RQD and its distribution was investigated. In addition, a three-dimensional visual inspection of the zones was undertaken in Leapfrog. The analysis was also supplemented by RMR and GSI data where applicable.

The analysis of the boreholes showed that there are zones with lower RQD (<30%) within the THC area. These were attributed to the faults present in the area. A definite trend relating to the BISH unit was not identified. However, in some areas lower RQD trends were identified. This is shown in Figure 15.3.10.

The currently modelled large-scale structures do not pose a major risk to slope stability, because of their orientation, but they may cause local instability where they cut into the slope at low angles. However, the additional weak zone identified will require further investigation prior to mining to ensure that it follows a trend that does not negatively affect slope stability, similar to the trend of the known large-scale structures.

Figure 15.3.10 Cross Section Through THC Showing Lower RQD Values



The lower stacks on the north slope of THC and Bulge intersect a potentially poor geological geometry. The orientation of the structural measurements as well as the investigated weak zones were assessed in these areas, and no significant deviation from the foliation model was identified, it is therefore considered that this geometry does not pose a risk to the slope stability. This should be re-visited in future geological model upgrades.

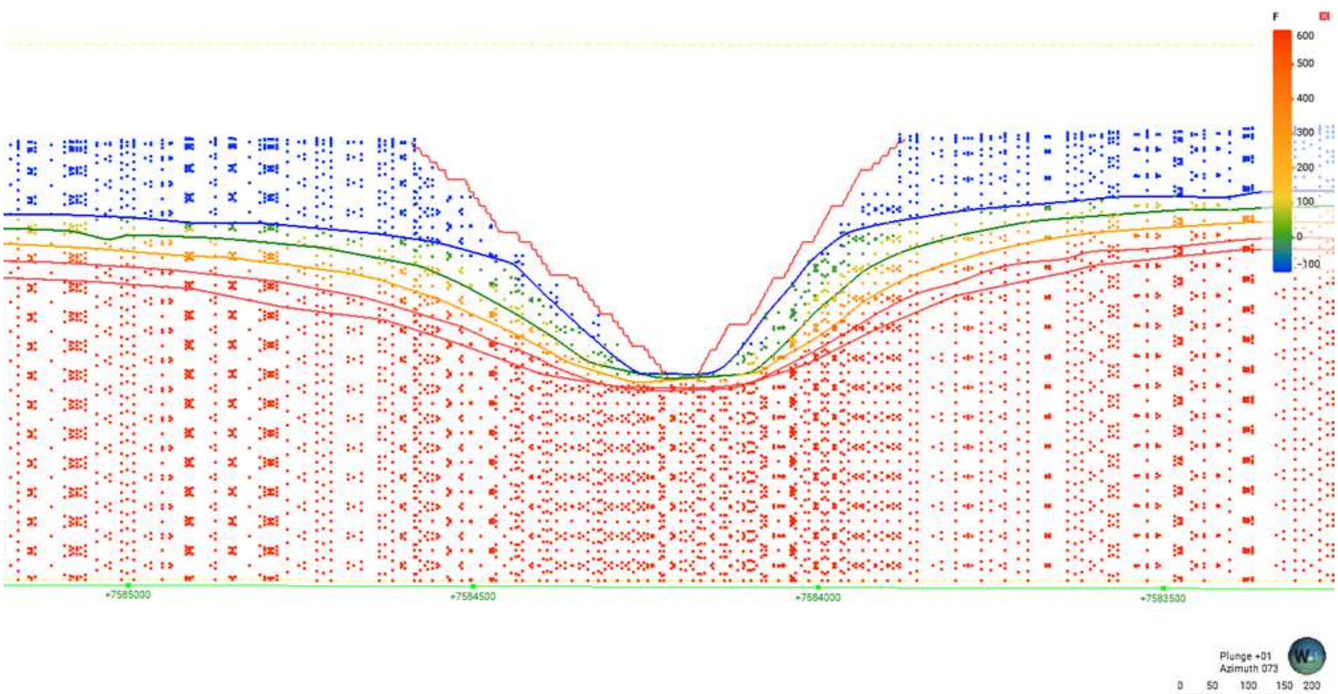
15.3.5 Hydrogeological Model

Previously no three-dimensional hydrogeological model was available and phreatic surfaces provided by Knight Piésold Consulting (KP) were applied to the section for the slope stability analysis. KP has subsequently carried out a hydrogeology study and developed a groundwater model for Osino. VWTs were installed, and pore water pressure data collected across the study area. The pore water pressure data set was provided by KP to SRK in April 2023 and was used in the two-dimensional stability analysis.

The three-dimensional numerical hydrogeological model provided by KP comprised pore water pressure measurements for each of the pits at the location of the respective geotechnical sections selected for analysis, an example of which is shown below in Figure 15.3.11. The model applied passive dewatering of the pit over the life of mine.

No active dewatering or groundwater abstraction was applied. For the two-dimensional stability analysis, the pore water pressure was modelled at 200 kPa intervals starting at 0 kPa. These were imported into the sections as pore water pressure grids.

Figure 15.3.11 Twin Hills Central Pore Water Pressure at 100 kPa Intervals



Despite low risk of elevated pore water pressures expected in the area, some seepage in the face is possible and dewatering is recommended as is good practice. Groundwater will likely not affect the overall stability of the slopes, however water along structures will reduce the shear strength thereby increasing the potential for structurally controlled failure.

15.4 Slope Stability Analysis

Slope stability analyses were carried out for slopes over a bench, stack, and overall scale. The details of the analyses are presented in the following sections. Kinematic analyses were conducted to identify possible modes of failure. Rock mass stability was assessed using limit equilibrium analyses.

15.4.1 Kinematic Analysis

As the drillhole database was updated, kinematic analysis was carried out to assess the stability of slopes. The analysis was based on structural domains as indicated in the PFS and details and results of the analysis are provided in the PFS report. For the THC and TH Bulge areas no new drillhole data was acquired for the DFS and the kinematic analysis of those areas was still considered representative and required no updates.

However, the Clouds pit was reanalysed including drillhole OKGT011 which was not included in the PFS study. Figure 15.4.1 shows the results for the Clouds Pit Domain D, considering slope dip directions from 340° to 020° (southern slopes). Based on the results the estimated toe to crest slope angles were 80° and 60° for the batter and inter-ramp angles respectively, which corresponds to results reported in the PFS. Twin Hills West kinematics were updated with the latest drilling data, including drillhole OKGT014 which was previously not available. As for the results from the Clouds pit, the kinematic results of THW correlated to those of the PFS. This is shown in Figure 15.4.2. Consequently, the kinematic analysis slope design limits from the PFS were maintained.

Figure 15.4.1 Probability of Wedge Failure for Clouds Pit, Domain D

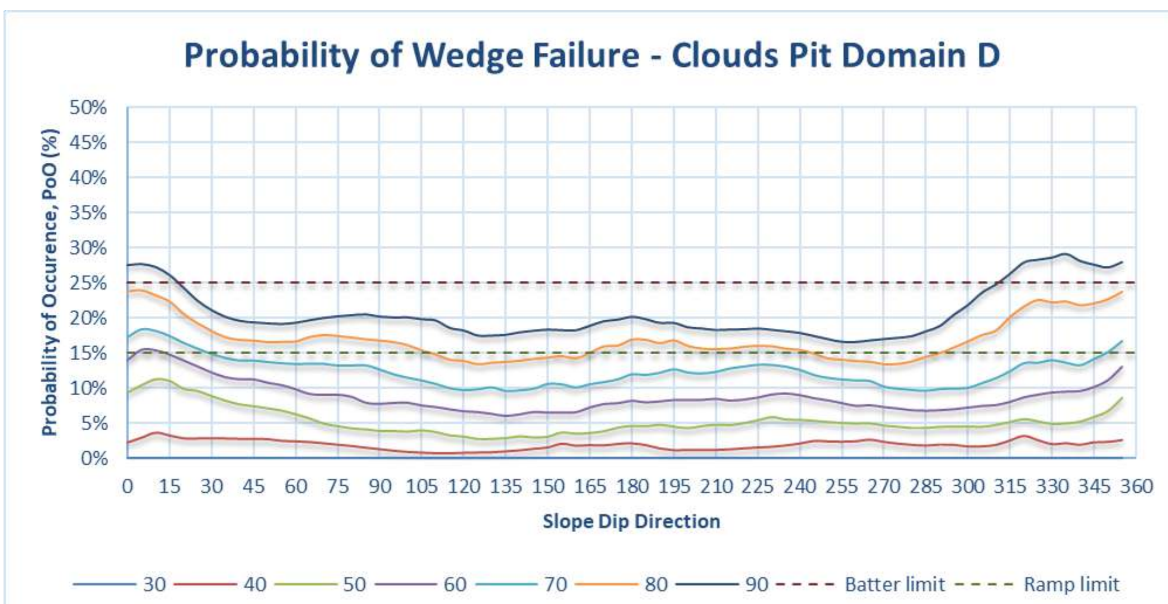
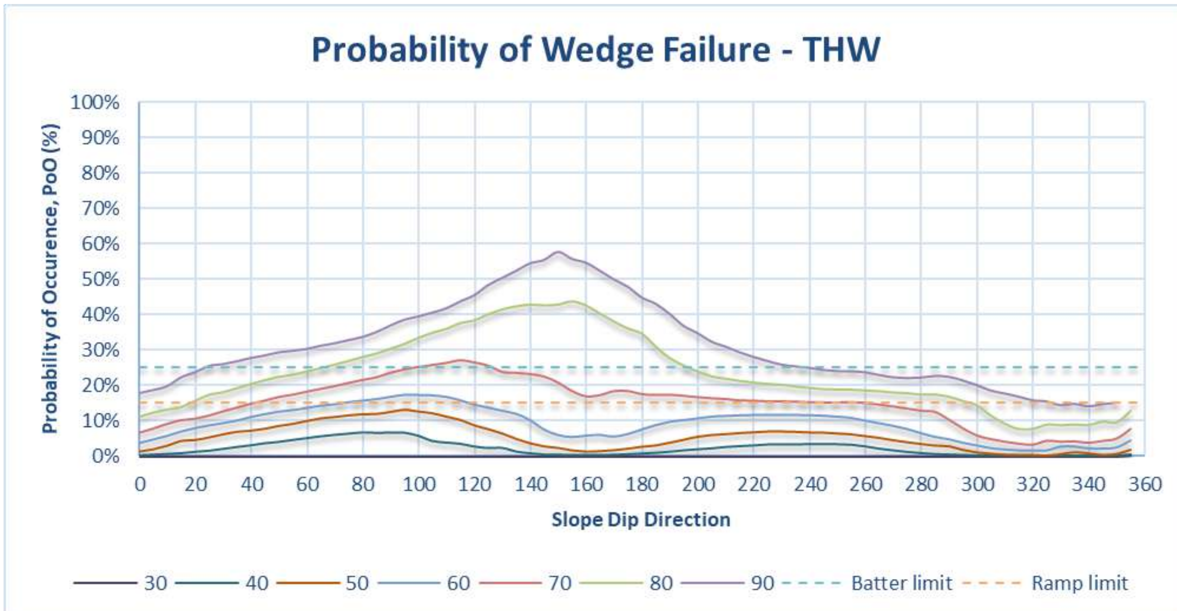


Figure 15.4.2 Probability of Wedge Failure for THW Pit



The batter and inter-ramp slope design limitations based on the results of the kinematic analysis is summarized in Table 15.4.1. It is important to note that the design considers some structurally controlled failures, as is standard practice, and that this needs to be managed operationally. It is therefore important that a double ramp system be implemented to ensure mining access if failure of a ramp does occur.

Table 15.4.1 Summary of Slope Design Limits Informed by Kinematic Analysis

	Toe to Crest Stack Angle (°)	Batter Angle (°)
TH Bulge North (Structural Domain A)	60	70
TH Bulge South (Structural Domain B)	63	80
TH BN North (Structural Domain A)	55	70
TH Central North (Structural Domain A)	60	70
TH Central South (Structural Domain B)	63	80
THC East End (Domain C)	63	80
Clouds Pit (Domain A)	60	70
Clouds Pit (Domains B - D)	60	80
THW Oryx Pit North	60	70
THW Oryx Pit South	60	80

15.4.2 Wedge Failure Analysis

Kinematic analysis identified the risk of structurally controlled wedge failure in THC and Bulge Domain A and Clouds Domain A. Kinematic analysis is a conservative approach in that it does not consider the geometry of the wedge which forms or any cohesion between the joint surfaces, additionally the impact of groundwater is not considered. For this reason, a more detailed analysis of wedges was carried out where the risk is identified, to determine the potential of these wedges to fail. Joints sets in Domains THC and Bulge Domain A and Clouds Domain A were analysed for the potential for wedge formation and the stability of these wedges. Joint orientations and strength parameters defined and reported previously were applied to the analysis. Analyses were limited to bench scale as the joint persistence is not known at this stage. With exposure and joint mapping an understanding of joint persistence is required to better define the risk of multiple bench and stack scale structurally controlled failures.

Twin Hills Central (THC) and Bulge Domain A

Due to the presence of the NW striking joint set, the data selected for the wedge analysis of THC and Bulge, Domain A was the combination of drillholes OKGT006 and OKGT008, as these had full representation of the set. The remaining holes were excluded since the high percentage of foliation measurements would result in a bias in the probability calculations.

Defect Sets 1 (foliation) and 3 (NW striking set) and their requisite orientation distributions were imported into SWEDGE for a probabilistic analysis, the joint shear strengths calibrated from the joint logging and laboratory testing were used along with the recommended batter angle of 70°. The probability of failure is based on the number of wedges that fail compared to the total number of wedges generated and presented in Figure 15.4.5.

The wedges that formed were predominantly slivers along the skin of the bench, along the foliation, which will largely break out during blasting and cleaning as indicated in Figure 15.4.3. This is expected, as the 70° batter angles was selected for this domain based on the kinematic measurements. The effect of groundwater was estimated by applying water to the joints, assuming the joint surface is open to surface at the crest and draining at the toe.

Clouds Domain A

Clouds Domain A was evaluated by importing the joints sets from drillhole OKGT009, which occurs on the same side of the fold hinge as the domain and a batter angle of 70° was analysed. Since the wedges identified in the kinematic analysis form on the foliation and with joint scatter, and not another distinctive joint set, a combination analysis was undertaken in SWEDGE. The impact of water on the wedge analysis was undertaken by applying water to the joints, assuming the joint surface is open to surface at the crest and draining at the toe.

The wedges in Clouds are highly sensitive to the presence of water which result in a significant increase in the probability of failure, above acceptance criteria. While the groundwater model indicates the phreatic surface below the pit surface, seepage from the water table into the pit will occur, resulting in water pressures developing on joint surfaces. This highlights the importance of ongoing slope depressurisation. As for the THC analysis, the majority of the wedges are thin surface wedges, The minimum factor of safety wedge is presented as Figure 15.4.4 and the results in Figure 15.4.5.

Figure 15.4.3 Representation of the Lowest Factor of Safety Wedge Identified in the THC and Bulge Domain A Wedge Analysis

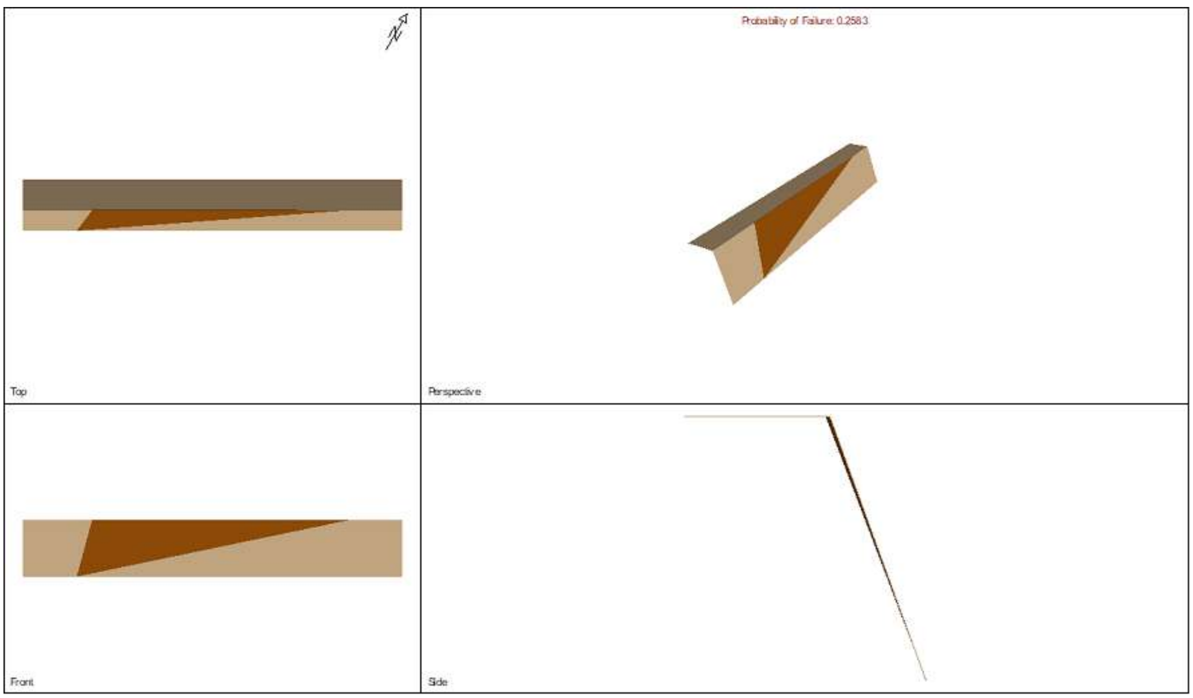
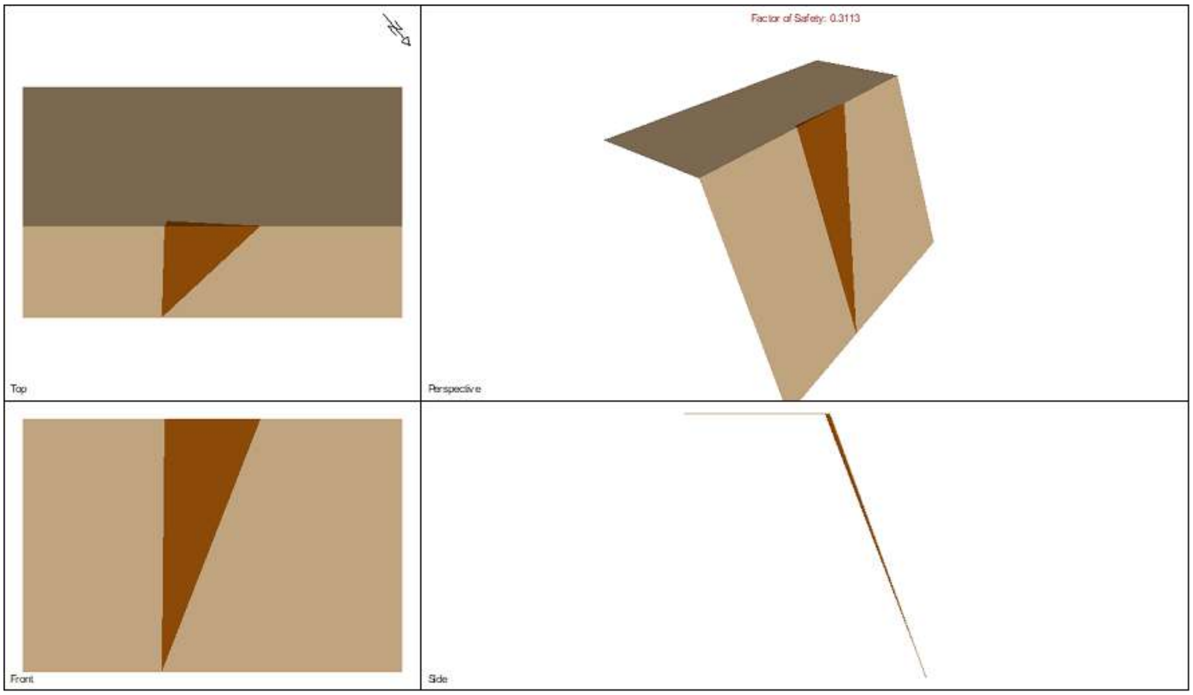
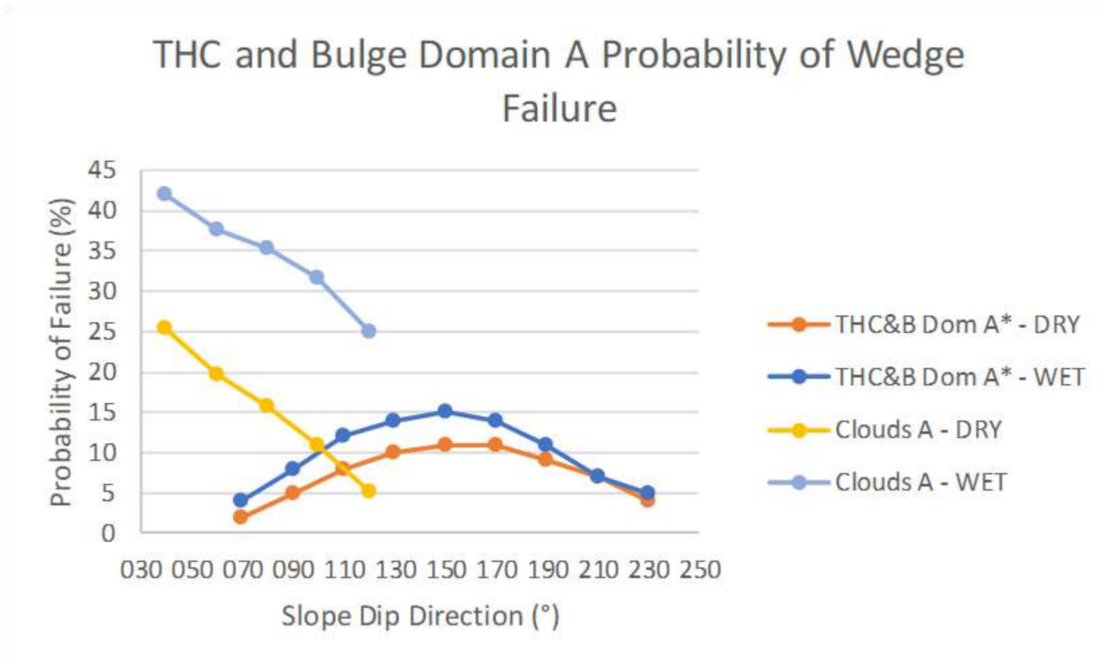


Figure 15.4.4 Representation of the Lowest Factor of Safety Wedge Identified in the Clouds Domain A Wedge Analysis



The results presented in Figure 15.4.5 show that THC and Bulge Domain A are more susceptible to wedge scale failures where the slope dips towards 150°, with the probability of failure dropping off in directions away from that. Clouds Domain A is marginally withing acceptance criteria for slopes dipping towards 040° with the PoF reducing rapidly as the slope dip direction increases, with dry joint conditions. Where the slope dip direction is less than 040° it is anticipated to be another domain, as this marks the intersection of the slope with the fold hinge. While the benches fall within the acceptance criteria of 25% for bench failure, it is important to note that wedge failures will occur and will require risk mitigation and management.

Figure 15.4.5 Results of the Wedge Analysis = Probability of Wedge Failure



* Based on drill holes OKGT006 and OKGT008

15.4.3 Limit Equilibrium Analysis

Rock mass stability analyses were carried out for the overall final pit slopes, and inter-ramp slopes using limit equilibrium and finite element (RS2) analysis techniques. Six geotechnical cross-sections were used to analyse the stability across the THC and Bulge, Clouds and West pits and the location of these sections are presented in Figure 15.4.6. Rock mass parameters previously defined for the geotechnical domains in the PFS were maintained and applied in the Slide2 models. Only one RS2 model was analysed, and the section is located in the TH Bulge pit. The TH Bulge pit was selected as this was the deepest section of the pits.

Stability analyses for THW were not conducted in the PFS due to delays in the receipt of pit plans. However, the design of the slope was informed by the kinematic analysis. Upon the completion of the stability analyses, the results validate the design recommendations for the THW pit made in the PFS. Two-dimensional limit equilibrium stability analyses were carried out using Slide2 of the RocScience suite of software.

The geology, rock mass strength parameters and pore water pressure grids were applied to all sections and models run to determine the FoS. Results of the analysis yielded Factors of safety (FoS) > 2 for all slopes, as a result of the strength of the material forming the final slopes. This exceeds the acceptance criteria of 1.5 for overall slopes suggesting that overall slope stability will not limit the slope design.

The result for Section NNW SSE 3 (representing the THC pit), SSE slope is presented in Figure 15.4.7. Table 15.4.2 shows the FoS results for all analysed sections. Further to the Slide 2 analysis, a finite element analysis was carried out in Rocscience (RS2) for TH Bulge (CS NNW-SSE 1). This was to compare with the limit equilibrium results. Figure 15.4.7 shows the results of the analysis. The model produced an SRF (FoS) of 1.66 which is also within the acceptable range. RS2 analyses typically have lower FoS than Slide, but the deepest section, with the lowest Slide FoS still has an SRF higher than the acceptance criteria of 1.3 to 1.5, indicating that no further RS2 analyses are required. Overall final pit slopes, and inter-ramp slopes using limit equilibrium and finite element (RS2) analysis techniques. Six geotechnical cross-sections were used to analyse the stability across the pits, including one cross-section in the ENE-WSW section through all pits except THW. Rock mass parameters previously defined for the geotechnical domains in the PFS were maintained and applied in the FS models. Only one RS2 model was built, and the section was located in the THC pit. The THC pit was chosen because of its depth and extent.

A sensitivity analysis was conducted on foliation which was included in the models to assess the potential impact of foliation on the overall stability of the pit slope. The results still yielded FoS > 1.9 for all sections, and a summary of all results is presented in the foliation was analysed using the Snowden anisotropic model, where a ubiquitous anisotropic surface is applied to the rock mass based on the expected foliation orientation and this acts as a directional weakness in the rock mass. The results of the anisotropic model are shown in Figure 15.4.8.

Figure 15.4.6 Cross Sections Locations Relative to the THC and Bulge and Clouds Pits

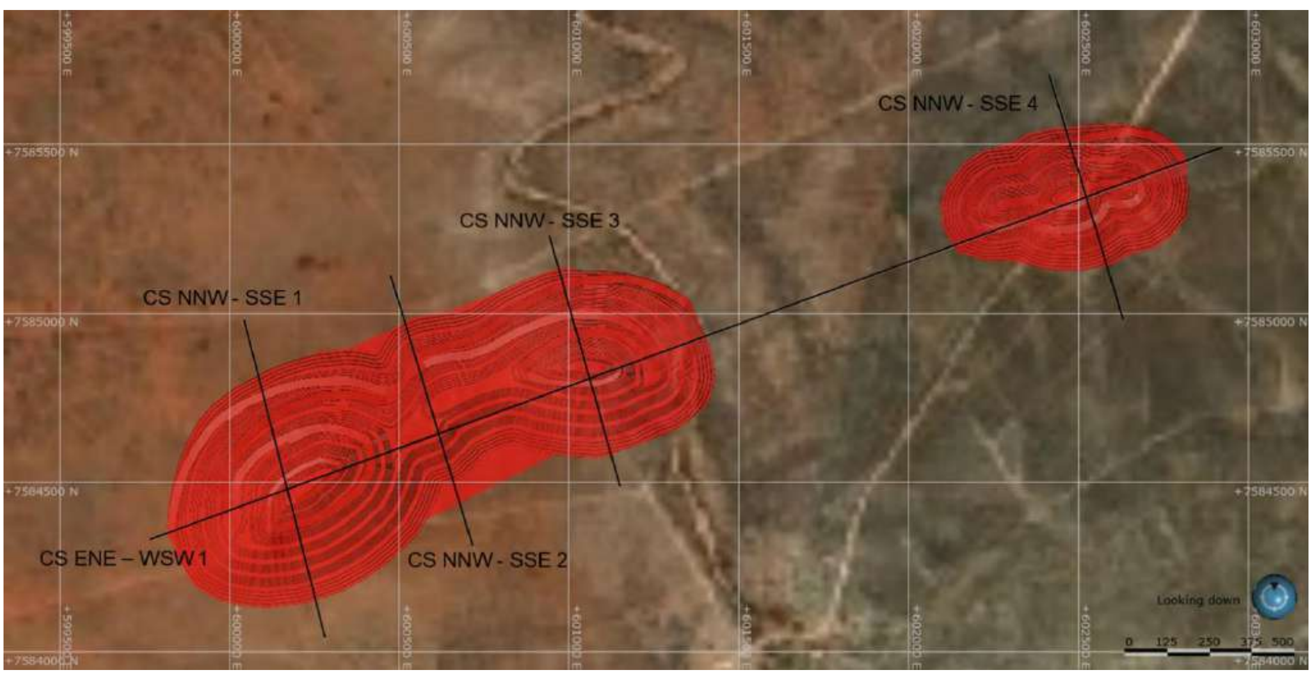


Table 15.4.2 Slope Stability Analysis Results

Slope Section	Isotropic	Anisotropic
TH Bulge North	2.22	2.04
TH Bulge South	2.05	1.94
TH Bull-Nose North	2.70	2.78
TH Bull-Nose South	2.95	2.97
THC North	2.58	2.55
THC South	2.69	2.63
Clouds North	3.25	3.35
Clouds South	2.99	2.87
THW North	2.30	1.85
THW South	3.40	3.17

Figure 15.4.7 Slide 2 Results for Section NNW SSE (THC), SSE Slope (FoS = 2.69)

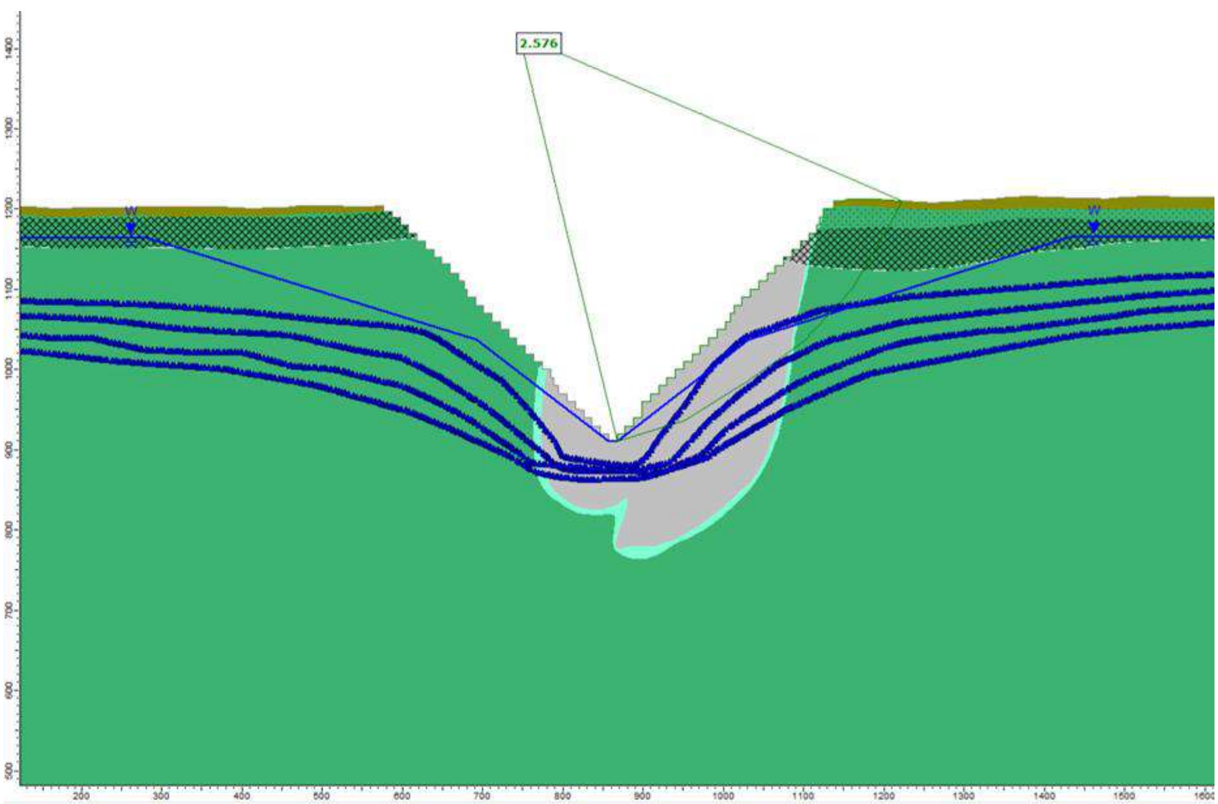


Figure 15.4.8 Slide 2 Results for Section NNW SSE 3 Anisotropic, SSE Slope (FoS = 2.9)

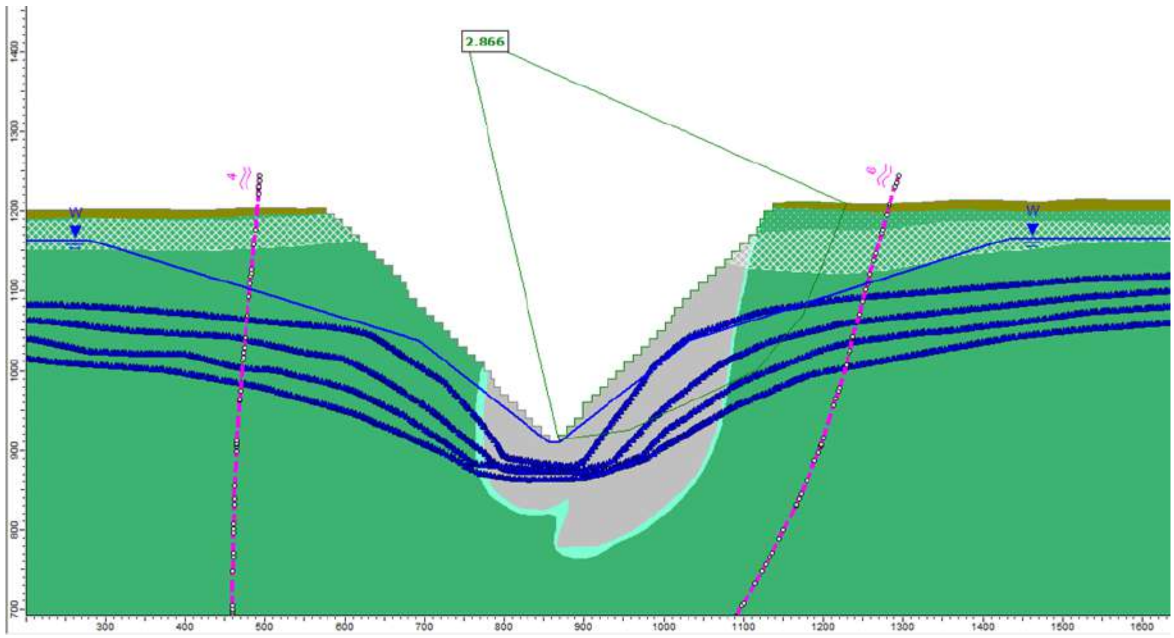
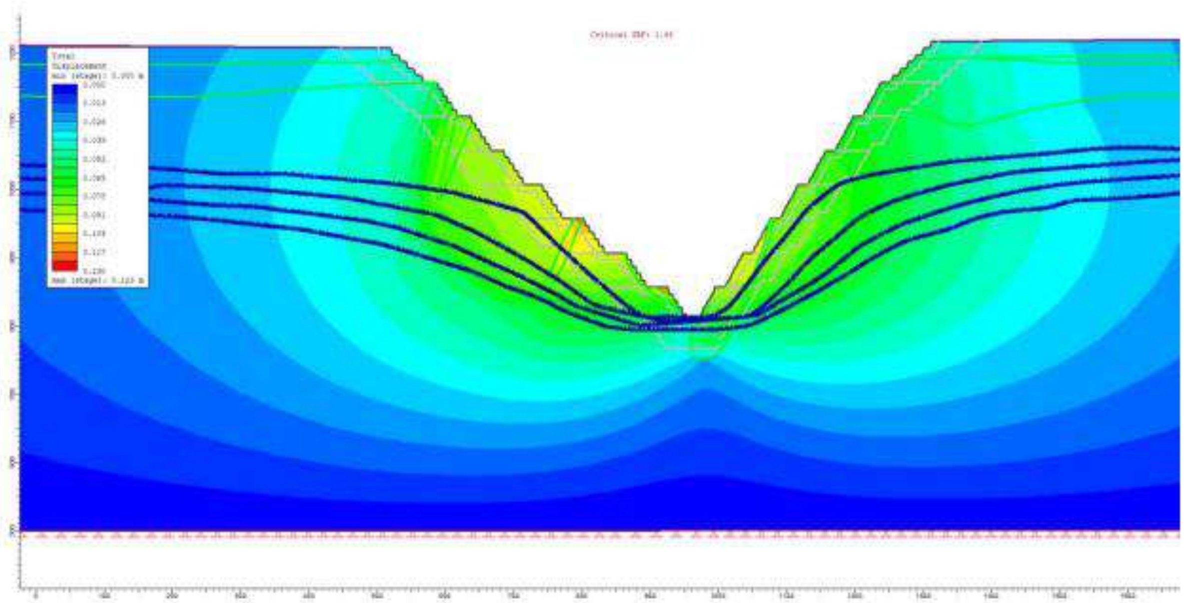


Figure 15.4.9 RS2 Results for Cross-Section NNW SSE 1, SSE slope (SRF = 1.66)



15.5 Slope Design Recommendations

A summary of slope design limits for the different design sectors is presented in Table 15.5.1, while Figure 15.5.1 provides an illustration of the terminology used.

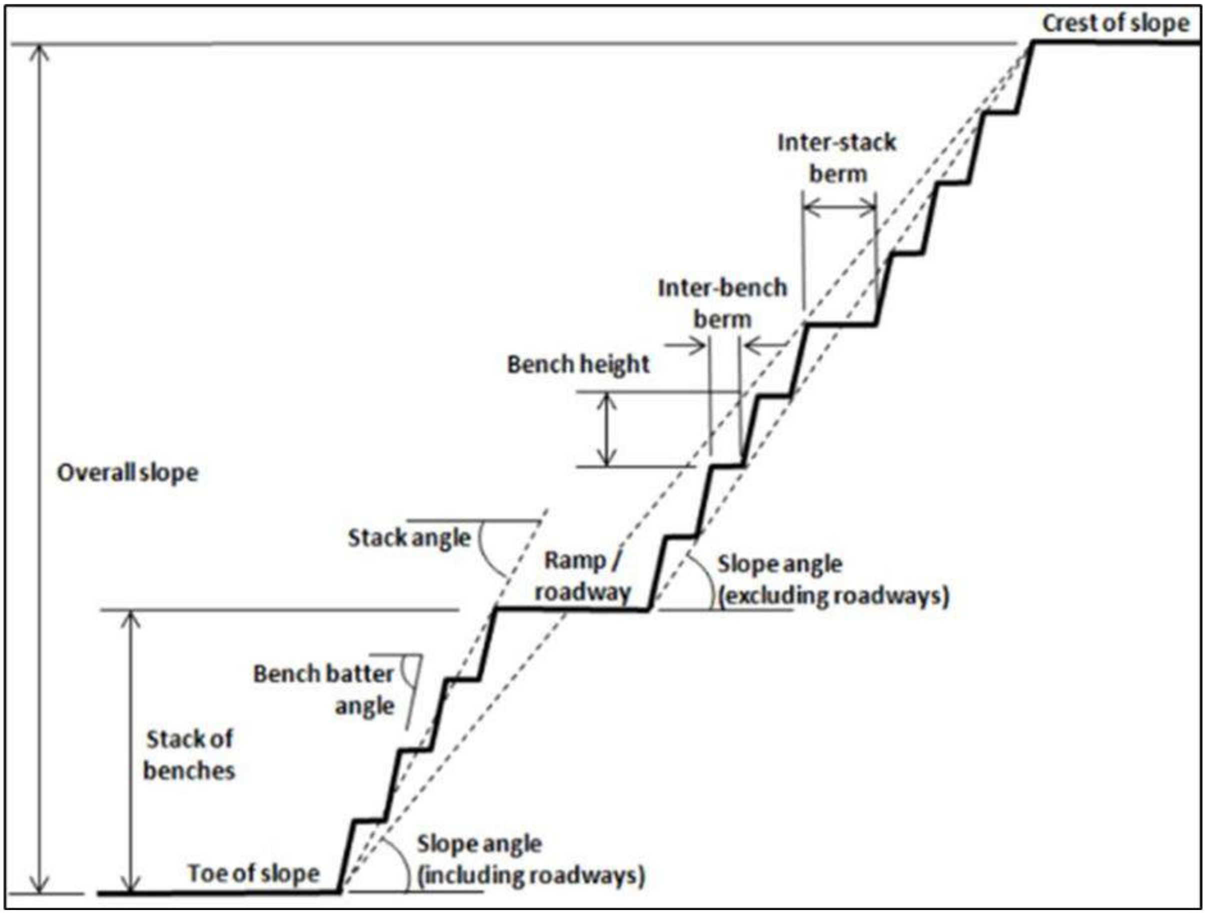
Table 15.5.1 Inter-Ramp and Batter Slope Design Limits as Defined by Kinematic Analysis

Design Sector	Toe to Crest Stack Angle deg.	Batter Angle deg.
Weathered	46	70
TH Bulge North Unweathered	60	70
TH Bulge South Unweathered	63	70
TH BN North Unweathered*	55	80
TH Central North Unweathered	60	70
TH Central South Unweathered	63	80
THC East End	63	80
Clouds N	60	70
Clouds S	60	80
THW Oryx Pit North	60	70
THW Oryx Pit South	60	80

Based on the results of the kinematic analysis, wedge analysis and slope stability analysis, slope design recommendations have been defined for the pits, and these are summarized in Table 15.5.2. The bullnose area in the THC pit has been identified as a separate design sector, due to long drill hole intersections of weak disturbed rock mass, the identified large-scale structures and parallel jointing and the effect of the convex slope curvature (due to lack of lateral confinement which results in decreased stability). Flatter slope angles have been recommended in this domain.

This section of the DFS report has led to the conclusion that the slope design developed in the PFS is still valid. Beside the review of foliation data and potential weak zones associated with previously modelled Biotite Schist, an update of the pore pressure model (hydrogeological model) was included in the investigation. Additionally, the analysis results indicate that the slope stability is governed by small scale structures, and adjustments have been made to the batter angles to account for it.

Figure 15.5.1 Slope Architecture Terminology



Double bench design recommendations have been included for the south slope, but due to flatter batter angles double benches on the north are not recommended. Further, 70° double benches are difficult to drill accurately, and the remaining berm widths on the north slope are small and prone to breakback, which can lead to instability.

The design recommendations were adjusted with regards to the batter angles and are presented in Table 15.5.1. Further, double bench parameters for the south slope were included.

Table 15.5.2 Design Recommendations for the Life of Mine Pit Plan

	Slope Height m	Bench Height m	Toe to Crest Stack Angle °	Stack Height m	Batter Angle °	Berm Width m	Toe to Toe IRA °	Geotechnical Berm Width m
Weathered	50	10	46	50	70	7.6	42	15
TH Bulge North Unweathered	350	10	60	50	70	2.8	57	15
TH Bulge South Unweathered	350	10 20	63 63	50 60	80 80	4.2 9.9	59 56	15 15
TH BN North Unweathered*	50	10	55	50	70	6.6	50	15
TH Central North Unweathered	250	10	60	50	70	2.8	57	15
TH Central South Unweathered	250	10 20	63 63	50 60	80 80	4.2 9.9	59 56	15 15
THC East End	250	10	63	50	80	4.1	60	15
Clouds N	170	10	60	50	80	5.0	56	15
Clouds W	170	10	60	50	70	5.0	56	15
Clouds S	170	10	60	50	80	5.0	56	15
THW Oryx Pit North	100	10	60	50	70	2.7	58	15
THW Oryx Pit South	160	10	60	50	80	5	56	15

15.6 Mining Model

15.6.1 Bench Height Selection

One of the significant areas evaluated was to select the most appropriate bench height for the project that balanced the benefits of an increased bench height against the impact of ore losses and dilution. Higher benches have the following operational benefits:

- A lower bench turnover rate – Bench turnover is the process of completely mining through one bench. It involves several different activities (drilling, blasting, grade control, ore mark-out, load and haul, working area maintenance, final wall pre-split and battering). Each of these activities is generally area limited or otherwise stated, the working area limited to the amount of equipment that can effectively operate safely. Therefore, the higher the bench height, the greater the tonnes released for any working area. Consequently, working efficiency increases, unit mining costs reduce, and operational risk associated with the required annual mill throughput decreases.

- Larger equipment size – A higher bench height means larger loading equipment can be utilized, consequently larger trucks and support equipment. The larger equipment provides the benefits of:

  - Inherently higher productivity (t/h) and, therefore, lower unit operating cost (USD/t)

  - Reduced fleet size leads to a reduction in overall personnel and road maintenance equipment and increased operational safety. Productivity also generally increases due to less traffic congestion.

These benefits will ensure the required material movement to the processing plant is maintained for the base case. However, increased bench height reduces ore selectivity along the ore and waste boundary. This results in:

- Higher ore loss where ore is lost as waste.

- Higher mining dilution, where ore is diluted with waste, increases ore tonnes but lowers mill feed grade.

For this DFS study, a maximum loading flitch height of 2.5 m has been selected in those areas where selective mining is required to minimize ore loss and dilution. These selective ore and waste flitches will be drilled and blasted in 5.0 m benches. In broad continuous areas of waste material, a 10.0 m bench height is planned (drilled and blasted) and will be loaded in two 5.0 m flitches.

15.6.2 Mine Modifying Factors

One of the significant inputs into the development of the Reserve Statement is the construction of the Mining Model for mine planning and production scheduling purposes. This section describes the mining modifying factors, a combination of mining dilution and mining recovery factors, to be applied in the mining model for the project.

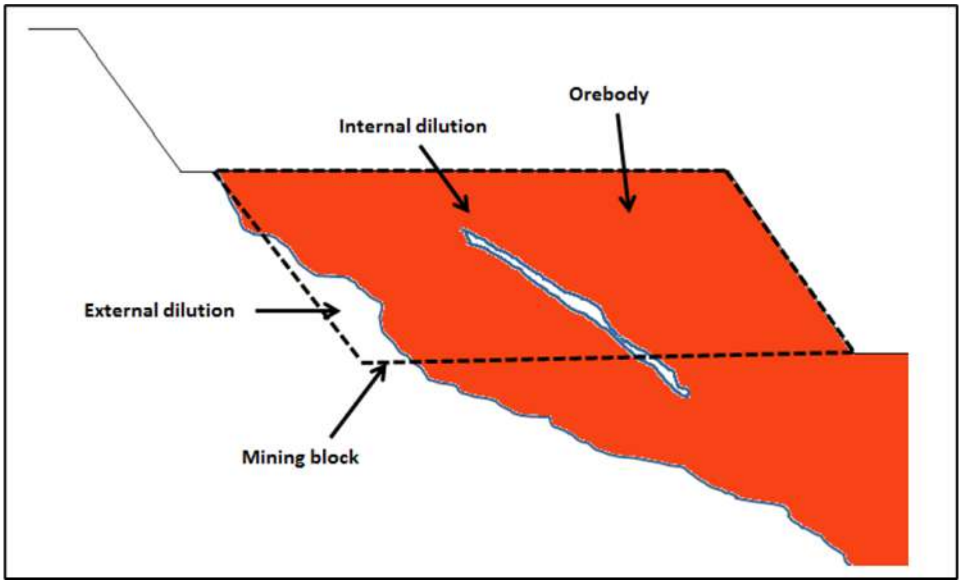
The FS Resource model is originally modelled with parent cell sizes in the east-west direction, north-south direction and a height of 5.0 m x 5.0 m x 5.0 m. These parent cells also included sub-celling to a minimum size of 2.5 m in the east-west direction, 2.5 m in the north-south direction and <0.5 m in height. This Resource model sub-cell resolution best represents the known in-situ mineralization.

Gold grade was estimated in the resource model using localized uniform conditioning (LUC) at Bulge, Twin Hills Central and Clouds (represents > 90% of contained metal above 0.4 g/t Au cut-off) from 2.0 m composites into 60.0 m x 60.0 m x 5.0 m (XYZ) panels and 10.0 m x 5.0 m x 2.5 m selective mining units (SMU). Due to limited drill hole data, Ordinary Kriging (OK) was used for grade estimation at Clouds West, Twin Hills North, Kudu and Oryx. The proposed mining practice for the Project is an open pit mining method with drilling and blasting on ore benches taking place on a 5.0 m bench height and loading the material in two flitches of equal height, which will nominally be 2.5 m high, or 3.0 m high after allowing for swell from blasting. This mining selectivity minimises ore loss and dilution.

Dilution refers to the waste material not separated from the ore during the operation and mined with ore. This waste material is mixed with ore and sent to the processing plant. Dilution increases the tonnage of ore while decreasing its grade. Dilution can be defined as the ratio of the tonnage of waste mined and sent to the mill to the total tonnage of ore and waste combined that are milled. It is usually expressed in a percentage format.

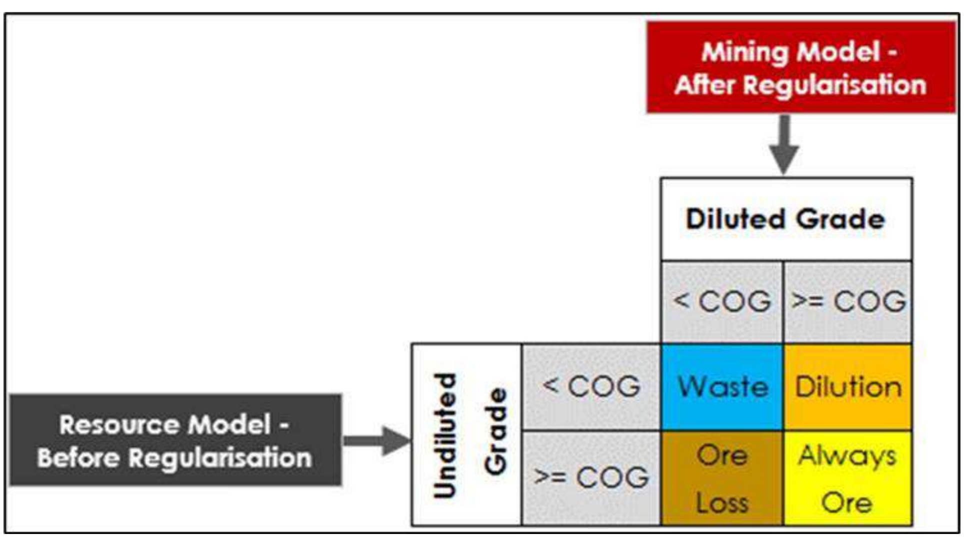
Referring to a mining block, dilution happens in two different areas. Sometimes within a mining block, waste inclusions or low-grade pockets of ore cannot be separated and are inevitably mined with the mining block, i.e. internal dilution. Internal dilution is difficult, if not impossible, to avoid. The amount of internal dilution varies in different types of deposits. Lithology and grade distribution are important factors in internal dilution. External or contact dilution refers to the waste outside the orebody that is mined within the mining block. External dilution varies based on geology, the shape of the orebody, drilling and blasting techniques, the scale of operation and equipment size. This type of dilution can be controlled using proper equipment and mining practices. Figure 15.6.1 shows a mining block in an open pit mine bench with different types of dilutions.

Figure 15.6.1 A Mining Block in an Open Pit and Different Types of Dilution



Following an initial assessment of the Resource model it was determined that a practical approach for this study would be to apply ore loss and dilution parameters on a block-by-block basis within the Resource model. In recent years the use of the SMU has become widely utilized to assist with the estimation of mining dilution. This technique involves the creation of a mining block model with a specific regularised cell size. The idea is to select the smallest regular cell size that can be practically mined by appropriately sized mining equipment.

Figure 15.6.2 Dilution and Losses Matrix



Dilution and ore loss through combining model blocks to a 5MU size

Ore loss and dilution assumptions associated with open pit mining were modelled through regularisation. Regularisation involves identifying an SMU block size to mimic the mining selectivity associated with grade control, blasting, excavation, and haulage practices. The following SMU was selected for the Twin Hills resource model:

- 10.0 m x 5.0 m x 2.5 m

The following steps were performed to transform the in-situ Resource block models into Mining block models by the assignment of mining dilution and losses:

- The sub-celled Datamine resource models were regularized to the SMU block size with the partial ore content reported per block.

- The partial ore tonnes were modified in an Excel spreadsheet by multiplying them with a 1,50 (50%) waste factor and a 0 g/t dilution grade.

- A check was applied so that the diluted ore tonnes did not exceed the total tonnes of the block. No dilution was assigned if the SMU block was filled entirely with ore material, while SMU blocks with a higher ore partial percentage attract pro rata a lower dilution rate.

- The elevated cut-off grades, described in the next section (chapter 15.6.3), were applied to each Mining block model.

- Furthermore, diluted ore blocks with an ore content of less than 100t (~30% by volume) were discarded as mining losses. A further 1% ore loss was applied for ore material sent mistakenly to the waste rock dumps.

These diluted Mining block models were then reported and compared with the in-situ Resource block models to quantify the overall ore dilution and losses. Table 15.6.1 summarizes the average mining dilution and losses applied to the Twin Hills DFS Mining block models.

They are referred to as the April 2023 Mining block models in contrast to the March 2023 Resource block model. The development of the Mining model was considered a robust and auditable approach, as the same model could be utilized for all mine planning without additional modifications.

Table 15.6.1 Mine Modifying Factors from Insitu Resource to Diluted Reserve Ore Tonnes

Model	COG (g/t) - Diluted	Parameter Units	Insitu Material	Diluted Material	Variance	Dilution	Mining Losses
	0.40 g/t	Tonnes (Mt)	50.88	54.49	7%	10%	-3%

Model	COG (g/t) - Diluted	Parameter Units	Insitu Material	Diluted Material	Variance	Dilution	Mining Losses
Main & Clouds West Pit Design		Metal (Moz)	1.81	1.77	-2%		
		Grade (g/t)	1.11	1.01	-9%		
Clouds Pit Design	0.40 g/t	Tonnes (Mt)	6.99	7.25	4%	12%	-7%
		Metal (Moz)	0.30	0.28	-4%		
		Grade (g/t)	1.32	1.22	-8%		
TH West Pit Design	0.45 g/t	Tonnes (Mt)	2.50	2.78	11%	18%	-6%
		Metal (Moz)	0.10	0.10	-6%		
		Grade (g/t)	1.26	1.07	-15%		
Total TH Pit Design	0.40 g/t	Tonnes (Mt)	60.37	64.51	7%	11%	-3%
		Metal (Moz)	2.21	2.15	-3%		
		Grade (g/t)	1.14	1.04	-9%		

15.6.3 Cut-Off Grade

The method employed for classifying material mined as ore and waste should not be confused with the method for establishing mining limits. If a block of material falls inside the optimized mining limits, the question is not whether to mine the block but whether to process the material. This study assumes that a block of material should be processed if the income derived from the product sale covers at least the cost of processing. The break-even cut-off grade (COG) is the grade at which the income from the product sale is equal to or more than the cost of processing.

The approach assumes that the cost of mining material from the pit to the waste dump is a sunk cost as it is intrinsic to the mining process, regardless of whether the material is ore or waste. The assessment of whether the material is ore or waste occurs once removed from the pit. Similarly, capital is a once-off cost that does not apply to the instantaneous evaluation of a tonne of material to determine its classification. The break-even COG (also referred to as the marginal or economical COG) is the lowest COG that will be applied at any point in time and will typically become applicable towards the end of the mine life when approaching resource exhaustion or during periods of high waste stripping. The mill limiting COG will typically apply when the open pit can produce sufficient ore, and the processing plant is the limiting constraint, which is the case for this DFS. The equation, as defined by Ken Lane, is shown below.

$$Mill\ Limiting\ Cut-off\ Grade\ \ (g/t) = \frac{(Unit\ Processing\ Cost\ (\$/t) + \frac{General\ and\ Admin\ cost\ (\$)}{Mill\ Capacity\ (t)}}{Net\ Price\ \left(\frac{\$}{g}\right) \times Processing\ Recovery\ (\%)}$$

The mine and market limiting cut-off grade equations are the other limiting cut-off grade scenarios. The mill limiting COG of ~0.30 g/t for the DFS was calculated (Table 15.6.2) utilizing the latest cost parameters described in section 15.8.1.

Table 15.6.2 Mill Limiting Cut-off Grade

Parameter	Unit	Value
Mill Capacity	Mt/annum	5.0
Gold Price	USD/oz	1 700
Net Gold Price	USD/oz	1 630
Variable processing cost	USD/ton milled	9.09
General & admin overheads	MUSD/annum	23.39
Variable selling cost	USD/oz	2.75
Recovery (lowest TH West)	%	88.00%
Mill limiting cut-off grade	**g/t**	**0.30**

Mineral Reserve Cut-off Grade: Used to identify the maximum value from an initial Mineral Reserve statement and Life-of-Mine plan. The optimal Mineral Reserve cut-off grade reflects the corporate strategy which can include such goals as:

- Maximization of a project's NPV or achieving a target economic goal
- Maximization of a project's mine life
- Controlling the metal or value production through a project's mine life
- Controlling the distribution of a project's cash flow through time, or
- Maximization of contained metal or value in the Mineral Reserve category.

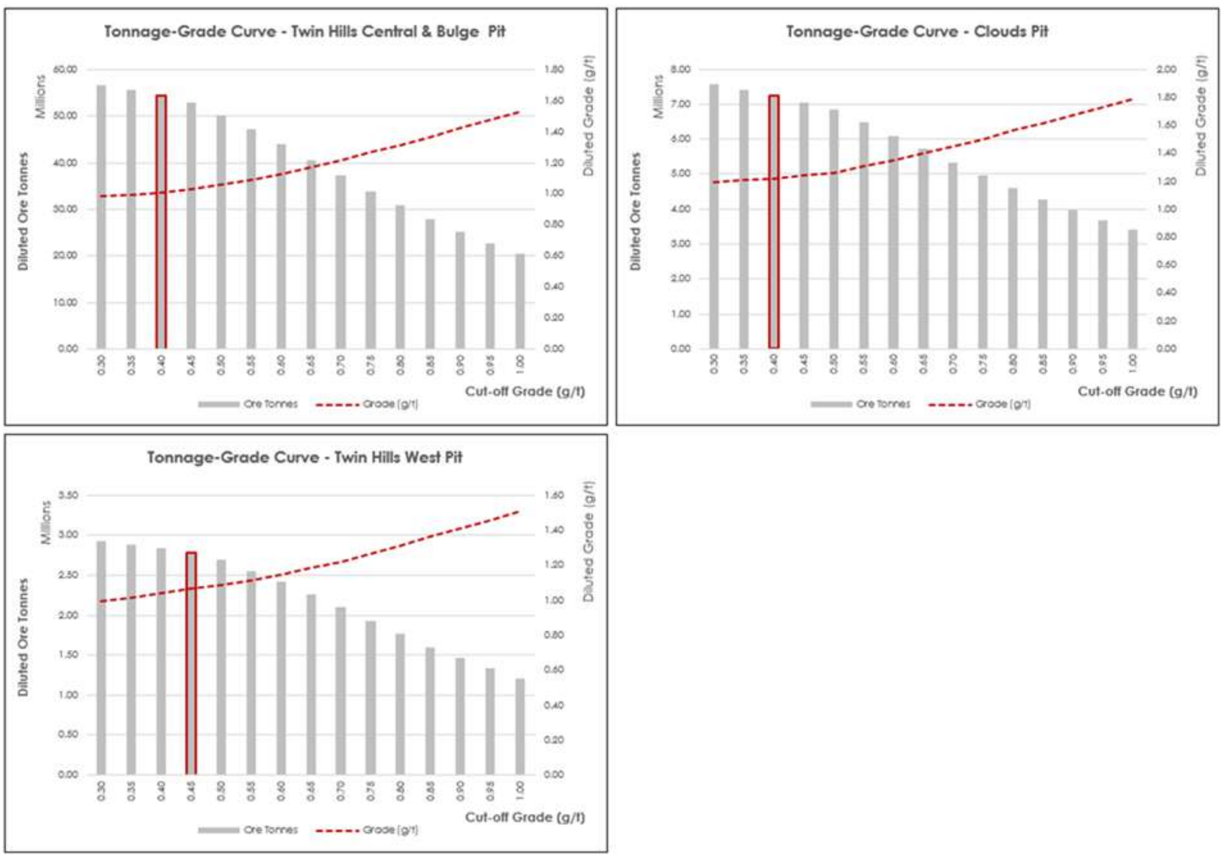
For the Reserve estimate the following elevated Mineral Reserve COGs were applied per pit:

- Main & Clouds West Mining Block Model: 0.40 g/t
- Clouds Mining Block Model: 0.40 g/t
- TH West Mining Block Model: 0.45 g/t

The mine schedule employed a variable cut-off grade approach to maximize the NPV following the theory of Ken Lane. Following this approach, the cut-off grade is flexed during the mine schedule to maximize metal production as early as possible. The resulting cut-off grade becomes a function of the economic parameters, the grade-tonnage distribution of the ore body, capacity constraints in the value chain and opportunity cost associated with the remaining resource.

Figure 15.26 shows the relevant tonnage grade curves and cut-off grade bars constrained by the pit design surface. Only diluted material within the Measured and Inferred material above the relevant elevated cut-off grades was used to report pit inventories and production schedules.

Figure 15.6.3 Tonnage-Grade Curves for the Relevant Pit Design Inventories



15.7 Project Licensing Status

15.7.1 Mineral Policy of Namibia

The regulations that govern the mining sector in Namibia are the Diamond Act (1999), the Minerals (Prospecting and Mining) Act 33 of 1992 (Minerals Act), and the Minerals Development Fund of Namibia Act of 1996. The current Minerals Act, which deals with granting access to mineral resources through various instruments, is administered by the Minister of Mines and Energy, who may grant a license, or the renewal of a license, subject to other laws or terms and conditions. The government is committed to developing the Namibian mining industry within a free-market environment. It recognizes that the private sector can best explore and develop its mineral wealth. The Minerals Act provides a comprehensive set of rules applicable to all aspects of mining, including acquisition, transfer, operation and termination of mining rights, environment protection, cultural heritage, protection of neighbouring communities, and tax and customs incentives. The Mining policies have been developed to ensure the continued development of the mining industry by the creation of an environment that attracts both foreign and local investment in mining as well as contributes to the development of opportunities for the Namibian people to benefit from their country's mineral resources in line with the Government's policy on socio-economic upliftment. All mineral rights are vested in the State, and the royalty schedule (2006) sees a 3% royalty on base, precious, rare metals, and nonnuclear mineral fuels. Mining Licenses are granted by the Ministry of Mines and Energy upon the submission of a:

- Mining plan.
- Environmental Clearance Certificate issued by the Ministry of Environment, Forestry and Tourism.
- Closure plan.
- Evidence of financial capacity.

15.7.2 Osino Licenses

Osino, through various locally held and majority-owned subsidiaries, holds 14 EPLs, covering a surface area of 153,658.07 ha, which comprise the Twin Hills Gold project. A Mining License (ML238) was granted in November 2022 by the Ministry of Mines & Energy and is valid for twenty years until November 2042.

15.8 Pit Optimization

The pit optimization process aims to determine a generalised open pit shape (shell) that provides the highest value for a deposit. Pit optimizations were done using the Whittle Four-X (Whittle) pit optimization software. Whittle software is considered the leader and widely used in the mining industry for open pit optimization and consequently was selected for the project. For a given block model, cost, recovery and slope data, the Whittle software calculates a series of incremental pit shells within which each shell is the optimum for a slightly higher commodity price factor.

The Lerchs Grossman (LG) algorithm determines the optimal pit shape for a given economic and slope criteria. The algorithm progressively constructs lists of related blocks that should or should not be mined. The final pit shell list defines a pit outline with the highest possible total value, subject to the required pit slope angles. This outline includes every block that adds value when waste stripping is considered and excludes every block that does not add value. The process takes into account all revenues and costs and includes mining and processing parameters. The resulting pit shells are not necessarily practical and do not incorporate ramps, catchment berms etc. From the analysis of all the nested shells generated in the optimization process, a single shell will be selected as the guide for a practical ultimate pit design. The Whittle pit shell results are used to assess the project's sensitivity to changes in the input parameters and to guide the practical pit design process.

The final pit design defines the project's ore inventory, and subsequently, the life of mine (LOM) production schedule and associated cashflows can be determined. Hence, the pit optimization process is the first step in developing any LOM plan and reserve statement. In addition to defining the ultimate size of the open pit, the pit optimization process also indicates possible mining pushbacks. These intermediate mining stages allow the pit to be developed practically and incrementally while at the same time targeting high-grade ore and deferring waste stripping.

The following sections detail the input parameters used for the pit optimization run.

15.8.1 Optimization Input Parameters

The pit optimization analysis was carried out applying the following base assumptions and parameters, which were agreed upon and signed off by all key stakeholders before the optimization exercise. The assumptions for the major mining cost consumables are as follows:

- Diesel Cost (incl Rebate): 18.90 (NAD/L); 1.08 (USD/L)
- Bulk Explosive Cost (Emulsion): 15,800 (NAD/t); 902.86 (USD/t)

The operating costs were split into a variable and fixed (period) cost portion for the Whittle pit optimisation exercise.

Mining Costs

The variable mining costs applied for the pit optimization are based on typical contractor mining rates in Namibia for loading, hauling, and drilling and sub-contracted rates for supplying explosives. The contract haul rates are based on elevation and haul distance. Using the haulage rates in, the relationship between elevation and mining costs could be determined. Monthly daywork charges were estimated at 5 % of the total load and haul costs. This linear relationship was used to calculate mining costs per bench in the mining model for pit optimization. The linear regression relationship by bench level was incorporated into a script that allowed for a mining cost to be calculated for every block in the mining model. These costs were then exported to the Whittle model as part of the mining cost adjustment factor (MCAF) field.

Table 15.8.1 Mining Operating Costs

Mining Operating Costs – Variable	Unit	Cost
Mining Costs – Ore @ Pit Rim	(USD /t Mined)	2.55
Mining Costs – Waste @ Pit Rim	(USD /t Mined)	2.35
Mining Costs – Ore – Elevation Dependent	(USD /t/10 m)	0.07
Mining Costs – Waste – Elevation Dependent	(USD /t/10 m)	0.07
Mining Costs – Average	(USD /t Mined)	2.70

Processing Cost

Table 15.8.2 lists the variable processing operating unit cost per ore material type. This cost is based on a defendable and plausible estimate revision preceding the pit optimization study. All blocks, waste, and potential ore material will be mined to the deposit's surface during the pit optimization runs. Whittle then performs a series of cut-off grade calculations to determine whether a block of material should be processed (ore material) or dumped to the waste rock dump. The processing costs below include a run-off-mine (ROM) rehandling cost of USD 0.23 /t.

Table 15.8.2 Variable Processing Operating Costs

Total Processing Operating Costs – Variable	Unit	Value
CIL Plant Operating Costs	(USD /t Milled)	9.32

Fixed (Period) Input Cost Assumptions

The fixed or period input cost assumptions were summarized by Lycopodium and are captured in Table 15.8.3. This overall fixed cost estimate includes supervision, general and administrative (SG&A) costs. SG&A costs are based on similar-sized mining operations in Namibia and consist of such overheads as shared services, sustainability, finance, management, HR, and security.

Table 15.8.3 Fixed General and Administrative Operating Costs

Fixed Cost	Unit	Value
Total Fixed Cost	(USD / annum)	23,394,147

Throughput Rate and Processing Recoveries

The Twin Hills process plant will have a nameplate capacity of 5.0 Mtpa of ore (Table 15.8.4), based on the availability of 7,700 hours per annum and a nominal capacity of ~650 tonnes per hour (tph) which is considered conservative. Typical gold plant availability is about 8,000 hours per year, but in this case a design contingency has been applied to major equipment, and most of the plant has been designed for a volumetric requirement to match 5.3 Mtpa to cater for the presence of softer oxidized ore that can be processed faster, in the early years of operation.

Table 15.8.4 Plant Production Metrics

Plant Production Metrics	Unit	Value
Plant Throughput	(Mtpa)	5.00
Oxide Ore Throughput Enhanced Factor	(%)	15.0

Following the completion of the PFS, Lycopodium was appointed to initiate and oversee several additional phases of core and composited sample tests using Maelgwyn Mineral Services Africa) (Pty) Ltd. (Maelgwyn) for the testwork and OMC for crushing and milling simulations.

These tests included samples from additional locations in the mineral resource and samples from the 'Clouds' and 'Twin Hills West' areas. These metallurgical and final variability tests were completed in time for use in this DFS Study. The recovery of gold from individual blocks or from sections of each pit was modelled following the testwork, using the final gold grades to develop recovery versus head grade algorithms for each portion of the resource. In the plant design and cash flow models these recoveries were discounted by about 0.7% to take account of gold losses in fine carbon and solution associated with filter cake reporting to the tailings storage facility (TSF).

Variability test work was conducted after completion of the PFS, on core samples from diverse locations in the ore body. The results confirmed the flowsheet tested and developed on composite samples and showed that the recovery algorithms developed during the PFS and DFS were valid for each ore type and over the whole range of head grades constituting economically viable ore. The processing recoveries for different material types and pit locations applied for the pit optimization exercise are summarized in Table 15.8.5.

Table 15.8.5 Processing Recoveries for Different Material Types and Pit Locations

Material	Pit	Overall Circuit Recovery
	LOM Average	%
Oxides	Bulge	94.2
	TH Central	94.2
	Clouds	94.2
	TH West	94.2
Fresh	Bulge	93.1
	TH Central	94.6
	Clouds	88.4
	TH West	93.1
Total	**All**	**Calculated – Weighted Average 92.0%**

Metal Price, Selling Cost and Royalties

Osino assumed a steady long-term gold base price of USD 1,700/oz for the Mineral Reserve estimation process. Table 15.8.6 lists the gold price, government royalty, treatment - and logistics / selling cost parameters used.

Table 15.8.6 Net Gold Price and Selling Costs

Parameter	Unit	Value
Base Gold (Au) Price – Real	**(USD /oz)**	**1,700**
Government Royalty (3%) + Export Levy (1%)	(%)	4.00
Metal Credit	(%)	99.90
Net Gold Price	**(USD /oz)**	**1,630.30**
Selling Costs – Gold Refining Costs	(USD /oz)	0.55
Selling Costs – Gold Transport Costs	(USD /oz)	2.20

Economic Parameters

The economic parameters are summarized in Table 15.8.7. The discount rate was sourced from Osino's long-term price and economic forecast. A discount rate of 5.0 % was specified for all discounted cash flow calculations during pit optimization and scheduling.

Table 15.8.7 Economic Input Parameters

Parameter	Unit	Value
Base Currency		USD
Base Date		2Q23
Exchange Rate – Real	(NAD: USD)	17.50
Discount Rate (for NPV Calculation)	(%)	5.00

15.8.2 Pit Optimization Methodology

Although a detailed description of the optimization methodology is beyond the scope of this report, the following section provides a summary. The optimization process can be divided into two processes, namely:

- A range of increasing-size nested pit shells is achieved by escalating the product price and generating a pit shell at each price point.

- The optimal pit shell is selected by generating various production schedules for each pit shell and calculating the net present value (NPV) for each schedule, the output of this process being a series of "pit versus value" curves.

The decision on what should be mined within the ultimate pit limits is time-dependent. The most effective solution should take into account knowledge of when a given block will be mined and the length of time required for stripping the waste. The analysis of pit limits which maximize NPV requires that the time value of money be considered in defining which blocks should be mined and which blocks should be left in the ground during the project's life. Pit limits that maximize the undiscounted profits for a given project will not maximize the project's NPV.

This statement is based on the fact that the discounting effect on the economic block value calculation tends to reduce ore block values to be mined later in the process, while the waste mining costs to reach these blocks must be incurred earlier. As a result, ore blocks that are very marginal in value drop out of the ultimate pit. The sequence of pit shell increments is sorted from the lowest cost (the inner smallest shell viable for the lowest commodity price) to the outer largest shell viable for the highest commodity price.

15.8.3 Pit Optimization Results

This section discusses the pit optimization results of the base case run, founded on the Measured and Indicated resource material only.

The process that Whittle undertakes is to vary the base input price both up and down to produce a series of shells. Each shell produced generates the maximum cash flow for the input parameters and its associated factored price. The lower factored price will produce smaller shells, and the higher price larger shells resulting in a set of 'nested' shells with the lower valued shell lying inside, the higher valued shells. These nested shells are important for several reasons:

- The smaller shells guide where initial mining should occur as the smaller shells drive towards the areas of the highest value in the ore body.

- The larger shells indicate how much additional mineralisation may become economical or, alternatively, what current ore may become unviable should parameters change.

- Permits Whittle to develop a schedule for mining the deposit over time, generating a discounted cash flow.

Along with the undiscounted cash flow of each shell, Whittle generates the three standard discounted cash flows: worst case, specified case, and best case. The best and worst-case discounted cashflows provide the extremities of the possible value that a shell can generate.

The result of the Whittle run optimizations for the base case scenario are summarized in graphs shown in Figure 15.8.2 to Figure 15.8.36 for the following mineralized domain optimization runs:

- The Main Pit consists of the Twin Hills Central (THC), Bulge, Twin Hills North (THN) and Clouds West mineralized targets.

- The Clouds mineralized domain.

- The Twin Hills West (THW) (also known as Oryx and Kudu) mineralised targets.

Figure 15.8.2 shows the typical pit optimization output for the Twin Hills deposit with three linear graphs, i.e., the specified case discounted cash flow (green), the best-case discounted cash flow (red) and the worst-case discounted cash flow (blue) for each pit shell. The ore and waste tonnes per pit shell is also indicated on the graph, while the x-axis represents the Whittle shell numbers representing a different revenue factor.

Figure 15.8.3 illustrates the cost of production (C1 costs) and stripping ratio over the range of nested shells for the base case Whittle scenario. C1 costs are cash production costs, including mining, processing, site administration and refining net of by-product credits, excluding depreciation and amortization charges, royalties, related head office, interest, and financing charges. Figure 15.8.4 shows the ounces produced for each shell and the expected life of mine based on a 5.0 Mtpa plant throughput. Figure 15.8.5 depicts the average plant head grade and total run-off mine ore tonnes over the range of pit shells. Figure 15.8.6 illustrates the percentage variance in indicative project value and troy ounces produced for each shell.

The cash flows are not based on practical pit and phase designs with ramps. Therefore, no realistic project NPV can be derived from such cash flows, while resulting numbers should be used only for project value comparison purposes. It is essential to base reserve statements and project valuation on technically sound designs, pit development and production estimates.

15.8.4 Pit Shell Selection

The objective of the open pit optimization process is to determine a generalised open pit shape (shell) that provides the optimal value for a deposit. From the analysis of all the shells generated in the optimization process, a single shape is selected to guide the practical ultimate pit design.

This final pit design defines the Reserve, life-of-mine (LOM) production schedules and associated project cashflows. Hence, the pit optimization process and the selection of the pit shell is the critical first step in developing any Reserve estimation. This pit optimization exercise, derived from the Measured and Indicated diluted resource ore tonnes, selects a suitable shell for the final pit design for the Twin Hills Mineral Reserve estimate. It aligns with the NI43-101 guidelines for generating the DFS pit shell to guide the ultimate Mineral Reserve pit design.

The conventional way of selecting the optimal pit is to opt for the revenue factor one shell (Shell #70), which delivers the highest undiscounted cash flow for a project. The contents of the resulting revenue factor one pit shell using the marginal cut-off grade usually defines the quantity of the deposit that can be regarded as economic. However, when the time value of money is considered, the outer shells of the revenue factor one pit can be shown to reduce the value since the cost of waste stripping precedes the margins derived from the ore ultimately mined and processed. The exact value depends on the specific deposit, project, and operation. It is influenced by the deposit's structure and mining constraints, such as minimum mining width, maximum annual vertical advancement and processing and mining capacity.

The shell selection criteria are usually based on the following strategic and sometimes potentially conflicting objectives:

- Maximizing NPV is often the only criterion for selecting the ultimate or optimum pit shell. Since the specified case represents the most practical mining scenario, the optimum pit shell maximizes the discounted cash flow.

- Maximizing mine life is a secondary criterion to maximizing NPV and is not necessarily consistent with the stated objective. A business strategy often used is to extend the life of a mine for as long as possible, provided that a certain minimum profit margin can be maintained, thereby allowing a company to achieve goals such as maintaining market share and capturing potential future market opportunities.

- Some companies prefer the minimum cost of production to establish the final pit limits. The incremental cost of producing one unit of the final product usually increases over the life of the mine. At some point in the LOM, the incremental cost of production will rise above a predetermined threshold - that point serves as selection criteria.

- Acceptable utilization of the resource.

Osino's main aspirations for the Twin Hills DFS / Project are as follows:

- Higher head grade in the first five years to achieve production of at least 175 000 oz Au per year.

- Close to 2 Moz Au to be produced over the LOM.

- 5 Mtpa plant ore treatment capacity.

- C1 cost of less than USD 1,050 per ounce produced.

- >10-year life of mine.

- Within the previous constraints, aim for maximum NCF and NPV/DCF.

Table 15.8.8 Selected Whittle Pit Shell Inventory Table

Parameter	Unit	Bulge, Central & Clouds West Whittle Shell	Clouds Whittle Shell	TH West Whittle Shell	Total
Ore Tonnes (Measured)	Mt	0.87	0.00	0.00	**0.87**
Indicated Ore	Mt	53.78	7.35	2.86	**63.99**
Total Ore Tonnes	Mt	54.65	7.35	2.86	**64.86**
Waste	Mt	216.34	42.79	22.80	**281.94**
Total Material Mined	Mt	271.00	50.14	25.66	**346.80**
Au Grade	g/t	1.01	1.23	1.09	**1.04**
Strip Ratio	Ratio	3.96	5.82	7.97	**4.35**
Life of Mine	years	10.93	1.47	0.57	**12.97**
Contained Metal (Ounces)	Moz	1.78	0.28	0.10	**2.16**

For the DFS Reserve estimation, considering the above criteria, the following Whittle shells were selected that will guide the ultimate practical pit designs:

- Twin Hills Central & Bulge: Shell nr 64 representing the 0.93 revenue factor shell.

- Clouds: Shell nr 57 representing the 0.96 revenue factor shell.
- Twin Hills West: Shell nr 30 representing the 0.96 revenue factor shell.

The Whittle shell inventory of the above-selected shells is summarized in (Table 15.9.3. The pit optimization shells are illustrated in isometric and plan view in (Figure 15.8.1) and (Figure 15.8.7).

Figure 15.8.1 Selected Pit Optimization Shells with Mineralized Bodies in Isometric View

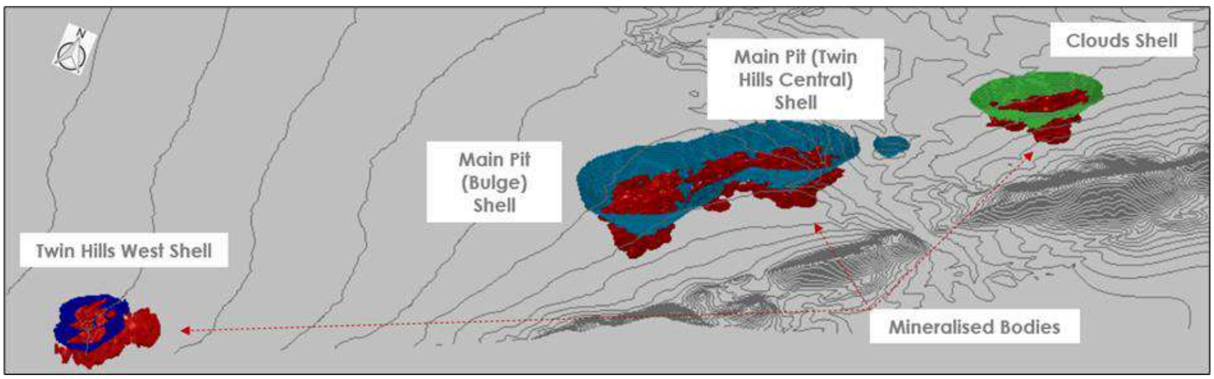
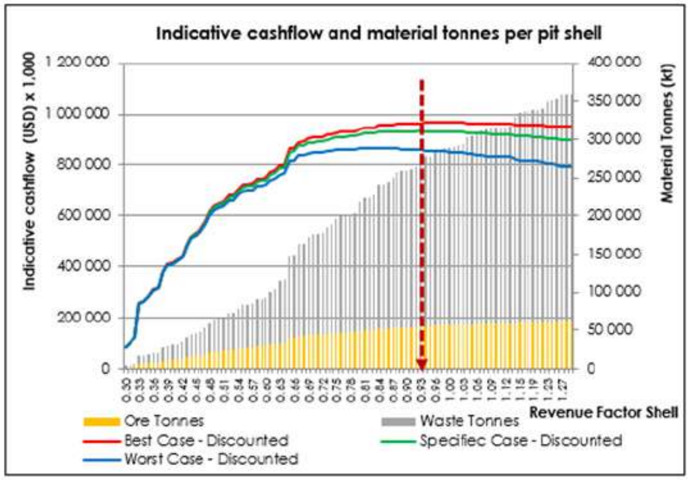
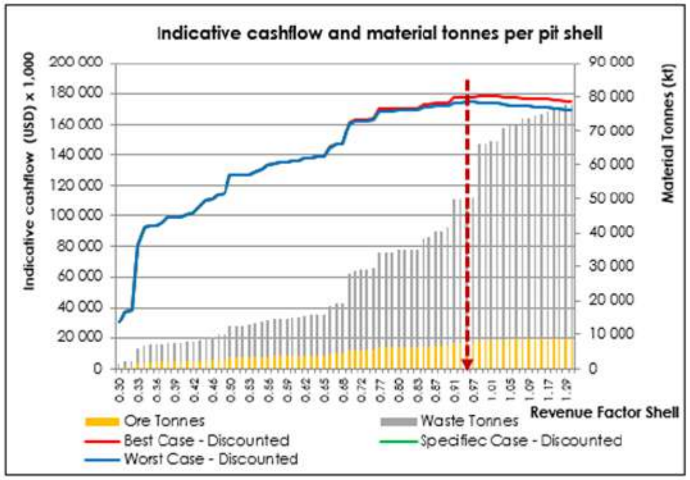


Figure 15.8.2 Whittle Pit by Pit Graph for TH Central & Bulge (top left), Clouds (top right) and TH West (bottom left)





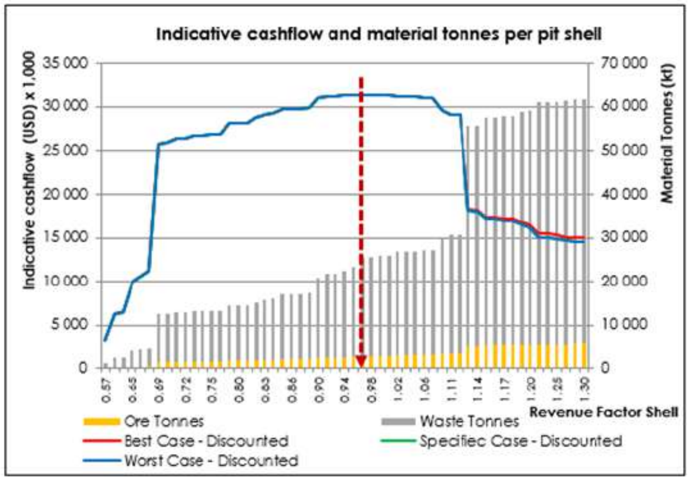


Figure 15.8.3 Whittle C1 Cost and Strip Ratio Graph for TH Central & Bulge (top left), Clouds (top right) and TH West (bottom left)

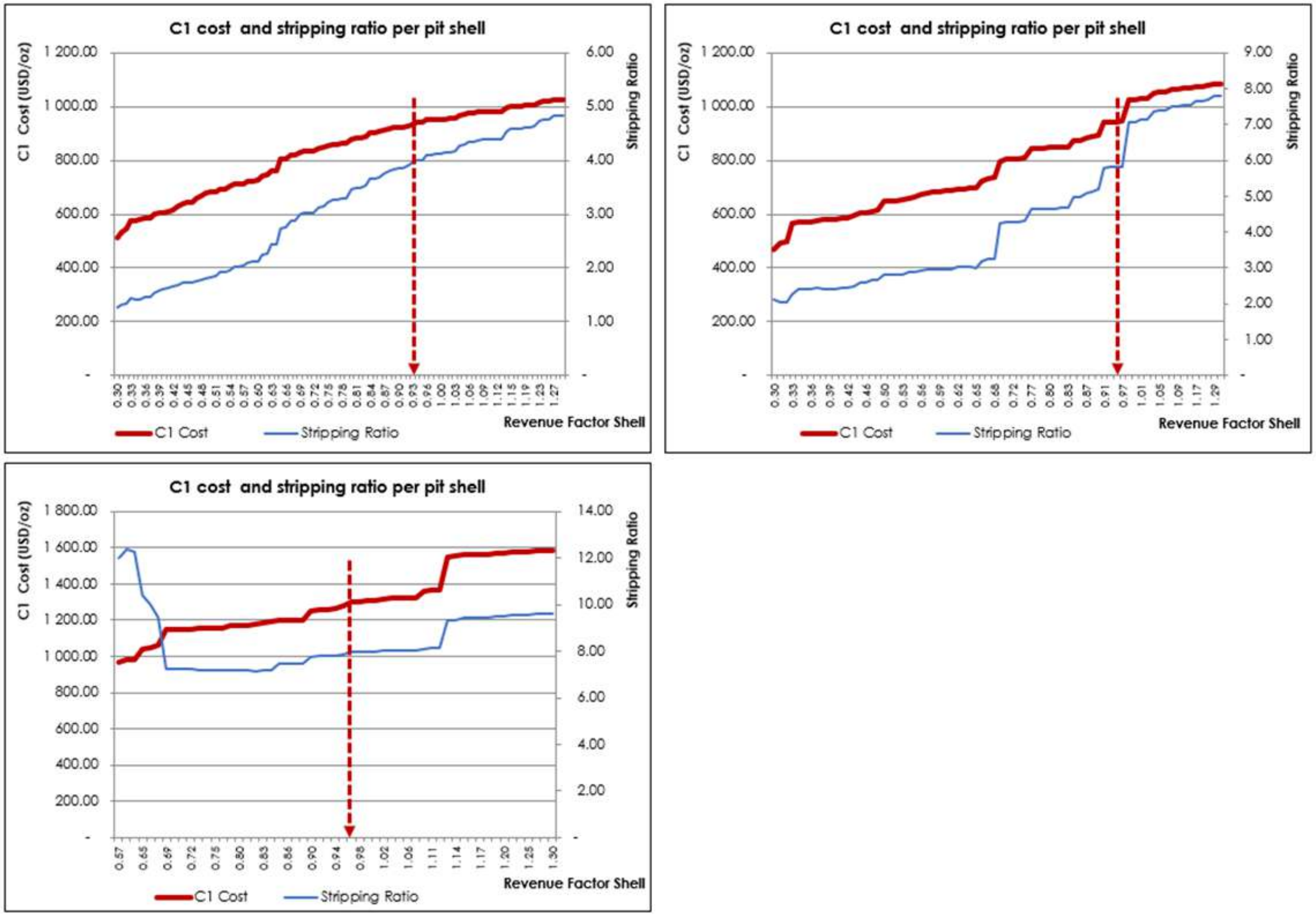


Figure 15.8.4 Whittle LOM and Metal Produced for TH Central & Bulge (top left), Clouds (top right) and TH West (bottom left)

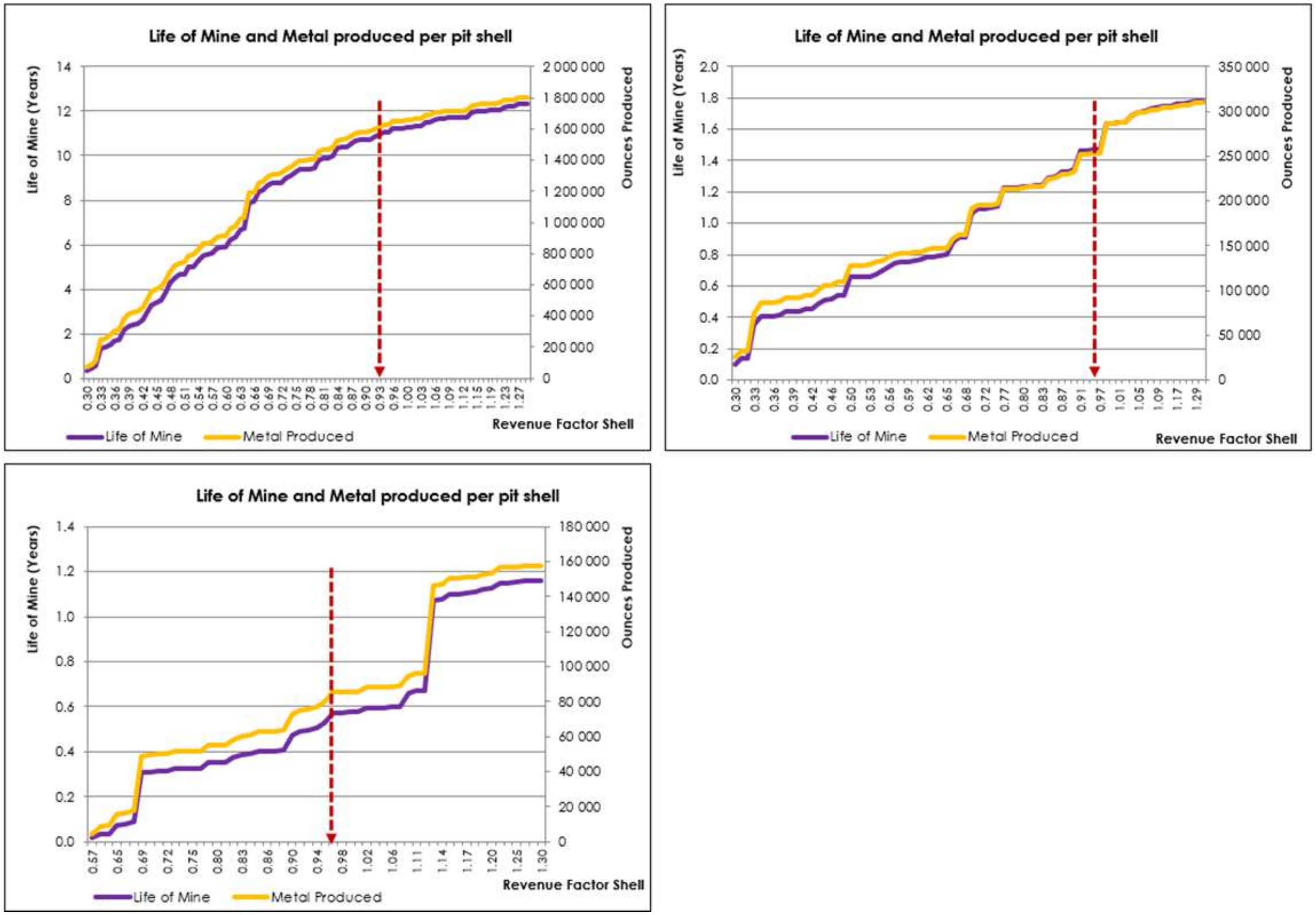


Figure 15.8.5 Whittle Head Grade (g/t) and ROM Tonnes for TH Central & Bulge (top left), Clouds (top right) and TH West (bottom left)

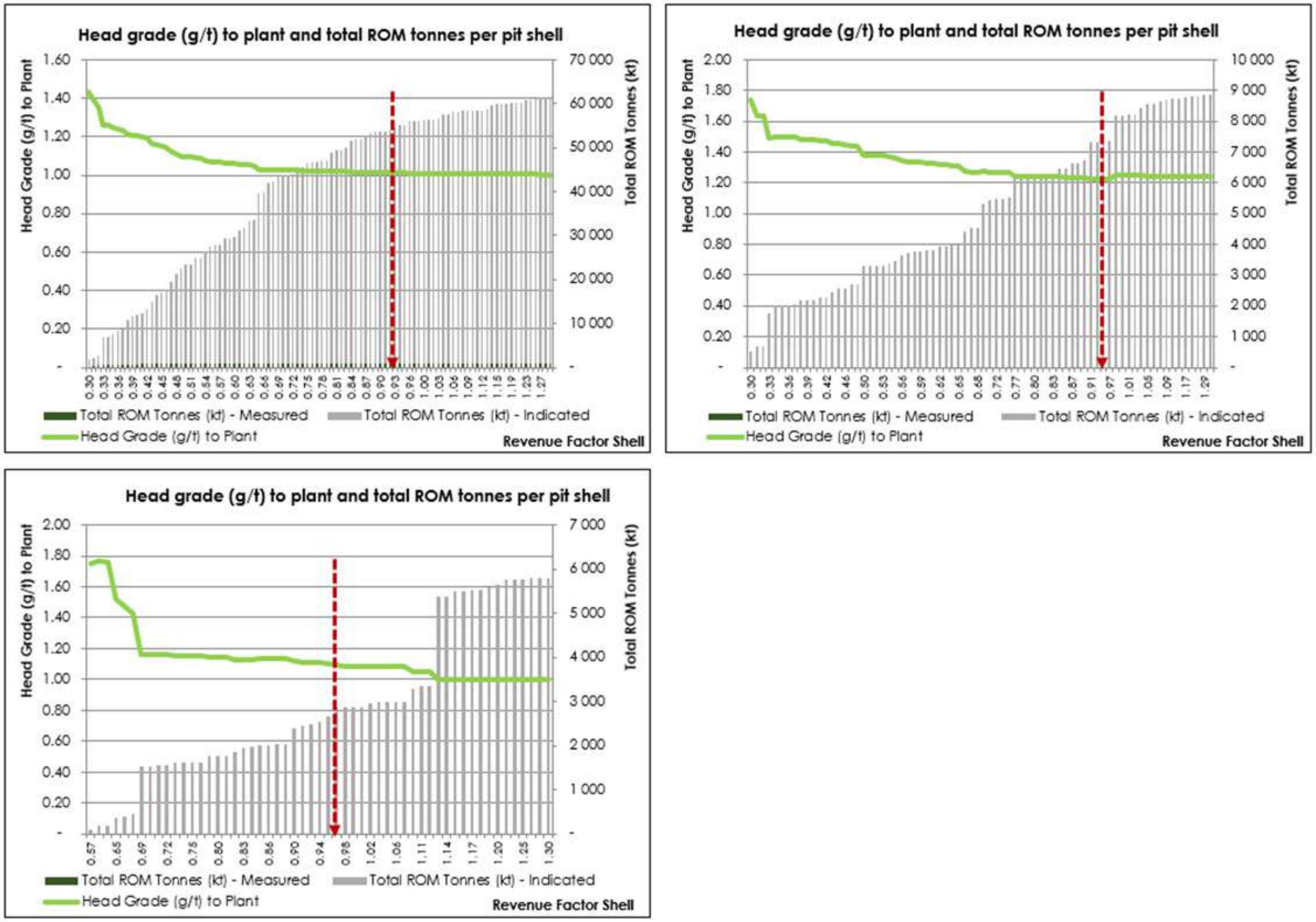


Figure 15.8.6 Percentage change in Contained Ounces & Project NPV for TH Central & Bulge (top left), Clouds (top right) and TH West (bottom left)

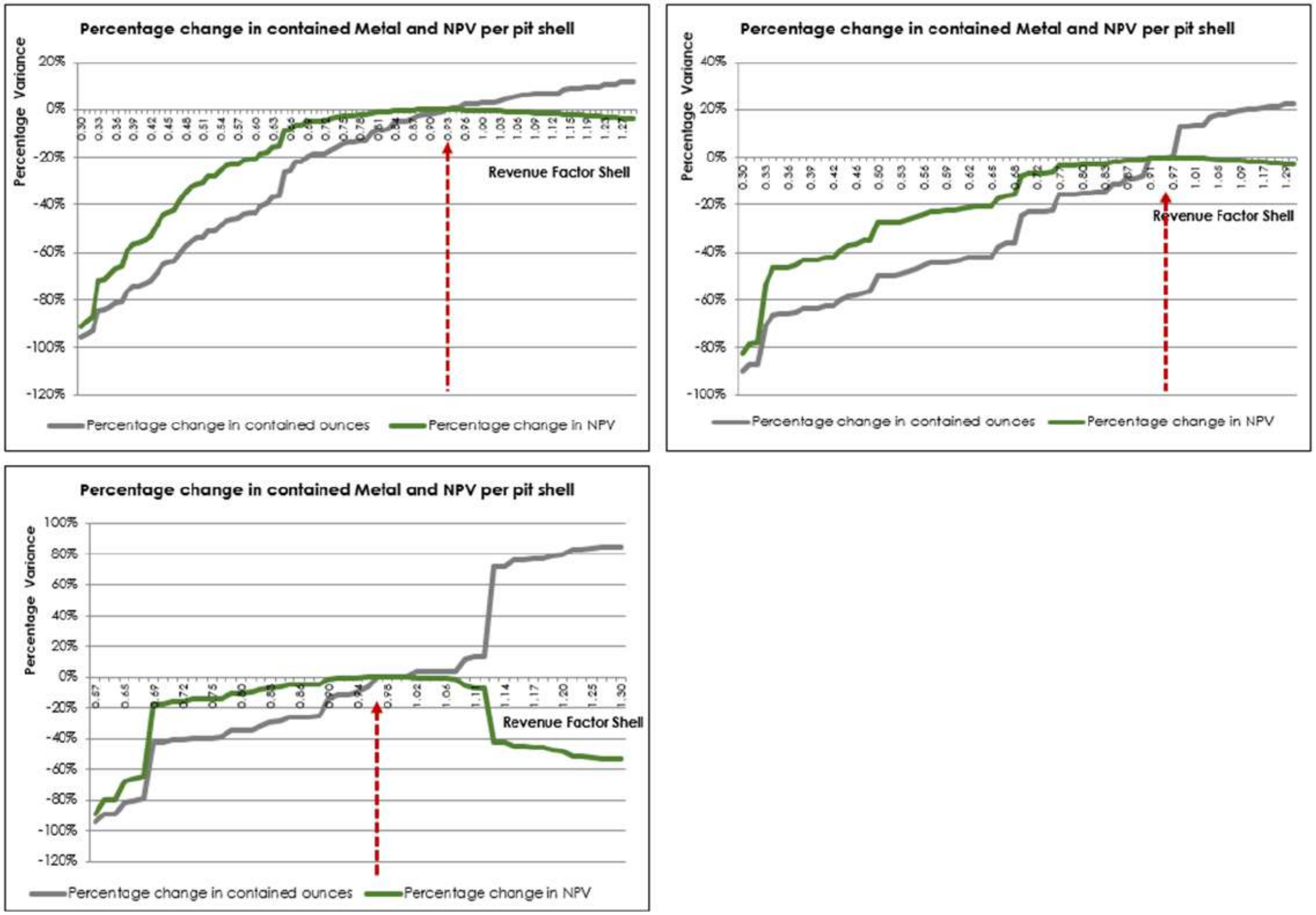
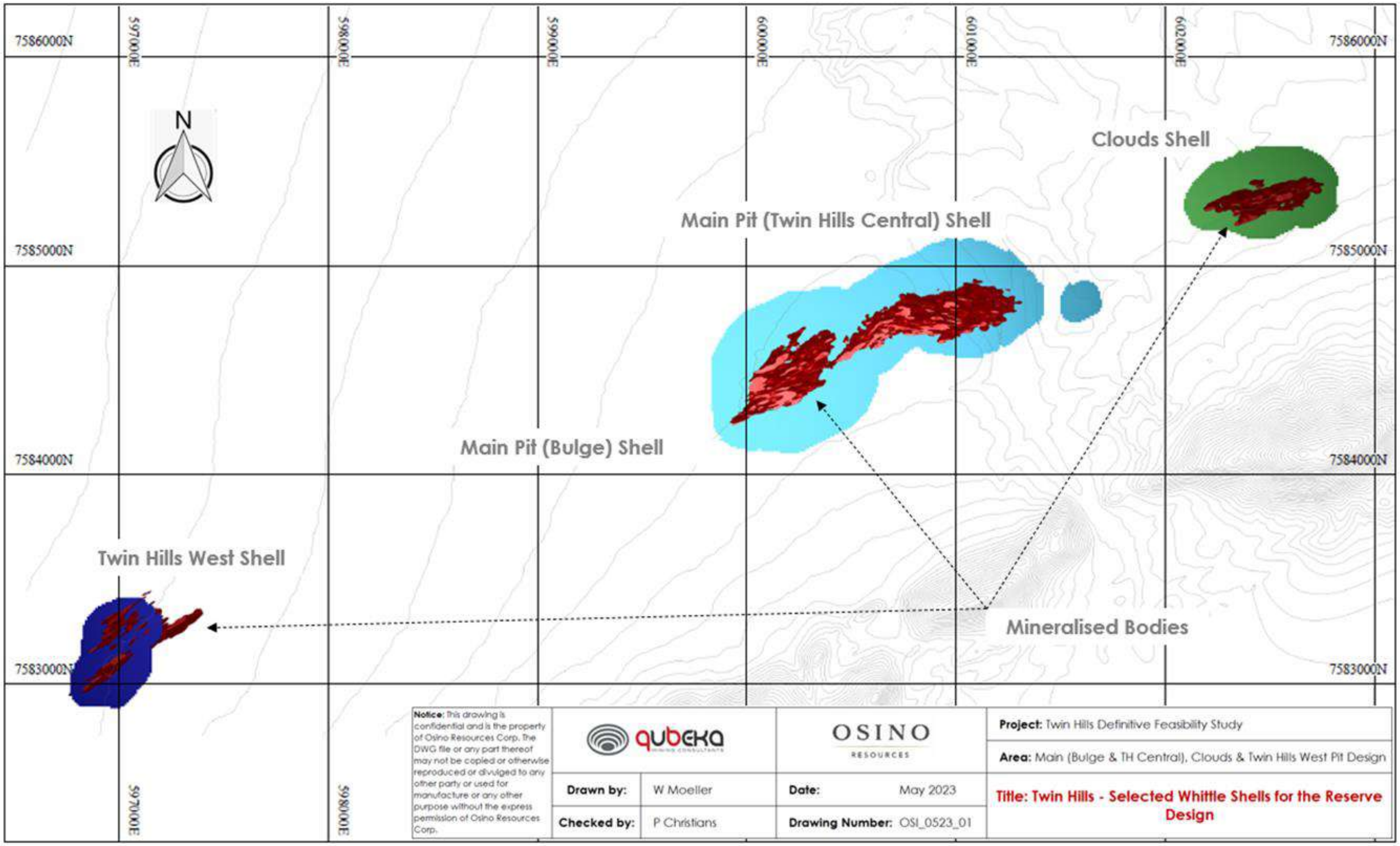


Figure 15.8.7 Selected Pit Optimization Shells with Mineralized Bodies in Plan View



15.8.5 Sensitivity Runs

A suite of sensitivity analyses was carried out on the base case. The objective of the sensitivity analysis is to assess the effect of the base case optimization results on changes in the key parameters:

- Mining Cost (± 20%).
- Processing Cost (± 20%).
- Supervision, General and Administrative (SG&A) Cost (± 20%).
- Commodity Price (bear case, bull case and blue-sky case).
- Process Recovery (± 5%).
- Inclusion of Inferred material.

Table 15.8.9 Sensitivity Ranking for a Percentage Variation in Key Parameter

Description	Unit% Range from Base Case
Insensitive	< 3%
Slightly Sensitive	3% - 8%
Sensitive	9% - 15%
Highly Sensitive	> 15%

Ore tonne variation indicates changes to the size and shape of the pit shell and is therefore a reflection of the robustness of the ore body at a fundamental level. Table 15.8.9 lists the different sensitivity rankings. The sensitivities shown are for the Measured and Indicated ore only option as this optimization is what the subsequent pit designs are based upon.

Table 15.8.10 summarizes the results on a series of sensitivity runs performed on key input parameters to establish the project's robustness on ore inventory in the pit shell. The ore tonnes range from insensitive to extremely sensitive against the defined parameters. This demonstrates the comparative sensitivity of the deposit, and therefore any subsequent pit design, to variations in key project parameters. Consequently, the mine life will be sensitive to any reasonable changes in project fundamentals.

Table 15.8.10 Whittle Sensitivity Runs

Scenario Description	Total Tonnes (kt)
Base Case (Resource Class 1&2) - USD 1700/oz	0.0%
Sensitivity Run: Metal Price - USD 1300/oz	-30.8%
Sensitivity Run: Metal Price - USD 1400/oz	-22.0%
Sensitivity Run: Metal Price - USD 1500/oz	-10.9%
Sensitivity Run: Metal Price - USD 1600/oz	-4.1%
Sensitivity Run: Metal Price - USD 1800/oz	7.6%
Sensitivity Run: Metal Price - USD 1900/oz	9.4%
Sensitivity Run: Resource Class - Inferred Material Included	2.6%
Sensitivity Run: Mining OPEX -20%	16.9%
Sensitivity Run: Mining OPEX -10%	8.7%
Sensitivity Run: Mining OPEX +10%	-4.7%
Sensitivity Run: Mining OPEX +20%	-10.4%
Sensitivity Run: Processing OPEX -20%	2.9%
Sensitivity Run: Processing OPEX -10%	0.9%
Sensitivity Run: Processing OPEX +10%	-0.5%
Sensitivity Run: Processing OPEX +20%	-1.0%
Sensitivity Run: SG&A OPEX -20%	0.9%
Sensitivity Run: SG&A OPEX -10%	0.8%
Sensitivity Run: SG&A OPEX +10%	0.0%
Sensitivity Run: SG&A OPEX +20%	-0.5%
Sensitivity Run: Processing Recoveries -2.0%	-1.0%
Sensitivity Run: Processing Recoveries -1.0%	-0.7%
Sensitivity Run: Processing Recoveries +1.0%	0.5%
Sensitivity Run: Processing Recoveries +2.0%	0.9%

15.9 Pit and Pushback Designs

The practical pit designs are based on the optimization results discussed in this document's previous pit optimization section.

The objective of the pit design process was to transform the optimal pit shell obtained from the pit optimization study into a practical pit with ramps, bench, and berm configurations, taking into consideration design criteria and geotechnical constraints. Only the ultimate (final) pit was designed, and the interim-selected Whittle shells served as pushbacks during the production scheduling process. The following methodology was followed during the design process:

- Use the selected optimal pit shells derived from the pit optimization as the design limit.

- Use the latest block model to show the ore distribution.
- Apply the pit design criteria and geotechnical parameters discussed in the preceding sections.

Ramp positioning within the overall pit design is an integral component of mine design because it influences the stripping ratio of the overall design, the performance of the equipment, and the operating costs. The exit positions of the ramps were determined considering the current position of the primary crusher and the waste rock dumps.

15.9.1 Design Criteria

Sufficient room for manoeuvring must be allowed at all times to promote safety and maintain continuity in the haulage cycle. The width criterion for a haul segment is based on the broadest vehicle in use, the Komatsu 785-7 100-t rigid dump truck (with an operating truck width of 6.9 m. Designing for anything less than this dimension would create a safety hazard due to inadequate clearance. In addition, narrow lanes often create an uncomfortable and unsafe driving environment, resulting in slower traffic and impeding production.

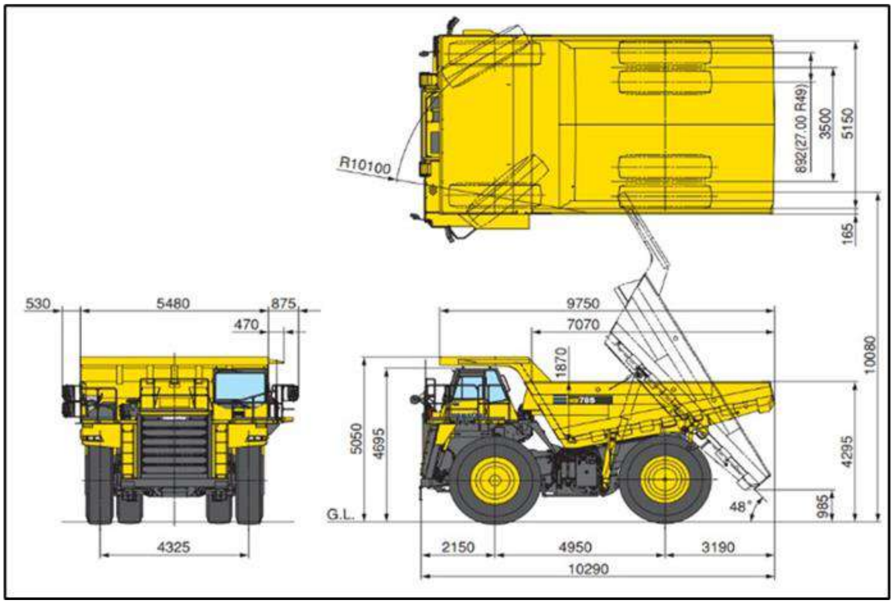
Figure 15.9.1 indicates the machine clearance turning radius of the selected truck. The wider the space created between the front wheels and the main frame increases the turning angle of the wheels, the larger the turning angle, the smaller the truck's turning radius.

The design criterion is subdivided into haul road and bench height design standards.

Haul Road Design Standards

The haul road design parameters were established considering the type and size of material hauling equipment used during the operation. The dimensions of the haul road were based on a Komatsu 785-7 rigid truck using global standards of good practice. Many of the guidelines specify that the vehicle operating width should be multiplied by a factor of 3.0 for two-lane traffic and 2 for single-lane traffic to determine the haul road's effective operating width and incorporate the road infrastructure, for example, the safety berm and drainage channel. The haul road gradient and width are discussed below.

Figure 15.9.1 Komatsu 785-7 Truck Dimensions



Haul Road Gradient

The haul road width for the double-lane haul road was calculated as follows:

- Tyre diameter = 2.70 m
- Berm height = 50% x 2.70 m = 1.40 m
- Width of berm = 2 x (1.40 ÷ tan 35°) = 4.70 m

The haul road width for two-lane traffic is computed in the following steps:

- Width of equipment = 6.90 m
- Effective operating width of the haul road surface for two-way traffic = 3.0 x 6.90 m = 20.7 m
- Safety berm = 4.70 m
- Drainage channel = 0.0 m
- Design width calculation = 20.7 m + 4.7 m + 0.0 m = 25.4 m
- Practical Design width => 25 m

Figure 15.9.2 below indicates the two-lane traffic haul road configuration. Because the last few pit levels will be open and in use for a limited period, extra measures will be taken to reduce waste stripping. These levels will have a relatively low stripping ratio which implies less equipment manoeuvring on these levels. The road width is decreased to allow for one-way traffic. As the risk of collision has decreased, the safety factor (rule of thumb) of two was decreased to 2.0 to enable a narrower ramp.

Figure 15.9.2 Two-Lane Traffice Haul Road Configuration

The haul road width for single-lane traffic is computed in the following steps:

- Width of equipment = 6.90 m.
- Width of haul road surface for one-way traffic = 2.0 x 6.90 m = 13.80 m.
- Safety berm = 4.6 m.
- Drainage channel = 0.0 m.
- Design width calculation = 13.80 m + 4.60 m + 0.00 m = 18.40 m.
- Practical Design width => 18 m.

Figure 15.9.3 indicates the single-lane traffic haul road configuration.

Figure 15.9.3 Single-Lane Traffice Haul Road Configuration

Other Considerations

The design, construction and maintenance of haul roads considerably impact haulage cost, which makes up a significant percentage of the total mining cost. It is, therefore, crucial that an appropriate detailed set of designs for haul road construction are compiled for the site.

The benefits of proper haul road design and construction are as follows:

- Reduced tyre wear and damage.
- Reduction in cycle time due to improved haulage efficiency.
- Reduction in fuel consumption; and
- Reduced truck component wear.

The benefits of an improved haul road design are haulage efficiency by reducing cycle time, fuel burn, and truck component wear. It is, therefore, desirable to generate a minimum site-wide construction standard for both new and existing haul roads. The size of the equipment limits the minimum bench operating width for the pit. The pit design parameters are summarized in Table 15.9.1.

Table 15.9.1 Pit Design Parameters

Parameter	Unit	Value
Minimum Mining Width (20 m + Single Ramp Width)	m	35.0

Parameter	Unit	Value
Minimum Pushback Width	m	60.0
Dual Ramp Width	m	25.0
Single Ramp Width	m	18.0
Minimum Turning Circle	m	10.0
Ramp Gradient (Short Ramps < 400 m)	1:#	8.0
Ramp Gradient (Short Ramps < 400 m)	%	12.0
Ramp Gradient (Short Ramps < 400 m)	deg.	7.1
Ramp Gradient (Long Ramps > 400 m)	1:#	10.0
Ramp Gradient (Long Ramps > 400 m)	%	10.0
Ramp Gradient (Long Ramps > 400 m)	deg.	5.7

15.9.2 Operational Considerations

With reasonable and appropriate pit slope angles, every pit design has several operational constraints, including sound, controlled blasting, routine bench scaling and rock-fall clean-up, effective slope depressurization, and slope performance monitoring during the mine operations.

- Controlled blasting: Controlled blasting methods will facilitate the development of the steepest possible final pit slopes by reducing bench face damage from blasting. Typically, controlled blasting strategies utilize small diameter blast holes detonated as a pre-shear line in harder massive rock or as a post-shear (cushion) line in weak or heavily fractured rock. Blasthole locations and lengths must be adjusted so the blasthole bottoms do not intercept or influence the stability of the bench's crest below. Otherwise, highly fragmented bench crests will develop, resulting in the loss of effective berm widths.

- Bench and high wall scaling: It is essential that the benches be kept clear of loose rock and that the bench faces be maintained regularly to minimize rock fall potential during mining operations. Scaling will be an important part of the bench maintenance program and may be conducted after blasting in areas where access is still available. Routine scaling and berm clean-up must take place.

- Groundwater management: The presence of groundwater can negatively affect the slope stability of the pit walls as it increases the effective stress in the walls. Keeping the open pit dry is crucial, so a sump to collect the occasional groundwater inflow into the open pit from the walls and transient stormwater inflow is considered crucial.

- Geotechnical performance monitoring: Geotechnical performance monitoring is recommended for all stages of pit development. Failure potential in the Fresh Rock could occur suddenly, but by industry experience is often preceded by slight increases in slope deformation. The monitoring program should be implemented as a staged approach, including visual observation, periodic inspections, detailed geotechnical mapping, tension crack mapping, and a suitable combination of surface displacement monitoring (surface prisms, GPS or wire extensometers). Large-scale structures should be characterized and monitored as they have the potential to develop tension cracks.

15.9.3 Design Approach

The following methodology was followed during the design process:

- Use the selected optimal pit shells derived from the pit optimization as the design limit.
- Use the latest block model to show the ore distribution.
- Apply the pit design criteria and geotechnical parameters discussed in the preceding sections.

Ramp positioning within the overall pit design is an integral component of mine design because it influences the overall design's stripping ratio, the equipment's performance, and the operating costs. The exit positions of the ramps were determined considering the proposed position of the primary crusher and the waste rock dump ramps.

The process that Whittle undertakes is to vary the base input price both up and down to produce a series of shells. Each shell produced generates the maximum cash flow for the input parameters and its associated factored price. The lower factored price will produce smaller shells, and the higher price larger shells resulting in a set of “nested” shells with the lower valued shell lying inside, the higher valued shells. These nested shells are important for several reasons:

- The smaller (interim) shells guide where initial mining should occur, as the smaller shells will drive towards the areas of the highest value in the ore body.
- These interim “high value” mining stages allow the pit to be developed practically and incrementally while simultaneously targeting high-grade ore and deferring waste stripping.

The following methodology was followed during the design process:

- Use the selected optimal pit shells derived from the pit optimization as the design limit.
- Use the latest block model to show the ore and grade distribution.

- Apply the pit design criteria and geotechnical parameters. The available pit room was used for haul roads wherever possible instead of expanding pit walls, and haul road width was reduced at the lower pit levels to minimise waste stripping as much as possible.

Ten pushbacks were designed for the Twin Hills Project consisting of:

- Seven pushbacks in the Main Pit comprised Bulge and Twin Hills Central.
- One pushback for Clouds.
- One pushback for Twin Hills West.
- One pushback for Clouds West.

The pushback designs were based on the selected interim pit shells, and the designs were used to evaluate the tonnage and grades of all the different material types, which in turn can be used to perform production scheduling. The conventional way pushback shells are selected is to select arbitrarily Whittle shells with roughly equal tonnes as intermediate phases from the nested pits. Qubeka, however, identifies nested pit shells that are more efficient in terms of stripping ratio and ore tonnes based on their net value (net revenue less net mining, transport, processing, and other costs). The correct selection of a first pushback with early access to high-grade material while still maintaining a low stripping ratio has the most significant impact on NPV when this mechanism is applied. Ramp positioning within the overall pit design is an integral component of mine design because it influences the stripping ratio on the overall design, the performance of the equipment, and the operating costs due to the direct impact of the ramps on the hauling profiles. The exit positions of the ramps were determined based on the proposed positions of the primary crusher and the waste rock dumps. The pit design allowed for a single ramp system along the northern faces of the Main Pit.

15.9.4 Geotechnical design recommendations

The geotechnical design recommendations were obtained from SRK and are presented in Table 15.9.2. Further, double bench parameters for the south slope were included.

15.9.5 Ultimate Pit Design

The Twin Hills DFS ultimate pit designs are depicted in Figure 15.9.4 and were designed with a pit access strategy along the north-eastern and north-western pit highwalls. The ultimate pit dimensions are summarized in Figure 15.9.4. Table 15.9.3 below summarizes the Twin Hills DFS ultimate pit inventory above a 0.40 g/t Au cut-off grade. The following section will compare the Whittle shell and pit design content.

Table 15.9.2 Design Recommendation for the Life of Mine Pit Plan

	Slope Height (m)	Bench Height (m)	Toe to Crest Stack Angle (°)	Stack Height (m)	Batter Angle (°)	Berm Width (m)	Toe to Toe IRA (°)	Geotechnical Berm Width (m)
Weathered	50	10	46	50	70	7.6	42	15
TH Bulge North Unweathered	350	10	60	50	70	2.8	57	15
TH Bulge South Unweathered	350	10 20	63 63	50 60	80 80	4.2 9.9	59 56	15 15
TH BN North Unweathered*	50	10	55	50	70	6.6	50	15
TH Central North Unweathered	250	10	60	50	70	2.8	57	15
TH Central South Unweathered	250	10 20	63 63	50 60	80 80	4.2 9.9	59 56	15 15
THC East End	250	10	63	50	80	4.1	60	15
Clouds N	170	10	60	50	80	5.0	56	15
Clouds W	170	10	60	50	70	5.0	56	15
Clouds S	170	10	60	50	80	5.0	56	15
THW Oryx Pit North	100	10	60	50	70	2.7	58	15
THW Oryx Pit South	160	10	60	50	80	5	56	15

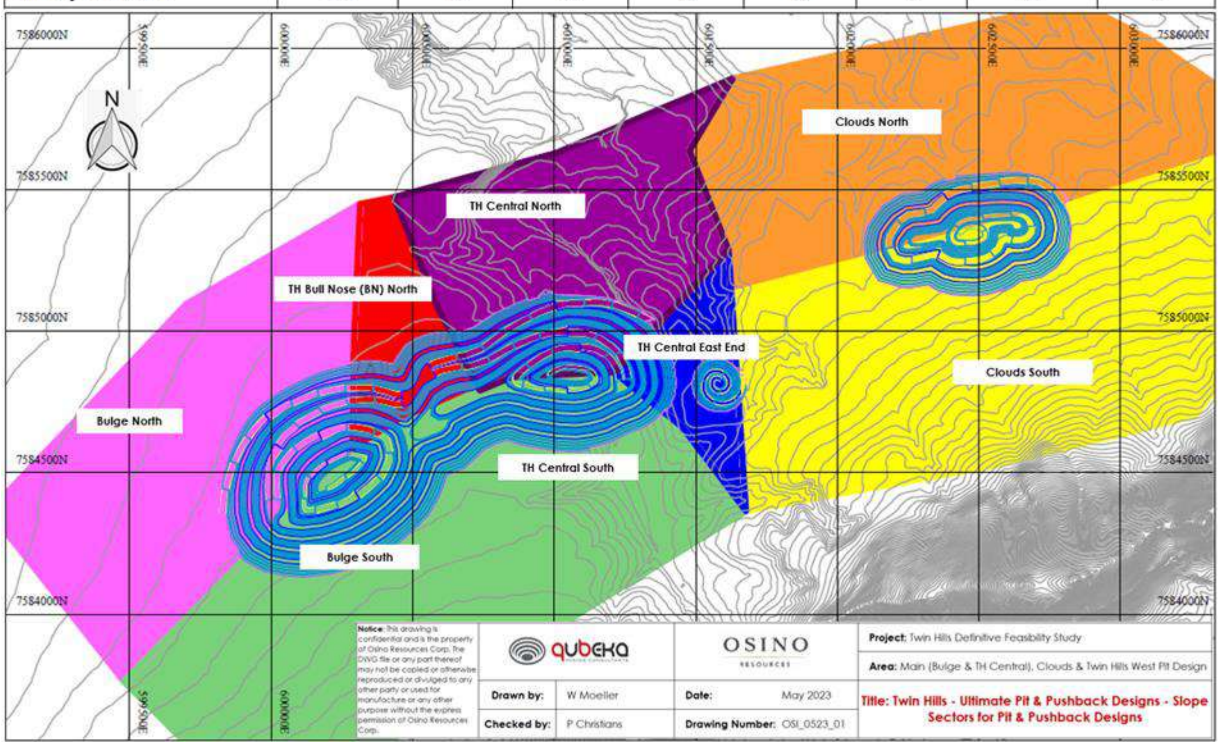
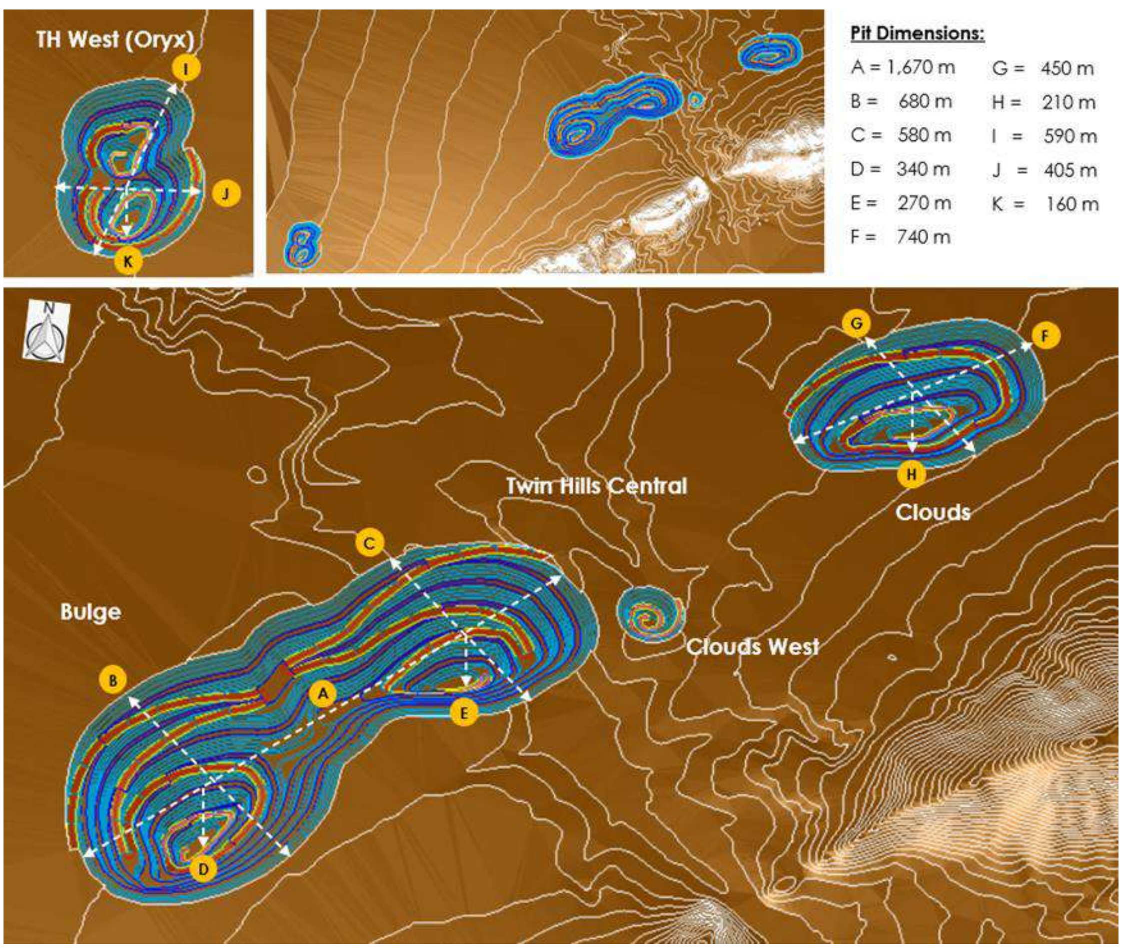


Table 15.9.3 Twin Hills DFS Ultimate Pit Inventory Above a Cut-Off Grade of 0.40 g/t Au

Parameter	Unit	Total	Main Pit	Clouds Pit	TH West Pit	Clouds West Pit
Ore	**Mt**	64.51	54.30	7.25	2.78	0.19
Waste	Mt	299.07	223.02	48.10	26.23	1.73
Total Material Mined	Mt	363.59	277.32	55.35	29.01	1.91
Au Grade	**g/t**	1.04	1.01	1.22	1.07	1.14
Strip Ratio	Ratio	4.64	4.11	6.64	9.43	9.31
Au Cut-Off Grade	g/t	0.40	0.40	0.40	0.45	0.40
Contained Metal (Ounces)	**Moz**	2.15	1.76	0.28	0.10	0.01

Figure 15.9.4 Twin Hills Ultimate Pit Designs in Isometric View with pit Dimensions



The overall stripping ratio for the whole mine is 4.64 resulting in 299.07 million tonnes (Mt) of waste to be stripped to expose the 64.51 Mt of ore at an average diluted gold grade of 1.04 g/t applying a cut-off grade of 0.40 g/t Au. Of the 64.51 Mt of ore mined, 86.7% will be fresh ore, while the remainder consists of oxidized and transitional ore. The pits will be depleted within 12 years of mining, and the life-of-mine (LOM) will be 13 years with a 5.0 Mtpa processing capacity. In the last year of the LOM, low-grade stockpile material will be reclaimed and treated.

15.9.6 Pushback (Stage) Designs

The pit optimization runs have highlighted the importance of pit staging in improving project value. An analysis of the pit optimization outputs was used to identify areas the optimization process considers high value. Therefore, the smaller pit shells (lower revenue factor) provide guidance towards the location of interim stage designs. Careful consideration ensures that mining access is coherent, bench turnover rates are realistic, and minimum mining widths are compliant. The pit with interim pushbacks will be mined to allow that grade to the plant to be maximized in the early years, and waste stripping is deferred as far as possible into the future. The Whittle pit optimization exercise resulted in a selection of lower revenue factor shells, the combination of which provides an optimum extraction sequence. The pushback stages were designed to provide access to the shallower portions of the orebody during the initial project life.

The ultimate pit will be mined in eight pushbacks, which represent areas that the optimization process considers to be of high value:

- Maximizing the feed grade to the processing in the early years.
- Deferring waste stripping as far as possible into the future.
- Ensuring design criteria such as overall and batter slopes are maintained.

The layout of the mining pushback is shown in Figure 15.9.5. A summary of the different pushback inventories with regards to strip ratio and tonnes per resource category is summarized in Table 15.9.4. Figure 15.9.6 to Figure 15.9.12 show the individual phase designs consisting of ten separate mining stages, namely:

- Seven pushbacks in the Main Pit comprised Bulge and Twin Hills Central (84 % of total ore tonnes).
- One pushback for Clouds (11% of total ore tonnes).
- One pushback for Twin Hills West (4% of total ore tonnes).
- One pushback for Clouds West (less than 1% of total ore tonnes).

Figure 15.9.5 Ultimate Twin Hills Pit Designs and Mining Model Coded by Pushback Number

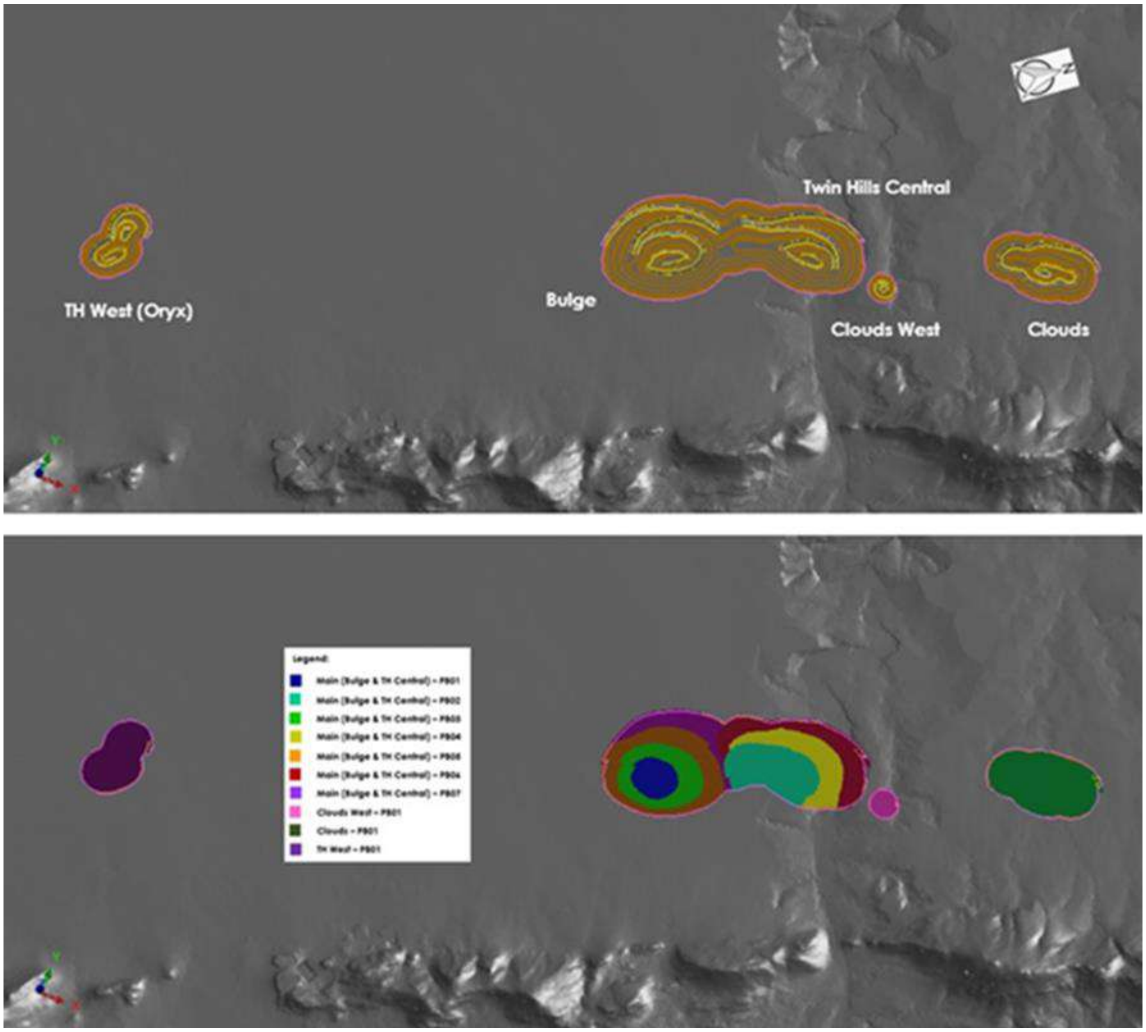


Figure 15.9.6 Twin Hills DFS – Main Pit Pushback 01 Design – Plan View

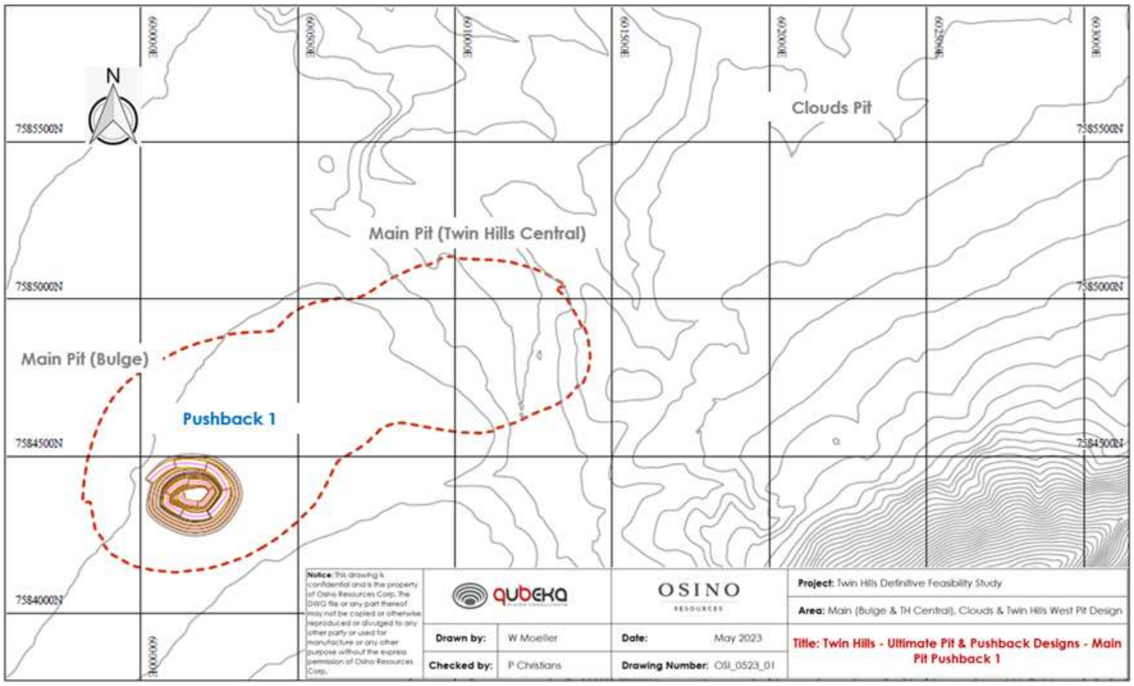


Figure 15.9.7 Twin Hills DFS - Main Pit Pushback 02 Design – Plan View

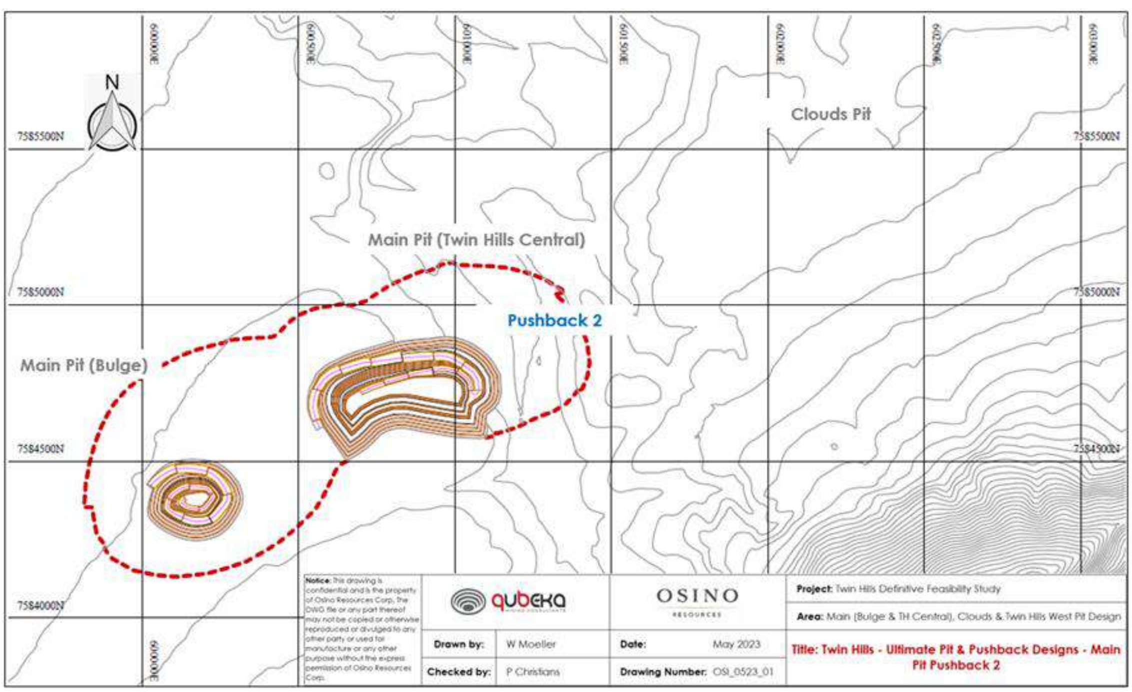


Figure 15.9.8 Twin Hills DFS – Main Pit Pushback 03 Design – Plan View

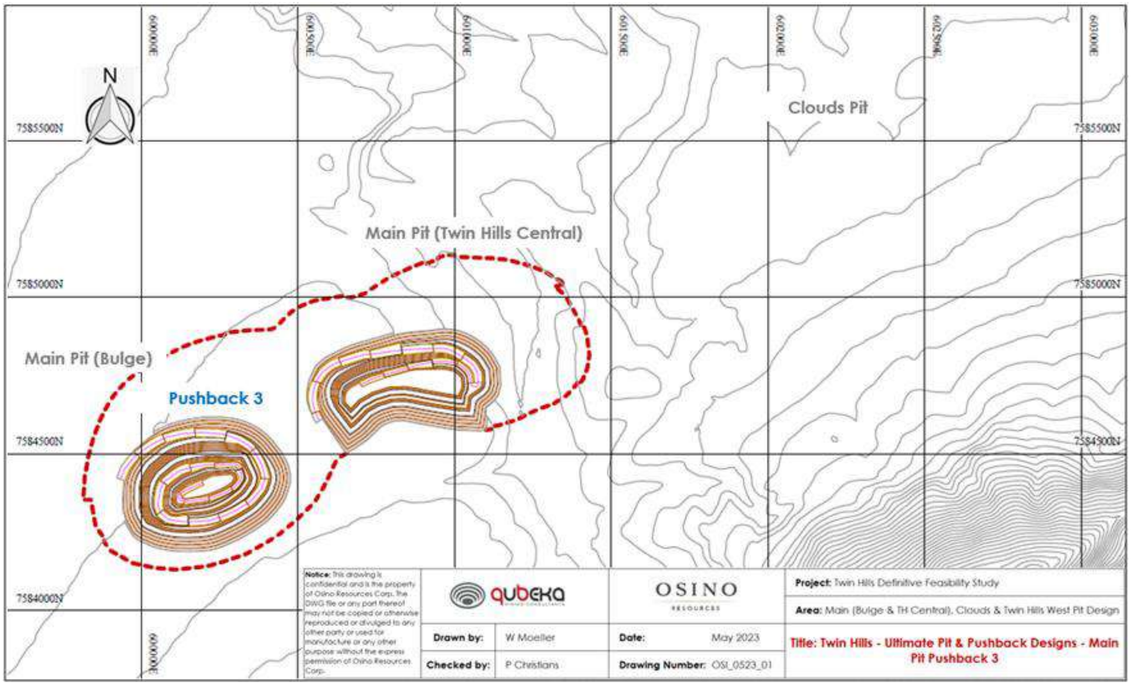


Figure 15.9.9 Twin Hills DFS - Main Pit Pushback 04 Design – Plan View

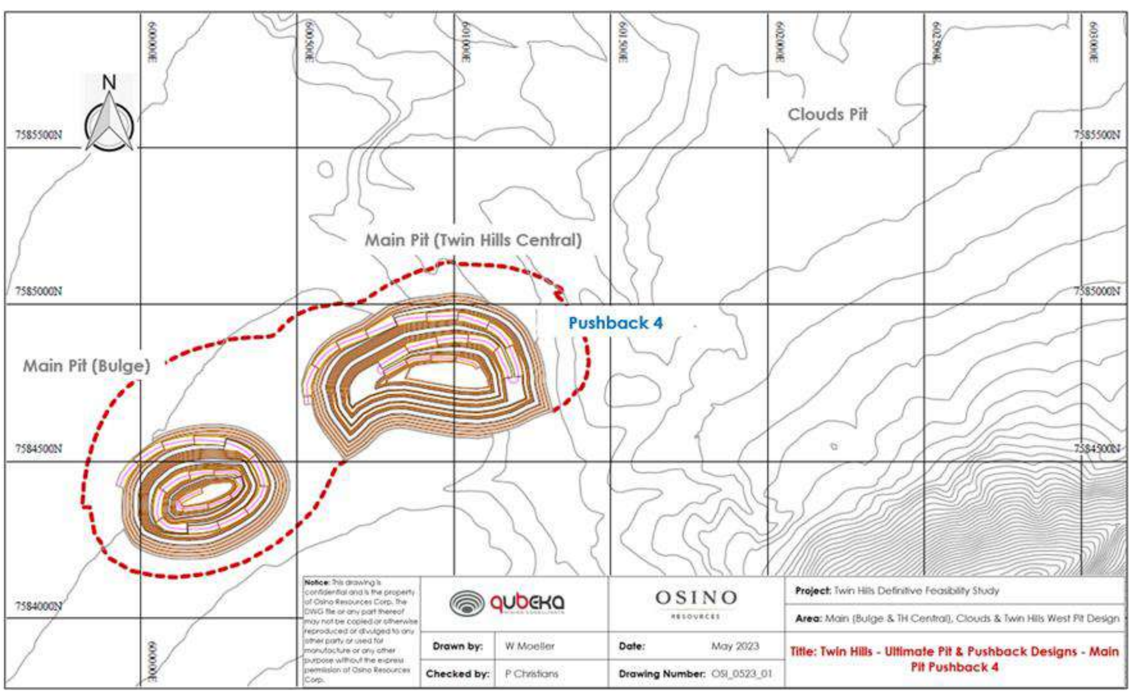


Figure 15.9.10 Twin Hills DFS - Main Pit Pushback 05 Design – Plan View

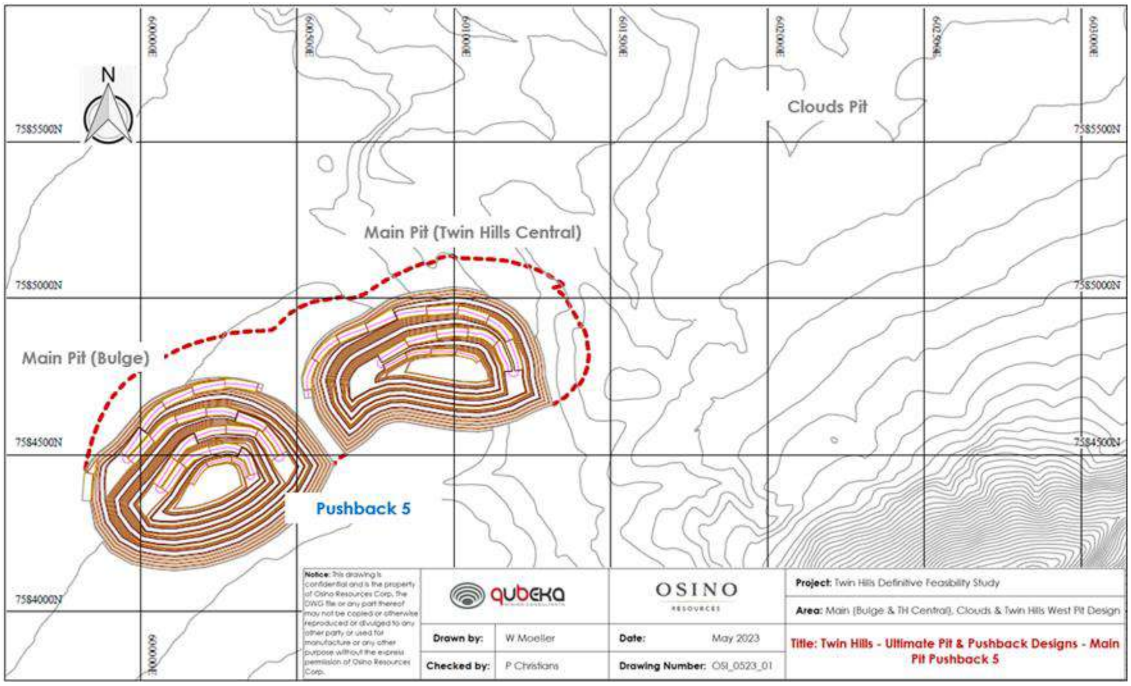


Figure 15.9.11 Twin Hills DFS - Main Pit Pushback 06 Design – Plan View

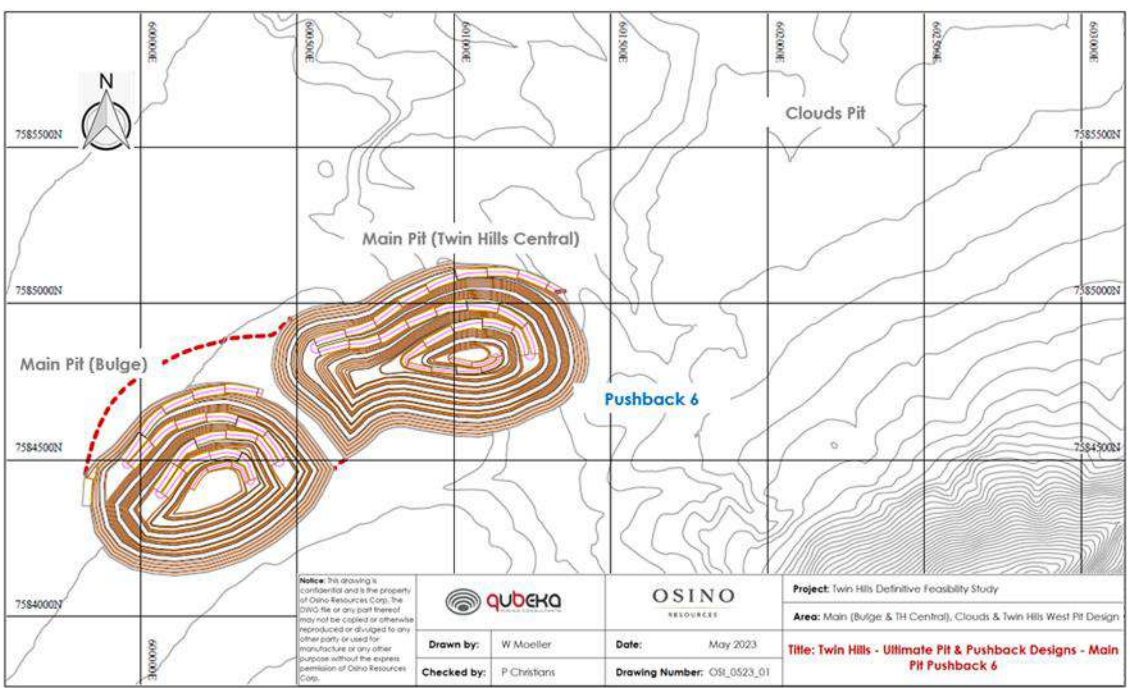


Figure 15.9.12 Twin Hills DFS - Main Pit Pushback 07 and Ultimate Pit Design – Plan View

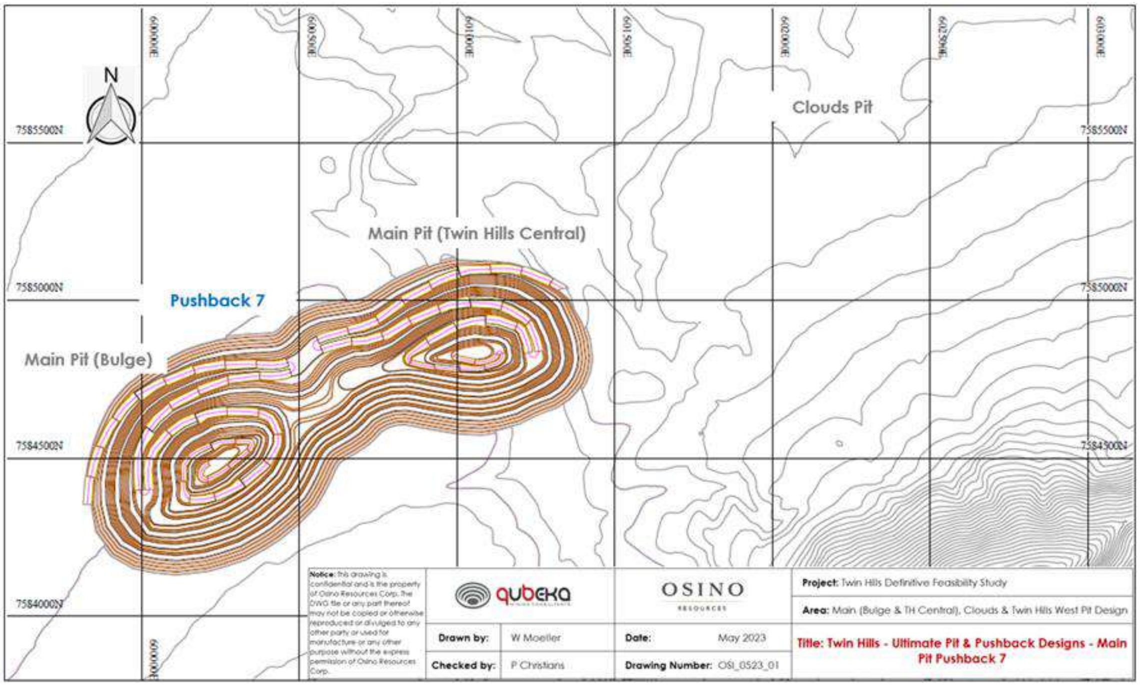


Figure 15.9.13 Twin Hills DFS – Clouds and Clouds West Ultimate Pit Plan – Plan View

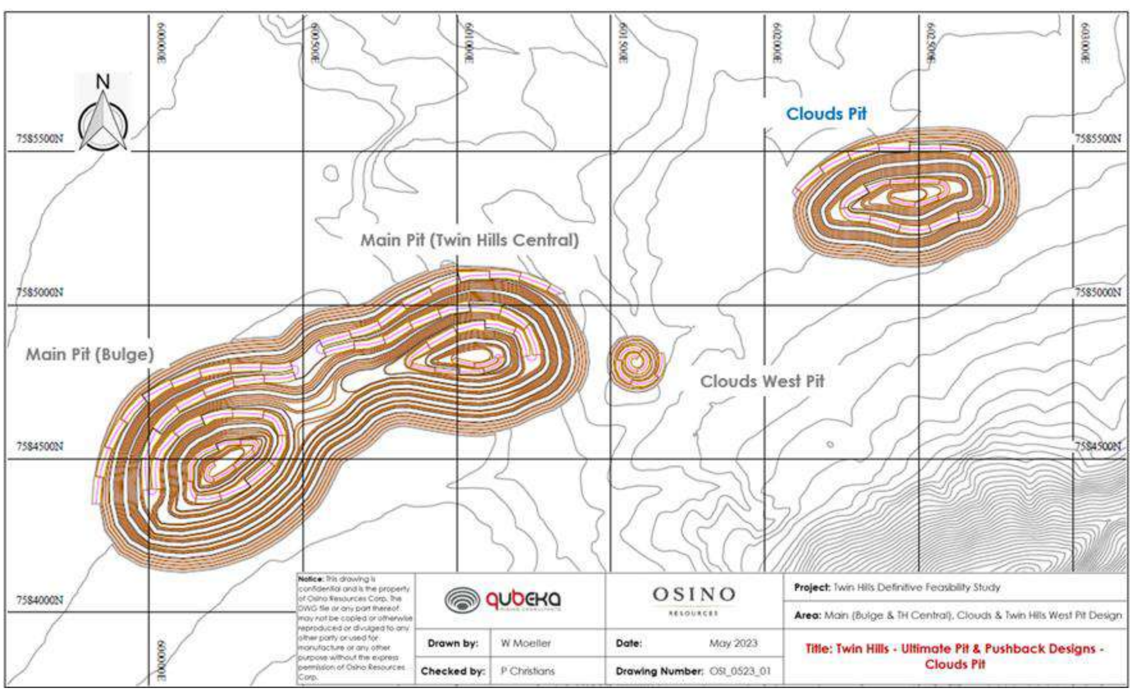


Figure 15.9.14 Twin Hills DFS – Twin Hills West Ultimate Pit Design – Plan View

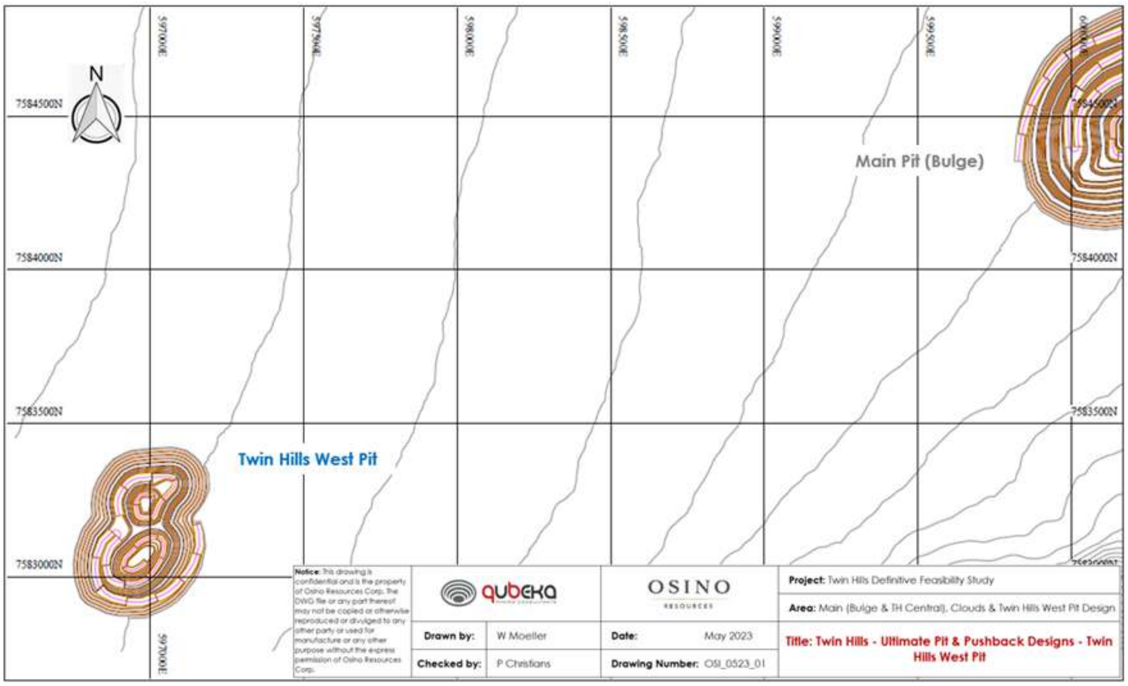


Table 15.9.4 Twin Hills DFS Ultimate Pushback Inventory Above a Cut-Off Grade of 0.40 g/t Au

Parameter	Unit	Total	Main Pit – PB 01	Main Pit – PB 02	Main Pit – PB 03	Main Pit – PB 04	Main Pit – PB 05	Main Pit – PB 06	Main Pit – PB 07	Clouds Pit – PB 01	TH West Pit – PB 01	Clouds West Pit – PB 01
Ore	**Mt**	64.51	2.51	7.39	7.62	6.22	9.20	7.05	14.31	7.25	2.78	0.19
Waste	Mt	299.07	3.21	16.53	18.70	28.45	46.05	50.97	59.12	48.10	26.23	1.73
Total Material Mined	Mt	363.59	5.72	23.92	26.31	34.67	55.24	58.02	73.42	55.35	29.01	1.91
Au Grade	**g/t**	1.04	1.15	1.18	0.98	1.05	0.91	1.02	0.95	1.23	1.15	1.6
Strip Ratio	Ration	4.64	1.33	2.37	2.29	4.57	5.23	7.02	3.77	6.55	9.11	12.96
Au Cut-Off Grade	g/t	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.45	0.40
Contained Metal (Ounces)	**Moz**	2.15	0.09	0.28	0.24	0.21	0.27	0.23	0.44	0.28	0.10	0.01

15.9.7 Grade-Tonnage Curve

Grade-tonnage curves visually represent the impact of cut-off grades on mineral reserves. The grade-tonnage curves display the ore tonnage above the cut-off grade and the average deposit grade relative to the cut-off grade. As the criteria for ore classification becomes more selective, the ore tonnage above the cut-off grade of the deposit decreases. Conversely, as the cut-off grade is lowered, the ore tonnage of the deposit increases. This is simply because the distinguishing standard between ore and waste has become less selective. As the cut-off grade increases, so does the average grade of the ore mined. The curves ultimately show how the average grade and tonnage of a material delivered to a specific process depend on the selected cut-off grade. Constraining the mining block model with the final pit design surface and evaluating the ore blocks per bin, the cumulative grade tonnage curves per pit are depicted in Figure 15.6.3 in Section 15.6.3.

15.9.8 Compliance with the Whittle Shell

Table 15.9.5 compares the practical pit design's inventory compliance to the selected Whittle shell. As indicated above, there is a 6.1 % increase in the total waste and a decrease of 0.5 % in the run-of-mine ore tonnes at an average Au grade of 1.04 g/t from the Whittle shell to the practical pit design. This results in a net increase in the stripping ratio from 4.35 to 4.64. The results also indicate a 0.3 % decrease in the metal contained. The above discrepancies are within industry-acceptable norms.

Table 15.9.5 Whittle Shell vs DFS Pit Design Inventory

Parameter	Unit	DFS Whittle Shell	DFS Pit Design	Discrepancy
Ore	**Mt**	**64.86**	**64.51**	**-0.5%**
Waste	Mt	281.94	299.07	6.1%
Total Material Mined	Mt	346.80	363.59	4.8%
Au Grade	**g/t**	**1.04**	**1.04**	**0.0%**
Strip Ratio	Ratio	4.35	4.64	6.7%
Contained Metal (Ounces)	Moz	2.16	2.15	-0.3%

15.10 Mineral Reserve Estimate

As stated in this section, the Mineral Reserve estimate is based on the DFS results for Osino Twin Hills Gold Project. Osino is a Canadian gold exploration and development company focused on the fast-tracked development of their Twin Hills Gold Project in central Namibia. The Twin Hills Gold Project is located within Namibia's prospective Damara sedimentary mineral belt, near and along the strike of the producing, open-pit Navachab and Otjikoto gold mines. Twin Hills is a sedimentary-hosted, structurally controlled gold deposit that fits the broad orogenic model and is amenable to conventional open-pit gold mining and carbon-in-leach metallurgical processing.

The orebody will be mined as a conventional shovel and truck operation, with bulk mining augmented by more selective mining in areas with narrow ore zones. It was assumed that mining would take place by conventional open pit methods and that the whole mining operation, except for the mine technical services function, would be outsourced to a reputable mining contractor company. This includes drilling, blasting, loading, and hauling of ore and waste. Gold recovery will be achieved using a 3-stage crushing, ball milling, gravity, pre-oxidation, carbon-in-leach (CIL), cyanide detoxification and tailings thickening and filtration process plant flowsheet. The process is based on conventional unit operations well proven in the industry and will achieve acceptable recoveries from all pit areas planned to be processed. The Twin Hills process plant will have a nameplate capacity of 5.0 Mtpa of ore. The Mineral Reserves are based on the following economic parameters summarized in Table 15.10.1.

Table 15.10.1 Major DFS Pit Optimization Input Parameters

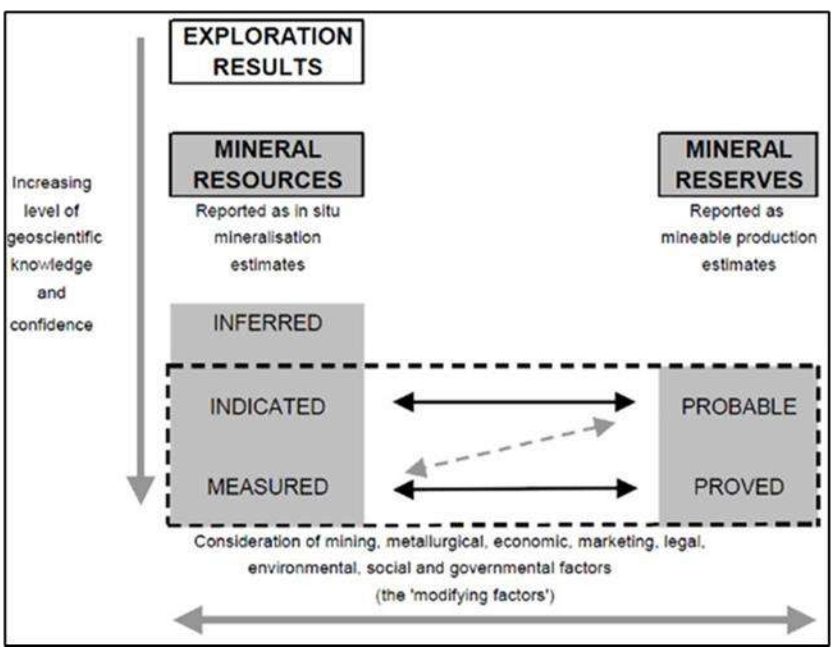
Parameter	Units	Values
Base Currency		USD
Base Date		2Q23
Exchange Rate – Real	NAD:USD	17.50
Discount Rate (for NPV Calculation)	%	5.00
Base Gold (Au) Price – Real	**USD /oz**	**1,700**
Government Royalty (3%) + Export Levy (1%)	%	4.00
Metal Credit	%	99.90
Net Gold Price	**USD /oz**	**1,630.23**
Selling Costs – Gold Refining Costs	USD /oz	0.55
Selling Costs – Gold Transport Costs	USD /oz	2.20
SMU Block Size	X (m) x Y (m) x Z (m)	10 x 5 x 2.5
Mining Dilution	%	11.0
Mining Losses	%	-3.0
Plant Throughput	**Mtpa**	**5.00**
Average Process Plant Recovery	%	92.92
Average Mining Costs	USD /t Rock	2.73
Process Plant Costs – Incl ROM Rehandling Costs	USD /t RoM Ore	9.32
Whittle Total Fixed / Period Cost (SG&A Cost)	M USD /annum	23.39

Twin Hills is at an advanced stage of exploration and development, with more than 225,000m of drilling completed on the project since its grassroots discovery by Osino, with various advanced development studies underway.

From a Mineral Reserve perspective, the study will comply with guidelines as defined within the Canadian National Instrument 43-101 (NI43-101) Standards of Disclosure for Mineral Projects for a Pre-feasibility Study (PFS), a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Mineral Reserves, which provides the minimum standards for Mineral Reserve reporting. The estimate has been prepared by a competent and appropriately experienced Qualified Person with a thorough knowledge of the operation. Inferred Resources were excluded from the pit optimization runs and the Reserve statement and were classified as waste during the LOM production schedule runs.

Public Reports dealing with Exploration Results, Mineral Resources and Mineral Reserves must use only Proved or Probable Mineral Reserves, Measured, Indicated and Inferred Mineral Resources and exploration results as shown in Figure 15.10.1. This diagram illustrates the framework for classifying tonnage and grade estimates to reflect different levels of geoscientific confidence and degrees of technical and economic evaluation. Mineral Resources can be estimated based on geoscientific information with some input from other relevant disciplines. Mineral Reserves, modified Indicated and Measured Mineral Resources (shown within the dashed outline in Figure 15.10.1), require consideration of the modifying factors affecting extraction. Measured Mineral Resources may convert to either Proved or Probable Mineral Reserves if there are uncertainties associated with modifying factors that are considered in the conversion from Mineral Resources to Mineral Reserves. The broken arrow in Figure 15.10.1 demonstrates this relationship. Although the trend of the broken arrow includes a vertical component, it does not, in this instance, imply a reduction in the level of geoscientific knowledge or confidence. In such a situation, these modifying factors should be fully explained.

Figure 15.10.1 Relationship Between Mineral Resources and Mineral Reserves



15.10.2 Modifying Factors

The term 'Modifying Factors' includes mining, metallurgical, economic, marketing, legal, environmental, social, and governmental considerations. The specialists are responsible for the various Modifying Factors are summarized in Table 15.10.2. Sovereign risk is understood with Osino and its sub-consultants having considerable experience in Namibia and other neighbouring Southern African countries. Residual environmental risks and social issues are low and manageable, especially with a neighbouring gold mine within 20 km. Work undertaken to date is sufficient to support DFS-level design and cost estimating. Responsible social and environmental design criteria have been key study elements and integral to design and project planning from the outset, contributing considerably to the robustness of the project.

Table 15.10.2 Source of Modifying Factors Used for Ore Mineral Reserve Estimate

Item	Source
Mining Design	Qubeka Mining Consultants
Metallurgical Aspects	Lycopodium
Process Design	Lycopodium
Infrastructure Design	DRA
Commodity Price	Osino Resources
Processing Cost	Lycopodium
General Administrative Cost	Lycopodium and Osino Resources
Geology and Resource Aspects	CSA Global
Social and Environmental	Environmental Compliance Consultancy (ECC)
Government and Permitting	Osino Resources
Geohydrology and Tailings Storage Facility	Knight Piésold
Geotechnical	SRK
Mining Dilution and Losses	Qubeka Mining Consultants
Discount Rate	Osino Resources

15.10.3 Overall Project Interpretation and Conclusions

A Mineral Reserve statement has been generated and included in this report, providing confidence in the resource tonnage and grade included in the project's positive DFS economic assessment. The DFS has identified, defined, and costed a relatively low technical risk conventional open-cut mine and carbon-in-leach processing facility. The process flowsheet is based on unit operations and an overall plant configuration proven in the industry. Commercial gold mining has been established in Southern Africa for over 100 years, and Namibia and surrounding countries have varying levels of established mining infrastructure.

The project has economic potential at current gold prices. The main techno-economic highlights of the project have already been included in a recent Osino Press Release and comprise the following:

- NPV of USD 742m (pre-tax) and IRR of 34% at a 5% discount rate and USD 1750/oz gold price.
- NPV of USD 480m (post-tax) and IRR of 28% at a 5% discount rate and USD 1750/oz gold price.
- At spot gold prices (USD1,950/oz), the project generates just under USD 1.5bn of net pre-tax cashflows, demonstrating the strong margins, cash generation potential and economics of the project.
- The overall capital cost of USD 365m (incl. USD 34m contingency & USD18m capitalised pre-strip) with a payback period of 2.2 years.
- A 13-year Life-of-Mine (LOM) and 5.0 million tonnes per annum (mtpa) design processing capacity.
- LOM gold recovery of 92% utilising conventional 3-stage crushing, ball milling, gravity separation, pre-oxidation and CIL circuit with filtration & dry-stack tailings deposition.

The key mining parameter results are summarized in Table 15.10.3 below.

Table 15.10.3 Key Results from the Mining Study

Key Mining Parameters	Unit	Total / LOM
Operations		
Mining Pre-Strip Period	months	6
Mine Production Life	years	12
Processing Production Life	years	13
Mining		
Ore Mined	Mt	64.51
Strip Ratio	constant	4.64
Waste Mined	Mt	299.07
Processing		
Ore Processed	Mt	64.51
Average Gold Head Grade	g/t	1.04
Average CIL Gold Recovery	%	92.92%
Gold Production	M oz	2.00
Mining Start-Up Capex	M USD	24.31
Mining Opex (Average)	USD /t	2.73

15.10.4 Twin Hills Mineral Reserve Statement

The Mineral Reserves estimate is based on a thorough pit optimization exercise that used modified Measured and Indicated Resources only. Inferred resources were excluded from the pit optimization runs and the Reserve statement and were classified as waste during the LOM production schedule runs. The practical ultimate pit designs based on the selected pit optimization shells were used to determine the Mineral Ore Reserves. Based on the 10-stage pit design, the mine production schedule and subsequent analysis show that the operation will be viable. An economic analysis of the mine schedule generated from the DFS resource model has shown the project's financial viability at a gold price of USD 1750/ oz, and the sensitivity analysis has demonstrated continued profitability against changes in key project parameters at different gold prices. A review of the outcomes of the DFS analysis indicates that the project is robust and has no fatal flaws. Therefore, the project is recommended to progress to the Front End Engineering Design (FEED) study level.

This Twin Hills Mineral Reserve estimate has been determined and reported in accordance with the guidelines as defined within the Canadian National Instrument 43-101 (NI43-101) Standards of Disclosure for Mineral Projects for an DFS, a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves and that appropriately experienced and qualified persons have prepared the estimates with a thorough knowledge of the operation.

An DFS is defined as a study that includes a realistic economic analysis and engineering studies sufficient to demonstrate the economic viability of a Mineral Project and declare a Mineral Reserve from the study. The NI43-101 Code provides a mandatory system for classifying Minerals, Exploration Results, Mineral Resources and Mineral Reserves according to the confidence levels in geological knowledge and technical and economic considerations in Public Reports.

The Twin Hills Gold DFS Reserve estimate has been determined and reported in accordance with the guidelines provided by the NI43-101 Standards of Disclosure for Mineral Projects. The Ore Reserve was declared as of 31 May 2023 based on a processing gold cut-off grade of 0.40 g/t and is summarized in Table 15.10.4.

Table 15.10.4 Declared Twin Hills Gold Project DFS Mineral Reserves as of 31 May 2023 at a Gold Cut-Off Grade of 0.40 g/t

Mine Project	Classification	Tonnes Mt	Grade g/t	Contained Metal M oz
Twin Hills Gold Project	Proven	0.87	1.19	0.03
	Probable	63.64	1.03	2.12
	Total Ore Reserve	**64.51**	**1.04**	**2.15**

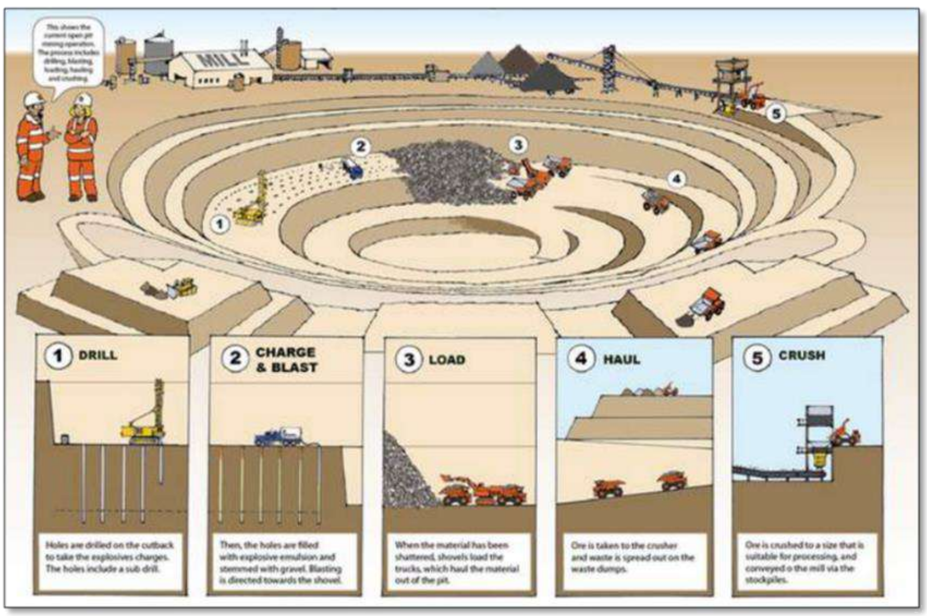
The reported Mineral Reserves have been compiled by Mr Werner K Moeller, who is a 'Qualified Person' as set out in NI 43-101, and because of his education, affiliation with a professional association (as defined in NI 43-101), and past work experience, fulfils the requirements of a Qualified Person as defined in NI 43-101.

16.0 MINING METHODS

16.1 Introduction

The Twin Hills Gold Project will use conventional open pit mining methods (Figure 16.1.1), with drilling and blasting performed on 5.0 m benches for ore and selective waste material; and 10.0 m benches for bulk waste material. The entire waste benches will be excavated in a bulk mining fashion with excavators on two 5.0 m bench flitches. In contrast, the mineralised benches will be selectively loaded in two 2.5 m flitches to minimise dilution. Ore and waste will be loaded with hydraulic excavators and hauled by diesel-powered trucks to the primary crusher, ROM pad stockpile, low-grade stockpiles, or waste rock dumps.

Figure 16.1.1 Typical Open Pit Mining Process



The Project is planned as a multi-pit mining operation with seven pushbacks in the Main Pit design (Twin Hills Central & Bulge mineralised domains) and one pushback each in the three different Satellite Pits (Clouds, Twin Hills West, and Clouds West mineralised domains), to be mined in different phases throughout the LOM. No equipment size trade-offs were performed during the FS, and it was assumed that a contractor mining model would be deployed with 100-t class haul trucks and suitably sized loading equipment. The medium-sized equipment increases flexibility and allows better loading selectivity, limiting dilution and mining losses. An array of secondary and support equipment will support the primary equipment. This chapter gives a broad overview of the Project's mining methods.

16.2 Overall Mining Strategy

For the Twin Hills FS, it was assumed that mining would take place by conventional open pit methods and that the whole mining operation, except for the mine technical services function, would be outsourced to a reputable mining contractor company (Contractor).

The mining process entails planning, drilling, blasting, loading, and hauling from a conventional open pit operation. It is planned that the mining owner team is supported by a mining Contractor that covers the following mining activities:

- Drilling operation.
- Blasting operation => Rock on Ground ('ROG').
- Ore handling to the ROM stockpiles.
- ROM stockpile re-handling.
- Waste handling to the waste dump.
- Road maintenance and waste dump profiling.
- Day works.

The mine technical service department (geology, survey, mine planning and geotechnical engineering), including mine management and grade control, will be the responsibility of the owner team. Anticipated local skills shortages may mean that ex-pats need to be contracted in initially. Still, an approved localisation plan will be established to train and equip the Namibian workforce sufficiently to enable and ensure a seamless transition of responsibilities over time. The bulk of the equipment operators are expected to be unskilled (approximately 80%) and will require training from a basic level. The start-up strategy for mining operations takes account of this requirement.

The mining process entails planning, drilling, blasting, loading, and hauling from a conventional open pit operation. A detailed request-for-quote (RFQ) document was submitted by Qubeka to the market in April 2023 to reputable mining contractor companies operating in southern Africa. The costs are supported by a rigorous cost build-up based on formal quotations from the market. All other mine technical services that include management, planning and grade control will be the responsibility of the owner team.

Due to the unavailability of specific local technical skills, the initial management team might include a small expatriate contingent to ensure the operation start-up is safe and efficient and to meet ramp-up targets. An approved localisation plan will be established to train and equip the local workforce to enable and ensure a seamless transition of responsibilities over time. The bulk of the equipment operators are expected to be unskilled (approximately 80 %) and will require training from a basic level. The start-up strategy for mining operations takes account of this requirement.

The mine will operate 361 days per annum (allowing for three lost days for public holidays) on a 24-hour basis with shifts rotating on a three by eight-hour duration. The support equipment is the lifeline of reliable and cost-effective mining production by supporting the primary production equipment with the following activities:

- Maintaining loading, tipping and haul road areas clean, thus prolonging tyre life and making the operation safe.
- Suppressing dust emissions from a health, safety, environmental and financial perspective.
- Supporting the complete equipment maintenance and diesel requirements to remote track-propelled equipment and breakdowns.

The collective support fleet cost per tonne is minimal within the mining cost. Typically, this cost would be between 15% or less of the total mining operational costs. Most surface haul roads, dumps and stockpiles required for the LOM will have to be constructed during the first year of mining. The waste dump will progress by the haul truck tipping on the top elevation of the dump with the dozer pushing the waste down. These actions will cause the waste dump to progress horizontally over time. Waste dumps should be progressively rehabilitated, where possible.

Rehabilitation will be performed as soon as possible on the external faces of the waste dump. Ore stockpile dumps will be constructed close to the primary crusher tipping point to minimize the reclamation costs.

Waste rock will also be required to construct mine infrastructure, such as the ROM pad and the tailings storage facility (TSF) retaining walls. During normal operations, the ore feed will be achieved by combining ore tipped directly into the ROM bin by the haul trucks from the pit with the ROM loader, adding other appropriate ore material from ROM grade control stockpiles. The assumption was that ~15% of direct ex-pit ore sent to the ROM pad would be stockpiled and re-handled due to ore blending and scheduling requirements.

In-pit water management will mainly consist of run-off control around the pit perimeter and temporary sumps at the lowest elevation in the pit. A mobile trailer-mounted pit-dewatering pump will pump excess water to the mine pond for dust suppression. The overflow will be pumped to the mine return water dam close to the plant for processing water and dust suppression. Haul road dust suppression is considered for the project. It will be handled through a comprehensive dust management system provided and managed by Dust-a-Side (DAS) or a similar product, an industry leader in this regard. DAS is a bitumen-based product applied during haul road construction and maintained on a customised maintenance programme.

Plant feed grade control for the project will be critical to the operation's success. Production control relies on different levels of mine planning in daily blending operations. Plans are developed with different levels of accuracy for different periods, including daily, weekly, monthly, yearly and LOM production plans. Reconciliations of production and ore quality against these plans will form part of the mine planning procedures. This will be done with the help of software such as Reconciler, which provides a comprehensive system for reconciling the overall mining project.

The different ore material types and waste boundaries would be delineated on each flitch with tape and paint based on grade control and the resultant geological modelling and interpretation for loading a block. It is assumed that grade control will be undertaken through blasthole sampling followed by assay lab testing to determine the grade distribution in a blast block. Bench and face mapping, for grade control and geotechnical reasons, should also be a routine task in finalising the ore and waste blocks to be marked out for excavation.

16.3 Contract Mining Strategy

16.3.1 Owner Mining

The conventional wisdom is that Owner mining is preferable to Contract mining in circumstances where:

- The mine life is sufficiently long to reduce the inherent mining risk. The Owner has the financial strength and mine life to provide and amortise its mining fleet.
- The Owner views mining as a core business.
- The mining schedule allows for a reasonably constant mining rate.
- The availability of trained and experienced personnel.
- There is a requirement for high-cost, long-term investment in essential infrastructure.
- There are strict product quantity and quality specifications, focusing on selective mining.

In general, the minimum LOM for owner mining is equivalent to the life of the majority of the mining equipment, say seven years, unless the cost advantages or other benefits outweigh a possible shortfall on the achievable residual value of the fleet. Continuous improvement in areas such as grade control, mine planning and scheduling, mining equipment maintenance and utilization, higher truck and excavator productivity, reduced duplication of management and supervision and lower unit mining costs can often be achieved where the owner controls the mining activities.

16.3.2 Contract Mining

Contract mining will be considered if a project does not meet the circumstances suited to Owner mining, as mentioned in the section above. It would depend on Osino's risk profile, staffing, capital, and operating cost priorities. Corporate issues include the best use and return on capital, the operating entity's company structure, and project-specific factors. The key operational issues involve people, equipment, and ore mining quality control.

Confidence in achieving similar production performance and efficiencies to Contractors is a key risk, and the need for detailed implementation planning should not be underestimated. Even if Contract mining is not considered as the best solution for the LOM, one option may be to consider Contract mining initially for the first five to seven years of the Project. The end of such a period represents achieving a steady state operation and an ideal break point to review progress to date and the cost and performance of the Contractor versus a potential Owner-operated operation.

Advantages and Disadvantages of Contract Mining

Listed below are some of the advantages and disadvantages of going with the Contractor mining option for the operation.

Advantages:

- No capital is required for mobile mining equipment at the start of the project.
- A reputable Contractor has previous project experience in southern Africa, which means they understand the mining conditions.
- A better understanding of industrial relations issues and negotiations.
- The bulk of labour relations is the Contractor's responsibility; the Contractor also takes responsibility for these workers.
- Maintenance of the mobile equipment is the responsibility of the Contractor.
- Contractors can be removed from the site if there is a breach of the Contract.

- Project risk shared with Contractors.

- Quicker project deployment due to existing equipment assets on standby.

Disadvantages:

- Potential higher cost per unit mined.

- Injuries/accidents still point to the mine, even if it was caused by a Contractor (mine still takes legal responsibility).

- Reduced owner control over the project.

Advantages and Disadvantages of Owner-Operated Mining

Listed below are some of the advantages and disadvantages of using the Owner mining option for the project.

Advantages:

- Lower cost per unit mined.

- More control over the day-to-day running of production.

Disadvantages:

- Start-up capital is required to purchase the necessary mobile equipment to enable the mine to meet production targets.

- The Owner is responsible for recruiting suitable personnel and training personnel.

- Equipment maintenance is the responsibility of the mine.

The decision to go either Owner- or Contractor-operated is a strategic choice that mine management needs to take at the end of the day. Suppose the Owner company has the capital to fund the start-up capital and feels confident they can address the challenges of starting up a mining operation in a foreign country. In that case, there are significant opportunities that can be gained. Contractor mining brings local mining knowledge, lower start-up capital and lower capital risk.

For the Twin Hills Gold Project FS, it was assumed that mining would take place by conventional open pit methods and that the whole mining operation, except for the mine technical services function, would be outsourced to a seasoned Contractor - this is in line with Osino's overall FS objectives to reduce the upfront capital and project funding hurdle. The hybrid owner-operated scenario will be further investigated during the FEED study stage.

16.3.3 Request for Quote (RFQ) Process

A comprehensive request for quote (RFQ) document was sent out to seven reputable shortlisted mining Contractor companies operating in Southern Africa for the mining and earthmoving contract. These mining Contractors were invited to submit a binding FS quotation for the loading, hauling and all related mining activities, which includes the supply and delivery to the site of the relevant earthmoving equipment to perform the job.

Details of this contract supply and other mining specifics, as well as the bill of quantities for bench volumes/tonnes by material type per area and bench elevation, were contained in the schedule of rates as part of the RFQ document. The RFQ was based on an initial five-year contract period with the option to extend, and these rates were extrapolated over the LOM. Osino management endorsed the RFQ document, which was sent out to seven reputable regional mining contractors for the Twin Hills FS mining and earthmoving contract, namely:

- Lewcor Group (Namibia).
- Basil Read Mining (Namibia, South Africa).
- Aveng Moolmans Group (Namibia, South Africa).
- Tulela Mining & Construction and Wesizwe Opencast Mining JV (Namibia, South Africa).
- Nexus and Teichmann Plant Hire JV (Namibia, South Africa).
- Scribante (South Africa).
- Trollope Mining Services (South Africa).

These shortlisted companies above are established, respectable mining Contractors in Southern Africa, and they all have sound contract mining experience with similar-sized operations on their resumes. These mining Contractors were invited to submit a binding implementation quotation for the loading, hauling and all related mining activities for a five-year contract period, which includes the supply and delivery to the site of the relevant earthmoving equipment to perform the job.

All services shall be supplied under all the Republic of Namibia legislative requirements. From the seven RFQ invitees, five responses were obtained from the market. The Osino Owner's Team and Qubeka feels satisfied with the quotations acquired to estimate the Twin Hills FS mining costs, as all submissions' overall unit mining cost were within industry norms.

In conjunction with the client Owner's Team, a tender adjudication process was embarked on where the most suitable company was selected, and mining rates are later discussed in this report. The recommended equipment requirements and associated mining rates in the RFQ submissions were benchmarked to other Namibian operations and endorsed by Talpac haul cycle productivity simulation runs. The data obtained from the Contractor's RFQ Schedule of Rates submissions include the following information for the contract mining OPEX and CAPEX estimate of the Twin Hills FS project:

- Site establishing cost (NAD).
- Site decommissioning cost (NAD).
- Fixed monthly cost (NAD/month).
- Drill and blasting costs (NAD/bcm) for waste and ore.
- Loading and Hauling costs (NAD/bcm) for waste and ore per mining bench elevation.
- Daywork rates.
- ROM and stockpile re-handling cost (NAD/t).
- Diesel consumption (L).

16.3.4 Contractor Scope of Work

The Contractor will supply all materials, equipment, facilities and services, supervision, and labour necessary to conduct the mining operations per the Contract specifications. The scope of work will include, but is not limited to:

- Mobilisation and establishment.
- Generally, the supply involves the drilling, blasting, loading and haulage of waste and ore material from the mining area to specific waste rock dumps and stockpile locations in the project's mining area. The supply includes providing support services to allow safe and efficient supply performance per the Mining Contract.
- The supply, on a routine basis, requires mining selected ore zones, loading, hauling, and stockpiling together with the waste stripping (overburden) required to expose the ore.

- Grade control stockpiles and ROM stockpile re-handling operation.
- The mobilisation and establishment of personnel, equipment and infrastructure.
- Construction of new haul roads and maintenance of existing roads, including dust suppression.
- Stripping and placing of overburden and waste material on waste rock dumps and the shaping thereof.
- Drilling and blasting of all material to be mined.
- Loading and hauling of the ore to a stockpile or directly into the tipping arrangement when so instructed by mine management.
- Creating and maintaining the ore stockpiles at the designated area.
- Supplying all equipment to perform the activities required.
- Mining, hauling, and stockpiling of ores and mineralised waste at the crusher or nominated stockpiling areas, including any drilling, and blasting as necessary.
- Mining, hauling, and dumping of waste at nominated dumping areas, including any drilling and blasting as necessary.
- Secondary breakage of oversized rocks in the pit and at the crusher or stockpile (as necessary).
- Pit dewatering works include excavating sumps, pumping and provision of drains in and around the pit.
- Maintenance of waste rock dumps and ore stockpiles.
- Provision of an approved all-weather in-pit and ex-pit haul road surface to be made from suitable materials found in the pit or as nominated by the Contractor from another source approved by mine management.
- Maintenance of own equipment.
- Logging of mining data as required by mine management for performance management.

16.4 Inferred Resource Strategy

The Canadian Institute of Mining, Metallurgy and Petroleum ('CIM') considers the confidence in Inferred Mineral Resources insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure. Inferred resources were excluded from the pit optimization runs and the Mineral Reserves estimate and were classified as waste during the LOM production schedule runs.

16.5 Ore Stockpiling Strategy

Ore mined is stockpiled as paired stockpiles on the ROM pad and other destinations according to grade bins summarised in (Table 16.5.1). Ore is then re-handled, if necessary, to the conventional three-stage crushing, ball milling and carbon in leach (CIL) plant as per the feed schedule. In-pit blending will minimize the extent of re-handling of ore from stockpile to crusher to cater for short-term grade variations over LOM.

Table 16.5.1 Stockpile Grade Bins

Stockpile	**Grade Bin (g/t)**
Low Grade	0.4 – 0.6
Medium 1 Grade	0.6 – 0.9
Medium 2 Grade	0.9 – 1.2
High Grade	> 1.2

The crusher bin has been designed to accommodate direct tipping from the production haul trucks, and it is assumed that about 15 % of ore will be re-handled with a suitably sized front-end loader (FEL). After mining stops, the processing plant will continue running on low-grade stockpiles as long the gold produced returns a positive cashflow.

ROM stockpiles will be classified into low-, medium 1-, medium 2- and high-grade bins. The stockpile strategy is to maintain at least two months (60 days) of ROM ore on stockpiles to allow for flexibility in blending and provide a consistent ore mix to optimize recovery and plant throughput. The 60 days are considered optimal and sufficient to manage the risk of model variability, allow for stripping, and ride out the possible and inherent ore supply disruptions from the pits.

16.6 Waste Rock Dump Strategy

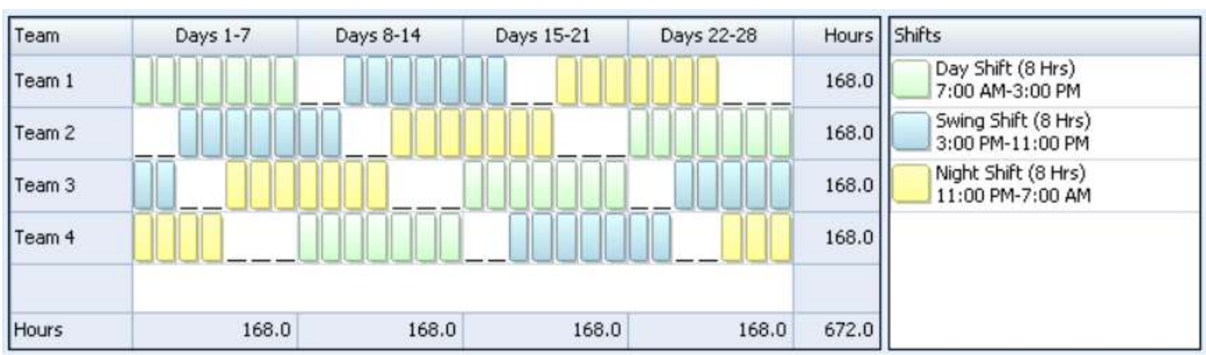
Waste rock dumps (WRD) are designed as close to the pit exits as possible to optimize productivity and minimize waste mining costs. Rehabilitation requirements are considered in WRD locations, and all dumping areas will undergo an ore sterilisation campaign before waste dumping. The WRD strategy reduces the hauling distance and similarly enables progressive rehabilitation of the waste dumps wherever possible. In-pit dumping will also be explored during the FEED stage of the Project.

16.7 Shift System

The mining operation is scheduled to work 365 days per year, less unscheduled delays such as high rainfall events, which may cause mining operations to be temporarily suspended. It was decided in collaboration with Osino to opt for a full calendar (four-panel shift) operation bearing in mind equipment utilisation and fatigue management.

Figure 16.7.1 shows that the four shifts rotate each week, completing a cycle every 28 days. All shift personnel receive a monthly shift allowance, incorporated into the labour costs. The shift rotation will take place as indicated in Figure 16.7.1.

Figure 16.7.1 Full Calendar – 4 Panel Shifts



16.7.2 Net Productive Work Time

It was necessary to make assumptions regarding how the shift is operated to calculate the effective annual operating hours per shift for a piece of equipment. Table 16.7.1 gives an example of assumptions made for the drilling fleet. Each mining equipment type will have its own set of specific assumptions, as seen for each unit in later chapters. Thus, the net productive work time per annum per drill is 5,513 hours, equivalent to an overall efficiency of 65.5%.

The net productive work time can be defined as the hours the drill is available for the actual drilling operation after subtracting the operational delays and maintenance activities. The engine time is measured as a serviced metered unit ('SMU') and is essentially when the equipment has the engine running or idling. These calculations only estimate the mining productivity. Ultimately, the Contractor will be held responsible for meeting the production targets within the parameters of an agreed mining contract. The relevant shift time components are defined in Table 16.7.2.

Table 16.7.1 Net Productive Work Time per Drill Rig

Parameter	Unit	Value
Calendar Time	days	365.25
Annual Closure	days	3
Operating Days	days	362.25
Weather Interruptions	days	1
Delay per Blast	hrs	2.5
Blasts per Week	nr	2
Blast Delays	days	10.83
Down Time	days	350.42
Available Operating Days	%	96.7%
Shifts per Day	nr	3
Hours per Shift	hrs	8
Available Time	hrs	8 410
Shift Change / per shift	hrs	0.50
Equipment Inspection / per shift	hrs	0.33
Meal Break / per shift	hrs	0.50
Fuel & Lubrication / per shift	hrs	0.50
Shift Change	days	21.90
Equipment Inspection	days	14.45
Meal Break	days	21.90
Fuel & Lubrication	days	21.90
Total Shift Delays	days	80.16
Mechanical Availability	%	85.00
Available Operating Days	days	229.72
Effective Utilisation	%	65.6%
Available Operating Hours per Rig	**hrs**	**5 513**

Table 16.7.2 Shift Time Component Definitions

Calendar Time (CT)		
Operating Standby per Year (ASYEAR)		Working Time per Year (WTYEAR)
Lost Operating Time per Year	Weather Delays per Year (WDYEAR)	

Parameter	**Definition**
Calendar Time (CT)	Days per Year
Lost Operating Time per Year (LOTYEAR)	Planned total operation shutdown (i.e. public holiday).
Weather Delays per Year (WDYEAR)	Total operation shutdown due to inclement weather.
Operating Standby per Year (OSYEAR)	LOTYEAR + WDYEAR
Working Time per Year (WTYEAR)	CT - OSYEAR

Shift Duration (SD)			
Operating Standby (OSSHIFT)	Utilized Time per Shift (UTSHIFT)		
	Operating Loss (OLSHIFT)		Net Productive Work Time (NOTSHIFT)
	Operating Delays (ODSHIFT)	Performance Loss (PLSHIFT)	

Parameter	**Definition**
Available Time per Shift (ATSHIFT)	Available time per shift defined as the total shift duration.
Operating Standby (OSSHIFT)	Time not operating with engine off (i.e. lunch, fuelling etc.).
Utilized Time per Shift (UTSHIFT)	UTSHIFT = ATSHIFT - OSSHIFT
Operating Delays (ODSHIFT)	Time not productive with engine on (i.e. shift change over, manoeuvring etc.) This is divided into general delays and those specific to loading units and drilling units.
Performance Loss (PLSHIFT)	Generic efficiency loss with engine on, to account for operator inefficiency, expressed in minutes lost per hour.
Operating Loss (OLSHIFT)	OLSHIFT = PLSHIFT + ODSHIFT
Operating Time (OTSHIFT)	NOTSHIFT = UTSHIFT - OLSHIFT
Net Operating Time (NOT)	Unit Operating Efficiency (UOE) = NOTSHIFT / UTSHIFT

16.8 Environmental, Health and Safety Requirements

A review of the overall site environmental and social impact assessment management requirements was undertaken by others and is not described in this report. This section provides a summary of some of the environmental, health and safety issues that are specific to the mining operation.

16.8.1 Safety

All mining will be carried out following the local mine health and safety regulations as a minimum standard. The project will implement a site occupational health, hygiene, welfare, and safety plan similar to other mining operations in the area.

All hazardous materials and chemicals will be appropriately stored under relevant Legislation, Conditions, Namibian Standards, and manufacturer's safety data sheets.

16.8.2 Dust Suppression

Drills will be fitted with effective water mist and dust-suppression systems, installed, and maintained to the manufacturer's specifications. In particular, care will be taken to ensure that the dust extraction systems operate effectively whenever drilling occurs. Dust suppression will be carried out in such a manner to ensure that saline or polluted water is not sprayed onto areas of vegetation, areas undergoing rehabilitation or areas and material designated for future rehabilitation.

16.8.3 Noise and Vibration

All dedicated mining equipment will be purchased new and specified to comply with local legislative noise and emission levels requirements. The impact of noise is restricted to mine crew due to the remoteness of the operation. Noise monitoring programmes will be employed as part of the mining operation. Blasting will be carried out during daylight hours and strictly controlled to minimize air blast and ground vibration issues.

16.8.4 Landform

With the size and scale of operations, the project will significantly impact the surrounding areas. Changing the existing landform with the mining of the pit void and construction of the mine waste dump will be the most significant visual impact of the mining operation.

16.8.5 Waste Products

Waste products will be managed within the criteria of the approvals and regulations for the site. This will have no impact on the mine operation or its planning.

16.9 Mining Equipment Maintenance

The maintenance responsibility will be entirely conferred to the mining contractor.

16.9.1 Maintenance Options

There are five main options for the maintenance of the major mining fleet that the Contractor could consider:

- All maintenance is in-house.
- Most minor or routine repair, maintenance, and servicing in-house; equipment suppliers repair or replace all major components.
- The equipment supplier undertakes all repairs, maintenance and servicing under a formal maintenance and repair contract (MARC).
- Independent company contracted for a MARC.
- Independent company initially contracted for a MARC; changed to in-house after several years.

The mining Contractor will maintain mobile equipment as part of its own fleet's supply and maintenance contract. The mining contractor will be responsible for providing the maintenance workforce and their direct supervision as well as all daily maintenance activities, including the refuelling and servicing of the machines and ground-engaging tools maintenance such as buckets, teeth, blades, trays, etc.

All mobile equipment will be purchased new by the mining contractor and maintained according to the equipment manufacturer's recommendations for servicing and component change-out. The following services would ordinarily form part of the scope of work covered by the mining contractor:

- Maintenance Planning.
- GET Fitment and Management.
- Preventative and Predictive Maintenance.
- Four Week Maintenance Schedules.
- Management Services.
- OEM Engineering Support.
- Technical Information.
- Modification of the Equipment.
- Repair of Equipment Damage.

- Execution of Extra Work.
- Equipment Testing and Acceptance.
- Management of Materials, Spare Parts and Consumables.
- Maintenance Information System.
- Fuel and Lubrication and
- Equipment Operator Training.

Tyre maintenance will be covered under the main contract mining agreement, which will include the management of all tyres on the Project. The contract includes routine tyre and pressure checks, record keeping, tyre repairs and changing, purchasing, and scrapping advice and all associated tyre fitting tools and equipment.

The Contractor needs to be checked that he maintains his mining fleet according to best practices; otherwise, the following major operational risks could creep up for the operation:

- Failing to achieve the expected productivity due to not maintaining the equipment to its rated performance standards.
- Failing to achieve the expected production due to not maintaining the equipment to its rated availability standards.
- Failing to achieve production cost targets by exceeding the expected cost of maintenance.
- Failing to achieve production cost targets by not achieving the expected life of the equipment, and therefore requiring additional capital for its replacement and
- Being unable to attract, train and retain a skilled maintenance workforce.

It is planned that these risks be transferred to the Contractor by way of the following mechanisms:

- Operational guarantees ensure the equipment is maintained to a level that allows acceptable performance.
- Maintenance guarantees that ensure the equipment is maintained to a level that allows acceptable availability and reliability.
- Capped costs for each type of equipment and penalties for below-par performance.

It should also be clear that while the guarantees are intended to provide commercial incentives for the Contractor to ensure the equipment is maintained to expected standards, the level of the Contractor revenue penalties in the event of not meeting the guarantees is unlikely to adequately compensate the mine owner for losses due to production shortfalls.

All preventative maintenance tasks (inspections, etc.) can be conducted individually on each item of machinery as part of the routine daily mobile plant operating procedures. The mobile equipment planned maintenance will be programmed to suit the feed requirements of the process plant and to coincide with the planned plant shutdowns. Major components will be changed as scheduled, with all component rebuilds performed off-site. Condition monitoring should allow for an increase in average component life hours.

Minimal major replacement parts would be kept on site, with levels of critical spares to be determined through consultation between the mining contractor and the OEM. Wherever possible, major maintenance equipment will be sent off-site for repair.

16.9.2 Maintenance and Fuelling Facilities

The mine maintenance facilities proposed for the Project will consist of a fuel farm that fills diesel bowsers, which will refuel the entire mining fleet. The recommended maintenance facilities for the project include the following items:

- The mobile equipment workshop includes a tool store, offices, amenities, work bays and serviced by an overhead travelling crane.
- Warehouse and laydown area.
- A tyre fitting slab and spare tyre storage area.
- A light vehicle workshop.
- A wash bay with waste oil traps and sumps.
- A lubrication bay with facilities for bulk lubricant delivery and waste oil removal.
- A fuel and lube truck to service tracked machines in the field as well as haul trucks.
- A fuel farm.

16.10 Mine Services and Infrastructure

Support facilities will be provided by Osino on site, including geological modelling, long-term planning, geotechnical engineering, hydrogeology and overall mine administration. The technical controls that make up these overheads include:

- Mine management and supervision.
- Ore control, comprising mine and process plant production reporting systems, equipment monitoring and recording systems and grade control systems.
- Mine planning computer systems for long and short-term mine planning and scheduling requirements.
- Provision for training and improvement of staff skills in all areas of mining and administration.

Mining overheads, including other associated overhead costs for personal protective equipment (PPE), hardware and software, training and general, will comprise the Owner team's monthly overhead costs. The mining engineering group will require systems and software to allow mine design, planning and scheduling, blast design and stockpile control.

The geological group will require systems to allow them to carry out logging of drill and blast holes, sampling, geological modelling, and grade control. Given the volume of data that will be generated over the life of the mine, Qubeka believes it is essential to incorporate a dedicated database for geological information. Systems will also be needed to generate dig plans, graphic drill-hole logs, and maps and to store resource / reserve estimate and reconciliation information.

The survey group will require a system interface for their surveying software and equipment.

16.11 Production Schedule

A schedule was produced with a maximum material movement of approximately ~ 35 Mtpa at peak, with mining taking place for 12 years and ore processing over 13 years, with the latter year dedicated to low-grade stockpile reclamation and processing. The primary driver has been to meet a plant ore feed requirement of ~ 5 Mtpa. This section discusses the production ramp-up, steady state and plant feed. Several mining studies have been undertaken on the Project over the past years. Each study involved the generation of mining schedules which have built up a considerable understanding of the most suitable approach for mining the various resources, both from a value and practical perspective.

During the development of the mining schedules, the primary blending constraint was too high-grade the plant feed grade in the initial five operating years, which is achieved using ROM stockpile bins as outlined in Table 16.1.1.

Only Measured and Indicated material within the pit design was treated as ore and contributed to the revenue stream. The LOM schedules furthermore estimate that ±15 % of all ex-pit ore destined for the primary crusher within any given year will be routed via the grade control and ROM pad stockpiles due to inherent material grade blending volatilities. Production scheduling was performed considering the following aspects:

- Overall Project NPV maximisation.
- Smooth mill feed tonnages and grade (blending of gold feed grade)
- Minimal stockpile rehandling and inventory.
- Constant, whenever possible, waste tonnes and total material mined.
- For production flexibility purposes, keep several mining benches active.

A series of production scheduling strategies were developed to assess the impact on project feasibility by considering the following:

- Defer waste stripping as far as possible but within acceptable risk towards achieving the required plant throughput rate.
- This has the effect of deferring initial capital and operating costs to some extent.

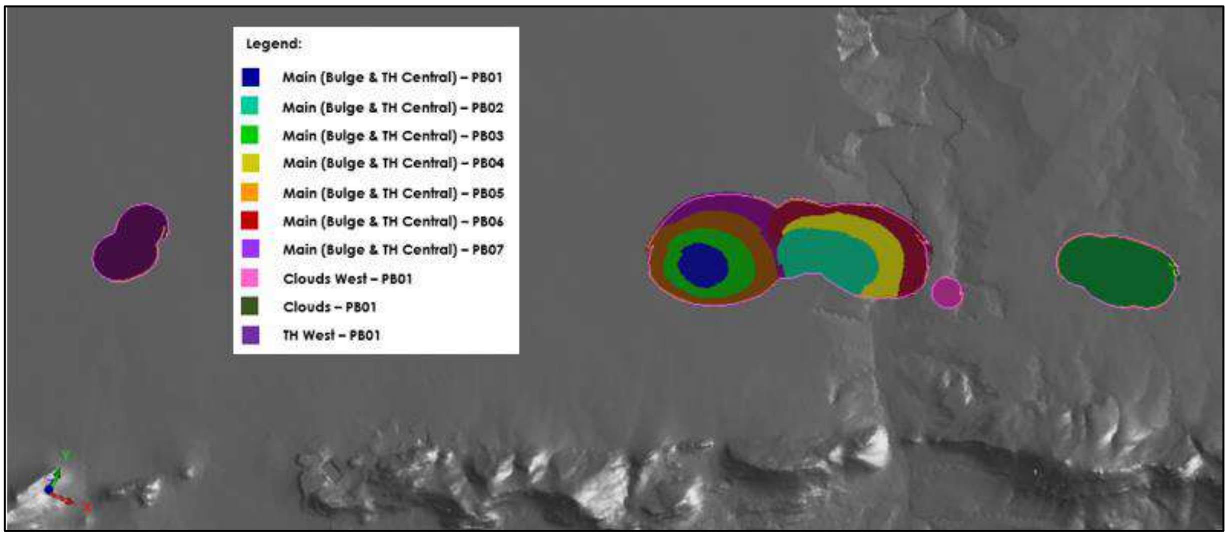
16.11.1 Interim Pushback Designs Guiding the Production

The exploitation strategy for any mining project is a crucial driver of overall project costs and economic value. The first step in arriving at an optimal exploitation strategy is through the sequential mining of the pit. The sequencing should preferably be chosen so that waste stripping is deferred for as long as practically possible. The pushback selection process dictates this sequence and is one of the main drivers in improving the Project's feasibility. The Whittle output identifies those areas that the optimization process considers to be of high value by:

- Maximizing grade to the mill in the early years.
- Deferring waste stripping as far as possible into the future.
- Ensuring design criteria such as overall and batter slopes are maintained.

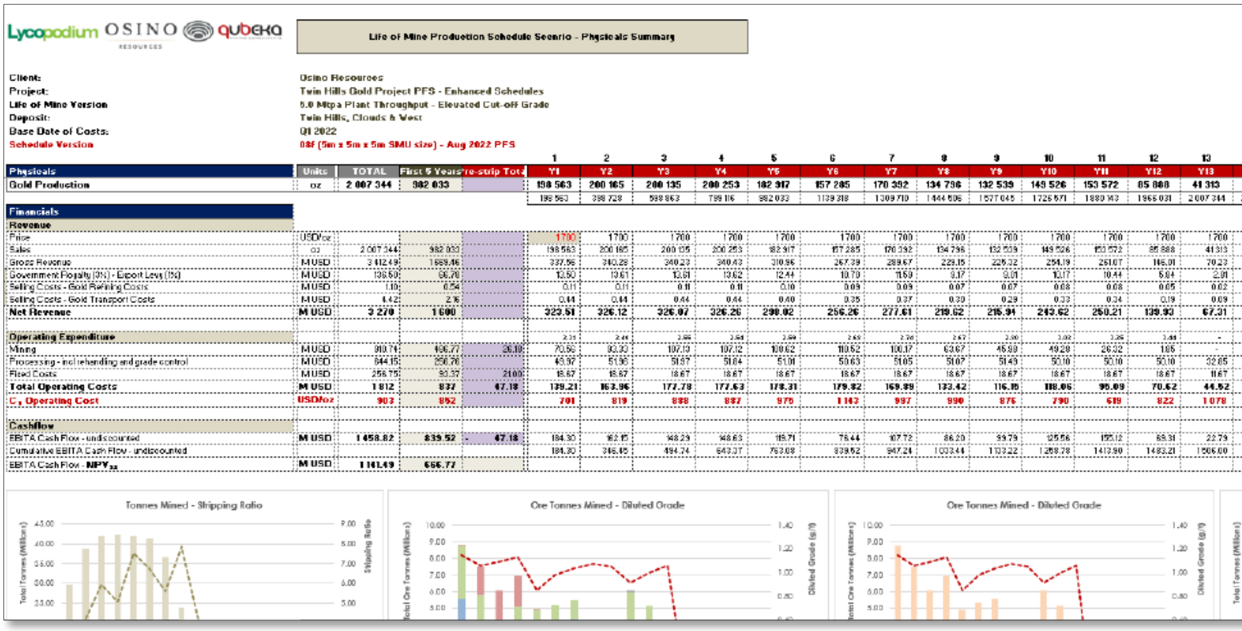
The lower revenue factor shells provide some guidance towards the location of interim stage designs. The conventional way pushback shells are selected is to select Whittle shells arbitrarily with roughly equal tonnes as intermediate phases from the nested pits. Qubeka, however, identifies nested pit shells that are more efficient in terms of stripping ratio and ore tonnes based on their net value (net revenue less net mining, transport, processing, and other costs).

Figure 16.11.1 Twin Hills Pushback Designs



The correct selection of the first pushback with early access to high-grade material while still maintaining a low stripping ratio has the most significant impact on NPV when this mechanism is applied. Figure 16.11.1 illustrates the interim pushback or mining phase designs that guided the production schedule.

Figure 16.11.2 Rudimentary Project Cost Model



Client:	Osino Resources
Project:	Twin Hills Gold Project PFS - Enhanced Schedules
Life of Mine Version	5.0 Mtpa Plant Throughput - Elevated Cut-off Grade
Deposit:	Twin Hills, Clouds & West
Base Date of Costs:	Q1 2022
Schedule Version	08f (5m x 5m x 5m SMU size) - Aug 2022 PFS

					1	2	3	4	5	6	7	8	9	10	11	12	13
Physicals	**Units**	**TOTAL**	**First 5 Years**	**Pre-strip Total**	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**	**Y7**	**Y8**	**Y9**	**Y10**	**Y11**	**Y12**	**Y13**
Gold Production	oz	**2 007 344**	**982 033**		**198 563**	**200 165**	**200 135**	**200 253**	**182 917**	**157 285**	**170 392**	**134 796**	**132 539**	**149 526**	**153 572**	**85 888**	**41 313**
					198 563	398 728	598 863	799 116	982 033	1 139 318	1 309 710	1 444 506	1 577 045	1 726 571	1 880 143	1 966 031	2 007 344
Financials																	
Revenue																	
Price	USD/oz				1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Sales	oz	2 007 344	982 033		198 563	200 165	200 135	200 253	182 917	157 285	170 392	134 796	132 539	149 526	153 572	85 888	41 313
Gross Revenue	M USD	3 412.49	1669.46		337.56	340.28	340.23	340.43	310.96	267.39	289.67	229.15	225.32	254.19	261.07	146.01	70.23
Government Royalty (3%) - Export Levy (1%)	M USD	136.50	66.78		13.50	13.61	13.61	13.62	12.44	10.70	11.59	9.17	9.01	10.17	10.44	5.84	2.81
Selling Costs - Gold Refining Costs	M USD	1.10	0.54		0.11	0.11	0.11	0.11	0.10	0.09	0.09	0.07	0.07	0.08	0.08	0.05	0.02
Selling Costs - Gold Transport Costs	M USD	4.42	2.16		0.44	0.44	0.44	0.44	0.40	0.35	0.37	0.30	0.29	0.33	0.34	0.19	0.09
Net Revenue	**M USD**	**3 270**	**1 600**		**323.51**	**326.12**	**326.07**	**326.26**	**298.02**	**256.26**	**277.61**	**219.62**	**215.94**	**243.62**	**250.21**	**139.93**	**67.31**
Operating Expenditure					2.35	2.44	2.66	2.64	2.69	2.62	2.74	2.67	3.00	3.02	3.26	3.44	-
Mining	M USD	910.74	496.77	26.18	70.56	93.33	107.13	107.12	109.62	110.52	100.17	63.67	45.98	49.28	26.32	1.85	-
Processing - incl rehandling and grade control	M USD	644.15	256.78		49.97	51.96	51.97	51.84	51.01	50.63	51.05	51.07	51.49	50.10	50.10	50.10	32.85
Fixed Costs	M USD	256.75	93.37	21.00	18.67	18.67	18.67	18.67	18.67	18.67	18.67	18.67	18.67	18.67	18.67	18.67	11.67
Total Operating Costs	**M USD**	**1 812**	**837**	**47.18**	**139.21**	**163.96**	**177.78**	**177.63**	**178.31**	**179.82**	**169.89**	**133.42**	**116.15**	**118.06**	**95.09**	**70.62**	**44.52**
C_1 Operating Cost	**USD/oz**	**903**	**852**		**701**	**819**	**888**	**887**	**975**	**1 143**	**997**	**990**	**876**	**790**	**619**	**822**	**1 078**
Cashflow																	
EBITA Cash Flow - undiscounted	**M USD**	**1 458.82**	**839.52**	**- 47.18**	184.30	162.15	148.29	148.63	119.71	76.44	107.72	86.20	99.79	125.56	155.12	69.31	22.79
Cumulative EBITA Cash Flow - undiscounted					184.30	346.45	494.74	643.37	763.08	839.52	947.24	1 033.44	1 133.22	1 258.78	1 413.90	1 483.21	1 506.00
EBITA Cash Flow - **$NPV_{5\%}$**	**M USD**	**1 141.49**	**666.77**														

The various pushbacks were used to achieve a lower strip ratio in the early years to increase the project NPV. The schedule was analysed primarily on relative project value and mining capital cost whilst considering unit mining operating costs and vertical pit advance rates.

A rudimentary project cost model, Figure 16.11.2, reporting discounted earnings before interest, taxation, and amortisation (EBITA) cash flow, was developed to rank the different production schedule scenarios. Inferred resources were excluded from the pit optimization runs and were classified as waste during the LOM production schedule runs.

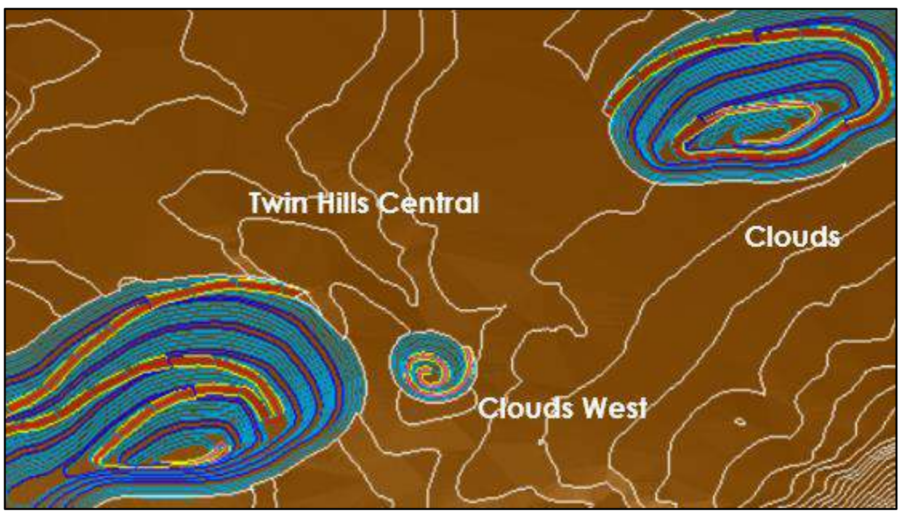
16.11.2 Scheduling Constraints and Inputs

The following approach was taken for the development of the schedule:

- The schedule was produced in quarterly periods over the LOM.
- The mine production schedule was based on a processing plant design capacity of 5.0 Mtpa, with a processing ramp-up period of 3 months.
- The Twin Hills process plant will have a nameplate capacity of 5.0 Mtpa of ore, based on the availability of 7,700 hours per annum and a nominal capacity of ~650 tonnes per hour (tph). A design contingency has been applied to major equipment.

- Oxidised / transitional ore mill feed allotment was kept below 25% of the total mill feed.
- The maximum mining rate is limited to 33.0 to 35.0 Mtpa.
- The vertical advance rate was limited to seven to eight 10 m benches yearly.
- The staged pit designs used a minimum cut-back width of 50 m.
- The number of active mining locations during any period was not constrained, as the total material movement requires around six to seven medium-sized excavators to be used. As such, there was unlikely to be a requirement to limit the number of working areas.
- Mining of the satellite pit Clouds West (Figure 16.11.3) was strategically brought forward to Year 1 to serve as a water dam (reservoir) for the river diversion channel.

Figure 16.11.3 Clouds West Pit to Serve as a Water Dam (Reservoir)



16.11.3 Scheduling Assumptions and Parameters

The mine scheduling software develops schedules based on the following:

- A set of user-defined objectives such as material movement, fleet capacity, etc.
- A block-by-block approach as opposed to a bench-by-bench scheduling approach. Consequently, the software does not need to utilize bench averaging. Instead, the actual grades and strip ratios are reported in any reporting period.

- Any schedule generated by the mine scheduling software adheres to several rules the user can impose.
- Furthermore, capacity constraints and targets can be used to control the tonnes and volumes of content being mined for flagged material types.
- The block size fits the required mining blocks and bench height increments. This is important since the mine scheduling software consolidates the blocks to fit the mining blocks as specified for the schedule.

The scheduling process and assumptions regarding the production schedule are described as follows:

- Determine an appropriate production schedule which provides the optimal value whilst balancing practical mining constraints, particularly bench turnover rates and capital expenditure during the ramp-up period.
- The strip ratio can fluctuate freely to meet all the defined scheduling strategies.

16.11.4 Objectives

Apart from general mining rules that were applied to each schedule, some objectives were also incorporated, which allows the scheduler to dictate the flow of the mining process:

- The direction of mining is from the ramp side of the pit.
- Schedule ore from high-grade stockpile only if required to top-up plant.
- Blocks with lower pushback numbers have higher priority than other available blocks.

16.11.5 Ramp-Access

To further increase the practicality of the schedule, the schedule was set to mine in the direction determent by the ramp. In other words, the ramp position determines the starting position for each mining level.

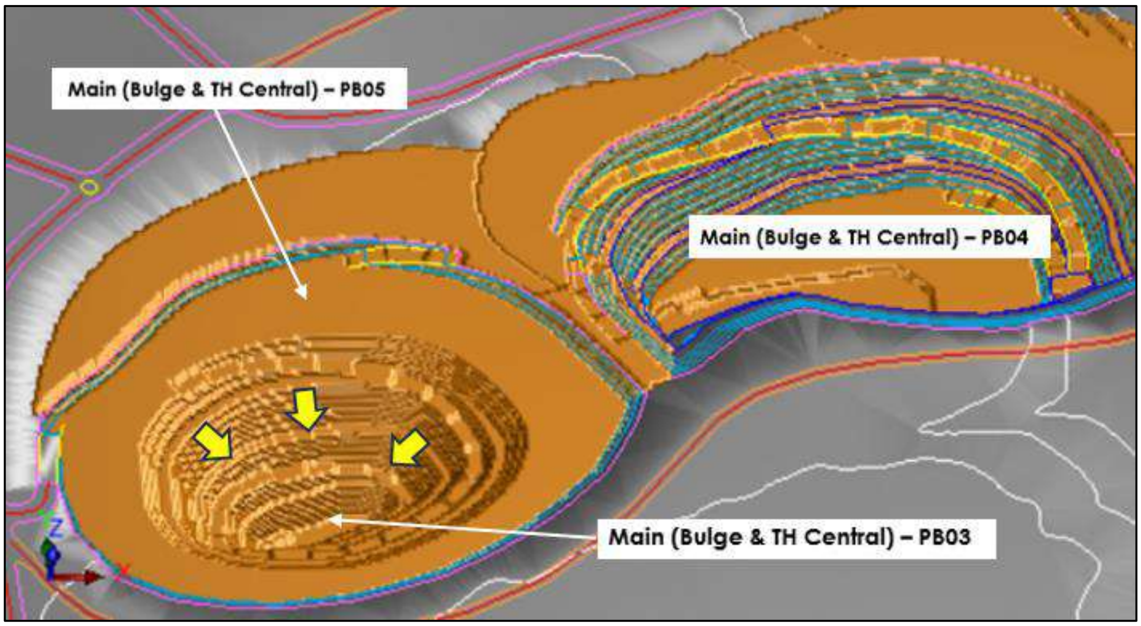
16.11.6 Bench Rules and Pushback Dependencies

To control the practicality of the mine production schedule, a constraint was set up to prohibit the mine scheduling software from simultaneously scheduling more than a certain number of benches in a pushback. This ensures that a practical, feasible schedule is produced and limits the movements of large, slow-moving machinery. The number of active benches mined at the same time tests the robustness and practicality of the schedule. The flexibility and practicality of the schedule are controlled by creating a rule in the mine scheduling software which limits the number of active benches mined simultaneously.

Due to the multi-pit operation, the production schedule offered considerable flexibility between mining locations. From a safety perspective, the pushback dependencies were controlled so that two consecutive stages were not mined simultaneously. Figure 16.11.4 illustrates this concept where Pushback 3 was mined entirely out before the stripping of Pushback 5 could commence.

Personnel and mining equipment working on lower benches are safeguarded against potential hazardous rockfall incidents. The pushback mining sequence over the LOM is depicted in Table 16.11.1.

Figure 16.11.4 Pushback Dependencies



16.11.7 Production Schedule Requirements

The following production schedule requirements were incorporated into the mine scheduling software simulations and incorporating the following requirements:

- Manage fluctuations in mining rates by applying a steady mining rate yet deferring waste as far as practically possible.
- Meet product targets throughout LOM.
- A practical approach.
- Low-risk achievable production schedule.
- Apply a variable elevated cut-off feed grade.

The mine schedule employed a variable cut-off grade approach to maximise the NPV, following the theory of Ken Lane. This approach flexes the cut-off grade during the mine schedule to maximise metal production as early as possible. The resulting cut-off grade becomes a function of the economic parameters, the grade-tonnage distribution of the ore body, capacity constraints in the value chain and opportunity cost associated with the remaining resource.

16.11.8 Selected Production Schedule

Tonnes Mined

Production schedule 03_Osino_Twin_Hills_DFS_2023_Mining_Schedule_Design_v04_10x5x2.5_v11.xls is described in this section. Staged development of the pit allows higher grade, lower strip ratio and higher value ore to be mined in the early stages of the project, and the lower grade, higher strip ratio, and lower value ore to be mined later in the mine life. The schedule incorporates a steady mining ramp-up over two years to 33 Mt per annum, as illustrated in Figure 16.11.5. The graph illustrates the ore and waste tonnes mined over the LOM and the associated stripping ratio.

Before plant commissioning, a six-month pre-stripping (PS) period is planned. During the pre-strip period, 6.79 Mt of total material will be moved, of which 0.73 Mt oxidised ore at a grade of 1.00 g/t will be stockpiled for plant commissioning. Figure 16.11.6 shows the total ore material mined from the mineralized domains and associated diluted grade. Figure 16.11.5 illustrates the ore material mined split between oxidized / transitional and fresh ore. Most oxidized / transitional ore is mined in the first few years. It cannot all be directly fed to the plant due to the limitation of the 25% oxidized / transitional ore mill feed allotment.

Figure 16.11.5 Total Tonnes Mined and Stipping Ratio

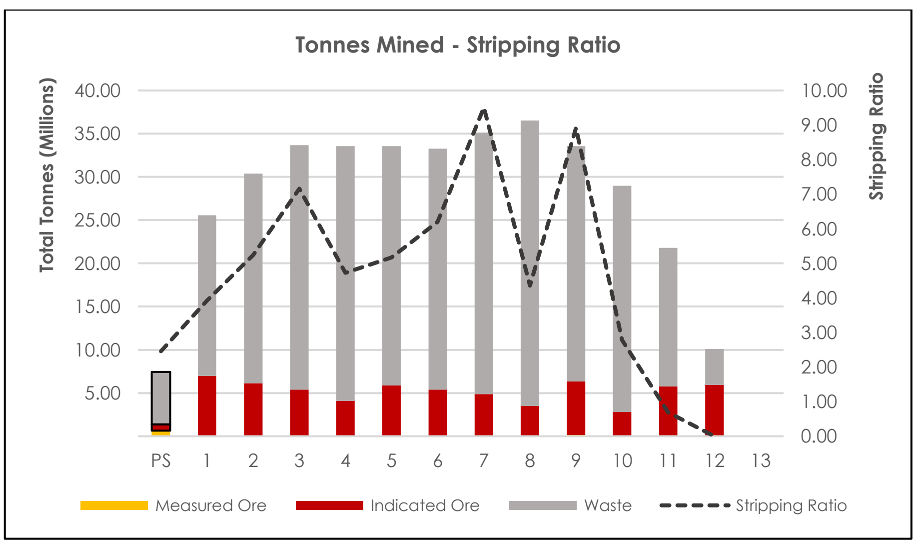


Figure 16.11.6 Total Ore Tonnes Mined by Mineralized Domain and Diluted Au Grade

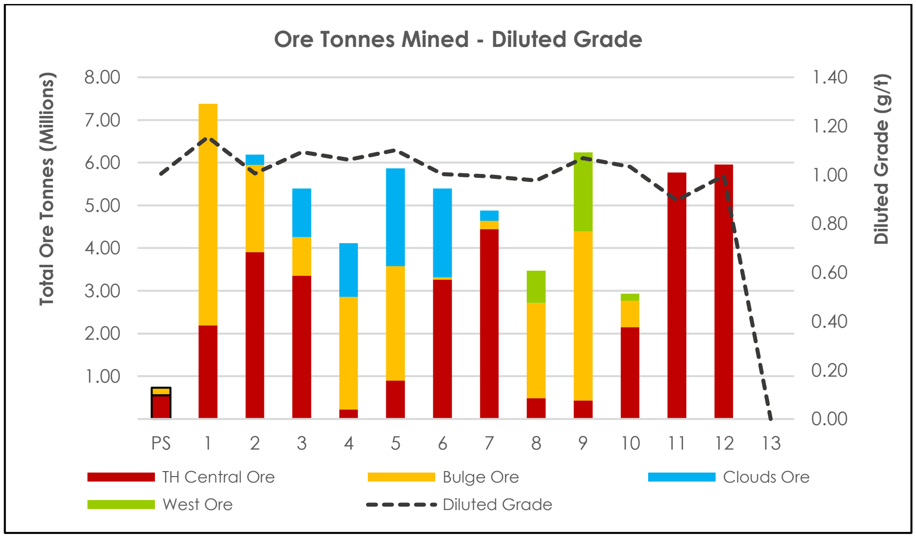
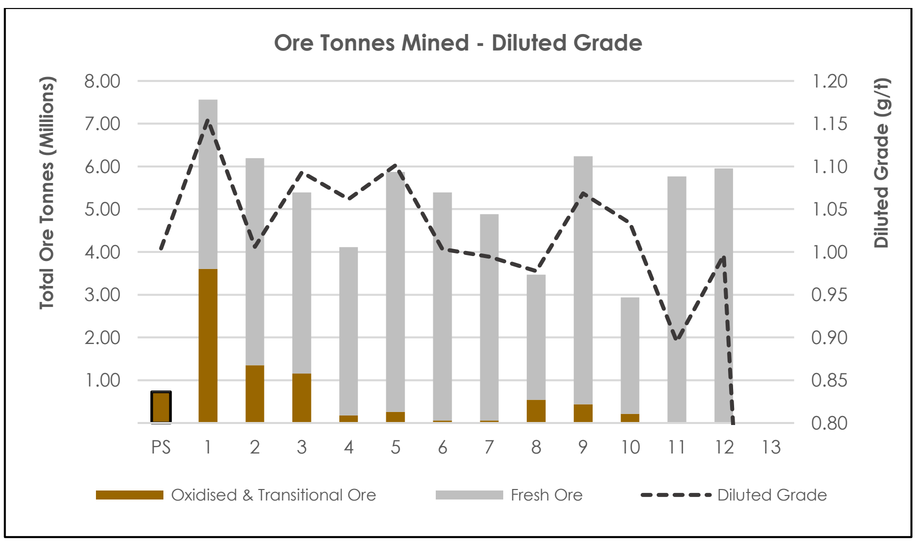


Figure 16.11.7 Total Ore Tonnes Mined by Material Type and Diluted Au Grade



As can be deduced from Figure 16.11.5, the objective of the scheduling strategy was to defer waste stripping in the initial LOM years as far as possible within acceptable risk toward achieving the required mill throughput rate. This was successfully achieved in the initial five years by targeting the high-grade areas and deferring initial operating costs to some extent, increasing overall project NPV. The production rates are required to ensure adequate waste stripping to achieve constant plant throughput as the relevant pushbacks' ore benches are exposed.

The staged mining succession over the LOM is depicted in Table 16.11.1.

Table 16.11.1 Pushback Mining Sequence over the LOM

Pushback Mining	PS	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12
TH Central & Bulge Pit - Pushback 1													
TH Central & Bulge Pit - Pushback 2													
TH Central & Bulge Pit - Pushback 3													
TH Central & Bulge Pit - Pushback 4													
TH Central & Bulge Pit - Pushback 5													
TH Central & Bulge Pit - Pushback 6													
TH Central & Bulge Pit - Pushback 7													
Clouds West (Satellite) Pit													
Clouds Pit													
TH West Pit													

Mill Feed and Gold Production

A plant production ramp-up period of three months after commissioning was assumed. The mill nameplate production rate is 5.0 Mtpa for fresh material, and an additional 15% throughput enhancement was assumed for oxidized / transitional material due to the material's lower grindability index. Figure 16.11.8 shows that the mill feed tonnes exceed 5.0 Mtpa in years when the oxidized / transitional material makes part of the mill feed composition. There were no product logistics/market constraints assumed. The following critical process design parameters used in the plant schedule are as follows:

- Nominal throughput of ~650 tonnes per hour (tph, equivalent to 5.0 million tonnes per annum of fresh material.
- Crushing plant availability of 70%.
- Plant availability of 88% overall, downstream of crushing. The nominal capacity of ~650 tonnes per hour (tph).

The graph in Figure 16.11.8 illustrates the annual tonnes fed to the plant and the feed grade. One can observe that the variable elevated cut-off grade exceeds the Mineral Reserve cut-off grade of 0.40 g/t Au in the initial production years. The stockpile reclamation always prioritizes depleting the high-grade stockpile bins.

Figure 16.11.8 Mill Feed Tonnes and Grade

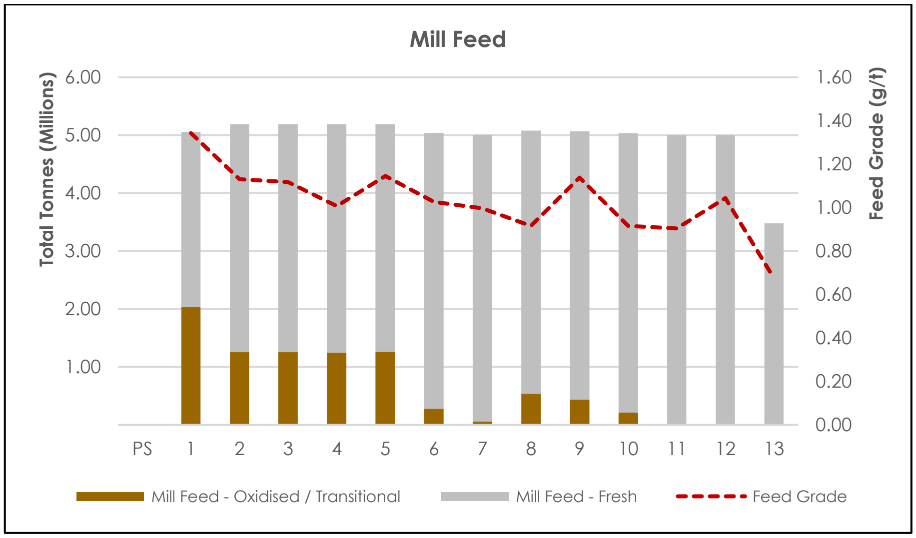
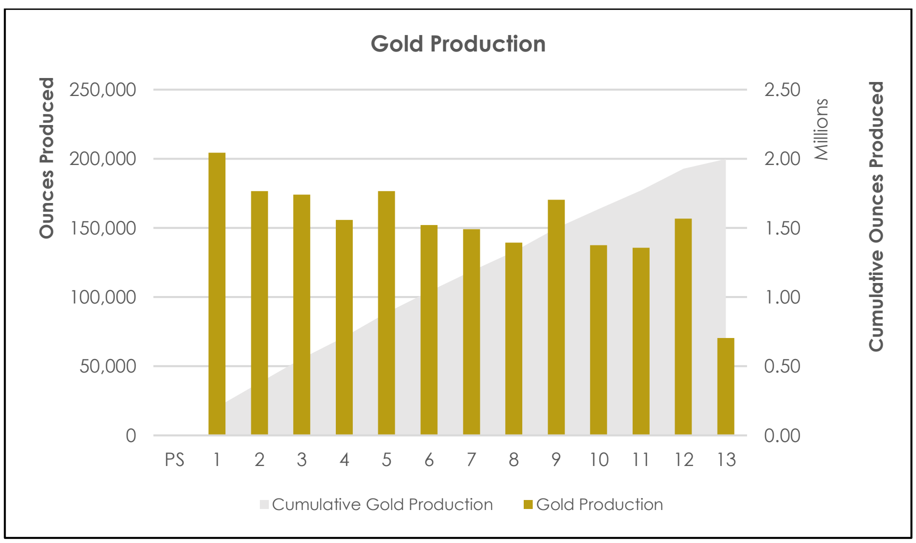


Figure 16.11.9 depicts the gold production (troy ounces), which averages around 177,000 ounces per annum gold production for the first five years. The average annual gold production over the entire LOM is approximately 154,000 oz annually, and the cumulative product produced is 1.998 million troy ounces.

Figure 16.11.9 Gold Production Over the LOM

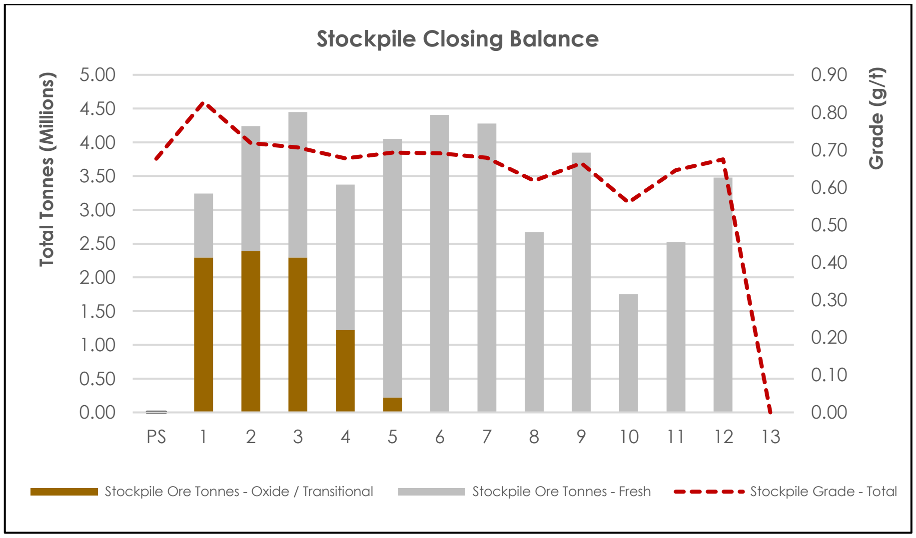


During the FEED study phase, the production schedule will be refined to explore opportunities to access fresh ore supply quicker to reduce the oxidised / transitional ore feed ratio in the first processing year, which exceeds the limit in the first three production months, i.e. during the plant commissioning period.

Stockpile Inventory

Figure 16.11.10 shows the combined stockpile inventory (closing balance) per period for the low and medium-grade stockpiles and indicates the size and footprint requirements. The stockpile inventory grows to a maximum of ~ 4.50 Mt in year three to enhance the variable elevated cut-off grade during the initial LOM years.

Figure 16.11.10 Stockpile Closing Balance



Number of Active Benches and Mining Bench Sink Rate

When evaluating the effectiveness of the production schedule, it is essential to consider critical factors that influence the practicality of the schedule. Two measures of this are:

- **The number of benches mined simultaneously** - The number of active benches mined simultaneously tests the schedule's robustness and practicality. Creating a rule in the scheduling software that limits the number of active benches mined simultaneously controlled the flexibility and practicality of the schedule. This was set at two benches to be mined simultaneously in a pushback.

- **Bench sink rate** – The number of new benches commenced in any given stage over 12 months. This was limited to eight benches per annum.

Table 16.11.2 LOM Mining Production Schedule

Mining	Units	TOTAL	First 5 Y	Pre-strip	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
Ore - Resource Class - Measured	Mt	0.87	0.71	0.00	0.65	0.06	0.00				0.01		0.02	0.14			
Ore - Resource Class - Indicated	Mt	63.64	29.15	0.73	6.92	6.13	5.39	4.11	5.87	5.40	4.88	3.47	6.22	2.80	5.77	5.96	
Ore - Total	**Mt**	**64.51**	**29.86**	**0.73**	**7.56**	**6.19**	**5.39**	**4.11**	**5.87**	**5.40**	**4.88**	**3.47**	**6.24**	**2.94**	**5.77**	**5.96**	
Ore - Resource Class - Measured	kg	1 038	851	3	780	66	1				5		22	160			
Ore - Resource Class - Indicated	kg	65 855	31 573	732	7 954	6 162	5 893	4 368	6 464	5 414	4 848	3 395	6 648	2 875	5 165	5 936	
Ore - Total	**kg**	**66 893**	**32 425**	**735**	**8 735**	**6 228**	**5 894**	**4 368**	**6 464**	**5 414**	**4 853**	**3 395**	**6 670**	**3 036**	**5 165**	**5 936**	
Ore - Resource Class - Measured	*g/t*	1.19	1.20	1.08	1.20	1.14	1.43				0.96		1.23	1.16			
Ore - Resource Class - Indicated	*g/t*	1.03	1.08	1.00	1.15	1.00	1.09	1.06	1.10	1.00	0.99	0.98	1.07	1.03	0.90	1.00	
Ore - Total	***g/t***	**1.04**	**1.09**	**1.00**	**1.15**	**1.01**	**1.09**	**1.06**	**1.10**	**1.00**	**0.99**	**0.98**	**1.07**	**1.03**	**0.90**	**1.00**	
Ore - Domain - Satellite	Mt	0.19	0.19		0.19												
Ore - Domain - Central	Mt	33.63	11.13	0.56	2.19	3.91	3.36	0.22	0.90	3.26	4.45	0.49	0.43	2.14	5.77	5.96	
Ore - Domain - Bulge	Mt	20.67	13.62	0.18	5.19	2.04	0.90	2.63	2.68	0.06	0.19	2.22	3.96	0.62			
Ore - Domain - Clouds	Mt	7.25	4.93			0.24	1.14	1.26	2.29	2.08	0.24						
Ore - Domain - West	Mt	2.78										0.76	1.85	0.17			
Ore - Total	**Mt**	**64.51**	**29.86**	**0.73**	**7.56**	**6.19**	**5.39**	**4.11**	**5.87**	**5.40**	**4.88**	**3.47**	**6.24**	**2.94**	**5.77**	**5.96**	
Ore - Domain - Satellite	*g/t*	*1.14*	*1.14*		1.14												
Ore - Domain - Central	*g/t*	*0.96*	*1.01*	*1.02*	1.16	0.87	1.11	1.04	0.83	0.83	0.96	1.17	1.11	0.97	0.90	1.00	
Ore - Domain - Bulge	*g/t*	*1.09*	*1.12*	*0.95*	1.15	1.27	0.85	1.00	1.16	0.84	0.91	0.91	1.06	1.25			
Ore - Domain - Clouds	*g/t*	*1.22*	*1.17*			1.04	1.23	1.20	1.14	1.28	1.71						
Ore - Domain - West	*g/t*	*1.07*										1.05	1.07	1.08			
Ore - Total	***g/t***	**1.04**	**1.09**	**1.00**	**1.15**	**1.01**	**1.09**	**1.06**	**1.10**	**1.00**	**0.99**	**0.98**	**1.07**	**1.03**	**0.90**	**1.00**	
Ore - Weathering - Oxide / Transitional	Mt	8.58	7.27	0.73	3.60	1.35	1.16	0.17	0.26	0.06	0.06	0.54	0.44	0.21			
Ore - Weathering - Fresh	Mt	55.93	22.59	0.00	3.96	4.84	4.24	3.94	5.61	5.34	4.82	2.93	5.80	2.72	5.77	5.96	
Ore - Weathering - Oxide / Transitional	kg	8 948	7 566	732	3 990	1 118	1 321	171	234	47	59	592	469	217			
Ore - Weathering - Fresh	kg	57 945	24 859	3	4 745	5 111	4 574	4 197	6 230	5 367	4 794	2 803	6 201	2 819	5 165	5 936	
Ore - Weathering - Oxide / Transitional	*g/t*	*1.04*	*1.04*	*1.00*	*1.11*	*0.83*	*1.14*	*0.99*	*0.89*	*0.84*	*0.99*	*1.10*	*1.07*	*1.01*			
Ore - Weathering - Fresh	*g/t*	*1.04*	*1.10*	*0.93*	*1.20*	*1.06*	*1.08*	*1.07*	*1.11*	*1.01*	*0.99*	*0.96*	*1.07*	*1.04*	*0.90*	*1.00*	
Waste - Weathering - Oxide / Transitional	Mt	86.9	59.2	1.69	8.98	11.98	20.80	7.40	8.37	4.89	8.26	5.11	7.83	1.62			
Waste - Weathering - Fresh	Mt	172.2	54.3	0.01	4.79	7.74	7.22	15.21	19.32	20.09	16.45	21.26	15.32	24.57	16.04	4.13	
Waste - Weathering - Calcretes	Mt	40.0	20.9	4.36	4.82	4.54	0.27	6.86	0.02	2.90	5.53	6.66	4.04				
Waste - Total	**Mt**	**299.07**	**134.37**	**6.06**	**18.59**	**24.26**	**28.28**	**29.47**	**27.71**	**27.88**	**30.25**	**33.03**	**27.19**	**26.18**	**16.04**	**4.13**	
Total Material Mined	**Mt**	**363.59**	**164.23**	**6.79**	**26.15**	**30.45**	**33.67**	**33.58**	**33.58**	**33.27**	**35.13**	**36.50**	**33.44**	**29.12**	**21.81**	**10.09**	
Strip Ratio	**Ratio**	**4.64**	**4.50**	**8.28**	**2.46**	**3.92**	**5.24**	**7.16**	**4.72**	**5.17**	**6.20**	**9.51**	**4.36**	**8.92**	**2.78**	**0.69**	

Table 16.11.3 LOM Milling Production Schedule

Mill Feed	Units	TOTAL	First 5 Y	Pre-strip	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
Ore Feed - Oxide / Transitional	Mt	8.58	7.05		2.04	1.26	1.25	1.25	1.26	0.28	0.06	0.54	0.44	0.21	0.00	0.00	0.00
Ore Feed - Fresh	Mt	55.93	18.76		3.02	3.93	3.94	3.94	3.93	4.76	4.95	4.54	4.63	4.82	5.00	5.00	3.48
Ore Feed - Total	**Mt**	**64.51**	**25.81**		**5.06**	**5.19**	**5.19**	**5.19**	**5.19**	**5.04**	**5.01**	**5.08**	**5.07**	**5.03**	**5.00**	**5.00**	**3.48**
Ore Feed - Oxide / Transitional Ratio	%	13%	27%		40%	24%	24%	24%	24%	6%	1%	11%	9%	4%	0%	0%	0%
Metal - Oxide / Transitional	kg	8 948	7 443		2 831	1 300	1 400	979	934	169	59	592	469	217	0	0	0
Metal - Fresh	kg	57 945	22 175		3 958	4 563	4 400	4 246	5 009	5 008	4 934	4 058	5 296	4 394	4 518	5 217	2 345
Metal - Total	**kg**	**66 893**	**29 618**		**6 788**	**5 862**	**5 800**	**5 225**	**5 943**	**5 177**	**4 992**	**4 650**	**5 765**	**4 611**	**4 518**	**5 217**	**2 345**
Feed Grade - Oxide / Transitional	g/t	*1.04*	1.06		1.39	1.04	1.12	0.78	0.74	0.61	0.99	1.10	1.07	1.01	0.00	0.00	0.00
Feed Grade - Fresh	g/t	1.04	1.18		1.31	1.16	1.12	1.08	1.28	1.05	1.00	0.89	1.14	0.91	0.90	1.04	0.67
Feed Grade - Total	**g/t**	**1.04**	**1.15**		**1.34**	**1.13**	**1.12**	**1.01**	**1.15**	**1.03**	**1.00**	**0.92**	**1.14**	**0.92**	**0.90**	**1.04**	**0.67**

Stockpiles (Closing Balance)	Units	TOTAL	First 5 Y	Pre-strip	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
Stockpile Ore Tonnes - Oxide / Transitional	Mt		0.22	0.00	2.30	2.39	2.30	1.22	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stockpile Ore Tonnes - Fresh	Mt		3.83	0.00	0.94	1.85	2.15	2.15	3.83	4.41	4.28	2.67	3.85	1.75	2.52	3.48	0.00
Stockpile Ore Tonnes - Total	**Mt**		**4.05**	**0.00**	**3.24**	**4.24**	**4.45**	**3.37**	**4.05**	**4.41**	**4.28**	**2.67**	**3.85**	**1.75**	**2.52**	**3.48**	**0.00**
Stockpile Grade - Oxide / Transitional	g/t		0.55	0.68	0.82	0.72	0.71	0.67	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stockpile Grade - Fresh	g/t		0.70	0.00	0.84	0.72	0.70	0.68	0.70	0.69	0.68	0.62	0.66	0.56	0.65	0.67	0.00
Stockpile Grade - Total	**g/t**		**0.69**	**0.68**	**0.83**	**0.72**	**0.71**	**0.68**	**0.69**	**0.69**	**0.68**	**0.62**	**0.66**	**0.56**	**0.65**	**0.67**	**0.00**

ROM & Stockpile Rehandling	Units	TOTAL	First 5 Y	Pre-strip	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
Stockpile Rehandling Tonnes	Mt	10.62	1.10		0.00	0.00	0.03	1.07	0.00	0.30	0.53	1.81	0.07	2.10	0.27	0.96	3.48
Direct Feed Tonnes	Mt	45.81	21.00		4.30	4.41	4.39	3.50	4.41	4.03	3.80	2.78	4.24	2.50	4.02	3.44	0.00
ROM Rehandling Tonnes	Mt	8.08	3.71		0.76	0.78	0.77	0.62	0.78	0.71	0.67	0.49	0.75	0.44	0.71	0.61	0.00

Production	Units	TOTAL	First 5 Y	Pre-strip	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
Overall Plant Recovery	%	92.92%	93.17%		93.62%	93.70%	93.32%	92.70%	92.39%	91.41%	92.91%	93.25%	91.93%	92.76%	93.39%	93.40%	93.33%
Gold Production	**oz**	**1 998 435**	**887 173**		**204 315**	**176 594**	**174 023**	**155 717**	**176 523**	**152 147**	**149 123**	**139 405**	**170 380**	**137 511**	**135 670**	**156 648**	**70 379**

Pit Progression

The yearly pit progression over the LoM can be seen in the collage of screenshots from Figure 16.11.11 to Figure 16.11.24 below.

Figure 16.11.11 End of Period Mining Face Positions – Start of Schedule

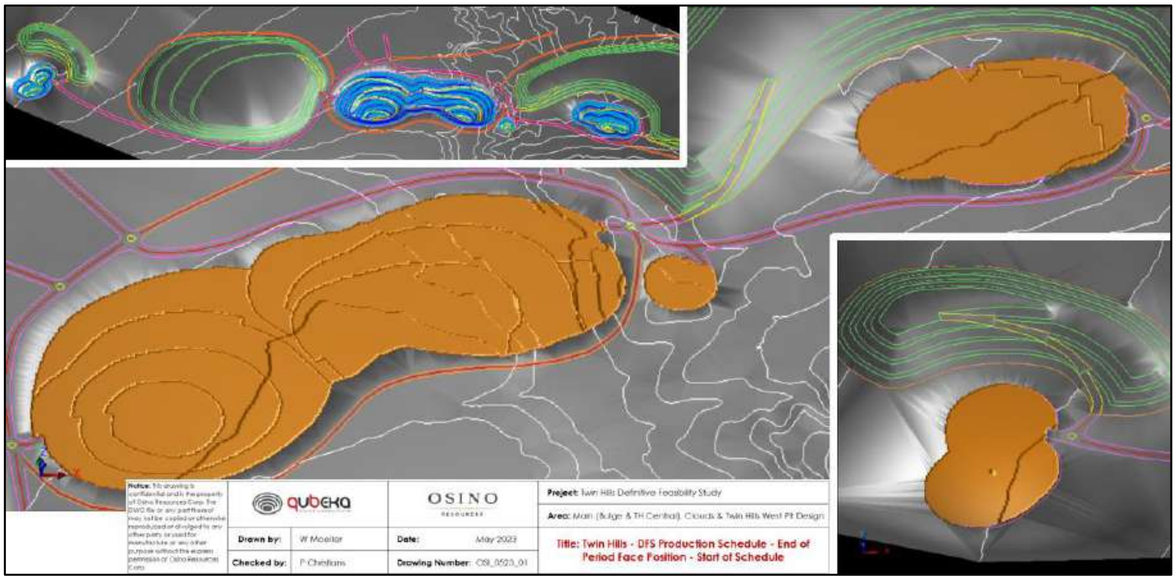


Figure 16.11.12 End of Period Mining Face Positions – End of Pre-strip (6 months) Period

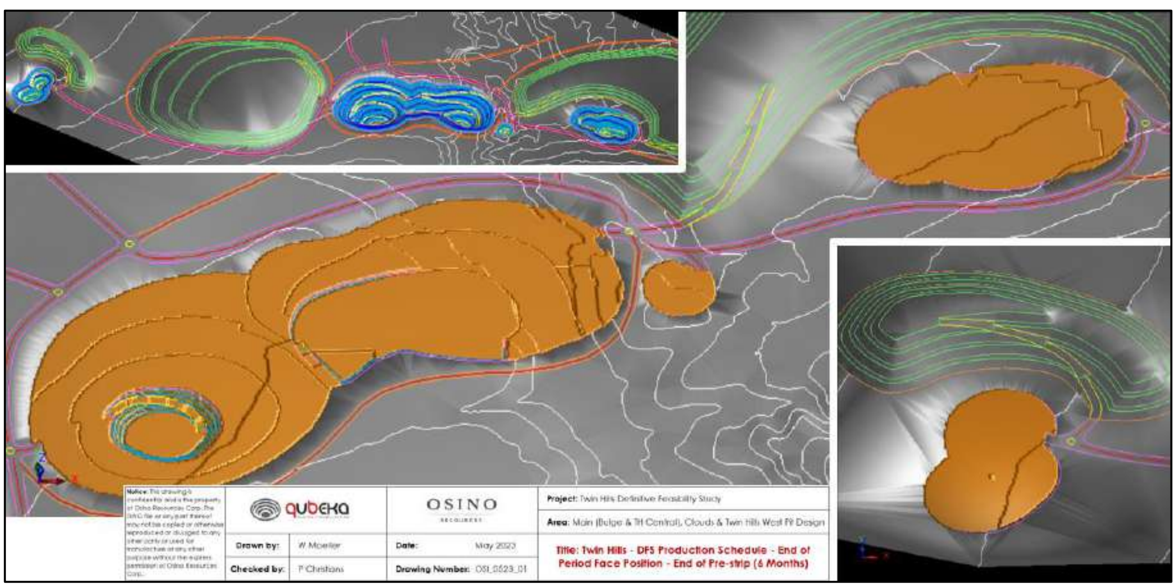


Figure 16.11.13 End of Period Mining Face Positions – End of Production Year 1

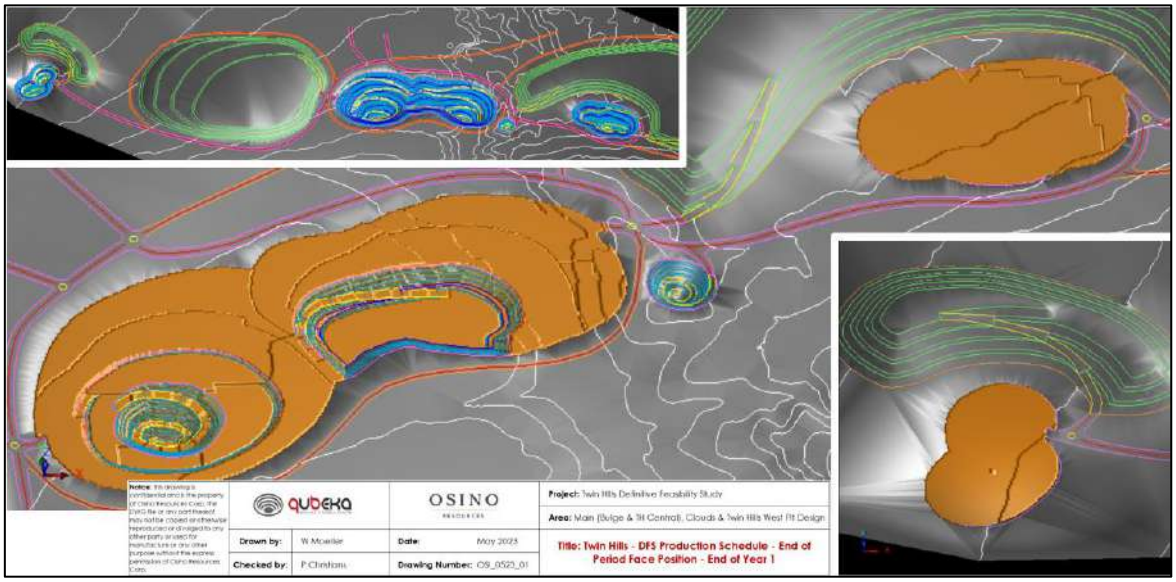


Figure 16.11.14 End of Period Mining Face Positions – End of Production Year 2

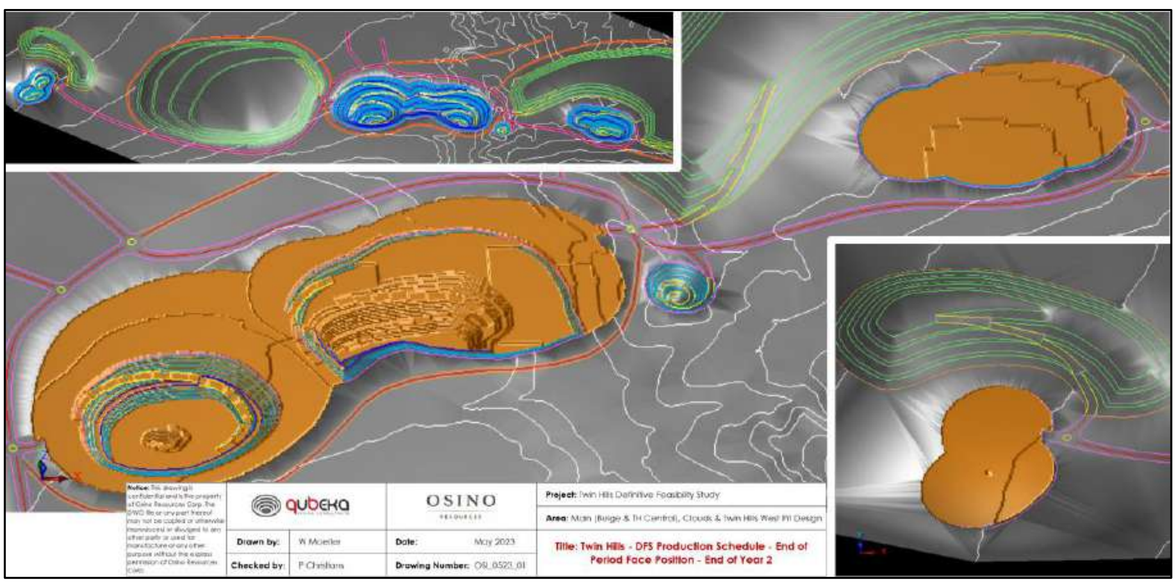


Figure 16.11.15 End of Period Mining Face Positions – End of Production Year 3

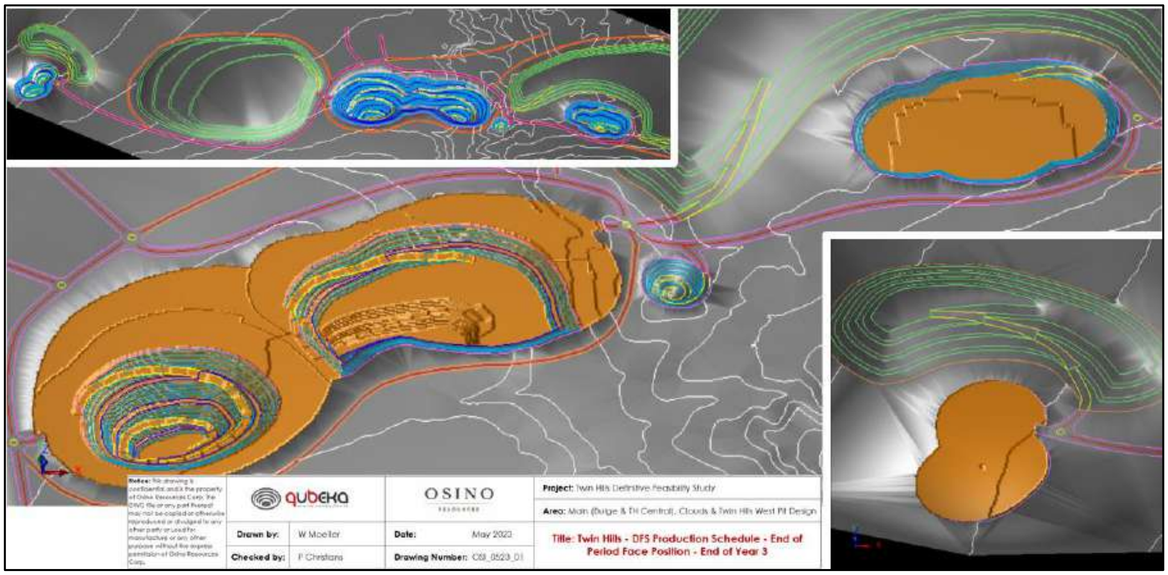


Figure 16.11.16 End of Period Mining Face Positions – End of Production Year 4

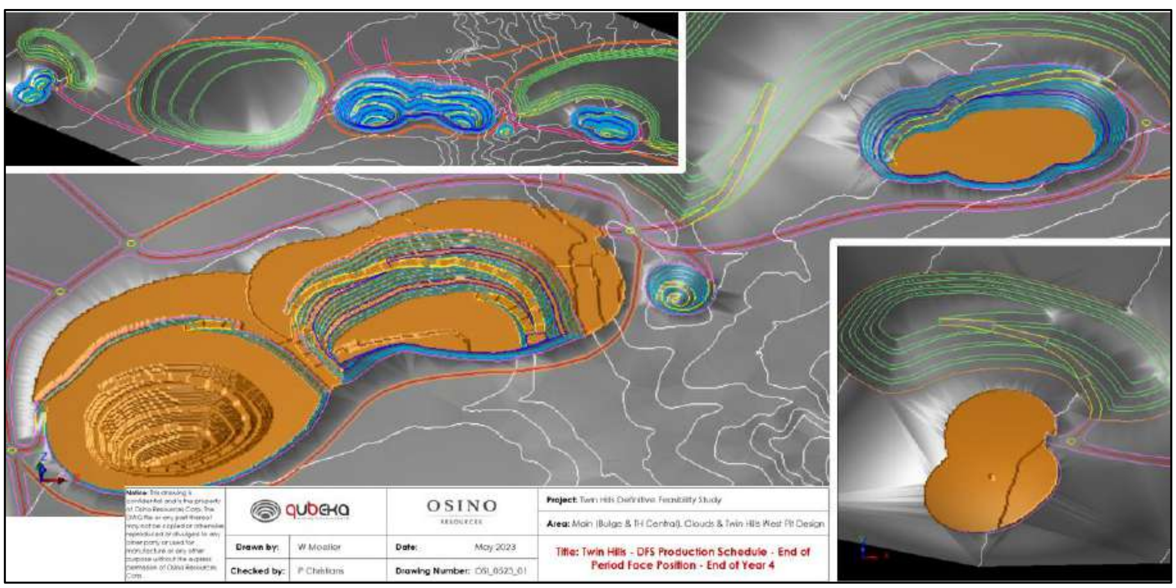


Figure 16.11.17 End of Period Mining Face Positions – End of Production Year 5

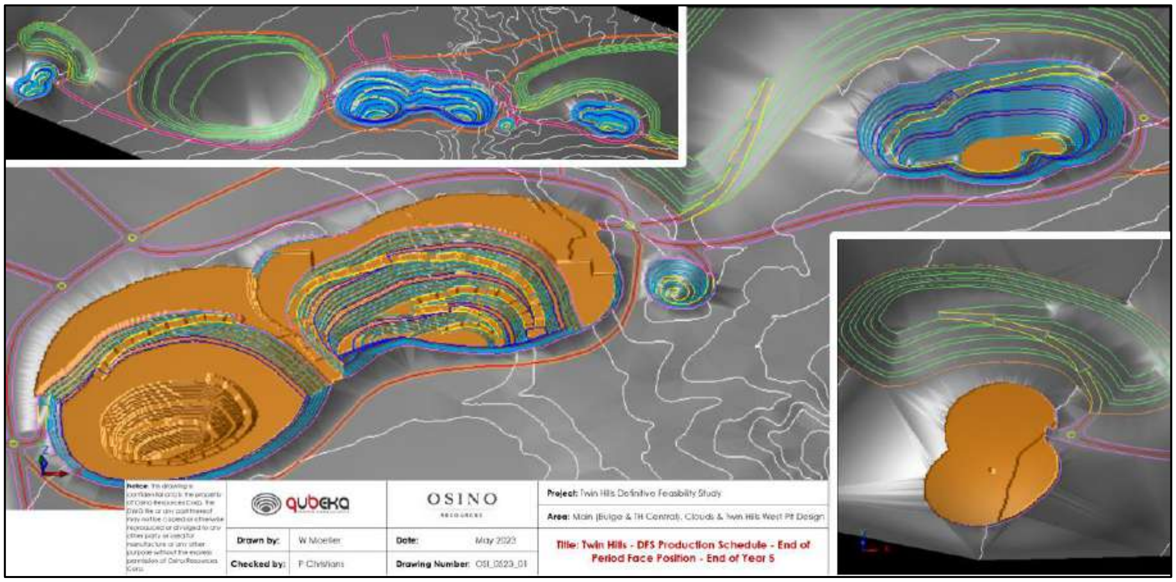


Figure 16.11.18 End of Period Mining Face Positions – End of Production Year 6

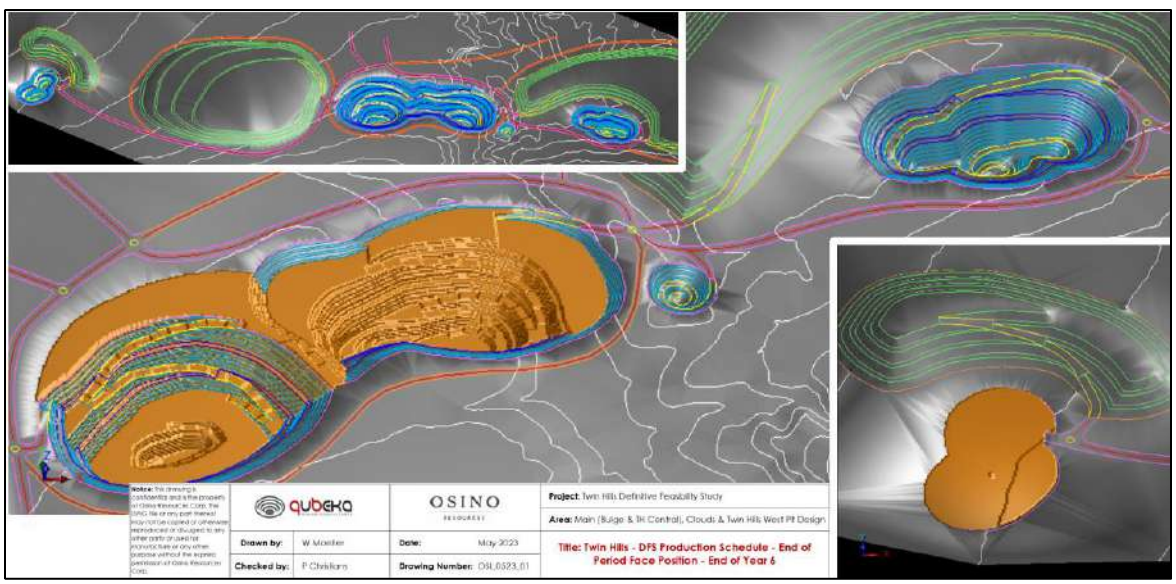


Figure 16.11.19 End of Period Mining Face Positions – End of Production Year 7

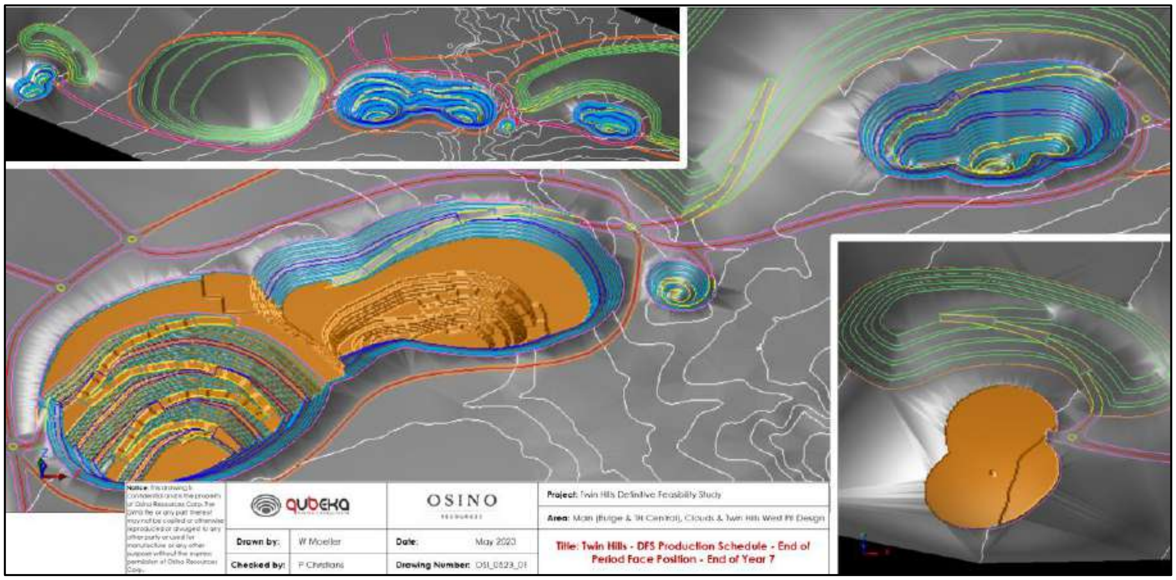


Figure 16.11.20 End of Period Mining Face Positions – End of Production Year 8

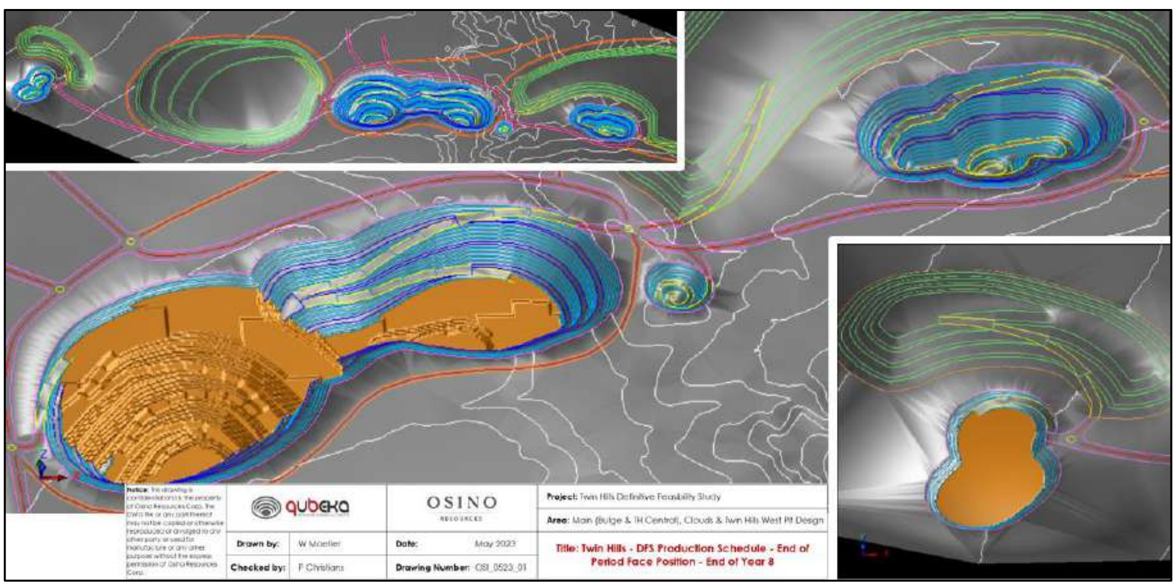


Figure 16.11.21 End of Period Mining Face Positions – End of Production Year 9

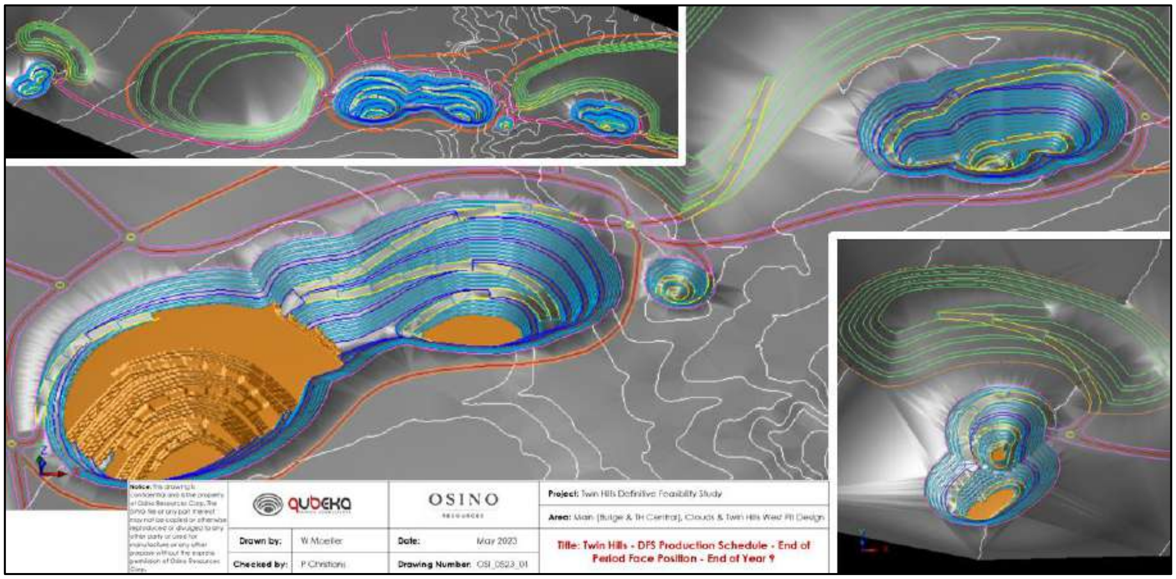


Figure 16.11.22 End of Period Mining Face Positions – End of Production Year 10

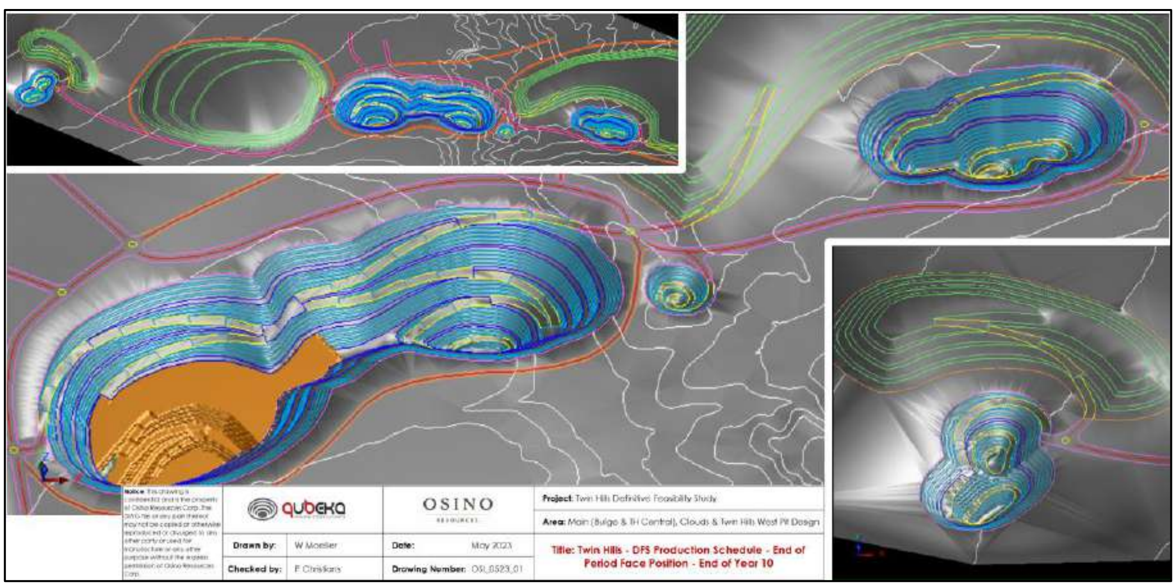


Figure 16.11.23 End of Period Mining Face Positions – End of Production Year 11

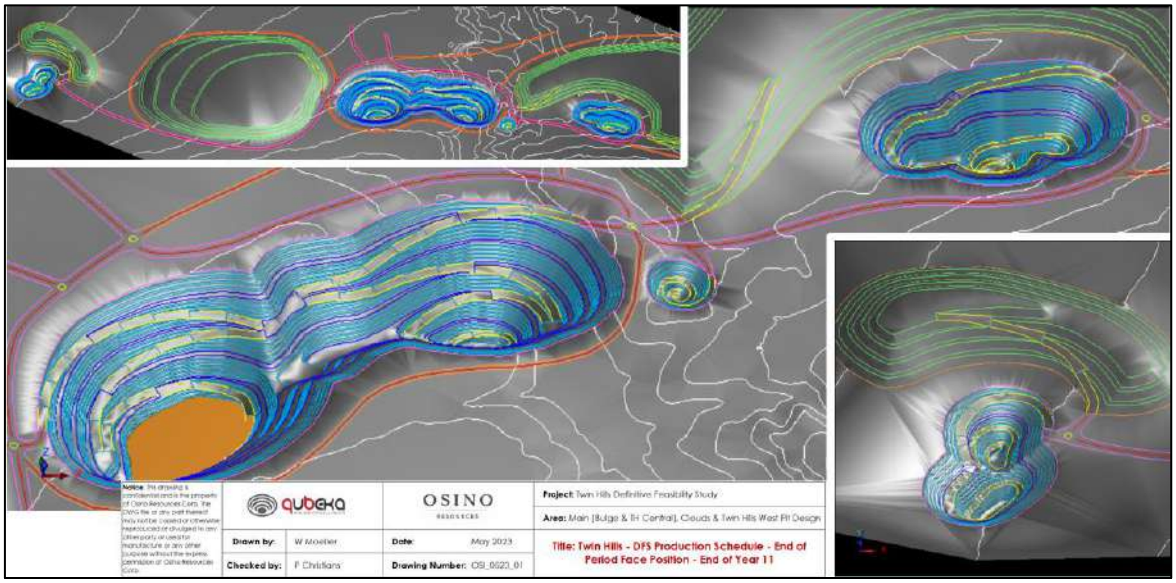
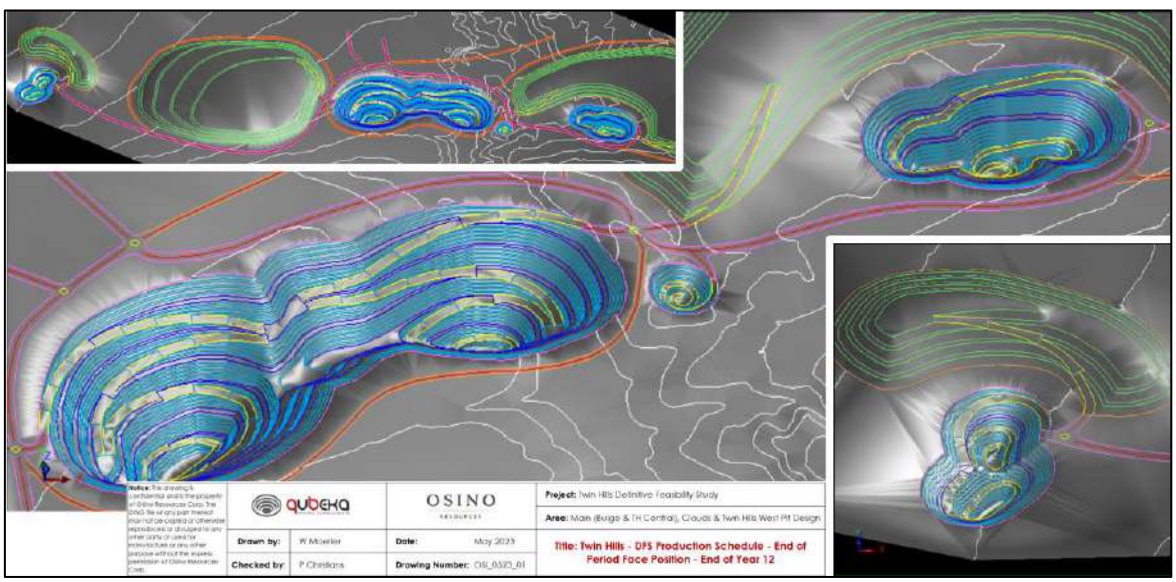


Figure 16.11.24 End of Period Mining Face Positions – End of Production Year 12



16.12 Waste Rock Dump & Stockpile Designs

16.12.1 Introduction

The waste generated from the mining operation is scheduled to be dumped on external waste rock dumps (WRD) around the pit. The effective bulking factor used in the study to convert the bank volume to lose volume considers the degree of dozer and haul truck compaction on the dumps. The dump design work was performed, considering the design criteria and the volume of waste expected from the mining stages. Table 16.12.1 summarizes the waste volumes expected from the various mining locations, with the swell factors used in calculating the dump volumes. Approximately 299 Mt (113.6 Mbcm) of waste will be mined over the life of the operation. Considering a re-compaction factor of 10% for the material on the waste rock dump, the combined dump capacity should be at least 156.7 million cubic meters to accommodate all waste mined.

Table 16.12.1 WRD Volume Requirements

Dump Design Parameters	Unit	Main	Clouds	West	Total
Waste Tonnes from Pits	Mt	224.74	48.10	26.23	299.07
Waste Volumes from Pits	Mm^3	84.89	18.12	10.57	113.58
Waste Material Swell Factor with Partial Dump Compaction	factor	1.38	1.38	1.38	1.38
Dry Waste Material Dump Placement Density	t/m^3	1.90	1.90	1.90	1.90
Waste Dump Volume Requirements	Mm^3	117.15	25.01	14.59	156.74

The waste rock dumping strategy reduces the hauling distance and similarly enables progressive rehabilitation of the waste dumps wherever possible. All dumping areas must be drilled before waste dumping to prevent future Mineral Resource sterilization.

16.12.2 WRD Design Criteria

The main objective of waste rock dump design is to ensure that the dump is safe, stable, and visually acceptable during the construction and following mine closure. Waste rock dumps are the most visual structures left after mining; therefore, poor design and construction can negatively impact the environment, which may result in public outrage and unnecessary regulatory intervention. The following factors were considered when reviewing and designing the waste dump location for the Project:

- Material handling, haulage, and rehabilitation costs.
- Environmental and visual impacts.
- Topographical features.

- Proposed mine infrastructure.
- Resource sterilisation.

The fundamental principles of construction will be per the environmental management plan (EMP). The staged construction and vegetation will be done in accordance with the EMP to reduce the visual impact from the LOM start. The top surface of the dumps will be soil-cladded and graded back at approximately 1:200 to prevent ponding on the top surface.

To ensure that the construction of the waste rock dump progresses smoothly, it is necessary to have a WRD development plan in place that is updated annually. The development plan needs to address the following:

- All significant potential risks identified.
- Progressive topsoil capture.
- Changes to the original design.
- Progressive rehabilitation as specified in the environmental management plan (EMP).
- Results of environmental monitoring where applicable.
- All other commitments that were made in the EMP.

16.12.3 Geotechnical Parameters

It is anticipated that the waste dumps will remain stable in the long term with minor slope creep over an extended time. Potential environmental impacts resulting from individual batter failure of the dumps will be minimal due to wide catch berms. During the design process, the following parameters were used to ensure that the designs adhere to all relevant requirements:

Lift height

The proposed WRD will be constructed by tipping over the crests with haul trucks to form lifts of 15 m.

Berm width

From a productivity and safety perspective, the berm width is at least 15 m to facilitate spillage material cleaning.

Batter angle

The envisaged batter angle for the dump is at 35˚ for each lift, per the design recommendation from the client.

Overall slope angle

Due to varying lift heights and berm widths, the overall slope angle varies. Given the berm width requirements and the lift heights at a batter angle of 35˚, the overall slope angle will not exceed 20˚.

16.12.4 Ramp parameters

Ramps are at least 25 m wide to allow for safe and efficient two-way travel, aid productivity, and ensure that health and safety requirements are met. A ramp gradient of 1:10 (10%) has been used for all the designs; this coincides with the ramp gradient of the current pit design. The dump design parameters are summarized in Table 16.12.2 below.

Table 16.12.2 WRD Design Parameters

Dump Design Parameters	Units	Value
Bench Angle (Angle of Repose)	deg.	35
Lift Height	m	15
Berm Width	m	15
Overall Slope Angle	deg.	20
Access Ramp Width	m	25
Access Ramp Gradient	%	10

16.12.5 Internal drainage

The density and pore-water pressures of waste dumps are governed by the methods used to place the waste material within the pile. Frictional material such as blasted rock may be placed by casting, end-dumping, or bulldozing over a face. Segregation of coarse particles occurs typically as the materials cascade down the face so that a concentration of the coarsest material will be deposited at the base. As the leading edge of the dump advances, the coarse fraction is covered, forming an under-drain at the base of the pile. This will generally preclude the development of hydrostatic pressure at the base of the pile. Hence, the need to consider hydrostatic pressure is eliminated from a design perspective.

16.13 Mine planning considerations

Mine planning considerations encompass aspects of the waste rock disposal plan that relate to hauling and mine scheduling. Haulage cost is the most considerable portion of waste rock disposal costs; hence, locating the WRD as close as possible to the open pit and the ramp access to the dump is desirable. Hence the dump designs were reviewed and redesigned to have the shortest hauling distance for each pushback.

16.14 Stockpiles

All ore mined is stockpiled in the form of paired finger stockpiles (Figure 16.14.1) on the ROM pad and other destinations depending on grade and ore type. Ore is then re-handled to the processing plant as per the feed schedule. The ore material is classified according to different ore types and grade bins, as summarized in Table 16.14.1. The ore types are associated with specific plant performance in terms of throughput and recovery hence the need to be stockpiled separately. The classification also assists and adds a measure of control in feed blend grade to ensure that stockpile grade variability is minimized, and the plant gets the best available feed grade at any given point during the LOM.

Figure 16.14.1 Typical Mine ROM Finger Stockpile Layout

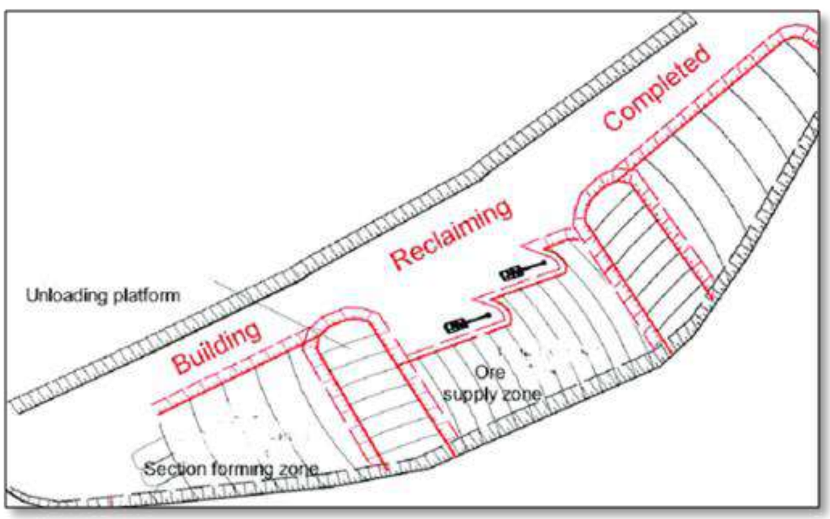


Table 16.14.1 shows the stockpile classification, which ranges according to ore type and grade bins. Ore from the 100-t rigid dump trucks can be direct tipped into the crusher bin. The stockpile strategy is to maintain two months (60 days) of ore on stockpiles to allow for flexibility in blending and provide a consistent ore mix to optimize recovery and plant throughput. The 60 days is considered optimal and sufficient to manage the risk of model variability, allow for stripping, and ride out the possible and inherent ore supply disruptions from the pits.

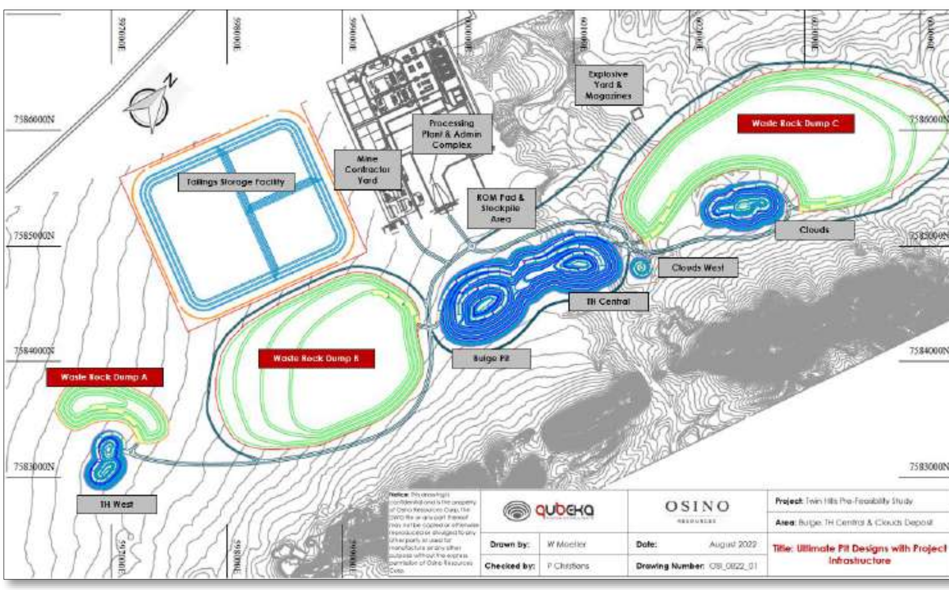
There should be a minimum of two ROM stockpiles of each category 'open' at any given time. One stockpile is under construction, and the other is fed to the crusher (reclaim). The operation will not build and reclaim any given ROM stockpile simultaneously. This allows for reasonable control on ore quality and reconciliation purposes.

Table 16.14.1 Stockpile Classification

Stockpile	Grade Bin (g/t)
Low Grade	0.4 – 0.6
Medium 1 Grade	0.6 – 0.9
Medium 2 Grade	0.9 – 1.2
High Grade	> 1.2

16.15 Waste Rock Dump Designs

Figure 16.15.1 Waste Rock Dump Layout



The site's general arrangement is provided in Figure 16.15.1. The proposed WRD complexes consist of three separate dumps located east (Dump B) and west (Dump C) from the Main pit and north of TH West (Dump A). The waste rock dump volumes correlate precisely to the LOM waste volume requirement of ~ 150 Mm3. Should more waste dumping volume be required, there is ample real estate to extend these dumps away from the pit.

16.16 ROM Pad, Ore Stockpiles and Ex-Pit Roads

The primary crusher and associated Run-of-Mine (ROM) pad are located southwest of the processing plant. The larger blending stockpiles are located in Figure 16.16.1. Some haul roads are temporary and serve stages (pushbacks) that do not align with final pit and dump exits (or entrances). The contract mining team will construct haul roads to ensure timely and safe start-up of mining operations whilst achieving the required construction standard.

Figure 16.16.1 ROM Pad, Ore Stockpiles and Ex-pit Haul Roads

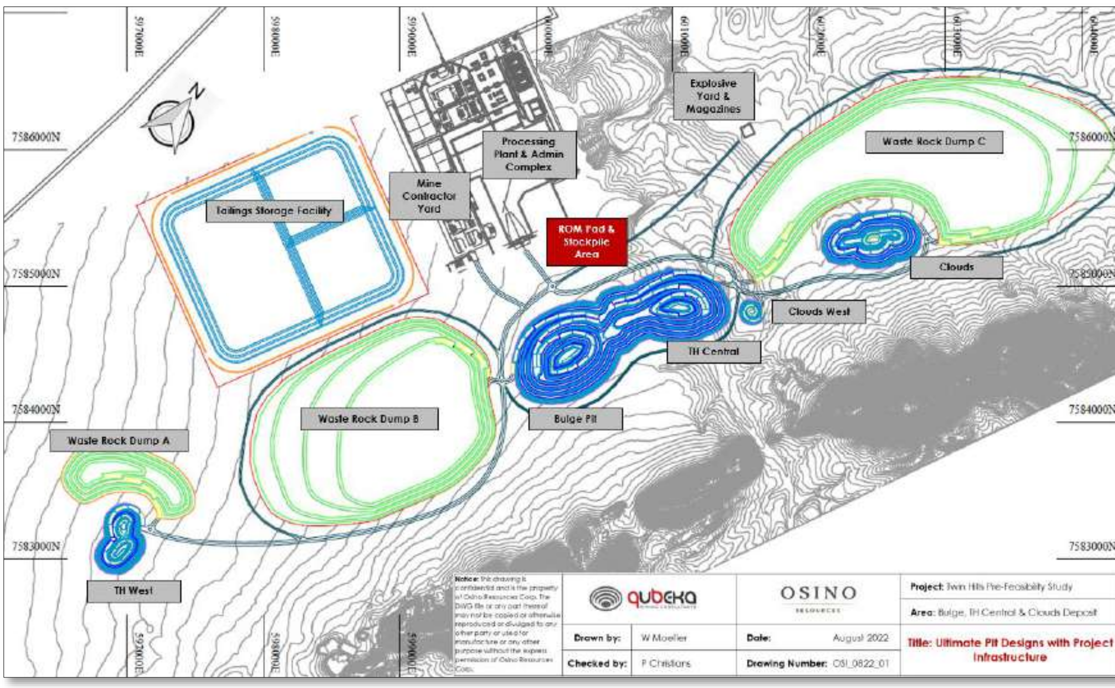


Figure 16.16.1 illustrates the proposed ROM pad and stockpile location for the Project.

16.17 Drill & Blast Operation

16.17.1 Design Criteria for Production Blasts

The primary role of blasting is to fracture the rock into fragments that can be efficiently excavated and handled by the downstream mining process. The nature of the rock mass largely influences the fragment size distribution resulting from blasting. Where the rock contains closely spaced joints and bedding planes, satisfactory fragmentation, displacement, and rubble pile looseness are usually achieved with a relatively low energy factor. Considerably higher energy factors and more shock energy are required where the rock is more competent and less fractured because a larger number of new fracture surfaces must be created to achieve the required degree of breakage.

In addition to these factors, other major blast design features that influence the outcome of a blast are the distribution of the explosive throughout the rock mass and the initiation and timing sequence of the explosive charges. Preliminary blast design parameters are based on rock mass-explosive-geometry combinations, which are later adjusted based on field feedback using that design. The primary requisites for any blast design are ensuring optimum results for existing operating conditions, possessing adequate flexibility, and being relatively simple to employ. The blasthole arrangement within a round must be balanced to maximize the explosive's energy released and the material's specific properties.

Figure 16.17.1 Blasting Scenes

The design of any blasting plan depends on two variables, uncontrollable variables, or factors such as geology, rock characteristics, regulations or specifications, the distance to the nearest structures, and controllable variables or factors. The blast design must provide adequate fragmentation to ensure loading, haulage, and subsequent disposal or processing are accomplished at the lowest cost. Further to the cost, the design of any blast must encompass the fundamental concepts of an ideal blast design and have the flexibility to be modified when necessary to account for local geologic conditions. The controllable and uncontrollable factors are discussed in this chapter and will be used in the blasting and costing models wherever necessary.

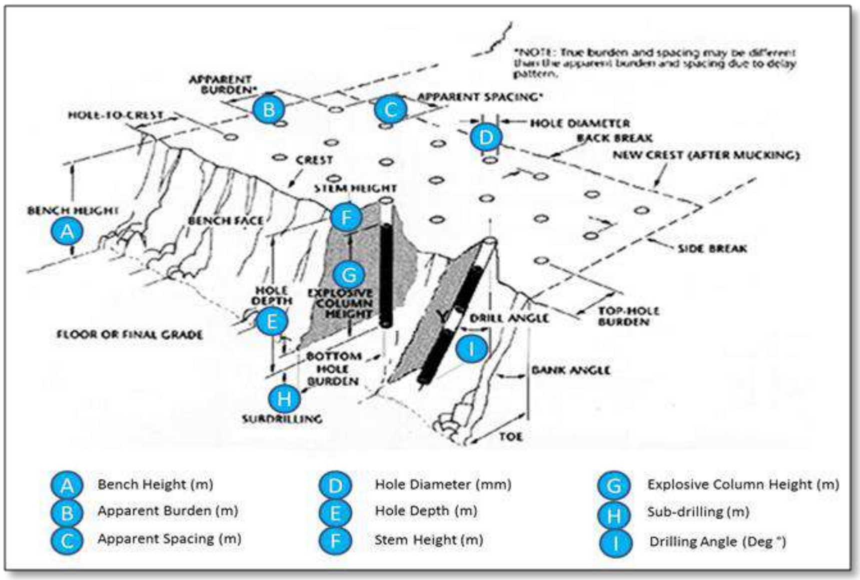
The results of the blasting operation will directly affect the safety, efficiency, and cost of Twin Hills' mining operation. Poorly designed blast layouts result in toes and poor fragmentation, increasing secondary blasting costs and greater wear rates on loading, hauling, and crushing equipment.

It is envisaged that 100% of waste and ore will be blasted. However, particular areas in the pre-stripping zones may be loaded without blasting due to the weathered nature of the material. This is difficult to quantify and may result in limited cost advantage and upside potential for the Project. Blasting will be planned to take place twice per week on the day shift only, if possible, during the day-to-afternoon shift change slot to minimize production delays,

16.17.2 Blasting Terminology

Figure 16.17.2 illustrates the various aspects of a blast design and the relevant terminology applied to them.

Figure 16.17.2 Bench Blasting Terminology



16.17.3 Blast Design Considerations

There are several factors to consider when designing a blast pattern. Some of these factors are interrelated and, therefore, must be considered together. The primary considerations are:

- Powder and Energy Factor.
- Fragmentation Requirements.
- Geotechnical Properties of the Rock.
- Explosives Type.
- Bench Height, Grade Movement & Ore Dilution.
- Hole Diameter.
- Stemming Length.

A description of the factors and assumptions made for the calculations follows.

Powder and Relative Energy Factor

The powder factor is generally defined as the mass of explosive used to fragment a cubic metre or ton of rock expressed in kg/m³ or kg/t.

$$K = \frac{kgperHole}{BxSxH} \qquad (1)$$

The powder factor required to break a given rock type depends on:

- The strength of the rock.
- The extent to which the rock has been pre-conditioned by geological processes such as jointing and bedding.
- The explosive's strength and characteristics.

Fragmentation Needs

Fragmentation is the liberation and breakage of the in-situ blocks that make up the rock mass. Suppose the size distribution of the resulting rock fragments after a blast varies significantly from the optimum. In that case, the productivity of the mining machinery, crusher and downstream processes can be adversely affected. Fragmentation is probably the most fundamental blasting outcome because of its direct influence on the economics of mining. The design strategy for blasting was to liberate ore into smaller fragments to save operating costs on the downstream mining costs, which is also reflected in the higher energy factor.

The primary mining equipment fleet and primary crusher selection from previous studies were used as a guide to determine the fragmentation needs. Blast parameters have been designed based on the fragmentation size requirements summarized in Table 16.17.1, based on the primary crusher, loading, and hauling equipment size and weight restrictions.

Table 16.17.1 Fragmentation Target Parameters

Fragmentation Target Parameter	Unit	Ore
Oversize	mm	700
Optimum (80% passing)	mm	300
Undersize	mm	200

The crusher feed opening is 1000 mm, so the ore material should be restricted to this size. But as the ore and waste fragments must physically fit into the bucket of the loading equipment, a top size of 700 mm can be tolerated. Most of the material should be much smaller than the top size to improve bucket fill factors and loading times. Equipment productivity is directly affected by the fragment size distribution.

The Kuz-Ram fragmentation model provided a basis for comparing the blast designs using the respective blasthole sizes in terms of fragmentation and primary drilling and blasting costs. The underlying assumption of the fragmentation model is that the smaller diameter blastholes will achieve comparable fragmentation to the larger blastholes at a relatively lower energy factor. The Kuz-Ram is an empirical model developed for surface bench blasting (Cunningham, 1987). The original intent of this fragmentation model was to be a tool to predict likely changes when blast design parameters are modified and do not accurately predict sizes. However, operators use the model, placing great confidence in its predictions.

Geotechnical Properties of the Rock

The properties of the rock mass are of fundamental importance in the design of open pit blasts. The intrinsic environmental factors that influence drilling and blasting are geologic conditions, state of stress, and the internal structure of rock, which affect its resistance to penetration. The following parameters affect rock behaviour in drilling and blasting:

- Geology of the deposit: Lithology, structural composition, rock types.
- Rock strength and properties: Mechanical properties, chemical and physical properties.
- Structural geology: Presence of fractures, fissures, folds and faults.
- Presence of water: Depending on the source and quantity, it may be an uncontrollable or a controllable factor.

These factors also influence the blast design parameters and the fragmentation produced; thus, their effects on blasting need to be quantified.

Explosive Type

Selecting the most appropriate explosive is integral to the blast design process. The selected explosive must deliver the energy required to fragment and loosen the rock mass and be suited to the prevailing conditions. Ammonium nitrate fuel oil (ANFO) can be considered for dry-hole conditions. Blend emulsion (30% ANPP and 70% emulsion) was considered for bulk mining conditions during the trade-offs because the blend explosives have a higher gas energy content, resulting in a more heaved, loose muckpile for efficient loading. It has a suitable combination of heave and shock energy for this type of rock formation. Pure emulsion was also considered for drilling and blasting selective material, resulting in a tight muckpile and minimal movement due to the greater shock energy content. The explosives properties used during the trade-off are summarised in Table 16.17.2 below.

Table 16.17.2 Explosive Characteristics

Description	Unit	Pure Emulsion	Blend Emulsion (35% ANPP, 65% emulsion)
Down-the-hole Density	t/m3	1.25	1.15
Relative Weight Strength	%	85	96
Velocity of Detonation	m/s	4 500	4 500
Effective Energy (@20MPa)	MJ/kg	2.391	2.831
Heave Energy (@20MPa)	MJ/kg	1.415	1.698
Shock Energy (@20MPa)	MJ/kg	0.974	1.118

Bench Height, Grade Movement and Ore Dilution

To create a loose muckpile, it is necessary to displace rock fragments relative to each other, and this may create a problem where the final location of ore-waste boundaries and the distribution of ore grade after the blast are critical. In order to reduce the overall mining unit cost, the Project must adopt a balance between a bulk and selective mining approach, and requirements for diggability may then conflict with the dilution criteria of the Project. Ultimately, this conflict can only be resolved by assessing the economic impact of each of these aspects of blast performance in the overall mining and processing operation. However, increased bench height reduces ore selectivity along the ore and waste boundary. This results in:

- Higher ore loss where ore is lost as waste.
- Higher mining dilution, where ore is diluted with waste, increases ore tonnes but lowers the mill feed grade.

A prior bench height study assessed the trade-off between these various parameters. As a result of this study, a maximum loading flitch of 2.5 m has been selected in those areas where selective mining is required to minimize ore loss and dilution. These selective horizons are drilled and blasted in 5.0 m benches. A 10 m bench height is planned for drilling and blasting in broad continuous waste areas. Paddock blasting techniques will be utilized for ore blasts to reduce material movement.

Production Blasthole Diameter

Factors governing the choice of blasthole diameter include:

- Rock mass properties.
- Muckpile characteristics (fragmentation and heave).
- Bench height.
- Explosive distribution.
- Relative economics of the different types of drilling equipment.

In competent and unexposed rock, smaller diameter blastholes have the advantage of better explosive distribution. Should the diameter increase, and the explosive powder factor remain constant, the larger blasthole patterns generally give coarser fragmentation. Higher powder factors must be used to compensate for this. The hole diameter choices matched the minimum bench height in Table 16.17.3.

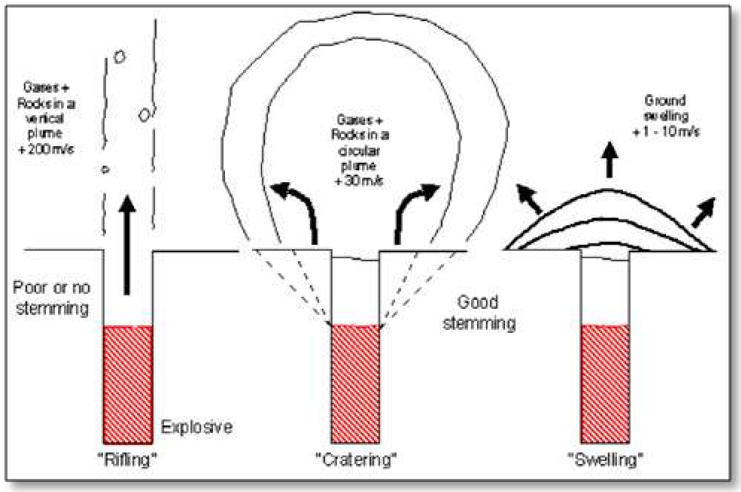
Table 16.17.3 Minimum Bench Height per Hole Diameter (mm)

Hole diameter (mm)	**115**	**165**	**203**	**251**	**311>**
Minimum bench height (m)	5.0	7.5	8.5	10	12.5

Stemming Length

The design and application of stemming is one of the most critical elements of a blast and the most often overlooked. Stemming provides a plug to retain the gas energy within the rock until burden relief is achieved. The process of achieving a reduction in fly-rock and better containment of the gasses can be illustrated in Figure 16.17.3.

Figure 16.17.3 Rifling, Cratering and Swelling



At this stage, it is essential to mention that the type of stemming material used influences the blast results, as the most effective material should have a high shear strength and density similar to a crushed aggregate. This obviously will increase the blasting cost, and for the Project, it was assumed that drill chippings from the hole collar would be used as stemming material. Using a good angular graded material with supervision over measuring stemming heights and correct placement tends to result in "swelling" of the ground and "cratering" at the top of the blast hole.

The gases are liberated in a much more elliptical shape, with any fly-rock moving out at much lower velocities, from 30 m/s down to 1 m/s, thus reducing the dangers and distances the flyrock will travel. Increasing the stemming heights to control flyrock has to be traded off against increasing fragmentation sizes and, thus, loading rates on the top of the blast.

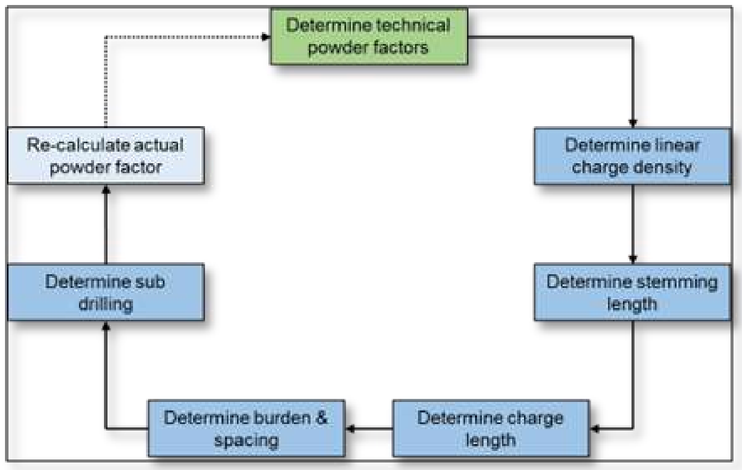
Blasthole Patterns

In bench blasting, the standard blasthole patterns are either square or rectangular, owing to the ease with which the collaring points can be marked. However, the most effective are staggered patterns, especially those drilled on an equilateral triangular grid, as they give the optimum distribution of the explosive energy in the rock and allow more flexibility when designing the initiation sequence and the break direction.

16.17.4 Calculation of Production Blast Patterns

Blast designs were determined from empirical formulas and rules of thumb used extensively in the industry over the past decades to determine the blast parameters in a green field project environment. The blast design process that was followed is depicted in Figure 16.17.4.

Figure 16.17.4 Blast Design Process



Technical Powder Factor **(K_{TECH})**

It is assumed that explosives below grade in the sub-drill do not contribute significantly to fragmentation. This portion of the explosive column is, therefore, not included in the charge length L and the technical powder factor can be described as follows:

$$K_{TECH} = \frac{Mass\ of\ explosives\ above\ grade}{Volume\ of\ rock\ broken}$$

$$K_{TECH} = \frac{L\ x\ M_C}{B\ x\ S\ x\ H}$$

Where M_C = Linear charge density (defined as the mass of explosives contained in one metre of charge length and measured in kg/m.

$$M_C = \frac{\pi}{4}\left(\frac{D}{1000}\right)^2 x\ \rho\ x\ 10^3$$

$$M_C = \frac{\rho\ x\ D^2}{1273}\ kg/m$$

Since the Project is a green field project, blast designs have been based on surrounding gold mines with a similar geological stratigraphy. The blast designs have been based on the following powder factors:

- Selective Ore & Waste 0.85 kg/m^3 (oxide & transitional rock – pure emulsion)
- Selective Ore & Waste 0.90 kg/m^3 (fresh – pure emulsion)
- Bulk Waste 0.75 kg/m^3 (calcretes – blend emulsion)

- Bulk Waste 0.75 kg/m^3 (oxide & transitional rock – blend emulsion)
- Bulk Waste 0.80 kg/m^3 (fresh rock – blend emulsion)

The lower waste material powder factor is because the waste material only needs to be efficiently and economically excavated, hauled, and dumped. With the ore material's higher relative energy factor, on the other hand, any finer fragmentation could benefit the project's downstream crushing and milling costs.

Stemming Length

The following relationship was used as an initial estimate for a suitable stemming length:

$$T = Z \times \frac{12}{A} \times \left(W \times \frac{E}{100} \right)^{\frac{1}{3}}$$

The rock factor 'A' was assumed to be 10.

Burden and Spacing

After determining the length of the stemming required and by rearranging equation 3, the burden can be determined with the following equation:

$$B = \sqrt{\frac{LM_C}{HK_{TECH}}} \text{ metres}$$

The ratio between burden and spacing was assumed to be:

$$S = 1.1 \, x \, B$$

Sub-Drill

The sub-drill is the portion of the hole drilled below the bottom elevation of a bench, and the purpose of the sub-drill is to maintain the required grade level. The length of the sub-drill required varies according to geological conditions but is often taken as 1/4 × burden.

$$U = 0.25 \, x \, B$$

16.17.5 Production and Trim Blast Designs

Table 16.17.4 summarizes the relevant production and trim blast designs to estimate the drill and blast FS operating costs. The below blast design parameter formed part of the Contractor RFQ document. Wall control blasting practices will comprise a pre-split and trim blast.

Table 16.17.4 Production and Trim Blast Designs

Parameters	Units	Production Blasts				Trim
		Ore	Ore	Bulk Waste	Bulk Waste	
		Selective Waste	Selective Waste			
		Oxide / Transitional	Fresh	Oxide / Transitional / Calcretes	Fresh	
Hole diameter	**mm**	**115**	**115**	**165**	**165**	**165**
Bench height	m	5	5	10	10	12
Explosive Type		Emulsion	Emulsion	Blend	Blend	Blend
Angle of the hole (90^0 is vertical)	°	90	90	90	90	90
Burden	m	3.3	3.2	5.2	5.0	5.5
Spacing	m	3.6	3.5	5.8	5.5	6.0
Stemming length	m	2.2	2.2	3.1	3.1	4.3
Sub-drill	m	1.0	0.9	1.6	1.5	1.7
Length of hole	m	6.0	5.9	11.6	11.5	13.7
Actual powder factor	**kg/m^3**	**0.85**	**0.90**	**0.75**	**0.80**	**0.63**
Mass of Explosive per hole	kg	50.00	49.57	228.56	226.94	251.11
Cubic metres blasted per hole	m^3	58.52	54.65	301.82	279.22	396.00
Tonnes blasted per hole	t	152.14	150.84	784.74	770.64	1049.40

Trim blast holes are detonated after the production blastholes are detonated. The purpose is to blast and loosen the remaining burden with lighter charges while not causing any additional damage to the new rock wall face.

16.17.6 Pre-Split Blast Designs

In areas where mining slopes have to remain intact for extended periods, it is good practice to minimize the fracturing of the high walls during blasting. In such identified areas, wall control blasting, also known as pre-splitting, can be considered. Pre-splitting was catered for the final pit boundary high walls to create safe operating conditions on the lower working benches. Limited guidance is available for designing a pre-split in a greenfield project area, and rules of thumb were made based on industry standards. Qubeka also considered the pre-split design parameters from a similar type of operation. A split factor (P) in the 0,5 kg/m² range should be used as a guide for pre-split calculations.

- S - Spacing between holes
- M_C - Mass per meter explosives
- M_h - Mass per meter explosives spaced in the hole
- L - Length of cartridge
- D_C - Centre-to-centre spacing of cartridges

$$S = \frac{M_h}{P} \qquad\qquad D_C = L\ x\ \frac{M_C}{M_h}$$

Pre-split holes will be 10.2 m long with an inclination of 80° (face batter angle). To reduce the blast hole pressure, the charge has to be reduced, and this is achieved by using 115 mm diameter holes loaded with decoupled explosive cartridges emplaced within a plastic sleeve and suspended within the hole. The explosive will be initiated by detonating cord with all holes firing virtually simultaneously, separated only by the burn time of the detonating cord (6 000 m/sec). Pre-split blasts will be fired separately in advance from the trim blasts. The pre-split holes are charged with 40 x 560 mm cartridges spaced at 0.5 m intervals between cartridges along a detonating cord suspended in each hole. In Table 16.17.5 below, the pre-split blast parameters are summarized.

Table 16.17.5 Pre-split Blast Parameters

Parameters	Units	Pre-split
Hole Diameter	**mm**	**115**
Bench height	m	10
Hole Inclination	°	80
Hole Length	m	10.2
Spacing	m	2
Mass of Explosive per Hole (Cartridges)	kg	10
Split Factor	**kg/m^2**	**0.50**

16.17.7 Rock-on-Ground (RoG) Contract

To secure competitive pricing and reliable supply, the appointed mining Contractor has to subcontract a reputable explosive supplier, namely in the form of Sasol Explosives (Sasol), African Explosive Limited Mining Services (AEL) or Bulk Mining Explosives (BME), all having regional offices in Swakopmund, for the supply of explosives and rock on ground (RoG) blasting services.

The tendering supplier would also be required to provide fulltime technical support to the project and to set up the physical infrastructures required to support the supply and storage of explosives should this be required. The provision for this infrastructure on site will not be required due to the scale of the mining operations. The emulsion will be manufactured off-site and will be trucked to the site. Trucking of emulsion from South Africa is widespread in Namibia.

The explosive suppliers will be requested to provide explosives and the RoG blasting services. The subcontracted explosive supplier would also be required to provide the following services and physical infrastructures, which include mobile and fixed assets. The scope of work by the subcontracted explosive supplier is detailed as follows:

- Engineering, procurement, construction and commissioning of the bulk manufacturing plant and Mobile Manufacturing Units (MMU).
- Engineering, procurement, construction and commissioning of explosive magazines and ammonium nitrate storage shed.
- Daily management of MMUs and manufacturing plant, including all associated procurement of consumables, spares, and equipment.
- Procurement of required chassis for MMU's and vehicles to carry explosives and personnel.
- Procurement of blasting vehicles to transport detonators and packaged explosives.
- Placement of bulk explosives down blast holes as per approved quantities.
- Establishment of practical production and limit drill and blast designs.
- Priming of holes.
- Tying-in of blasts.
- Stemming handling equipment.
- Firing of blasts.
- Implementation of an integrated Blast Management System.
- Development of relevant standard operating procedures and the training thereof.
- Routine tracking of blasting performance through high-speed filming, VOD testing, firing sequences etc.
- Continued mine-to-mill optimisation projects.
- Any related technologies available to enhance performance.
- Training and development of relevant mine personnel.

16.17.8 Secondary Breaking Cost

Secondary breaking may be required where oversize material has been produced. Oversize material may be caused by various conditions and not purely due to poor blasting practices. The following areas contribute to oversize material:

- Excessive toe burden of the front row: this usually occurs when drilling is impossible due to unsafe conditions at the face or excessive back break from the previous blast has created unsafe conditions to allow drilling at the crest of a blast.

- Stemming: The stemming area does not contain any explosives, and depending on the geological formation, oversize is produced from the stemming area. This is especially evident when the fly rock must be controlled and stemming lengths are increased.

- Drilling Accuracy: Where drilling accuracy is not maintained, resulting in over and under-burdened blast holes, fragmentation is compromised, and oversize material is produced and

- Geology: Where excessive jointing occurs in a formation, oversized material will be produced regardless of the amount of explosives used.

Considering the above and a 2% oversized blast fragment generation according to the Kuz-Ram fragmentation prediction, the Contractors had to assume that as part of their RFQ submission, 3% additional secondary rock breaking cost was added to the primary drilling and blasting costs. Rock breaking is recommended over secondary blasting due to reduced production delays in cleaning and flyrock. The secondary breaking cost forms part of the mining Contractor's drill and blast rate.

16.18 Drilling Equipment Selection

Drilling is the first operation performed at most open-pit mining operations. Rotary drills are predominantly used, although, for smaller hole (<200 mm) applications like quarries, down-the-hole (DTH) hammer drills have often been employed. Over the past three decades, the trend has been towards larger holes for many open pit mines. Advances in explosives technology that have resulted in reliable bulk-loaded products have contributed to this trend, as well as improvements in bit technology, especially the introduction of tungsten carbide rotary tri-cone bits.

One of the parameters that provide minimum cost for the targeted production in a mine is the suitability of the equipment selected. Moreover, equipment selection directly affects the pit design and production planning. The primary purpose of the drill equipment selection is to choose the optimum and most cost-effective drill rigs that comply with the mining conditions and other limitations and meet the basic condition requirements. The most important factors that have to be taken into consideration are:

- Rock formation to be drilled & structural geology.

- Desired borehole diameter.
- Drill air pressure and consumption.
- The desired degree of drill mobility.
- Hole Length.

16.18.1 Drilling Methods Considered

A variety of factors affect the type of drill to be selected for the job at hand. The three primary surface drilling methods, namely down-the-hole (DTH), top hammer and rotary drill, are classified according to how the rock is churned during the drilling action, as seen in Figure 16.18.1 and Figure 16.18.2. Varying bit diameter and hole depth ranges are summarised in Table 16.18.1.

Figure 16.18.1 Drilling Methods

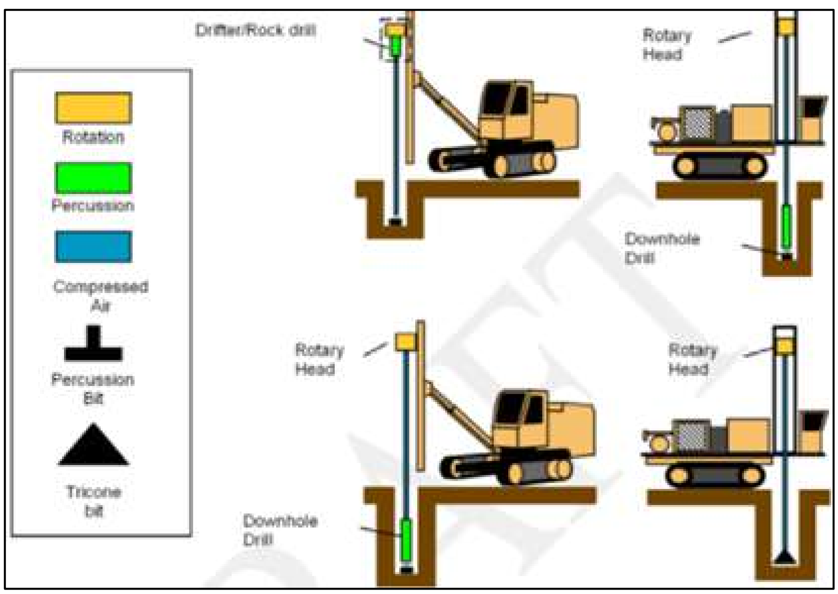


Figure 16.18.2 Drilling Technique Relative to Drill Bit Loaction

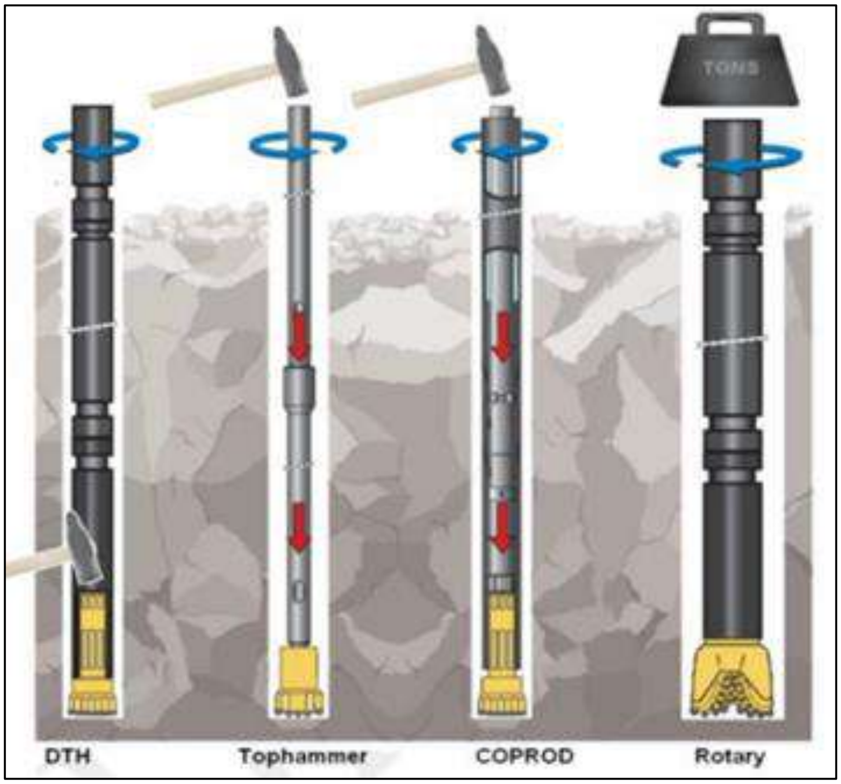


Table 16.18.1 Drilling Method Limitations

Parameter	Hole Diameter Range mm	Normal Bench Height Range m
Top Hammer	19 - 127	0.5 – 10.0
DTH	89 - 203	5.0 – 15.0
Rotary	201 - 381	8.5 – 60.0

Top Hammer Drilling

As seen above, the top hammer drilling method is used in hole applications ranging from 19 mm to 127 mm. The energy drifter is located on top of the drill string. A major disadvantage of this drilling method in long holes is that the extended drill string absorbs most of the drifter impact energy, reducing penetration rates. This is the most important descriptor of drill performance in a particular formation. Furthermore, hole deflection in top hammer drills occurs very quickly because the drill string is narrow compared to the hole diameter, and the hammer is located at the top of the drill string. The narrow drill string section also results in an inefficient baling velocity of the drill cuttings making this drilling method unsuitable for the Project’s conditions.

Down-the-Hole (DTH) Drilling

On the contrary, down-the-hole ('DTH') drilling, which can be employed in hole applications ranging from 89 mm to 203 mm, is a hammer drilling method where the energy drifter is located directly above the bit. The DTH method drills longer straight holes, and the penetration rate remains relatively constant with depth since no energy is lost along the drill string. This is also why this drilling technique is favoured in hard rock formations.

Rotary Drilling

Rotary drills are used in various materials and can be utilized over a broad range of bit diameters, from about 203 mm to 381 mm. Important performance factors include rotary horsepower, pull-down capability, and air capacity. In hard rock formations, the rotary drill uses rotary crushing drilling using tri-cone roller bits studded with tungsten carbide cutting edges and thus do not have any impact components.

These are cut by crushing the rock into chips as they are pressed successively into the rock surface at the hole bottom by the force of the rotating drill rod. This requires bits that can withstand high pull-down pressures with a modest rotational speed compared to softer formations. As diesel fuel price increases, the debate whether electric-powered rotary drill rigs are more cost-effective resurfaces, as electricity is a fraction of the cost of diesel fuel. This option was not considered during the drill selection and trade-off process.

16.18.2 Rock types

The cost of drilling significantly depends on the rock material's penetration rate and wears characteristics and on the size and depth of the drill hole. Rock-type characteristics were taken from previous studies, and the blast designs and drill penetration rates differed according to the:

- Weathered and transitional ore material.
- Fresh ore material.
- Weathered and transitional waste material and
- Fresh waste material.

16.18.3 Drill Factor and Penetration Rates

Like the powder factor, the drill factor can be defined as the number of meters that need to be drilled to blast one cubic meter or tonne of material. One can compute the drill factor for the different powder factors encountered from the production blast designs. They are listed in Table 16.18.2.

Table 16.18.2 Drill Factor

Parameters	Units	Production Blasts				Trim
		Ore	Ore	Bulk Waste	Bulk Waste	
		Selective Waste	Selective Waste			
		Oxide / Transitional	Fresh	Oxide / Transitional / Calcretes	Fresh	
Drill Factor	t/m	25.5	25.4	67.8	66.9	76.9
	m/m^3	0.102	0.109	0.038	0.041	0.034

In the drilling industry, the rate of penetration ('ROP'), also known as penetration rate or drill rate, is the speed at which a drill bit breaks the rock under it to deepen the borehole. It is commonly measured in meters per hour. The assumed non-drilling time components in a drilling cycle for the Project are tabulated in Table 16.18.3. The resultant overall drill penetration rates for the various material types are listed in Table 16.18.4.

Table 16.18.3 Non-Drilling Time Components in a Cycle

Operational Activities	Unit	Value
Hole-to-hole movement	min	1.25
Levelling time	min	1.10
Steel add time	min	0.90
Steel retract time	min	1.20
Steel rack time	min	0.70

Table 16.18.4 Overall Drill Penetration Rates

Parameters	Units	Production Blasts				Trim
		Ore	Ore	Bulk Waste	Bulk Waste	
		Selective Waste	Selective Waste			
		Oxide / Transitional	Fresh	Oxide / Transitional / Calcretes	Fresh	
Overall Penetration Rates	m/ ops hr	30	27	27	25	25

16.18.4 Operational Inefficiencies

The following operational inefficiencies were applied during the drilling and blasting study:

- Explosive Spillage Factor: 4 %
- Re-drill Factor: 2 %

- Overall Mechanical Availability: 85 %
- Operator Efficiency: 90 %

16.18.5 Drill Rig Choice

The preferred Contractor selected the Sandvik LEOPARD™ DI650i (DI650i) series as his drilling machine of choice for the Project. Simple, durable and efficient, the DI650i with an extendable boom incorporates a self-adjusting drill system that ensures high productivity regardless of the drilling situation. Figure 16.18.3 shows a photo of the DI650i production drill rig on a bench. All drill productivity estimates were based on this drill rig, and it boasts the following general specifications:

- 403 kW @ 1800rpm power plant
- 115 – 203 mm bit size diameters

Figure 16.18.3 Sandvik LEOPARD™ DI650i Drill Rig

For continuous ore reverse circulation (RC) blasthole sampling, the Leopard DI650i RC drilling system is equipped with an industry-proven Metzke RC sampling unit (Figure 16.18.4) as part of the Project's grade control protocol. The unit consists of an isolated sample route from the bit face to the cone splitter compartment, ensuring no contamination and accurate sampling results.

The drill rig will be equipped with the TIM3D drill navigation system and driller's notes measurement-while-drilling (MWD) option. These features enable the Operator to easily add the sample bag number with comments at a specific location and depth to a graphical user interface inside the cabin for later grade control analysis at the office.

Figure 16.18.4 Metzke RC Blasthole Sampling Unit

16.19 Load and Haul Operation

The overall scale of mining envisaged at the Twin Hills Gold Project is a medium to large-sized mine with a maximum material movement of approximately 33.0 to 35.0 Mtpa. As a result of the limited extent of mineralisation at the project, selective mining practices have been incorporated into the ore mining methodology. To achieve this, various truck simulations were considered for ore and waste hauling for deriving the most cost-effective and applicable ground handling solution.

The preferred mining Contractor selected the suggested load and haul fleet for in-pit loading and hauling, considering experience in similar-sized operations and local OEM support. The costing was based on actual mining contracting quotes for The Project. The recommended load and haul fleet will consist of a fleet of 100t rigid frame dump trucks with the following matched loading unit fleet:

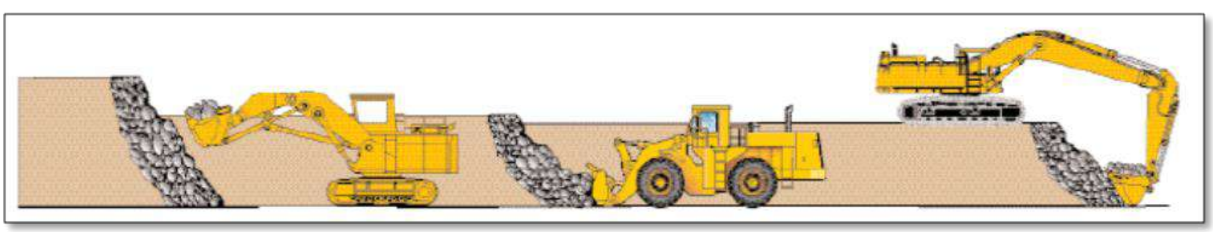
- ROM rehandling and in-pit ad hoc loading assistance: ~ 105-t class wheel loader.
- ~ 200-t hydraulic backhoe shovels would be employed for selective ore and bulk waste loading purposes.

16.19.1 Loading Equipment Selection

The material size distribution, muckpile shape, distribution swell and bench size drive the loading efficiency. Factors which influence the selection of loading tools are:

- Face material type and density.
- Material fragmentation (a factor of blasting).
- Penetration characteristics.
- The material angle of repose.
- Face height and angle.
- Bench width.
- Manoeuvring space.
- Blending requirements.
- Blasting restrictions.
- Support equipment in the loading area.

Figure 16.19.1 The Three Loading Methods



When making a loading unit selection, care should be taken to consider the life of the mine, primary loading characteristics, multi-surface loading and secondary functions such as stockpiling, feeding the primary crusher, cleaning up and maintaining a buffer stockpile. The hydraulic front shovel, wheel loader and hydraulic excavator can fit into primary loading functions, as shown in Figure 16.19.1.

Multi-face loading or secondary functions do not favour hydraulic shovels or excavators but certainly favour wheel loaders due to their speed and flexibility.

Hydraulic Backhoe Excavators

Hydraulic backhoe excavators provide high digging forces in a versatile form and can work in various conditions. With proper job set-up, a hydraulic excavator can be the centrepiece of a productive crushed stone loading system as a mass excavator.

As seen in Figure 16.19.2, hydraulic excavators work best when positioned on an upper bench, top-loading haul trucks at a lower level. In contrast, excavators with a general-purpose linkage work best when same-level loading is required. The optimal bench height is no greater than the stick length to provide adequate reach for loading and dumping. This typically requires a material with a high angle of repose for the excavator to be as close as possible to the haul truck.

Figure 16.19.2 Hydraulic Excavator

Although excavators require support equipment to minimize truck tyre hazards, prepare the working bench, clean-up and remove oversize material, the excavator's ability to achieve fast cycle times has made it a popular choice. Backhoe excavators are also more applicable to selective loading.

Hydraulic Face Shovels

Hydraulic face shovels (Figure 16.19.3) combine the benefits of high digging forces with large-capacity buckets. Shovels are usually used at highly consolidated working faces (10 m plus) in tough-to-penetrate material with large blast fragmentation, such as in bulk waste benches. As can be seen in Figure 16.19.3, they have an arc-shaped digging motion, similar to wheel loaders.

Hydraulic shovels work well when extreme underfoot conditions exist (soft or jagged floors) and in tight corners where benches may be narrow. Truck positioning and proper truck match are critical to maximizing productivity.

Figure 16.19.3 Face Shovel

Wheel loader and Front-End Loader (FEL)

Wheel loaders have grown in size over time to match increasing off-highway truck payload capacities properly. High levels of productivity are possible with wheel loaders due to consistent high bucket fill factors. They are used effectively as primary loading tools when mobility is paramount. The machines keep loading floors clean, work between multiple faces, and transport oversized material away from loading areas. Productivity remains high even when the machines encounter conditions in the face, such as free-flowing material or material with low angles of repose. Front-end loaders (FEL) usually are more suitably applied as support loaders to hydraulic shovels or as primary loaders in stockpile areas.

Figure 16.19.4 Front-End Loader

16.19.2 Loader Choices

Table 16.19.2 provides generally accepted guidelines for matching equipment to favourable or unfavourable loading conditions. Each loading tool has a definite application range in which it is regularly used and is most economical (suitable). A 'not recommended' designation typically means a loader is not the most economical or productive selection. Table 16.19.2 summarizes the loader selection criteria for this study based on specific factors and conditions.

Table 16.19.1 Loader Selection Criteria

Factor	Condition	Wheel Loader	Front Shovel	Excavator
Load area	Single Open Bench	Green	Green	Green
	Multiple Benches	Green	Red	Red
	Confined area	Yellow	Green	Green
	Distant truck position	Yellow	Red	Red
Rock Condition	Good fragmentation	Green	Green	Green
	Blocky	Green	Green	Green
	Highly interlocked	Yellow	Green	Green
	Oversize rocks common	Yellow	Yellow	Yellow
	Bank state earth and clay	Yellow	Green	Green
	Selective Digging	Red	Yellow	Green
Bench Height	High	Green	Green	Red
	Low	Green	Yellow	Green
Angle of Repose	Steep	Green	Green	Green
	Shallow	Green	Yellow	Red
Floor - Shape	Level and firm	Green	Green	Green
	Uneven or undulating	Yellow	Yellow	Yellow
Floor - Surface	Wet, Good traction	Yellow	Yellow	Yellow
	Wet, Low traction	Yellow	Yellow	Green
	Wet and jagged	Red	Yellow	Yellow
Bucket Performance	Achieve rated capacity	Green	Yellow	Yellow
	Match multiple targets	Yellow	Green	Green
	Dig above grade	Green	Green	Yellow
	Dig below grade	Red	Yellow	Green
Clean Up	Blast clean up	Green	Red	Red
	Scaling face	Green	Green	Yellow
	Load area clean up	Green	Yellow	Red
	Levelling floor	Green	Yellow	Red
	Digging out toe	Yellow	Green	Green
Travel	Multiple loading sites	Green	Red	Red
	Sorting oversize	Green	Red	Yellow
	Evacuate for blasting	Green	Yellow	Yellow
	Load crusher	Green	Red	Red
Secondary Tasks		Green	Red	Red
Blending		Green	Red	Red
Ripping		Red	Red	Yellow
Fit Quick Coupler		Red	Red	Yellow

Green – Highly Recommended
Yellow – Recommended
Red – Not Recommended

Due to their design, hydraulic shovels and excavators have faster overall loading cycles than wheel loaders. The wheel loader is not a favourable choice as a primary loader because tyre availability for these machines working in a rugged loading area environment is not favourable. However, a large wheel loader would be beneficial in scenarios where multiple faces are to be mined, perhaps in conjunction with primary excavators or shovels.

When comparing the two hydraulic loading methods, the hydraulic excavators' cutting height gives it a slight disadvantage. Because hydraulic shovels are typically suited for higher benches, they would be well suited for the maximum bench height of 10.0 m used at the project.

With the project's production scenario, there are mining flexibility requirements; the ore and selective waste benches will be loaded with a backhoe excavator and an FEL. A hydraulic backhoe excavator will also load bulk waste benches. One FEL would be used at the ROM pad and for ad hoc in-pit ore loading. The hydraulic backhoe excavator has been selected due to the ore body's relatively flat dipping and scattered nature. A backhoe excavator is better suited for selective loading than a front shovel.

16.19.3 Hauler Selection

The hauling selection was limited to Articulated Dump Trucks (ADT) and Rigid Frame Dump Trucks. Both these hauling methods are discussed in the following sections, and the most suitable one, from an applications point of view, was selected.

Articulated Dump Trucks

ADTs (Figure 16.19.5) are multi-propulsion haulers with an articulation of 45° to each side, giving this type of truck excellent manoeuvrability in tight mining situations. They are effective on temporary roads with high rolling resistance and very wet and muddy conditions. The major drawback of ADTs is that they are limited to 60-ton payloads. ADTs are efficient in small-scale mining operations.

Figure 16.19.5 Articulated Dump Trucks

Rigid Frame Dump Trucks

As shown in Figure 16.19.6, rigid-frame diesel trucks have been used in medium and large open pits for many years, and their mechanical capabilities are well respected. Of these trucks, two mechanical philosophies are followed in their design, namely straight mechanical drives, and the newer AC-drive systems, where a diesel motor drives an alternator which generates current to drive the large AC motors in the rear wheels of the truck.

Figure 16.19.6 Rigid Frame Dump Trucks

16.19.4 Truck and Shovel Selection

Qubeka is confident that the preferred mining Contractor selected suitable loading and hauling equipment for the Project (Table 16.19.2), namely:

- Hauling of all mining material: 100 t rigid dump truck.
- ROM rehandling and in-pit ad hoc loading assistance: ~ 105 t class wheel loader.
- Selective loading operation: ~ 200 t class hydraulic backhoe excavator.
- Bulk loading operation: ~ 200 t class hydraulic backhoe excavator.

Table 16.19.2 Primary Equipment Selection List

Equipment	Description	Make	Model
Haul Trucks	100-t Rigid Dump Trucks	Caterpillar	777
Hydraulic Excavators	200-t Backhoe Excavator	Liebherr	R9200
FEL - Ore in-pit & Stockpiles	105-t Front End Loader	Caterpillar	992
Production and Wall Control Drills	Down-the-Hole Drill Drig	Sandvik	DI650i

16.19.5 Loading Productivities

The Contractor nominated a versatile backhoe excavator to load the 5.0 m bulk and 2.5 m selective flitches effectively. Table 16.19.3 summarizes the Liebherr R9200 backhoe excavator's loading rates for bulk and selective loading flitches. The key differences between the two loading applications are the bucket fill factor and the average bucket cycle time.

Table 16.19.3 Backhoe Excavator Loading Productivities

Shovel Loading Productivity			
Material	**Units**	**Ore**	**Waste**
Make		**Liebherr**	**Liebherr**
Model		**R9200**	**R9200**
Loading Unit bucket size	m^3	12.5	12.5
Bucket fill factor	%	70%	85%
Allowance for increase in Bucket Size	%	0%	0%
Calculated Max. Bucket Capacity	m^3	8.8	10.6
Tray / Bucket capacity	m^3	12.5	12.5
Rated Lift	t	26.6	25.5
Calculated Lift	t	18.6	21.6
Actual Bucket Payload	t	17.3	21.6
Bucket Utilisation	%	93%	100%
Average Bucket Cycle Time	minutes	1.30	0.75
Tray Fill Factor	%	95%	95%
Dump Truck Rated Capacity	m^3	60.1	60.1
Dump Truck Rated Capacity	t	91.0	91.0
Max. Dump Truck Capacity	t	86.5	86.5
Passes per Truck Theor.	#	4.64	3.99
Passes per Truck Actual	#	5	4
First Bucket Drop Time	minutes	1.20	1.20
Loading spot time	minutes	0.00	0.00
Total load time	minutes	6.40	3.45
Average Fuel Consumption	L/eng hr	180	180
Loading Unit Theoretical Prod.	**t / hour**	**810**	**1 503**
Total shovel loading cycle	**minutes**	**6.40**	**3.45**

16.20 Secondary & Support Equipment

16.20.1 Introduction

Trucks and excavators are the lifeline on the surface mine site, responsible for moving the bench cubic meters. But sites that remember the importance of secondary and support machines like dozers, motor graders and wheel dozers will increase their productivity — and profitability — as these machines make it possible for the loading and hauling equipment to do their jobs more efficiently. From constructing and maintaining haul roads to cleaning up the loading and dumping areas, support machines have a direct impact on productivity. Several types of equipment do similar jobs, and it's essential to understand their differences to ensure they are being used in the correct application to deliver their full value. Secondary equipment is the lifeline of reliable and cost-effective mining production by supporting the primary production equipment with the following activities:

- Keeping loading, tipping and haul road areas clean, thus prolonging tyre life and making the operation safe.
- Maintaining haul road conditions, thus prolonging tyre life and making the operation safe.
- Suppressing dust emissions from a health, safety, environmental and financial perspective.
- Supporting the complete equipment maintenance and diesel requirements to remote track-propelled equipment and breakdowns.
- Bench preparation and levelling.
- Rehabilitation – Track Dozers.

The support equipment fleet consists of units that assist in tasks required to make primary and secondary fleets work easier and safer. Other functions they complete are not production-related and have no direct impact on production, known as support tasks. The fleet consists of:

- Small trucks are used for maintenance activities.
- LDV's used to transport management, technical services, and maintenance personnel around the mine.
- Busses transport operators from the change houses to the equipment in the field and back.
- Lighting plant to increase visibility around the excavators and tipping areas during the night time.

- Pumping equipment for pit dewatering.

The collective support fleet cost per tonne is relatively low within the overall mining cost.

16.20.2 Secondary Equipment Selection

Front End Loader (FEL)

Throughout any mining operation, the primary production shovels will occasionally break down. To mitigate the risk of this impacting the mines' production, having a multipurpose loader on site, preferably a loader unit that can react quickly to such problems, is useful. FEL are the most diverse type of loader there is. It is quick compared to other loader types and can be matched to almost any truck size these days.

Figure 16.20.1 Front End Loader in Action

Other applications for FELs are at stockpiles for loading trucks or direct load and carry tipping into the primary crusher. The FEL's speed allows it to move quickly between different finger stockpiles for blending purposes. Figure 16.20.1 shows an FEL busy doing some in-pit loading. A disadvantage of FEL loading within the pit environment is that the tyre life is shortened due to challenging underfoot conditions.

Track and wheel dozers

Track dozers are ideal for manoeuvring over uneven surfaces and pushing large rock fragments, and they work well in applications with challenging terrain. They are planned to assist the in-pit excavators by cleaning the loading areas from scattered rock to create a safer, more productive shovel environment and minimize haul truck tyre punctures. Track dozers are also used to shape the blasted muck pile to a level elevation so that the excavators can load the flitches from the elevated loading platform. Track dozers are also primarily used around the tipping areas of the waste rock dump for cleaning and shaping purposes.

Regardless of size, wheeled dozers allow for easy road transport, greater mobility, and increased production capabilities because they move faster than tracked dozers and can cover more ground in less time. See Figure 16.20.2 for an illustration of a track dozer shaping a waste dump.

Figure 16.20.2 A Track Dozer in Action

Figure 16.20.3 A Wheel Dozer in Action

Wheel dozers (Figure 16.20.3) help create a clean loading area for trucks and shovels to operate safely and productively. Further, it would be responsible for general purposes in and around the pit. Some of its responsibilities are for helping out on haul roads, loading areas and dumping areas. Graders often cannot remove large rocks on haul roads so the quick-reacting wheel dozers would assist. Wherever backlog occurs due to breakdowns, these dozers will be able to mitigate the workload.

Grader

Regardless of how carefully a haul road is planned and constructed, its surface will deflect under haul truck loading, leading to cumulative damage to the road pavement. Physical degradation of the pavement materials also occurs due to abrasion and environmental factors such as rainfall. Thus, having a proper road maintenance plan for safety and economics is essential, bearing in mind haul truck tyre shortages and costs. A grader can be seen in Figure 16.20.4, busy with regular road upkeep. The road graders will carry out the following haul road maintenance activities:

- Road grading (including watering by water bowsers and compaction by the haul truck themselves).
- Maintenance trimming and spillage removal.
- Scarifying and reshaping to regain cross-fall and superelevation.
- Re-sheeting and treatment of low spots.
- Re-shaping retention berms and diversion structures.

Figure 16.20.4 A Grader in Action on a Haul Road

Water truck

Water carts are employed to suppress dust emissions for health, environmental, safety (visibility) and financial (maintenance costs) reasons at the following mine's working areas:

- The blast muck-pile around the loading areas.
- Haul roads and
- On the dumps around the tipping areas.

Figure 16.20.1 illustrates the regular use of a water truck watering a road to prevent dust from entering the air, inhibiting proper vision, and causing health and safety-related issues.

Figure 16.20.5 Water Cart

16.20.3 Secondary Mining Equipment List

Table 16.20.1 summarizes the secondary mining equipment list recommended for the Twin Hills FS Project.

Table 16.20.1 Secondary Mining Equipment List

Equipment list	Manufacturer	Model
Track Dozer (Waste rock dumps)	Caterpillar	D9
Track Dozer (In-pit loading areas)	Caterpillar	D8
Wheel Dozer	Caterpillar	834K
Diesel Bowser	Volvo	A30
Water Tanker	Komatsu	HM400
Hydraulic Hammer	Caterpillar	336
Grader	Caterpillar	14M

16.20.4 Support Equipment Requirements

During construction and ongoing operations, the mine will require several support equipment to ensure that construction and general maintenance can be carried out effectively. The fleet sizing (capacity and the number of units) has been based on experience from the preferred mining Contractor stating specific requirements to maintain their particular fleet:

Forklift

Only one forklift model has been provided to cater for the different applications and weights of the small to large components which will be used for packing, unpacking and transporting lightweight components and consumables from the mine stores to the workshops. This is a large 16-t unit which will help move large equipment parts such as buckets etc.

Skid Steer Loader

The main function will be clean up in and around the workshops, tyre bay and wash bays. They will also double to transport stemming material to the blast holes in the pit.

Backhoe Loader

They are mainly used for light-duty digging of trenches and drains, cleaning around the workshops and surface haul roads, cleaning of sumps, and general lightweight maintenance. Additionally, this unit is not bought as the rock breaker is bought with a detachable bucket and a rock hammer.

Integrated Tool Carrier

Integrated tool carriers are for ad-hoc light construction work, transporting consumables and general transport of material and equipment. This unit will be integrated with a maintenance truck.

Water Pump

To remove in-pit water from the sump developed at the bottom of the pit.

Light Duty Vehicles and Transport Busses

Transport vehicles are required to operate in the mining area to transport shift operators to and from the shift change area, and vehicles for the mining technical, supervisory and operation staff require individual transport to enable the execution of duties. The fuel and lube truck fleet size has been calculated by assuming working areas in the pit and on the dumps and then estimating travel and re-fuel/lube times at each unit.

Tyre Handler

The tyre handler handles large tyres from mining equipment and has been sized to manipulate the most prominent and heaviest wheeled EMV (100 t rigid frame dump truck).

Mobile Lighting Plant

To provide sufficient lighting in the pit working areas and on the waste rock dumps at the tipping heads during hours of darkness.

16.20.5 Support Mining Equipment List

Table 16.20.2 summarizes the support mining equipment list recommended for the Twin Hills FS Project.

Table 16.20.2 Support Mining Equipment List

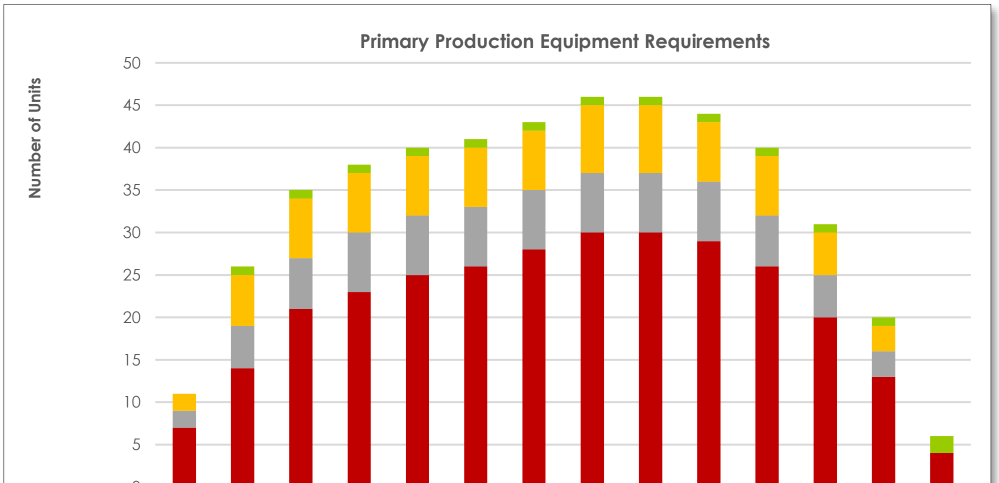
Equipment list	Description
Mobile Lube Truck	(4x4 – 420 HP) Lube truck complete
Mobile Service Truck	(6x4 – 380 HP) Service, maintenance, and welding truck
Tyre Handler	Wheel Loader equipped with tyre handler
Roller / Compactor	(12-t) Single Drum Vibratory Roller
Rock Breaker	Hydraulic Excavator (30-t) with a bucket and Hydraulic Hammer of 2.5-t
Lightning Plant	9m Mobile Tower Light with integrated generator set
Crane	Rough terrain crane – 60-t
Skid Steer Loader	Skid Steer Loader with open cab, a 72-inch bucket and forklift attachment
Hi-Lift Crane / Access Platform	New Holland LM 1745
Forklift	Feeler FD160
Light Delivery Vehicle	Pick-up Double Cab 4x4
Busses	14 - Seater
Lowbed and Truck	(6x4 – 540 HP) Truck Tractor with a New Martin RGN1207244WB Multi Axle Removeable Gooseneck semi-trailer.
TLB	82 kW backhoe and front loader
Pit dewatering Pump	MTC A 150/5 Multi-stage Pump and Diesel pump & piping

16.21 Mining Equipment Requirements

The primary and secondary mining fleets recommended by the preferred mining Contractor and scrutinised and endorsed by the load and haul cycle time study are shown in Figure 16.21.1 and Figure 16.21.2. The study suggests that approximately 25 to 30 haul 100-t class haul trucks will be required to handle the proposed Twin Hills FS production profile at a steady state.

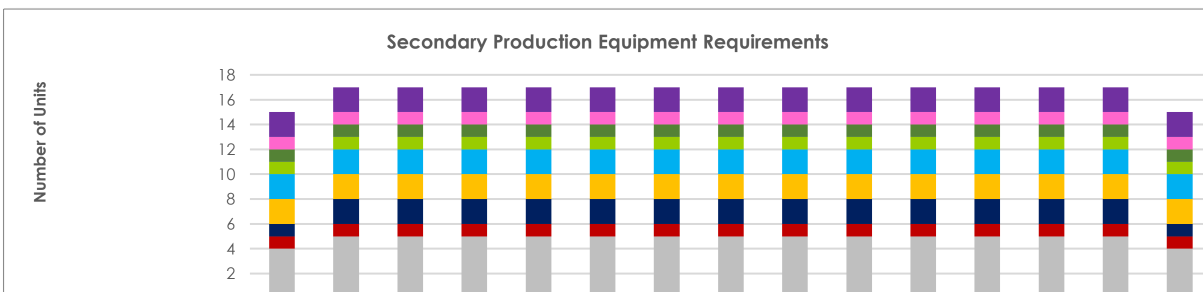
It is clear from the study that the operating hours increase as more material is handled. The haul cycle's length is another factor influencing the hauling operation's operating hours. Haul cycle length increases during the Project's latter stages as the pits get deeper and the trucks travel long distances to reach their destination on the waste rock dumps. This means that more operating hours are required to move each tonne of material in the latter years of the project.

Figure 16.21.1 Primary Mining Equipment Requirements



	Pre-strip	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
Rehandling FEL	0	1	1	1	1	1	1	1	1	1	1	1	1	2
Drills	2	6	7	7	7	7	7	8	8	7	7	5	3	
Excavators	2	5	6	7	7	7	7	7	7	7	6	5	3	
Haul Trucks	7	14	21	23	25	26	28	30	30	29	26	20	13	4

Figure 16.21.2 Secondary Mining Equipment Fleet Profile



	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15
Lube Truck	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Road sweeper	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Excavator for highwall scaling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Excavator with rockbreaker	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Water Carts	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Diesel Bowser	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Grader	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Wheel Dozer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Track Dozer	4	5	5	5	5	5	5	5	5	5	5	5	5	5	4

Most utility / support equipment numbers remain fixed over the LOM, with the requirements tapering off towards the end of the mine life when the production tonnages also decrease. The numbers for units such as the tyre handler, compactor, crane, forklift, lowbed, and TLB remain constant throughout the LOM regardless of production requirements, whilst the rest will vary according to the production rate.

16.22 Mine Labour Requirements

The mining Contractor operation is scheduled to work 365 days per year, less unscheduled delays, which may temporarily cause mining operations to be suspended. It was decided in collaboration with the client, to opt for a full calendar (three-panel shift) operation bearing in mind equipment utilisation and fatigue management. This section will discuss the proposed labour organogram for the mining Owner's team according to management and technical services personnel. The mining Contractor's labour organogram will not be discussed here, but the approximate number of Contractors employed will be discussed.

16.22.1 Owner Mining Team Organogram

The Owner mining team comprises management, mine planning, geology and survey and is represented in Figure 16.22.1. The proposed management level for the owner mining team will consist of a Superintendent Technical Services (Chief Geologist) and a Superintendent Mining (Chief Mining Engineer) reporting to the Manager Operations. The Operations Manager will be responsible for mining and processing production KPIs. The geology, geotechnical and mine survey departments report to the Superintendent Technical Services (Chief Geologist), while the mine planning department and the Contract Manager of the preferred contract mining company report to the Superintendent Mining (Chief Mining Engineer).

16.22.2 Labour Requirements for Mining

The maximum mining Owner team complement comprises 23 people, and Table 16.22.2 lists each job position with the associated salary level. The Patterson grading scale, widely used in southern Africa surface operations, was applied to estimate labour costs. Each position was assigned a grade that corresponds to a salary band. These salary bands, termed total cost to the company, include the basic rate, overtime and shift payments, payroll burdens, employee benefits including health schemes, annual and long service leave, and pension fund contributions. The preferred mining contractor will have a maximum total labour complement of ~ 426 people as in Table 16.22.1.

Table 16.22.1 Labour Requirements

Area	Maximum Number
Managers / Foreman / Supervisors	11
Admin, Accounts & HR	6
Safety & Training Officers	5
Survey Team	2
Blasting Crew	12
Production Crew & Equipment Operators	348
Maintenance Crew	42
Total Contractor Employees	**426**

Figure 16.22.1 Owner Mining Team

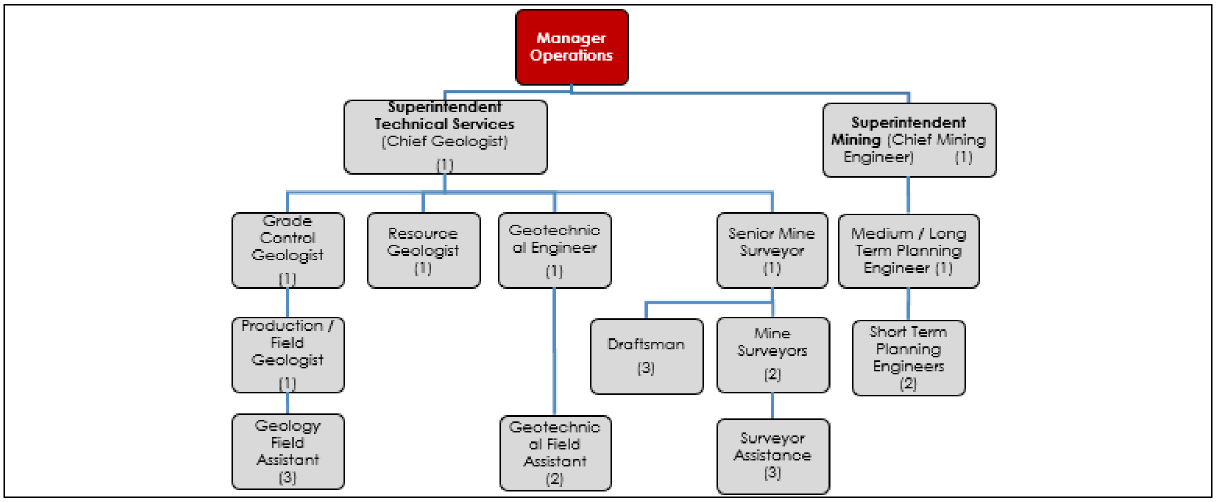


Table 16.22.2 Mining Owner Team Labour Complement

Job Position	Maximum	Salary Band Level
Superintendent Technical Services (Chief Geologist)	1	D2
Grade Control Geologist	1	D1
Production Control Geologist	1	C5
Geology Field Assistant	3	B4
Resource Geologist	1	D1
Geotechnical Engineer	1	D1
Geotechnical Field Assistant	2	B4
Senior Mine Surveyor	1	D1
Mine Surveyor	2	C4
Surveyor Assistance	3	B4
Draftsman	3	C1
Superintendent Mining (Chief Mining Engineer)	1	D2
Short Term Planning Engineer	2	C5
Medium / Long Term Planning Engineer	1	D1
Total	**23**	

16.23 Mining Related Infrastructure

The following mining infrastructure is required to support safe and efficient mining operations. The study considers a contractor-operated mine. The contractor would have to operate the entire mining process except for management and technical services labour (Twin Hills Project payroll) and overheads that accompany their functions on the mine.

A list of key mining infrastructure requirements is needed for mining operations to function efficiently. Mining infrastructure, broadly grouped as 'Mining Complex', is required to support efficient mining operations. The mining infrastructure required, together with the responsible party in brackets, is summarized as follows:

16.23.1 Mining Office Block (Project Owner Team's Responsibility)

The mining office block is a modular structure installed on a mesh reinforced concrete slab. The building will provide office space to the Mining personnel, including the Mine Manager and the Technical Services Manager, Geology personnel, Survey, Maintenance Engineers, and Mining support staff. The building has one main boardroom and two meeting rooms; male and female ablutions, a kitchen, a pit control room, a first aid room and an open quadrant for landscaping.

16.23.2 Mining Change House (Mine Contractor's Responsibility)

The mining change house will provide ablution facilities to all mining employees (production and maintenance crews), including respective foremen. All employees who use the change house will clock in through the change house turnstiles when they enter or exit Mining Complex. A single-tier locker is allocated to each employee, either on shift or off shift, for personal belongings and clean overalls.

16.23.3 Warehouse (Mine Contractor's Responsibility)

The mining warehouse (or stores) will be a sheeted steel portal structure. The warehouse shall be used to store all critical and operational spares, office equipment, and other consumables. The store personnel will receive goods in fenced bays before storage in the main building. Access to the store building is limited to store personnel, and dispatch will either occur over a goods issue counter or through a fenced dispatch bay. Stores yards external to the warehouse will be used for pipes, large equipment, tyres etc. Acetylene gas, oil, paint, and other flammable materials will be stored in separate areas.

16.23.4 Geological Core Shed (Project Owner Team's Responsibility)

The geological core shed building will be a sheeted steel portal structure. The geology section will use the core shed to assess and store cores. Operations will include the night shift; hence internal ablution facilities have been provided in the building.

16.23.5 Heavy Mobile Equipment Workshop (Mine Contractor's Responsibility)

The heavy mining equipment (HME) workshop is the main shop for maintenance and re-builds of mining equipment. The building design can handle maintenance work for 100-t capacity trucks and support equipment per the maintenance plan. The structure will be a sheeted steel portal supported on concrete plinths, with double-storey container offices.

16.23.6 Light Vehicle Workshop (Mine Contractor's Responsibility)

The light vehicle workshop will be used to maintain all mine light vehicles, including those operating in the processing plant areas. The structure will be a sheeted steel portal supported on concrete plinths. The light vehicle workshop will be erected as an extension of the (HME) workshop.

16.23.7 Maintenance Pad (Mine Contractor's Responsibility)

A hard stand maintenance pad will be provided for the maintenance of mining equipment outside the HME workshop in line with the maintenance plan.

16.23.8 Tyre Repair, Storage and Change-Out Facility (Mine Contractor's Responsibility)

Open concrete slab with IBR roof cover to storeroom and tyre inflating area. The storeroom will be a modular building structure.

16.23.9 Fuel Farm (Project Owner Team's Responsibility)

Diesel for mine operations will be delivered by trucks to the fuel farm. Space provision has been made for the facility. A site-based fuel service provider will erect infrastructure and facilities for the fuel farm. The fuel service provider will also be responsible for the mine's supply, delivery, and management of stock.

16.23.10 Explosive Magazine and Bulk Emulsion Storage Facility (Mine Contractor's Responsibility)

The number and capacity of magazines are determined based on the defined mine production schedule and rock mass conditions in terms of strength. A total of two explosive magazines have been determined:

- Two magazines holding 100 cases of accessories.
- Two magazines holding 100 cases of high explosives.

The designs are based on an explosive supplier's recommendation and address all legal requirements. There is also provision for three ANPP storage silos with a 42-t capacity. An appointed explosive company will be subcontracted based on site to provide explosives and blasting services to the mine. The subcontractor will establish and be responsible for the explosive magazine infrastructure and his office / workshop infrastructure. Space provision has been made for both sites, and the siting of the explosive magazine will conform to the Occupational Health and Safety Act, 1993 – Explosives Regulations.

The explosive magazines must be located 700m in radius away from any infrastructure and about 1km from the open pit.

16.23.11 Pit Service and Refuelling Pad (Mine Contractor's Responsibility)

Hard stand pad for minor maintenance will be provided for servicing of mining equipment outside the pit perimeter. The hard stand will be 30 m x 30 m and will also be used for refuelling equipment from the fuel bowser.

16.23.12 Pollution Control System (Mine Contractor's Responsibility)

A pollution control system is capturing contaminated water, sediment, and lubricants. All used oil as far as possible is reticulated from the various workshops to a central used oil tank.

16.23.13 Oil Interceptor (Mine Contractor's Responsibility)

Concrete sub-terrain structure with inspection of main holes. Covered drains from the workshops and lube / oils section will be laid to the oil separator. A mud sump preceding the oil interceptor will also be constructed to keep the infrastructure mud free.

16.23.14 Lubes and Oils (Mine Contractor's Responsibility)

The site-based fuel service provider will provide lubes and oils. The Service provider will erect infrastructure next to the HME workshop, where space provision has been made. Supply of the product to workshops and management of stock will be the responsibility of the Service provider during the life of mine.

16.24 Mine Dewatering

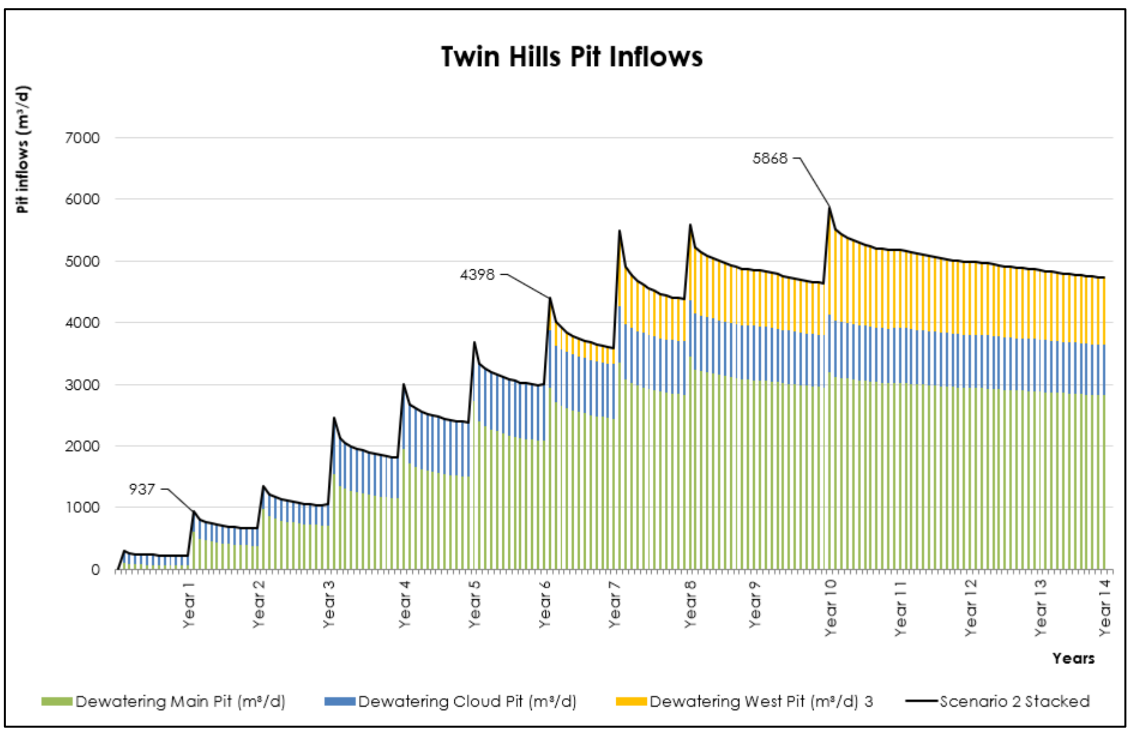
Based on the updated FS hydrogeological numerical flow model, estimates of groundwater inflows to the pits were calculated over the Life of Mine (LOM) as per the mining plans and schedule provided. Estimates of groundwater flow range from 0.21 Mm3/year in Year 1 increasing to a cumulative maximum of 1.71 m3/year in Year 10 when all pits (Central, Cloud, Cloud West and West) are in operation.

These inflows can be managed from in-pit sumping providing the dewatering reticulation and infrastructure is sized appropriately to include direct precipitation as well as predicted groundwater inflows.

Active dewatering boreholes have not been included, as the passive inflows can be managed from in-pit sumps and the pore pressures remain at least 50 m behind the pit walls due to passive dewatering but may require localized depressurisation by sub-horizontal drainholes behind disconnected structures or due to transient higher inflows following rainfall events.

The model indicates a higher seepage face could develop on the southern pit wall slope of Central Pit due to Okawayo river trace upgradient, particularly if managed aquifer recharge implemented to augment groundwater supply boreholes. Please price for in-pit pumping to small sumps for in-pit haul road and loading muckpiles dust palliation purposes. The dewatering from the pits data indicates a max of 3,510 m^3/day for Main Pit and 1,060 m^3/day for Clouds pit during the rainy season in year 5. For excess water not to be handled by the above sumps the client made provision for a settling pond close to the Mine laydown area. Piping from the edge of the pits to the settling ponds are allowed. The contractor to allow for tie into these pipes to be able to pump the dewatering of the pits to the settling ponds. The graph below indicates the dewatering requirements for the first five years of the LOM.

Figure 16.24.1 Twin Hills Pit Water Inflow Estimates



16.25 Mine Technical Services Disciplines

The following disciplines are commonly grouped under the Mine Technical in terms of the organizational structure, as in this study.

- Mine Planning.
- Geology and Grade Control.
- Geotechnical Engineering.
- Survey.

16.25.1 Mine planning

The Mine Planning department comprises medium- and short-term mine planning functions. The long-term planning function sets the long-term strategy and goals, while the medium and short-term function focuses on executing the plan and attaining the goals.

Long Term Planning

The long-term planning function would probably be outsourced; however, it will remain Mining Manager's responsibility to ensure that the life of mine plans and Mine-to-Plan audits are performed as required. The long-term planning responsibilities would include:

- Developing, in conjunction with the mining accountant, a mine-wide operating cost database for use in planning exercises.
- Performing open pit economic evaluation using the Whittle Four-X software.
- Selecting the stage and final shells to use as templates to guide mine design.
- Developing a set of detailed stage and final pit designs that conform to the Whittle shells.
- Evaluating split shell design concepts.
- Developing a set of production plans (mine face positions) from the stage and final designs that the short-term planning section will use. These plans will typically be in quarterly intervals for the first three years, bi-annual to the end of year five, and annually, with each plan depicting ore tonnes, grade, and waste tonnes for the period. These plans will be used for longer-term (annual) cost and operating calculations ultimately developing the official mine budget.

- Performing quarterly reconciliation of actual versus planned face positions. The quarterly reconciliation is a process that takes a 'snap-shot' of the pit at any given time (usually the end of each quarter). It evaluates the as-mined versus the planned face positions. A series of processes are performed to measure the volumetric and spatial under and over mining of the benches, ultimately determining a Mine-to-Plan index. This index is the mining score card and is used to identify threats or risks of attaining the long-term plan at the current state of the pit at the time of the reconciliation. The process will also identify the ramifications of non-compliance and requirements to re-align the pit position to the long-term plan.

- On-going optimization and evaluation of mine designs and depletion strategies to determine opportunity and potential leverage for the mine.

- Design and optimize the waste rock dumping plan and deposition program.

- Developing the life of mine plan, associated equipment, manpower and critical events schedule.

- Responsible for determining and co-ordinate the various mining engineering trade-off studies required for on-going optimization and improvement.

Short term planning

The short-term mine planning ('STP') engineer will be responsible for executing the long-term plans and will use the Resources (equipment) available to ensure the long-term goals are met. This will be achieved by:

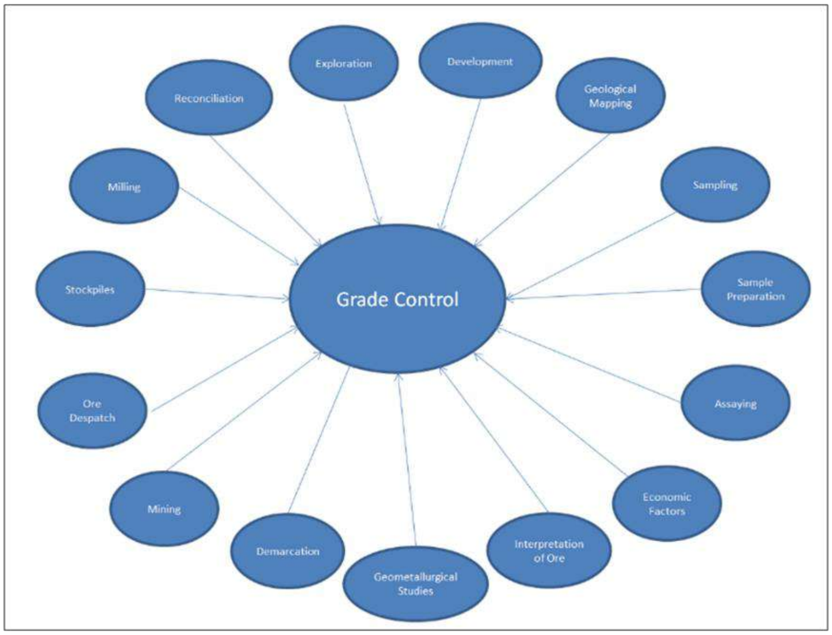
- Development of the daily, weekly, and monthly production and dumping plans within the quarterly face positions provided by the long-term planner. These quarterly plans are developed into monthly, weekly, and daily plans, providing the operations department with medium- and short-term targets. Each plan will provide ore tonnes, grade, ounces, and waste tonnes against which the production team will be measured.

- Develop the equipment schedules required to meet the short-term planning targets taking cognisance of planned maintenance schedules, blasting schedules, equipment moves and public holidays.

- Regular planning meetings will be held with the production team, where the STP will present the current status and forecast for the week / month. At these meetings, the production team will agree to action plans required to correct any deviations or shortfalls in the plan.

- Adjusting the short-term plans to re-align to the long-term plans as required and agreed upon at the regular planning meetings.

Figure 16.25.1 Inputs into the Grade Control Model



16.25.2 Geology and Grade Control

Introduction

Grade control is a cyclical process that encompasses the entire mining business and continues throughout the life of an operation. Figure 16.25.1 indicates the required inputs into Grade Control to optimize the recovered product. There are multiple components to the grade control cycle, as shown in Figure 16.25.1. The following sections describe each component of the grade control cycle.

Geology

Understanding the orebody's geology is central to a mining operation's success. This understanding guides every decision in the grade control cycle. At the highest level, recognising the differences between major ore types may determine processing characteristics. At lower levels, knowledge determines, amongst many others, sample spacing, the direction of mining, the height of mining benches, and the direction of blasting. Continuous revision of the geology model during the life of the operation will include:

- Regular and routine face and floor mapping for lithology contacts, structural controls on mineralisation, and the presence of structures that may impact pit wall stability.
- Geological logging of all grade control and Resource development samples to identify lithology.

- Reconciliation of pit mapping with Resource and grade control geology interpretations.
- Regular updates to 3D geological models provide the foundation for grade models, ore block designs, and material designation.

Geological Mapping

Geological bench mapping will be essential for this deposit. Due to the structural controls of the mineralisation. It will be necessary to optimize grade control effectiveness by identifying the stratigraphy and mineralisation controls. It will also aid in minimizing dilution.

Grade Control Drilling and Sampling

The deposit exhibits high localized grade variability. Minimizing dilution and ore loss through miss-classification will be extremely important to the grade control department at the mine site. The parameters that will affect the selective mining of the deposit include:

- The geologic and structural complexity of the ore body.
- Cut-off grade established for ore, stockpile, and waste classification.
- The continuity of the ore body above the cut-off grades both along strike and across strike.
- Blasting design and implementation practices that control blast movement.
- The mining method and size of the SMU (selective mining unit).
- The required production rate and size of the mining equipment.

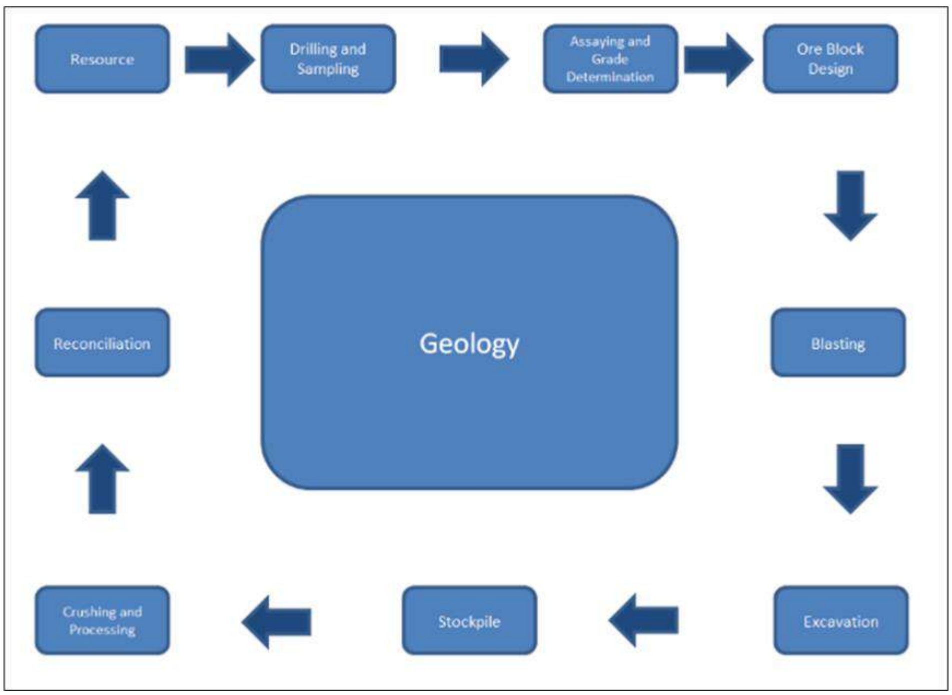
Blast Hole Sampling

During start-up production mining, a series of blasthole sampling test programs is being carried out on portions of the deposit to evaluate and optimize blast hole sampling to obtain the best data to monitor grade variability in the pit. The grade control labour complement comprises a geologist, geotechnician and sampling crew. The pit geologist is responsible for the following duties:

- Blast hole plan layout.
- Training and maintaining optimal sample collection techniques.
- Logging of blast holes.
- Supervision of blasthole samples to the assay lab.

- Pit Mapping.
- Collation and verification of blast hole assay data used for ore delineation.
- Providing geologic input on ore block definition boundaries.
- Supervision of dig lines in ore / waste boundary outlines.
- Stockpile management.

Figure 16.25.2 Grade Control Cycle



Grade control sampling strategy at the Project envisions that 50 % of the blast holes drilled in the ore will be sampled. To best delineate contacts between domains such as 1) low grade versus waste and 2) low grade versus high grade, a higher density of samples will be collected from blast holes perpendicular to the strike or long axis of the deposit.

Figure 16.25.3 Blast Hole Sampling

	0.0	3.3	6.6	9.9	13.2	16.5	19.8	23.1	26.4	29.7	33	36.3	39.6	42.9	46.2	49.5	52.8	Blast Holes sampled
	Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
0.0	Line																	
3.3	1		+		+		+		+		+		+		+		+	8
6.6	2	+		+		+		+		+		+		+		+		8
9.9	3		+		+		+		+		+		+		+		+	8
13.2	4	+		+		+		+		+		+		+		+		8
16.5	5		+		+		+		+		+		+		+		+	8
19.8	6	+		+		+		+		+		+		+		+		8
23.1	7		+		+		+		+		+		+		+		+	8
26.4	8	+		+		+		+		+		+		+		+		8
29.7	9		+		+		+		+		+		+		+		+	8
33	10	+		+		+		+		+		+		+		+		8
36.3	11		+		+		+		+		+		+		+		+	8
39.6	12	+		+		+		+		+		+		+		+		8
42.9	13		+		+		+		+		+		+		+		+	8
46.2	14	+		+		+		+		+		+		+		+		8
49.5	15		+		+		+		+		+		+		+		+	8
52.8	16	+		+		+		+		+		+		+		+		8
													Total Blast Holes Sampled					128
													Total Amount of Samples Collected					128 X Bench height

+ BlastHole not Sampled

(shaded) Blast Hole: sample per meter

It is envisioned that the blast hole drill rigs be fitted with cyclones (Figure 16.25.4), and drill chip samples are collected per meter at the cyclone to ensure the whole sample is collected and to minimize loss of fines.

Blast holes drilled within ore will be drilled to a depth of 10.9 metres, including a 0.9-metre sub-drill. Samples will be taken every meter. The sub-drill portion of the hole will not be sampled. Sample weights will vary based on the drill hole diameter. The sample will be split two times on site with a Gilson or Jones splitter to reduce the sample volume. It will be imperative to capture all size fractions from the blast hole and make all efforts to reduce the loss of sample fines due to wind.

Figure 16.25.4 Blast Hole Drill with Attached Cyclone for Optimal Sample Recovery

Quality assurance and control samples will include matrix-matched certified reference standards, rig duplicate samples and laboratory blank, standard reference samples and blank laboratory samples.

A geologist will log the blast holes sampled in one (1) meter intervals. Only data relevant to grade distribution will be recorded to be used during ore control block definition.

Grade Control Modelling and Ore Block Design

Grade control blocks and dig lines will be generated with a mining software package that incorporates pit mapping, blast hole assays, existing grade control data and logged geologic attributes such as alteration and weathering.

Ore and waste blocks have been predefined in the Resource BM, with every 5 m x 5 m x 1 m block defined as either waste or ore. This will be confirmed from the blast hole assays. The block size will be adapted if required to optimize mining selectivity and minimize ore loss and dilution during actual mining practices.

Blasting

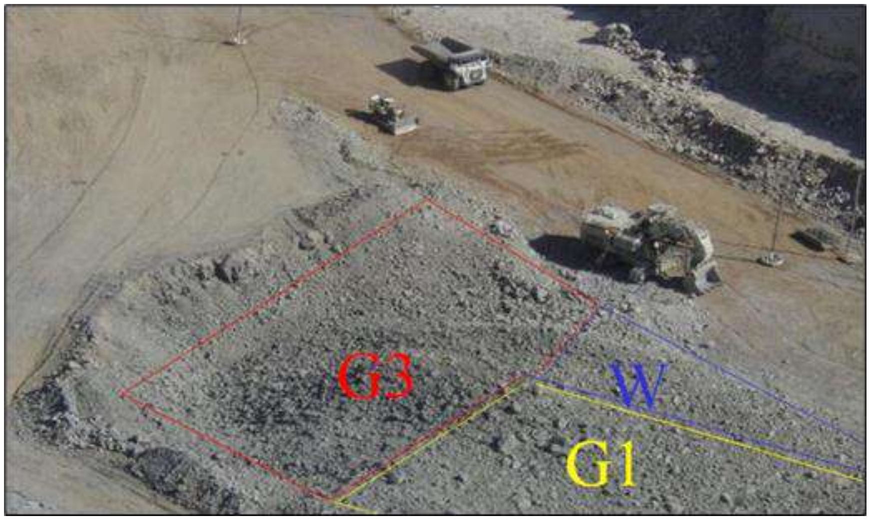
Usually essential for mine productivity, blasting can be one of the largest sources of error in the grade control cycle. The physical process of blasting mixes rock and ore types leading to ore loss and dilution, which affects the ability of an operation to deliver the desired quality and quantity of product.

Blasting practices must include provisions for monitoring the direction and extent of blast movement. Blast movement monitors are surveyed in situ before and after blasting. Methods such as inserting Polypipe in an uncharged blast hole have limited success but are cheap and efficient. In these cases, placing more monitor pipes than required is wise to allow for losses. Place blast monitors around important contacts. It is recommended that such a method be employed, especially during start-up, to determine the movement during blasting for ore loss and dilution minimization. Once blasted and surveyed, the rock mass is available for marking the ore blocks. Mine surveys and geologists must adjust the position of each ore block to account for blast movement once it has been established.

Excavation

The physical process of digging up ore and waste using excavators and trucking it from the pit requires considerable focus during day-to-day operations to maintain ore quality. Accurate excavation of ore block boundaries, lithological contacts and floor levels minimizes ore loss and dilution. Trucks must also deliver the material to the right destination.

Figure 16.25.5 An Example of Grade Division on Blast Blocks



Systems and procedures with in-built redundancy ensure that mistakes are minimized. Ore block mark outs in the pit using both tapes and paint to prevent confusion should tape be damaged, or paint washed away. Truck dispatch systems that include verbal confirmation, satellite / GPS tracking, and visual displays, such as coloured cards showing the destination, help eliminate errors.

Bench and floor maintenance activities, such as grading, bulldozing, and sheeting, designed to improve mining productivity can lead to ore loss, dilution, and contamination if not managed well. Systems that educate mine operators and provide guidance for these activities (e.g., grading along strike) are essential. Trucks driving on ore zones need to be minimized, and grading across ore boundaries should be minimal.

Geologists and experienced mine technicians will supervise direct feed and run-of-mine (ROM) ore excavation.

Stockpiling

The current mine plan indicates that not all ore mined from the pit is processed immediately. The operation will stockpile lower-grade material, perhaps for processing later in the life of the mine. The operation will also stockpile some run-of-mine (ROM) ore for emergency blending requirements.

Table 16.25.1summarizes the ROM stockpile classifications consisting of low-, mid- and high-grade bins categorised according to ore type and process route. The stockpile strategy is to maintain at least two months (60 days) of ROM ore on stockpiles to allow for flexibility in blending and provide a consistent ore mix to optimize recovery and plant throughput. The 60-day period is considered optimal and sufficient to manage the risk of model variability, allow for stripping, and ride out the possible and inherent ore supply disruptions from the pits.

Table 16.25.1 Stockpile classification

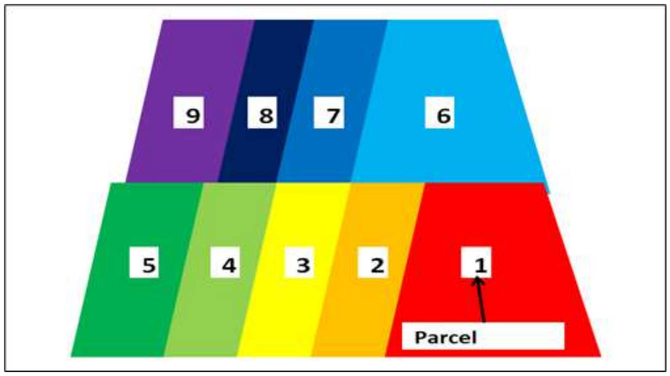
Stockpile	Grade Bin (g/t)
Marginal	0.3 – 0.4
Low Grade	0.4 – 0.6
Medium 1 Grade	0.6 – 0.8
Medium 2 Grade	0.8 – 1.0
High Grade	> 1.0

The rest of the ore will be direct feed to the crusher. Monitoring and controlling the construction of stockpiles is critical for predicting the properties of the ore during reclaim.

Long-term, stockpile management is as follows:

- Mine planners design stockpile build sequences, including limits of the stockpile, lift heights, and position of ramps.
- Surveyors conduct a detailed topographic survey of the stockpile footprint before the build commences.
- Mine production crews progressively build each stockpile as the material is excavated from the pit.
- At the end of each production period (typically monthly or quarterly), surveyors complete a detailed survey of the stockpile face and slope positions.
- A geologist compares survey volumes and mined tonnages to determine if any stock adjustment is necessary.
- The build during each period gets assigned a 'parcel' number and ore quality parameters derived from weighted averages of mining production and grade control data (e.g., LG Stockpile, Parcel 1 might be labelled LGSP-001).
- Reclaim of the stockpile is by 'parcel' as far as is possible, and depleted tonnes and grades are recorded in the mine data management system.

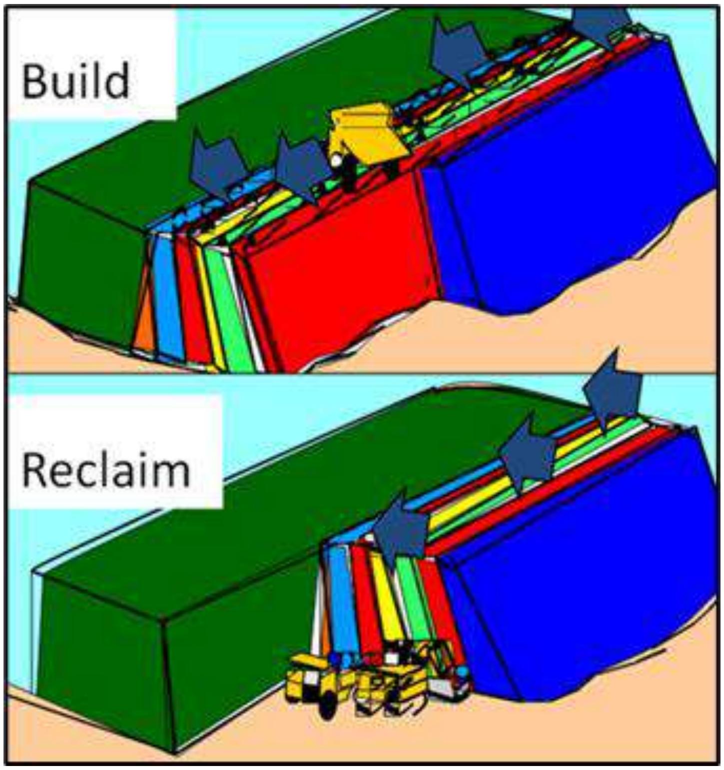
Figure 16.25.6 Diagram to Visualize Long Term Stockpile Parcel Construction



ROM stockpile management is as follows:

- ROM will be separated when blending must occur. Ore is separated into direct feed and ROM SP. The ROM stockpile will have a unique identifier (e.g., ROM_001).
- There should be a minimum of two ROM stockpiles at any given time. One stockpile is under construction, and the other is fed to the crusher (reclaim).
- The operation will not build and reclaim any given ROM stockpile simultaneously. This allows for reasonable control on ore quality and reconciliation purposes.
- The construction of each ROM stockpile is in layers and reclaimed perpendicular to the build orientation to maximize blending (Figure 16.25.7)

Figure 16.25.7 A Diagram to Indicate ROM Stockpile Management



Crushing and Processing

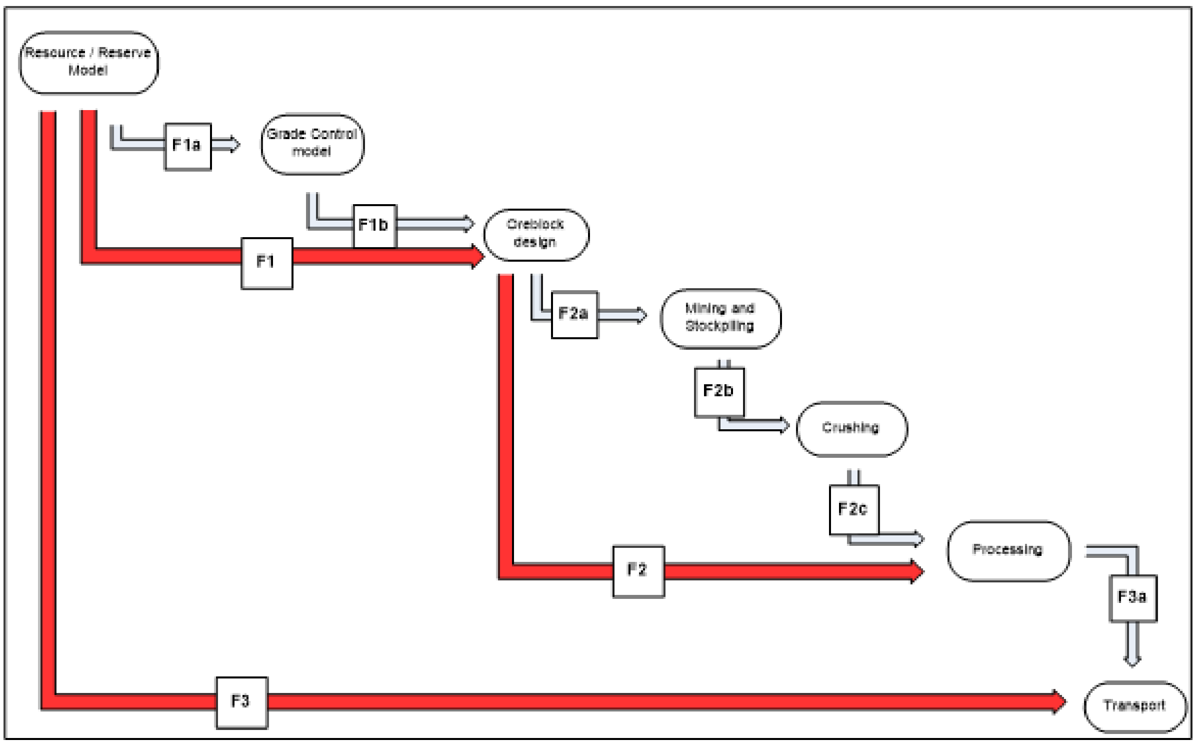
The role of grade controllers and geologists in this component of the grade control cycle is limited to the following:

- Monitoring crusher feed quality to deliver 'on specification' ore.
- Provide ore quality measures to Processing personnel, including grade.
- Monitor Process plant performance for reconciliation purposes.
- Initiate quality assurance studies to improve the prediction of ore quality parameters (e.g. recovery, throughput, etc.).
- Monitor and recommend blend ratios from ROM stockpiles.

Reconciliation

A critical quality control step is the reconciliation of product with that predicted from the Resource or Reserve model. Reconciliation is the measurement and control of variance to identify an opportunity. This step closes the grade control cycle, allows critical assessment of the operations' performance, and identifies opportunities for improvement. Together with plan compliance measures (e.g., productivity, throughput, etc.), reconciliation provides a measure of the "health" of the operation. While variances between each component of the operations value chain may demonstrate areas for improvement, three major reconciliations will be carried out periodically.

Figure 16.25.8 A Visualization of the Reconciliation Process



In Figure 16.25.8 F1 reconciliation measures the variance from resource to ore block design. High variability in this section of the value chain indicates:

- Potential differences in the underlying data (e.g., exploration vs. grade control samples).
- Inadequate or inappropriate estimation techniques.
- Differences in the level of mining selectivity assumed in the Resource / Reserve compared with operational practices.

This measure will be tracked monthly. F2 reconciliation, in Figure.25.8 measures the variance across the mining and process systems. High variability in this section of the value chain indicates:

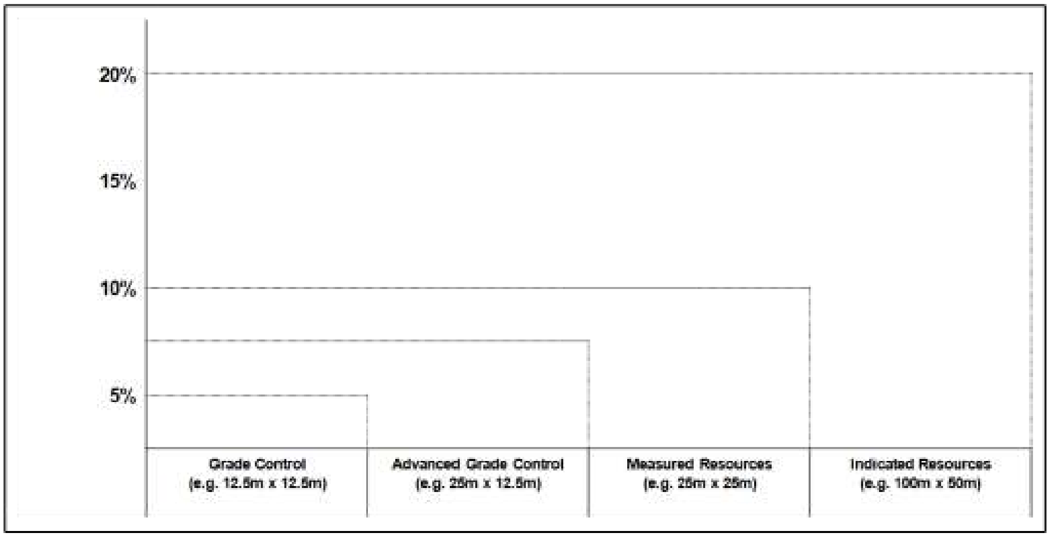
- Poor mining recovery (e.g., excess dilution or ore loss).
- Problems with density assignment of the various ore types.
- Poor stockpile management and ore control.
- Imprecision and inaccuracies in tonnage measurements (e.g., weightometers, load cells).
- Process plant performance predictors are inadequate or incorrect.

This measure will be reported monthly as three-monthly rolling averages to eliminate variances associated with large stock changes. InFigure 16.25.8, F3 reconciliation is the essential measure. This measures variance across the entire operation by comparing predicted and actual production. F3 reconciliation will be reported monthly as a progressive annualised.

Resources and Reserve Development

Mineral resources and mining reserves underpin the operation. They form the basis of mine plans and budgets, hence forecasts of production and cash flow. Systematic resource development is essential for maintaining a reasonable level of precision in medium-term (3-5 years) business plans. Figure 16.25.9 demonstrates potential variance against business plans from reliance on wide-spaced drilling data. This is particularly important in areas with a high degree of geological complexity.

Figure 16.25.9 Effect of Data Density on Ore Predictions

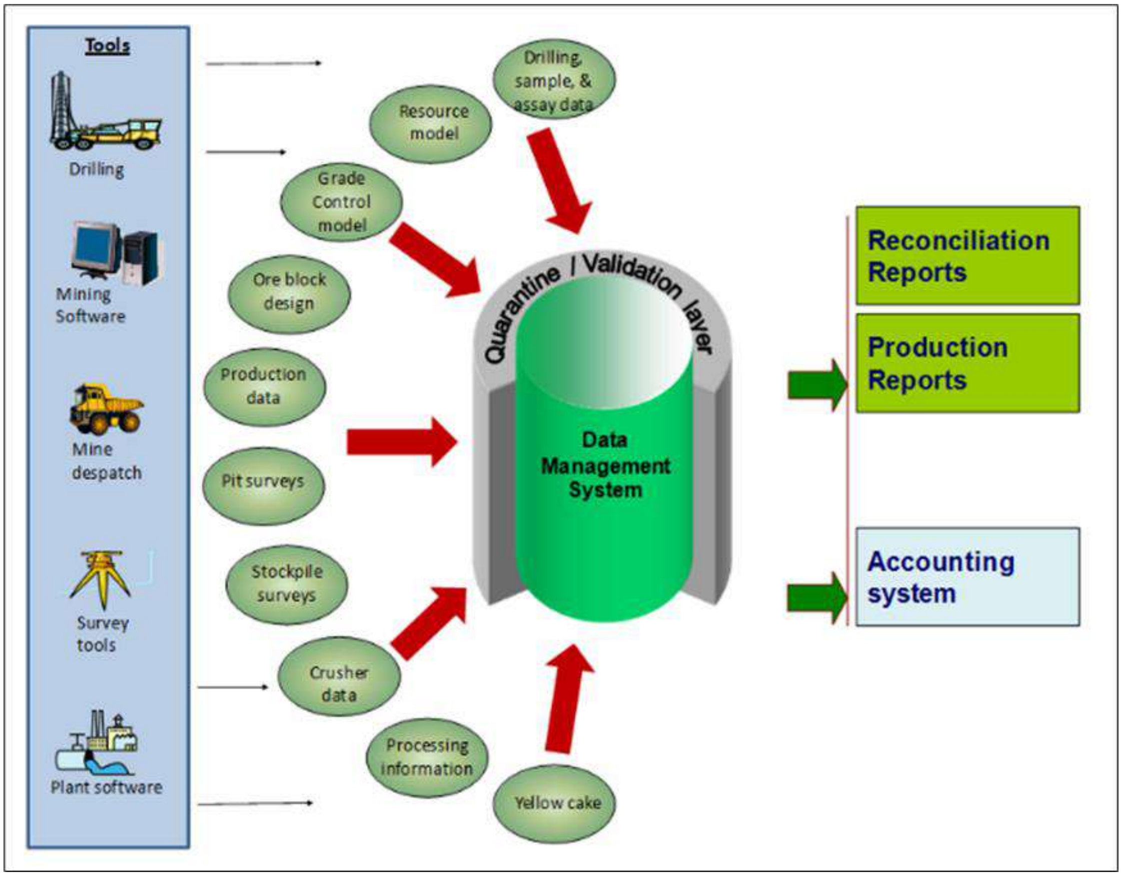


Grade Control Systems and Procedures

The core of the grade control system is a secure, fully integrated mine data management system for reconciliation and production reporting (Figure 16.25.10). Data acquired from tools such as mining software, survey instrumentation, production tracking, and laboratory reporting systems are, as far as practically possible, fed seamlessly into the data management system. Seamless transition of data improves efficiency and eliminates data transcription errors.

The system should generate reconciliation and production reports and other critical business information in standard formats, allowing geology staff to spend time analysing results rather than manually manipulating data to produce the same report.

Figure 16.25.10 Mine Data Management Systems



The geology section is currently developing the following guidelines and procedures during the start of the mining operations:

- Pit mapping guidelines.
- Grade control pattern design.
- Grade control pattern set out.
- Drilling contracts, including quality control clauses.
- Drilling procedures.
- Sample collection and QAQC protocols.
- Templates to report samples and assay QAQC results.

- Density and moisture sampling protocols and procedures.
- Downhole spectral survey procedures and calibration guidelines.
- Sample despatch procedures, including transport contracts.
- Assay laboratory contracts, including Quality Assurance measures and assay turnaround time.
- Grade control modelling procedures.
- Ore block design and material designation guidelines.
- Blast control and monitoring procedures.
- Ore block set out procedure.
- Ore excavation procedures.
- Daily dig plan templates.
- Bench and floor maintenance guidelines.
- Stockpile management procedures, including naming conventions, build procedures, reclaim procedures, stock adjustments from survey data, and survey control.
- Reconciliation procedures and guidelines.
- Reconciliation report templates.
- Period reporting templates.

16.25.3 Geotechnical

A competent geotechnical consultant will oversee geotechnical aspects of the pits and dumps and will provide the following support to the geotechnical section.

- To continue to optimize geotechnical criteria for pit and dump designs.
- Continue developing the structural model based on face mapping and ad hoc drilling requirements.
- Aid in the implementation of the necessary geotechnical systems and internal procedures.

- Establish with input from the operations team all necessary operational procedures governing the pit and dumps.
- To mentor and establish training programmes for the mine's personnel.
- To undertake periodic reviews initially on a more frequent basis and less so when personnel become more competent.

16.25.4 Survey

The Survey section mainly addresses the following requirements:

- Provides all necessary mine plans as per statutory requirements.
- Volume calculations predominately govern pits, dumps, and all stockpiles.
- Creating shovel loading plans as well as drill and blast plans.
- Geotechnical monitoring of defined slopes and providing necessary data to the geotechnical section.
- Maintenance of the as-built plans across the entire site.
- General surveying requirements across the site after project completion.
- Marking out of required exploration holes in the greater area (if and when required).
- Generation of ad hoc plans / layouts for use across various disciplines.

Incorporating technology in terms of advanced surveying instruments and the fleet management system reduces the need for high surveying staff numbers.

16.26 Mining Systems

For mining operations to function efficiently, a set of crucial mining systems is required in addition to the Enterprise Resource Planning (ERP). The mining systems specifically required to operate a mining project are as follows:

- Mining fleet management.
- Blast management.

- An integrated mine technical system comprises mine design and planning, resource modelling and ore control, geotechnical and survey.
- Fuel management system.
- Tyre management system.

The ERP system covers the required mine maintenance management system as a module along with all the other business system requirements that address human resources, financial and cost management accounting, and procurement.

The mentioned mining systems, including the mine maintenance, are described below.

16.26.1 Blast Management

The costs incurred by drilling and basting make up ~ 20% of the total mining operating cost and are one of the largest cost centres which make up the total operating costs.

To manage such a large cost centre and keep costs to a minimum, a blast management system (BMS) will be used. In summary, the BMS comprises several products and services, the core module being the software blast design system and in-field logging system, which logs and reports explosive charge and drilling quantities. Other services include data analysis for fragmentation and face profiling.

The BMS also provides cost information and energy comparison data for blasting. It possesses a number of simulation models that can examine the likely results of the blast designs. These include:

- Blast timing simulations.
- Fragmentation modelling.
- Vibration prediction.
- Wave interference maps.

This information is stored in a database for future use. A valuable feature of the blast design system is that survey data can easily be imported into the design module and simulated to optimize timing designs for shock tube initiation systems or electronic initiation systems. Actual imported values can be checked against planned values. The in-field logging system that forms part of the overall BMS is an electronic data logging and reporting system for effective field control and reporting of explosives application and drilling. It records field information such as:

- Actual hole depths.

- Charge quantity in each hole.
- Stemming lengths.
- Charging time.
- Truck number.

16.26.2 Mine Technical

A geology and mine planning software suite were already purchased that addresses all mine technical requirements in an integrated manner. This software package should be widely used and well supported in Zambia.

The standard features are described below:

- Core 3-D rendered viewing capabilities for topographic, polyline and point data. Generic CAD tools to create and modify point, polyline, and primary surface data. It includes PlotMaker for all plotting requirements.
- Tools:
  - Volumetrics
  - Polygons
  - Surface and solids modelling
- Geology
  - Drill hole management
  - Basic statistics
  - Geostatistics
  - Block modelling
  - Ore control
- Engineering:
  - Short term planning

   - Long term planning
   - Pit and dump design
   - Surface blast design
   - Reconciliation reporting
- Survey:
   - Survey
   - Survey maps
- Scheduling:
   - Production scheduler.

16.26.3 Mine Maintenance

The mine itself will do maintenance of all heavy mobile mining equipment. This will include:

- All servicing.
- Repairs.
- Overhauls.
- Parts inventory management of mobile equipment covering a 24-hour operation.

16.26.4 Fuel Management

Fuel management becomes critical as it is one of the significant drivers of surface mining operational costs. Fuel is the largest operating cost of the entire mining fleet, making up half of the mining equipment's operating costs.

The tracking of diesel from delivery to storage and then to dispensing via permanent and mobile units to each equipment is important to control and monitor actual consumption rates and continually compare them to OEM figures. This is achieved through a fuel management system that provides comprehensive tracking and reporting. It also monitors operator efficiencies and highlights problem areas.

16.26.5 Tyre Management

The following serves as a brief description of a typical tyre management system for the operation:

- Tracks tyres and rims.
- Provides in-depth information on tread wear and tyre usage.
- Monitors day-to-day tyre maintenance.
- Reports on tyre performance and condition as well as provide for accurate tyre budget forecasting.
- Performs tyre brand comparisons.
- Determines inventory requirements.
- Evaluates repair and re-thread performance.
- Monitors casing age and flags tyre warnings.
- Calculates cost per kilometre based on actual tyre performance.

16.26.6 Fleet Management

In medium to large-sized open pit mining operations, it becomes very important and increasingly difficult to continuously monitor and improve productivity whilst reducing fleet operating costs. A leading fleet management system, Modular, was used for cost estimate purposes and formed the basis of this section's technical detail. Real-time mine management programs today encompass a flexible design to accommodate the various requirements of different mining operations. The programs can be tailored to meet specific operational needs and offer some benefits:

- Improved mine performance with best practice software, hardware and infrastructure offering quantifiable benefits within months of project initiation.
- Availability of full support from highly experienced engineers and technicians.
- Transfer of knowledge programs that ensure appropriate skills development for optimal mine management efficiency.
- Equipment performance reporting system.

- Fuel service aids in increasing overall haulage productivity by minimizing refuelling events. The system monitors fuel usage and queuing at fuel stations before assigning.

- Component tracking serves to manage major component inventory and monitor component performance.

- A prestart checklist allows the operator to report the pre-shift status of equipment from the field.

- The speed alert module serves to manage mobile equipment speeds. Speed limits can be set for areas of interest within the mine. Equipment speeds are monitored continuously, and feedback is provided to operators, dispatchers, and supervisors to drive with the desired behaviour.

- The material blending module works with the truck and shovel module dispatching algorithm to meet a mine's blending needs.

Other offerings from fleet management systems are real-time flow of accurate information enabling senior management, operations, engineering, maintenance, and plant staff to quantify, optimize, and track the value of decisions. All while ensuring optimal equipment utilization that reduces fleet requirements and operating costs.

Some solutions provided by fleet management systems to solve problems experienced at mines are:

- Material management.

- Optimization of fleet productivity and cycle time.

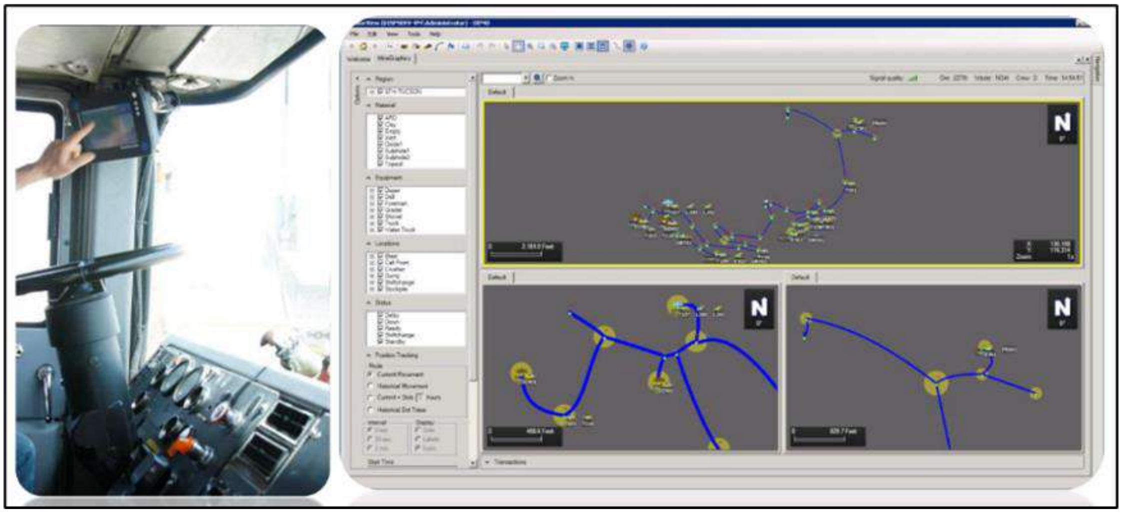
- Asset health monitoring and management.

- Crew management and safety.

- Manage and optimize support fleet.

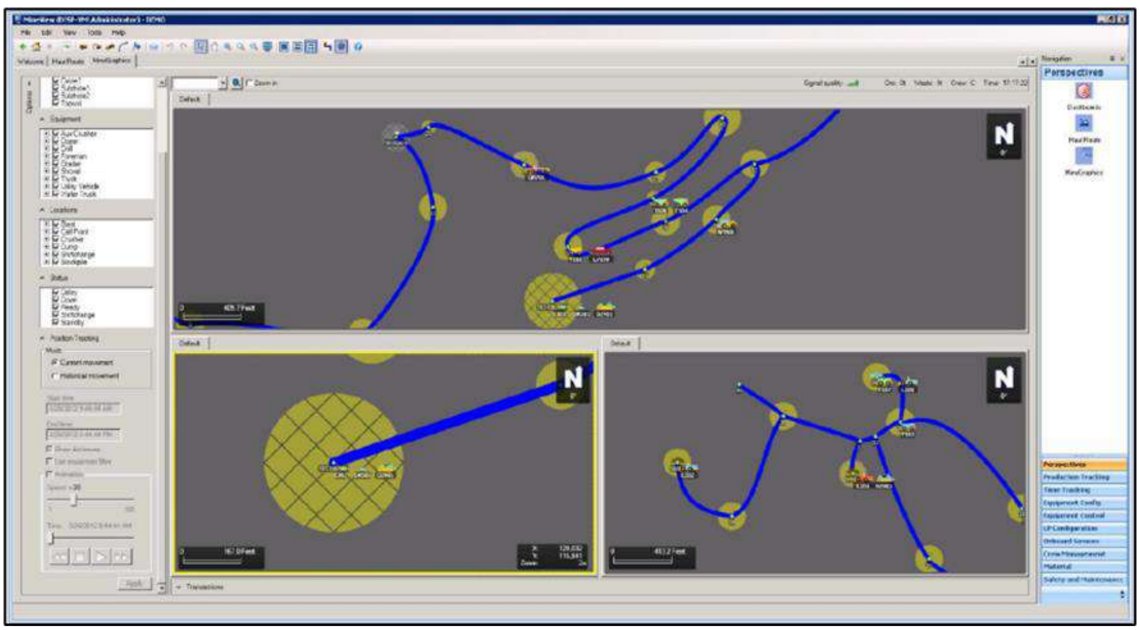
With real-time interfaces with the operator in the equipment cabin, valuable information takes the decision-making away from the operator. The operator only needs to look at the interface screen shown in Figure 16.26.1 to know where they are and where the next destination is. This interface also allows for input from the operator concerning the status of the equipment. If the unit is on a breakdown, the status will update in the control room by pushing a button. The correct support will be dispatched with the exact location of the unit.

Figure 16.26.1 Operator Interface



The fleet management system also provides a real-time monitoring interface, as seen in Figure 16.26.2 that will keep the control room operator up to date with the whereabouts and status of every unit fitted with the hardware. This interface can be changed by the click of a button giving the control operator a different view with different information as required. This gives the control operator all the necessary data to make the correct decisions if required.

Figure 16.26.2 Control Room Interface



16.26.7 Slope Management Program

Mine management and their relevant planning engineers should not be unaware of large-scale failures in their open pit operations. Therefore, the value of a slope management program cannot be overemphasised. As such, the system forms an indispensable part of the day–to–day operation of any world-class open pit mine, and responsibility for the effective functioning of the program must be assigned to a person with the necessary authority. Typically, pit slope management is the responsibility of the Geotechnical Section within the Mine Engineering Department. Support is provided by other mining disciplines, including the Geology Department, Survey Department, Planning Department, and Operations Department. The following aspects all form part of an effective slope management program:

Development and Maintenance of a Mine Hazard Plan

A mine hazard plan should be developed and regularly updated based on observations during regular inspections of pit slopes and reported failures or rockfalls. The most recent version of the mine hazard plan should be on display at selected locations on the mine premises and be accessible to all mine personnel working in the open pit. Furthermore, the mine hazard plan is recommended to be used as the basis for discussions on mine safety during regular mine health and safety meetings.

Regular Inspections

Slope crests and faces, especially along access ramps and above working areas, should be inspected regularly, preferably by the engineering or mining geologist. Any evidence of cracking along slope crests, or potentially unstable blocks on slope faces, should be reported and indicated on the mine hazard plan superimposed on a plan of the current pit layout. Significant falls of ground, as well as slope failures, should be reported in detail and indicated on the mine hazard plan. Small-scale toppling and ravelling should be reported, generally in terms of its occurrence and location, with the appropriate notations on the mine hazard plan. Furthermore, such inspections must be carried out on foot to allow careful examination of the slope and ensure adequate time is spent on this activity. Moreover, the development of small cracks, that may be indicative of the development of large-scale instability, may not necessarily be observed when driving in a vehicle. Finally, it is recommended that regular inspection cycles for various parts of the open pit be developed, depending on current mining activity and the level of perceived risk in different areas, to ensure that inspections be carried out appropriately.

Cleaning of Mine Faces

It is recommended that potentially unstable material and slope overhangs be removed above working areas as far as may be practical. Should it not be practical to remove potentially unstable material and/or slope overhangs in certain areas, access to and traffic flow below, such areas should be restricted to the minimum to reduce exposure of personnel and equipment to undue risk.

Survey Monitoring

Slope monitoring may be defined as any appropriate method of observing slope behaviour and encompasses daily visual inspections to install sophisticated instrumentation. Various instrumentation is available to detect surface and deep-seated slope movement. State-of-the-art monitoring systems, currently available can be connected to continuous data recorders and can be programmed to trigger an alarm when movement exceeds a pre-determined threshold limit. It is crucial that an appropriate monitoring system be installed at the earliest opportunity to facilitate all the necessary systems being put in place timeously and to begin identifying displacement trends.

It is recommended that a network of pipe beacons be installed at regular intervals along the crest of the proposed pit. These beacons should be located at intervals not exceeding 100m to 150m along the pit's rim. Furthermore, the beacons should be well founded to ensure that observed slope movement is due to slope deformations and not a result of the instability of the beacon itself. The beacons should be marked to prevent damage during mining. However, should a beacon be damaged due to mining, it would need to be replaced forthwith, and survey monitoring of the area will continue. A monthly survey monitoring cycle is recommended with a survey accuracy of 5mm or less. Monthly survey readings from at least two different base locations to each pipe beacon to accurately measure the amount and direction of movement.

Finally, it should be noted that initial slope movements might be insignificant. However, care should be taken not to disregard the survey monitoring activity following initial results as such records' real value, and importance only becomes evident once instability starts developing. In such a case, and with timeous warning based on regular survey monitoring data and slope inspections, proactive intervention measures could prevent large-scale slope failure or, at the very least, allow evacuation of personnel and equipment to safe ground.

History of Failures

A record should be kept of all slope failures in the open pit. All failures should be investigated with respect to the local structural geology and an effort should be made to understand the failure mechanisms involved. Where possible, such failures should be back analysed to enhance the database on the strength of geological structures in the open pit. The locality of failures should also be indicated on the mine hazard plan. Finally, cognisance should be taken of the fact that small-scale failures often indicate larger-scale distress in the slope. Should such larger-scale instability be anticipated, evacuation procedures should be implemented to ensure the safety of personnel and equipment operating in areas affected by such instability.

Regular Safety Precautions

Routine safety precautions on the mine, such as stand-off distances from the edge of the slope crests, precise distances at the toe of slopes, and demarcation of unsafe areas, both at the toe and slope crests, should be rigorously complied with.

Blasting

A pit limit blasting program must be implemented to reduce damage to the rock mass behind the mine design line and hence prevent a reduction in rock mass shear strength parameters. Double benching on the pit limits, whether interim or final limits, should be considered to negate crest problems that occur with a regular bench / berm configuration.

The stability of rock slopes is typically controlled by pit wall geology, structural geology, intact rock strength, rock mass quality, groundwater conditions, stress conditions, mining sequences and blasting and excavation practices.

17.0 RECOVERY METHODS

17.1 Overall Process Design

The Twin Hills Gold Project plant design for this feasibility (DFS) study is based on a flowsheet that comprises three stages of crushing and screening followed by milling and size classification, gravity recovery, a carbon-in-leach (CIL) circuit, carbon elution, and a gold recovery circuit. CIL tailings will be treated in a cyanide destruction circuit followed by thickening and pressure filtration. Tailings filter cake will be transferred on an overland conveyor for stacking at the tailings storage facility (TSF). Some mine waste rock will be delivered to the TSF by dump truck and used in the construction of the outer containment berm of the TSF.

The key criteria for equipment selection for this DFS were suitability for duty, reliability, and ease of maintenance. The plant layout provides ease of access to all equipment for operating and maintenance requirements, whilst in turn maintaining a layout that will facilitate construction progress in multiple areas concurrently.

The key project design features or criteria for the plant were:

- Nominal throughput of 5.0 Mtpa of ore feed.

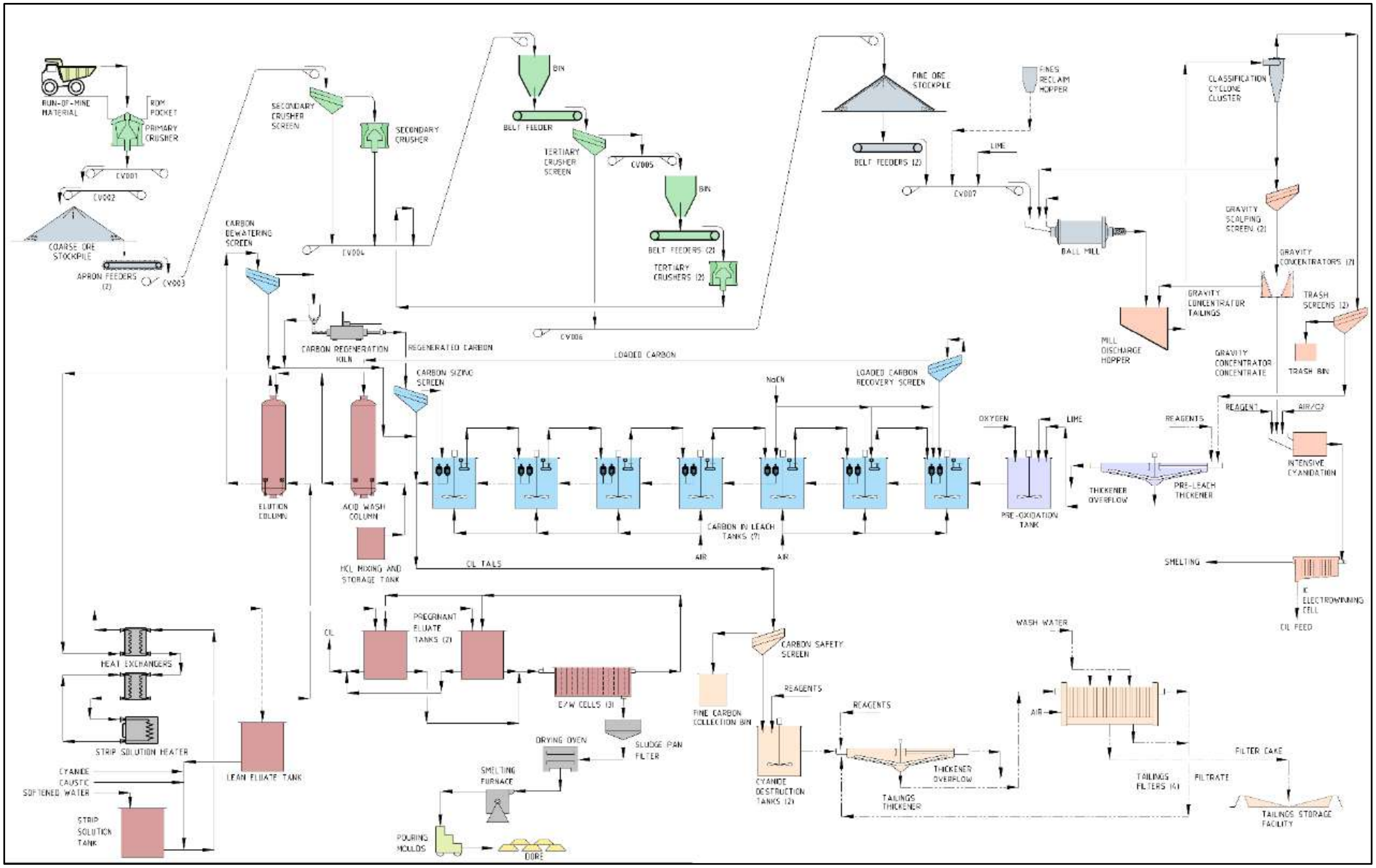
- A primary gyratory crusher with a coarse ore stockpile, secondary and tertiary cone crushing with an annual utilisation of 6,132 hours (h).

- A fine ore stockpile with ball mill grinding and classification circuit, and a downstream processing plant with an annual utilization of 8,000 h. This includes the gravity concentration, CIL plant, cyanide destruction with possible future arsenic precipitation, thickening, pressure filtration, and gold recovery operations.

- Thickened tailings stock tanks followed by a pressure filtration circuit with an annual utilization of 7,008 h.

An overall process flow diagram depicting the unit operations incorporated in the selected process flowsheet is presented in Figure 17.1.1.

Figure 17.1.1 Overall Process Flow Diagram



17.2 Process Plant Description

The proposed process design includes the following steps, circuits, and major equipment items:

- Primary gyratory crushing of run-of-mine (ROM) material onto a coarse ore stockpile.
- Secondary and Tertiary cone crushing circuit with classification screens, to produce a fine product for storage on a covered fine ore stockpile ahead of the milling plant.
- Grinding circuit: Single-stage ball mill operating in closed circuit with classification cyclones.
- Gravity recovery of cyclone underflow by a semi-batch centrifugal gravity concentrator, followed by intensive cyanidation of the gravity concentrate and electrowinning of the pregnant leach solution in a dedicated electrowinning cell located in the goldroom.
- Trash screening and thickening of cyclone overflow before leaching.
- Pre-oxidation with shear reactors ahead of the carbon in leach (CIL) circuit and oxygen addition to the leaching tanks via a PSA oxygen plant.
- Acid washing of loaded carbon and split AARL elution circuit followed by electrowinning and smelting to produce doré. Carbon regeneration by rotary kiln.
- Cyanide destruction of tailings using the SO_2/Air process with future allowance to include arsenic precipitation.
- Thickening of the detoxified slurry, with thickened tailings routed to agitated storage tanks.
- Pressure filtration of tailings thickener underflow and conveying of the filter cake to the tailing's disposal facility.
- Provision made in the design for possible future intensive cyanidation of gravity concentrate from the off-site Ondundu deposit and electrowinning of the pregnant leach solution in a dedicated electrowinning cell located in the goldroom.

17.2.1 Key Process Design Criteria

The key process design criteria are listed in Table 17.2.1.

Table 17.2.1 Key Process Design Criteria

Parameter	Units	Value
Plant Throughput	Mtpa	5.0
Gold Head Grade (LOM)	g(Au)/t	1.04
Crushing Plant Annual Utilization	h	6,132
Leach and Refinery Annual Utilization	h	8,000
Pressure Filtration Plant Annual Utilisation	h	7,008
Bond Crusher Work Index (CWi) – Design (85th Percentile)	kWh/t	18.9
Bond Ball Mill Work Index (BWi) – Design (85th Percentile)	kWh/t	13.3
Abrasion index (Ai) – Design (85th Percentile)	g	0.224
SMC Axb (85th Percentile)	kWh/t	27.9
Primary Crusher Lump Feed Size	F_{100}	900
Coarse Ore Stockpile Live Capacity	tonnes	9,785
Crushing Plant Product Size, P_{80}	mm	9
Fine Ore Stockpile Live Capacity	tonnes	7,500
Primary Ball Mill	MW	12.5
Cyclone Overflow Size, P_{80}	µm	63
Gravity Gold Recovery – Design	%	30
Leaching Tails Solid Grade (Gravity Tails Leaching)	g(Au)/t	0.08
Leach Time - Target	h	24
Leach Tails Solution Grade	g(Au)/m^3	0.015
Sodium Cyanide Addition (NaCN)	kg/t material	0.46
Lime Addition (at 90% CaO purity)	kg/t material	0.98
Elution Column Size	tonnes	12
Number of Carbon Strip Per Week	#	7
Leach Tails CNWAD	ppm	100
Detoxed Tails CNWAD	ppm	< 50
Pressure Filter Feed Tank Capacity	h	11.7
Filtered Tailings Cake Moisture for Disposal	%w/w	15
Ondundu Concentrate Processing (Future)	kg/day	15,000

17.2.2 Primary Crushing

Run of Mine (ROM) material will be trucked from five pits: Bulge, Central, Clouds, Clouds West, and Twin Hills West. Low grade ore from each pit will be diverted to run of mine stockpiles of weathered (transitional) and fresh ore types. Higher grade transitional and fresh ore will be despatched with a limit of no more than 25% transitional by mass to the primary gyratory crusher station for direct tipping into the dump pocket of the gyratory crusher via Cat 777s. Lower grade ore will be reclaimed from the ROM stockpiles if necessary to keep the primary crusher fully optimized and to maintain the minimum percentage of fresh ore specified. A fixed rock breaker will be utilized to break oversize rocks at the top of the dump pocket. Dust suppression with fog sprays will be automatically activated during tipping. Extraction of the dust from the discharge points below the crusher will be done with dry dust extraction systems.

The crushed rock will be withdrawn from the primary crusher discharge bin under the gyratory crusher with a wide heavy-duty primary crusher discharge conveyor which transports the ore via a coarse ore stockpile feed conveyor onto a coarse ore stockpile with 12 hours live storage capacity. The coarse ore stockpile feed conveyor is equipped with a weightometer for crushing throughput control as well as a tramp metal magnet system to protect downstream equipment.

The primary crushing circuit includes the following key equipment:

- Gyratory crusher.
- Primary crusher discharge bin.
- Rock breaker.
- Wide primary crusher discharge conveyor and coarse ore stockpile feed conveyor.
- Coarse ore stockpile (9,785 tonne, 12 h live).
- Primary crushing area sump pump.

17.2.3 Secondary and Tertiary Crushing

Primary crushed ore is reclaimed with two variable speed apron feeders located in the coarse ore reclaim tunnel (both running with option for one to be on standby) onto the secondary crusher screen feed conveyor. Each feeder is sized for 100% plant capacity. A dry dust extraction system extracts dust from the secondary crusher screen feed conveyor. The secondary crusher screen feed conveyor is equipped with a weightometer for secondary and tertiary crushing throughput control as well as a metal detector to protect downstream cone crushers. There is a coarse ore reclaim chamber ventilation fan to displace the air in the coarse ore reclaim tunnel.

The ore is conveyed to a double-deck secondary crusher screen, with the oversize of the 100 mm top deck and the 35 mm bottom deck passing into the secondary cone crusher. Secondary crusher discharge passes to the tertiary crusher screen feed conveyor, joining the secondary crusher screen undersize and is conveyed to the tertiary crusher screen feed bin. A dry dust extraction baghouse system in the crushing area extracts dust from the tertiary crusher feed conveyor extraction hood, secondary crusher screen extraction hood and the tertiary crusher screen feed conveyor extraction hood, onto the tertiary crusher screen feed conveyor.

The combined secondary and tertiary crusher products and secondary crusher screen undersize is conveyed by a tertiary crusher screen belt feeder to a double-deck tertiary crusher screen, with the oversize of the 25mm top deck and the 14mm bottom deck passing onto a tertiary crusher feed conveyor. This conveyor feeds a twin tertiary crusher feed bin with double conical bottoms, each discharging to separate belt feeders. Variable speed belt feeders reclaim the ore and choke feed the two duty tertiary crushers at a controlled feed rate. Tertiary crusher product discharges onto the tertiary screen feed conveyor. A dry dust extraction baghouse system extracts dust from the tertiary crusher screen feed bin extraction hood, the tertiary crusher screen extraction hood, and the fine ore stockpile feed conveyor extraction hood and deposits the collected dust onto the fine ore stockpile feed conveyor.

Tertiary crusher screen undersize P_{80} 9 mm discharges onto the fine ore stockpile feed conveyor which in turn discharges onto the covered fine ore stockpile with 12 h live storage capacity.

The secondary and tertiary crushing circuit includes the following key equipment:

- Two coarse ore reclaim apron feeders.
- Secondary crusher screen feed conveyor.
- Double deck secondary crusher screen.
- Secondary crusher.
- Tertiary crusher screen feed conveyor.
- Tertiary crusher screen feed bin (235 tonne, 9.2 minutes).
- Tertiary crusher screen belt feeder.
- Double deck tertiary crusher screen.
- Tertiary crusher feed conveyor.
- Twin tertiary crusher feed bin (120 tonne, 10 minutes total).

- Two tertiary crusher belt feeders.
- Two tertiary crushers.
- Fine ore stockpile feed conveyor.
- Fine ore covered stockpile (7,500 tonne, 12 h).
- Dust extraction and suppression at strategic equipment discharge points.
- Coarse ore reclaim, secondary and tertiary crushing area sump pumps.

17.2.4 Fine Ore Reclaiming and Conveying

Fine ore is withdrawn from a reclaim tunnel beneath the covered stockpile, by two variable speed fine ore reclaim belt feeders (both running with option for one to be on standby). Each feeder is sized for 100% of plant capacity. The feeders discharge onto the mill feed conveyor, which conveys the fine ore to the ball mill feed box. The mill feed conveyor will be fitted with a weightometer, used for controlling the speed of the belt feeders and hence the feed rate to the grinding circuit. Extraction of the dust from the feeder discharge points is achieved using dry dust extraction system. A fine ore reclaim tunnel ventilation fan displaces the air in the fine ore reclaim tunnel.

A fines reclaim hopper and fines reclaim belt feeder over the mill feed conveyor is provided where fine ore, grinding media (balls) and/or ball mill pebbles will be fed into the circuit as required.

Quick lime is added directly to the mill feed conveyor via a lime silo using a rotary valve. Lime addition will be adjusted by a pH meter in the carbon-in-leach circuit and by the mill feed rate as measured by the mill feed conveyor weightometer. The fine ore reclaim circuit includes the following key equipment:

- Two fine ore reclaim belt feeders.
- Mill feed conveyor.
- Fines reclaim hopper and belt feeder.
- Lime system.
- Fine ore reclaim area sump pump.

17.2.5 Grinding and Classification Circuit

The primary grinding circuit consists of a ball mill operating in closed circuit with a classifying cyclone cluster. At the targeted grind size P_{80} of 63 µm, generation of pebble scats will be minimal. Oversize from the ball mill trommel is directed to a pebble bunker, while the undersize gravitates to the mill discharge hopper from where it is pumped to the classifying cyclones. Cyclone overflow gravitates to two duty trash screens via a trash screen distribution box, ahead of the pre-leach thickener, while cyclone underflow gravitates to the ball mill feed box via classification cyclone underflow splitter box for further grinding. A portion of the cyclone underflow also feeds the gravity concentration circuit.

The grinding and classification circuit includes the following key pieces of equipment:

- Ball mill.
- Classification cyclones.
- Mill discharge hopper and pumps.
- Milling feed and discharge area sump pumps.

17.2.6 Gravity Recovery Circuit

The gravity circuit comprises of two centrifugal concentrators complete with two gravity scalping screens. Feed to the circuit is a bleed stream from the classification cyclone underflow splitter box, this flows by gravity to the gravity scalping screens. Gravity scalping screen oversize at +2 mm gravitates to the ball mill feed box. Each scalping screen undersize gravitates to a dedicated gravity concentrator. Gravity concentrator tails gravitates to the mill discharge hopper. During the batch cycles the scalping screen undersize periodically bypasses the concentrators and is directed to the mill discharge hopper.

The operation of the gravity concentrator will be semi-batch and the gravity concentrate will be collected in the Intensive Cyanidation Reactor (ICR) feed storage hopper and subsequently leached by the ICR circuit.

The gravity recovery circuit includes the following key pieces of equipment:

- Two gravity scalping screens.
- Two gravity concentrators.

17.2.7 Intensive Cyanidation Reactor

Concentrate from the gravity concentrator gravitates to the ICR to recover the contained gold by cyanide leaching.

The concentrate from the gravity concentrator gravitates to the ICR gravity concentrate storage hopper and is then transferred to the ICR drum after the predetermined weight is reached at the storage hopper, at which point batch processing is initiated.

Process water is added to the ICR drum. ICR leach solution (~1.2%w/v NaCN and ~2.0%w/v NaOH) is stored in the ICR solution storage hopper and transferred to the ICR drum. Caustic soda solution is added to maintain the pH above 10.5. The ICR circulating pump splits the solution between the ICR solution hopper and the ICR drum. Oxygen is added to the circulation line through a sparger during leaching, for a predetermined period of time. Flocculant is added to the ICR pump hopper and circulates through the ICR solution storage hopper and ICR drum. Flocculant allows the fine flocculated solids to settle in the ICR reactor drum.

After completion of leaching, the ICR drum is stopped, and the solution is transferred to the ICR solution storage hopper to settle the solids. Sodium hydroxide is then added to the solution storage hopper and the decanted clarified solution is drained to the ICR pump hopper and pumped to the ICR electrowinning feed tank in the goldroom as a pregnant solution for gold sludge recovery using a dedicated electrowinning cell. The sludge is combined with the sludge from the carbon electrowinning cells and smelted or may be smelted separately for metallurgical accounting purposes.

Once the pregnant solution transfer is complete, the ICR drum and ICR solution storage hopper are washed, and the slurry is collected in the ICR pump hopper. The slurry is then pumped to the mill discharge hopper.

The ICR circuit includes the following main pieces of equipment:

- ICR feed storage tank.
- ICR drum.
- ICR pump hopper.
- ICR solution storage hopper.
- ICR circulating pump.
- ICR area sump pump with imbedded gold trap.

17.2.8 Pre-Leach Thickening

Cyclone overflow is distributed over two trash screens, to remove foreign material prior to leaching. Trash reports to the trash bin which will be periodically emptied. Screen undersize gravitates to the pre-leach thickener to increase the solids concentration of the leach feed to 50% solids. Flocculant is diluted in the pre-leach thickener flocculant static mixer and added to the pre-leach thickener. Thickener overflow gravitates to the thickener overflow tank and combines with tailings thickener overflow and recirculates as plant process water. The pre-leach thickener underflow is pumped to the CIL circuit via a sampling system.

An automatic slurry sampler, installed on the feed to the pre-oxidation feed box distributor collects a representative sample of the pre-leach thickener underflow stream for plant control and metallurgical accounting purposes.

The pre-leach circuit includes the following main pieces of equipment:

- Two trash screens.
- Pre-leach thickener and CIL feed pumps.
- Pre-leach thickener flocculant static mixer.
- Leach feed automatic sampler.
- Pre-leach area sump pump.

17.2.9 Pre-Oxidation and CIL Circuit

The leach circuit consists of one pre-oxidation tank and seven carbon-in-leach (CIL) tanks. Slurry can bypass the pre-oxidation tank or any of the CIL tanks when necessary. Oxygen is sparged through two oxygen shear reactors. An oxygen shear reactor pump is used to circulate slurry through the contactors to the pre-oxidation tank. Oxygen is also added to each of the CIL tanks via the agitator shafts to maintain adequate dissolved oxygen levels for leaching. Cyanide solution can be added to the first four CIL tanks as required, but generally is added only to the first two tanks with the dosage controlled by the cyanide analyzer.

Fresh carbon or regenerated carbon from the carbon regeneration circuit is returned to the last tank of the CIL circuit with the alternative option of addition to the second last CIL tank and is advanced counter-currently to the slurry flow by recessed impeller carbon advance pumps in each CIL tank. The intertank screens in each CIL tank will retain the carbon whilst allowing the slurry to flow by gravity to the downstream tanks. This counter-current process is repeated until the gold loaded carbon reaches the first CIL tank. Recessed impeller pumps are used to transfer slurry from the first tank to the loaded carbon screen mounted above the acid wash column in the elution circuit. Undersize from the loaded carbon screen gravitates to the leach feed distribution box. The recessed impeller pump in CIL tank 2 is used to transfer slurry from the second tank to the loaded carbon screen when the first tank is offline.

Slurry from the last CIL tank gravitates to the vibrating carbon safety screen to recover any carbon leaking from worn screens or overflowing tanks. There is an option to add milk of lime to each CIL tank as required to maintain the pH above 10.5 during when quick lime addition to mill feed conveyor is not sufficient. pH measurement and control will be included in the pre-oxidation tank to ensure a high enough pH is maintained prior to cyanide addition.

The pre-oxidation and CIL circuit includes the following main pieces of equipment:

- Pre-oxidation tank with agitator.
- Two oxygen shear reactors and feed pump.
- Seven CIL tanks with agitators, interstage screens and recessed impeller carbon transfer pumps.
- Gantry crane.
- Cyanide analyzer and HCN gas monitor.
- Three CIL area sump pumps.

17.2.10 Carbon Acid Wash, Elution and Regeneration Circuit

Carbon Acid Wash

Before carbon stripping (elution), loaded carbon is treated with a 3% hydrochloric acid solution to remove calcium, magnesium, and other salt deposits that would otherwise render the elution less efficient or be 'baked on' in the subsequent elution and carbon regeneration steps and ultimately foul the carbon.

Loaded carbon from the loaded carbon recovery screen gravitates to the acid wash column.

Entrained water is drained from the column which is then refilled with a 3% hydrochloric acid solution, from the bottom up. Once the column is filled with the carbon, it will be left to soak in the acid for 30 minutes, after which the spent acid will be rinsed from the carbon and discarded to the tailings hopper.

The acid washed carbon will then be hydraulically transferred to the elution column for carbon stripping.

The acid wash circuit includes the following main equipment:

- Loaded carbon screen.
- Acid wash column.

Carbon Stripping (Elution)

Carbon stripping (elution) will utilize the split AARL process.

The elution sequence will commence with the injection of a set volume of strip solution into the bottom of the elution column. The strip solution is made up of 2.0% w/w NaOH and 2.0% w/w NaCN. After an initial preheat (95°C) and soak period the strip solution is re-circulated through the strip solution heater to bring the solution up to 130°C before entering the elution column. Eluate leaving the elution column passes through the recovery heat exchanger to either the strip solution tank, lean eluate tank or one of two pregnant solution tanks depending on the sequence step. Lean eluate tank solution is used in the elution step and refilled in the rinse and cooling steps in preparation for the next elution.

Upon completion of the cool down sequence, the carbon is hydraulically transferred to the carbon regeneration kiln feed hopper via a dewatering screen. A bypass option is provided to bypass the carbon regeneration if required. Anti-scalant dosing and sulphamic acid cleaning systems are provided.

The stripping circuit includes the following main pieces of equipment:

- Elution column.
- Strip solution heater with heat input and heat recovery heat exchangers.
- Strip solution tank.
- Lean eluate tank.
- Elution area sump pump.

Electrowinning and Goldroom

Gold is recovered from the pregnant eluate by electrowinning and smelted to produce doré bars.

Pregnant eluate from the elution circuit is transferred to one of two pregnant solution tanks to allow an elution to occur to one tank while the other is recirculating through the electrowinning cells or pumping out barren solution to the CIL circuit. During an electrowinning cycle pregnant eluate passes through two electrowinning cells with stainless steel mesh cathodes. Gold is deposited on the cathodes and the solution returns by gravity to the selected pregnant solution tank for recirculation until it is deemed barren, or the sequence time has been complete.

ICR pregnant solution from ICR electrowinning tank passes through one additional dedicated electrowinning cell to process ICR pregnant solution. Barren ICR solution is pumped back to the leach feed distribution box in the CIL circuit.

In future, pregnant solution from the Ondundu ICR will be transferred to one of two Ondundu ICR electrowinning feed tanks to allow an eluate transfer to occur to one tank while the other is recirculating through the dedicated Ondundu ICR electrowinning cells. Barren solution will be pumped to the leach feed distribution box in the CIL circuit.

The gold-rich sludge is washed off the steel cathodes in the electrowinning cells using high pressure water sprays and gravitates to the sludge hopper. The sludge is then filtered in a pan filter, dried, mixed with fluxes, and smelted in a diesel fired furnace to produce gold doré.

The electrowinning and smelting process takes place within a secure and supervised goldroom equipped with access control, and security systems.

The electrowinning circuit and goldroom include the following key pieces of equipment:

- Two pregnant solution tanks
- ICR electrowinning feed tank.
- Three electrowinning cells with dedicated rectifiers.
- Sludge hopper and sludge pan filter.
- Drying oven.
- Flux mixer.
- Diesel smelting furnace with bullion moulds.
- Bullion vault and safe.
- Fume extraction and ventilation systems.
- Goldroom crane.
- Goldroom security system.
- HCN gas monitor.

- Goldroom sump pump with imbedded gold trap.
- Ondundu ICR feed tanks, electrowinning cells with dedicated rectifiers (Future).

Carbon Reactivation

Carbon is reactivated in a diesel fired rotary kiln. Dewatered barren carbon from the stripping circuit is held in a kiln feed hopper. A screw feeder meters the carbon into the reactivation kiln, where it is heated to 650 - 750°C in an atmosphere of superheated steam to restore the activity of the carbon. Carbon discharged from the kiln is quenched in water and pumped to a carbon sizing screen at the discharge end of the train of CIL tanks to remove undersized carbon fragments. The undersized fine carbon is discharged to the carbon safety screen and the oversize directed to either of the last two CIL tanks.

As carbon is lost by attrition, new carbon is added to the circuit via the carbon quench vessel. The new carbon will then be transferred via the carbon sizing screen into the circuit the same way as reactivated carbon.

The carbon reactivation circuit includes the following main pieces of equipment:

- Carbon dewatering screen.
- Regeneration kiln including feed hopper and screw feeder.
- Carbon quench tank and pump.
- Carbon sizing screen.

17.2.11 Ondundu Intensive Cyanidation Reactor (Future)

Provision has been made in the design for gravity concentrate to be transported from the Ondundu site by truck to the plant goldroom area. It will then be lifted by the transport hopper lifting hoist to one of the two Ondundu concentrate feed cones and gravitated to a dedicated ICR to recover the contained gold by cyanide leaching. This recovery process is similar to that described above in section 17.2.7 'Intensive Cyanidation Reactor'.

Low pressure process water will be used to fluidize settled concentrate into the transport hoppers and also to wash the transport hoppers. The wash water will then drain into the Ondundu ICR feed storage hopper via the Ondundu concentrate feed cone and will overflow from the Ondundu ICR feed tanks and be collected into a overflow collection hopper to be used for the next batch of wash water.

Once cyanidation is complete, the pregnant solution will be transferred to the Ondundu ICR electrowinning feed tank at the goldroom.

The possible future Ondundu ICR circuit will include the following main pieces of equipment:

- Two concentrate feed cones.
- Two ICR feed storage tanks.
- Two ICR drums.
- Two ICR pump hoppers.
- Two ICR solution storage hoppers.
- Two ICR circulating pumps.
- ICR area sump pump with embedded gold trap.
- Overflow collection hopper.
- Transport hopper wash pump.

17.2.12 Cyanide Destruction

CIL tailings pass through a carbon safety screen and is detoxified to weak acid dissociable cyanide (CNWAD) concentration of <50 ppm by the SO_2/Air process where after the stream is thickened prior to filtration for cake deposition on the tailings storage facility (TSF). Future space allowance has been made to precipitate out solubilized arsenic with ferric sulphide after cyanide destruction.

The CIL tails, carbon sizing screen water and carbon dewatering screen water gravitate to the vibrating carbon safety screen to recover any carbon leaking from worn screens or overflowing tanks. Screen underflow gravitates to the cyanide destruction distribution box. Screen oversize (recovered carbon) is collected in a fine carbon collection bin for potential return to the circuit.

Slurry from the cyanide destruction distribution box gravitates into one of the two cyanide destruction tanks. The tanks operate in series but can operate in parallel if required. Total residence time in series is approximately 90 minutes to reduce maximum CNWAD design levels from 200 ppm (100 ppm operating) to less than 50 ppm.

Cyanide destruction is undertaken using the SO_2/Air method. The reagents required are blower air, milk of lime, copper sulphate, and sodium metabisulphite (SMBS). The cyanide destruction tanks are equipped with air addition points and an agitator to ensure that the air and the reagents are thoroughly mixed with the tailing's slurry. After the cyanide destruction process, the slurry gravitates to the tailings hopper and is pumped to the tailing's thickener.

Preliminary designs have been prepared for possible future installation of an arsenic removal circuit, and an area for this has been left open in the plant layout. Detoxified tailings will gravitate into the first of three arsenic precipitation tanks operating in series to achieve a total residence time of 150 minutes. Reducing solubilized arsenic to below detectable limits will be by precipitation in an acidic environment utilizing ferric sulphate and oxygen. After the precipitation process, the slurry will be neutralized with milk of lime and gravitates to the tailings hopper and will be pumped to the tailings thickener.

The cyanide destruction circuit includes the following main pieces of equipment:

- Carbon safety screen.
- Two agitated cyanide destruction tanks.
- HCN gas monitor and WAD cyanide analyser.
- Cyanide destruction area sump pump.

17.2.13 Tailings Thickening and Filtration

Conveyability and materials flow testwork was done during the DFS. Based on the testwork results, the required filter cake moisture was specified to be <16.1%, to be transported using belt conveyors.

Prior to the selection of the tailings disposal method a trade-off study was conducted investigating tailings high pressure filtration (HPF) versus tailings vacuum belt filtration (VBF). The trade-off study determined that HPF was the preferred option. The alternative option of VBF would probably require expensive filter cake air drying to be included and would result in higher water consumption in the process plant. The preferred option of HPF has been included in the plant design and cost estimates.

Tailings Thickening

Tailings from the tailings hopper is pumped to the tailings thickener feed box. An automatic slurry sampler, installed on this line collects a representative sample of the tailings thickener feed stream for plant control and metallurgical accounting purposes.

Flocculant is diluted with a tailings thickener flocculant static mixer and added to the tailings thickener. Tailings thickener overflow gravitates to the thickener overflow tank to be re-used as plant process water. Tailings thickener underflow is pumped to the tailings filter feed tank distributor.

The main equipment in this area includes:

- Tailings hopper and pumps.

- Tailings thickener and transfer pumps.
- Tailings thickener flocculant static mixer.
- Tailings thickener area sump pump.

Tailings Pressure Filter

Thickened tailings will be held in three filter feed tanks with combined capacity 8600 m^3 amounting to approximately 12 h storage, before being fed to the four pressure filters (three duty and one standby).

The tailings filter feed tanks operate in parallel, and any one of the three tanks can be bypassed when necessary. The tailings filters operate in a batch process. Slurry from the tailings filter feed tanks is fed by dedicated pumps to each filter respectively. Once chambers are filled with slurry the same pump is used for compacting and squeezing. Four duty and one standby air compressors are used to dry the cake to achieve the cake moisture level (approximately 15% moisture) to make it suitable for cake transport and stacking. Filter cake from each pressure filter is discharged onto their corresponding tailings cake discharge feeder conveyor.

Once cake is discharged from the chambers, two cloth rinsing pumps operating in parallel are used to quick wash off filter cloths within each filter. Each filter has its own dedicated set of two cloth rinsing and core wash pump sets (eight pumps in total). In addition, one duty and one standby HP cloth wash pump is used to clean the filter cloths thoroughly once per day. The filtrate and the wash water are collected in a filtrate tank and pumped to the tailings thickener feed box.

All the filter cake is combined and conveyed to a filter cake transfer conveyor, fitted with a weightometer, which in turn discharges onto an overland conveyor that transfers onto several grasshopper conveyors for the dry stacking of the tailings cake in the tailings disposal facility. These units are discussed in more detail in the Infrastructure Section (Section 18) of this report.

The main equipment in this area includes:

- Three tailings filter feed tanks.
- Four pressure filters with dedicated feed pumps.
- Tailings filtrate tank with pumps.
- HP cloth wash water tank with pumps.
- Cloth rinsing and core wash tank with four sets of two pumps.

- Five drying air compressors.
- Two tailings filtration area sump pump.
- Four tailings cake discharge feeder conveyor.
- Filter cake transfer conveyor.

Storm Water Pond

The process plant is designed to operate in compliance with ICMC standards with zero discharge of high cyanide containing process solutions to the local environment. To ensure compliance the plant has been provided with a lined storm water pond designed to contain any foreseeable spillage event. The storm water pond, combined with the bunded concrete areas within the plant perimeter, is designed to contain the run-off from an extreme storm event occurring simultaneously with the catastrophic failure of the largest slurry containing vessel within the plant site. Material accumulating in the storm water pond will be returned periodically to the tailings thickener feed box.

17.3 Reagent Handling and Storage

For the management of unexpected reagent spills, the reagent preparation and storage facilities are located within containment areas designed to accommodate more than the content of the largest tank. Where required, each reagent system is located within its containment area to facilitate its return to its respective storage vessel and to avoid the mixing of incompatible reagents. Storage tanks are equipped with level indicators, instrumentation, and alarms to ensure spills do not occur during normal operation. Appropriate ventilation, fire and safety protection, eyewash stations, and Material Safety Data Sheet (MSDS) stations will be located throughout the facilities. Sumps and sump pumps are provided for spillage control.

The following reagent systems is required for the process: quick lime, milk of lime, sodium cyanide, sodium hydroxide, hydrochloric acid, copper sulphate, sodium metabisulphite, ferric sulphate (future), flocculant, activated carbon, anti-scalant, and smelting fluxes.

17.3.1 Quick Lime (Calcium Oxide)

Quicklime is delivered in 1 t bulk bags and transferred to the lime silo. Quicklime is extracted from the lime silo via a lime silo rotary valve and dropped onto the mill feed conveyor in the milling facility.

17.3.2 Hydrated Lime (Calcium Hydroxide)

Hydrated lime is delivered in 1 t bulk bags and transferred to the lime hopper by a lime lifting frame and hoist. Lime is extracted from the lime silo via a lime feeder and fed to the lime mixing tank, fitted with an agitator, with HP process water to produce a 20%w/w milk of lime slurry. Lime is pumped in a ringmain system to the CIL circuit, detox, and arsenic precipitation (future option).

17.3.3 Sodium Cyanide

Sodium cyanide briquettes are delivered in 1 t bulk bags in boxes. The bags are removed from the boxes and lifted into the bag breaker located on top of the cyanide mixing tank by the cyanide lifting frame and hoist. Raw water is added to the cyanide mixing tank to the level required for achieving the stock solution concentration of 20%w/v. Caustic soda (sodium hydroxide) is also added to the mixing tank to provide protective alkalinity to avoid the generation of hydrogen cyanide gas. An agitator is used to dissolve the cyanide in the mixing tank. After the mixing period is complete, cyanide solution is transferred to the cyanide storage tank using the cyanide transfer pump.

Sodium cyanide is delivered to the CIL circuit via a re-circulating line. A separate cyanide dosing pump is used to deliver cyanide to the intensive leach circuit, possible future Ondundu concentrate cyanidation and elution circuit.

17.3.4 Sodium Hydroxide

Sodium hydroxide pearls (caustic soda) is delivered in 1 t bulk bags. Bags are lifted into the bag breaker located on top of the mixing and storage tank by the same lifting frame and hoist used in cyanide mixing. Caustic soda is transferred to the caustic soda mixing and storage tank by a caustic feeder. Raw water is added to the mixing tank to the level required for achieving the stock solution concentration of 20%w/v before the addition of caustic soda pearls.

The caustic soda solution is pumped to the elution circuit, intensive cyanidation; pregnant solution tanks, ICR electrowinning feed tank, future Ondundu concentrate cyanidation, future Ondundu ICR feed tank and the sodium cyanide mixing tank.

17.3.5 Hydrochloric Acid

Concentrated hydrochloric acid is delivered in 1 m^3 isotainers. A hydrochloric acid drum pump pumps the concentrated acid to the hydrochloric acid mixing and storage tank where raw water is added to dilute the acid to the desired 3%w/v stock solution concentration.

Diluted hydrochloric acid solution is pumped to the acid wash column.

17.3.6 Sodium Metabisulphite (SMBS)

SMBS is delivered in the form of powder in 1 t bulk bags. Raw water is added to the agitated SMBS mixing tank. Bags are lifted into the SMBS bag breaker, located on top of the tank, using a lifting frame and hoist. The powder reagent falls into the tank and is dissolved in water to achieve the required concentration of 20%w/v. After mixing for a pre-set time, the SMBS solution is transferred to the SMBS storage tank using the SMBS transfer pump.

SMBS is delivered to the cyanide destruction circuit using the SMBS dosing pump. An extraction fan is provided over the SMBS mixing tank and SMBS storage tank to remove SO_2 gas that may be generated during mixing.

17.3.7 Copper Sulphate

Copper sulphate is delivered in crystal powder form in 1.2 t bags. Raw water is added to the agitated copper sulphate mixing tank. Bags are lifted into the copper sulphate bag breaker, located on top of the tank, using the copper sulphate lifting frame and hoist. The reagent falls into the tank and is dissolved in water to achieve the required dosing concentration of 20%w/v. Copper sulphate is delivered to the cyanide destruction circuit using the copper sulphate dosing pump. Copper sulphate solution is stored in the copper sulphate buffer tank after mixing and is used during the next batch preparation, to provide a continuous supply of solution for the cyanide destruction circuit.

17.3.8 Ferric Sulphate (Future)

Ferric sulphate will be delivered in 1 t bulk bags and transferred to the Iron sulphate hopper by an Iron sulphate lifting frame and hoist. Iron sulphate will be extracted from the Iron sulphate silo via an Iron sulphate feeder and fed to the Iron sulphate mixing tank, fitted with an agitator. Raw water will be added to achieve the required dosing concentration. Iron sulphate will be pumped in a ringmain system to the arsenic precipitation (future option).

17.3.9 Flocculant

Powdered flocculant is delivered to the site in 25 kg bags. A vendor supplied mixing and transfer system is installed, which includes a flocculant hopper, flocculant blower, flocculant wetting head, flocculant mixing tank, and flocculant transfer pump. Powder flocculant is loaded manually into the flocculant storage hopper located at ground level. Dry flocculant is pneumatically transferred into the wetting head, where it is contacted with water. Flocculant solution, at 0.25% w/v is agitated in the flocculant mixing tank for a pre-set period. After a pre-set time, the flocculant is transferred to the flocculant storage tank using the flocculant transfer pump.

Flocculant is dosed to the pre-leach thickener, intensive cyanidation, tailings thickener, and possible future Ondundu concentrate cyanidation using variable speed helical rotor style pumps. Flocculant is further diluted before the addition points.

17.3.10 Activated Carbon

Activated carbon is delivered as a solid granular form in 500 kg bulk bags. The fresh carbon is introduced into the carbon quench tank in the carbon regeneration area where it is slurried and pumped over the sizing screen where the carbon fines discharge to the carbon safety screen, and the coarse carbon particles can be transferred to the end of CIL circuit.

17.3.11 Anti-Scalant

Anti-scalant is delivered as solution form in 1 m^3 isotainers and stored in the reagent shed until required. Permanent bulk boxes will be installed to provide storage capacity local to each dosing point. Anti-scalant is dosed neat, without dilution. Positive displacement style dosing pumps delivers the anti-scalant to the required locations around the milling plant. Top up of the permanent bulk boxes is carried out manually as required.

17.3.12 Goldroom Smelting Fluxes

Borax, silica sand, sodium nitrate and soda ash are delivered as solid crystals / pellets in bags or plastic containers and stored in the reagent shed until required.

17.4 Services and Utilities

17.4.1 High- and Low-Pressure Air

High pressure air at 700 kPag is required in the plant and produced by compressors (two duty and one standby). The entire high-pressure air supply is dried and used to satisfy both plant air and instrument air demand. Dried air is distributed via the air receivers located throughout the plant.

Low pressure air required for cyanide destruction is supplied by air blowers (one duty and one standby).

17.4.2 Oxygen Plant

A dedicated PSA oxygen plant is a vendor supplied package. Oxygen is supplied to the pre-oxidation tank contactors, CIL circuit and the ICR including the possible future Ondundu concentrate cyanidation at the required pressure, flow, and quality.

The main equipment in this oxygen plant includes:

- Four oxygen plant air compressors and dryers.
- Four coal towers.
- Four oil / water separators.
- Adsorption tower.

17.5 Water Supply

17.5.1 Raw Water Supply System

Raw water will be supplied externally by the infrastructure services and will be stored in a raw water storage tank within the plant and supplied to all users requiring clean water with no suspended solids, such as:

- Gland water for pumps.
- Reagent make-up.

17.5.2 Process Water Supply System

Pre-leach thickener and tailings thickener overflow will meet the main process water requirements. Raw water provides any additional make-up water requirements. Overflow from the tailings thickener overflow tank is stored in a process water pond (capacity 10,000 m^3, 4.0-hours) which provides the buffer storage capacity of water required to sustain the plant production and the peak quantities of water required for starting up the milling plant.

17.5.3 Potable Water Supply System (by others)

Potable water will be supplied externally and distributed by the infrastructure services to several users. Dedicated potable water pumps for the plant the safety showers will draw water from the provided tank.

17.5.4 Demineralized Soft Water Supply System

Raw water is passed through a water softening system and is stored in a softened water tank. Softened water from this storage tank is supplied on a batch basis to the elution plant as required.

17.5.5 Fire Water Supply System

Fire water will be externally supplied and distributed by infrastructure services to the fire hydrants and fire hoses within the plant.

17.6 Sewage Transfer and Sewage Treatment

17.6.1 Sewage Transfer

Two sewage transfer pumps in the process plant area will transfer sewage to the sewage treatment plant. Both the transfer pumps and treatment plant are provided by others.

17.7 Fuels

17.7.1 Plant Diesel Supply

Plant diesel will be supplied by a tanker to the plant diesel day tank. Diesel fuel is stored in a bunded area with a pump feeding a diesel ring main and distributed to the smelting furnace, carbon regeneration kiln and strip solution heater.

18.0 PROJECT INFRASTRUCTURE

As described in more detail in Section 4, the Project is located near a significant town (Karibib) and is also near to a main road and an airport. These factors limit the extent of the infrastructure development required by the Project.

18.1 Process Plant

18.1.1 Process Plant Related Buildings Specified for the DFS

After site clearance, preparation of earthworks terraces or platforms, and erection of fences, the buildings listed below and shown under cost code 370 of the Definitive Feasibility Study (DFS) capital cost estimate, will be erected during the project implementation period. These will be used by the Engineering, Procurement and Construction Management (EPCM) Contractor during construction, for handover to the Owner's operational team on commissioning of the Project:

- Air services building.
- Motor control centre buildings.
- Analytical laboratory.
- Reagent storage shed.

18.1.2 Radioactive Sources and Condition Monitoring Buildings

Radioactive Sources Building

The National Radiation Protection Authority (NRPA) is active in Namibia, and in terms of the Namibian Radiation Protection Act and regulations, it is required that all radioactive sources be stored in a fenced off building that has 220 mm thick brick walls, concrete roof slab and a steel door. The store must be approved by the NRPA and provide space to store new, spare, and damaged or expended radioactive sources normally associated with densitometers, online analysers or x-ray equipment that contain isotope radioactive material.

A record of all radioactive sources must be kept by a trained and authorized radioactive sources officer whose appointment has been approved by the Energy and Petroleum Regulatory Authority (EPRA). A radioactive sources management plan approved by the EPRA is also required.

The overall site plan in Figure 18.1.1 shows the locations of the major project facilities. Figure 18.1.2 shows the plant elevations.

Figure 18.1.1 Overall Site Plan

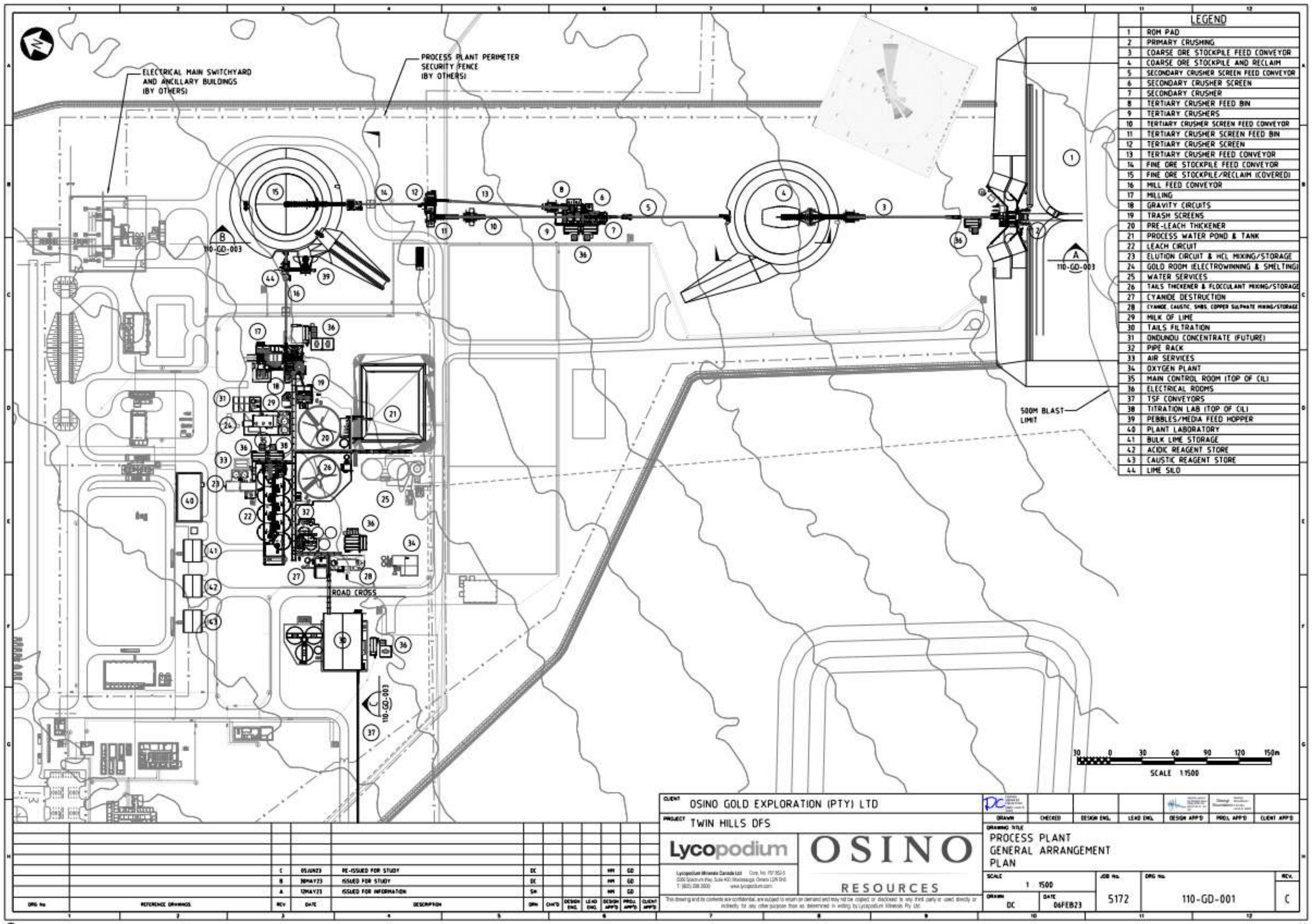
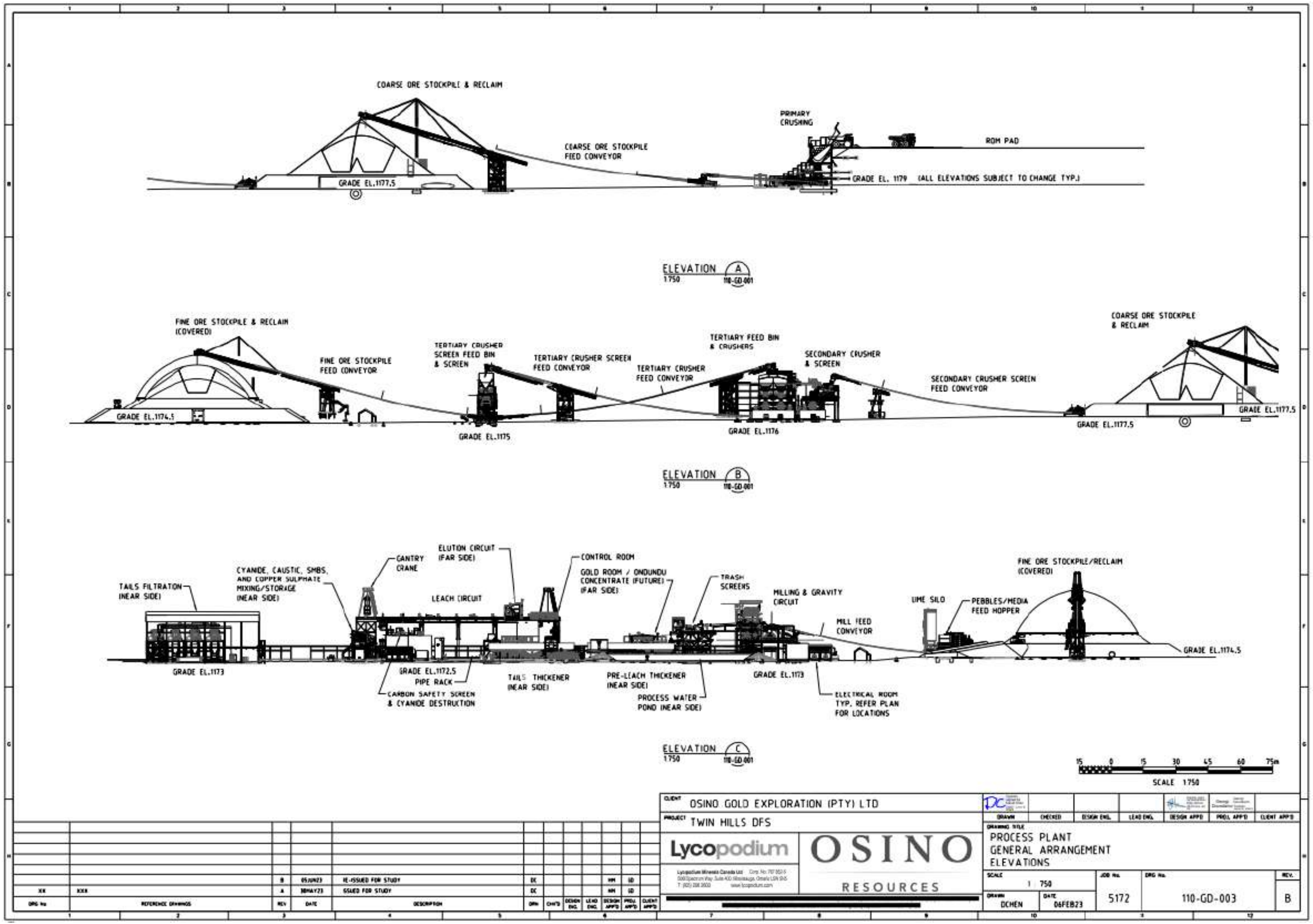


Figure 18.1.2 Overall Site Elevations



18.2 Non-Process Infrastructure

18.2.1 Summary of Other Infrastructure Outside the Process Plant

This Technical Report covers the critical infrastructure required for the Twin Hills Gold Mine Project, which includes the process plant, mining operations and offsite infrastructure.

The Osino Twin Hills Mine permit area is located 7.5 km due east of the Karibib Air Force Base.

The Twin Hills site is located less than 16 km from the intersection with the B2 route, and approximately 230 km from Walvis Bay Port. The town of Omaruru is 50 km from the mine site. The sealed roads to Walvis Bay, as well as Omaruru, are constructed to 120 km/h design standards, traversing relatively flat areas.

Road access is via a bitumen tar road (the C33) that connects the site to the nearby towns of Karibib to the southwest and Omaruru to the north, as well as the capital of Namibia Windhoek to the east and the harbour town of Walvis Bay to the west.

Employees will be housed in Karibib or Omaruru. No accommodation will be provided at the site for the administration, mine, and plant personnel.

Infrastructure required outside of the process plant footprint will include:

- A new rerouted district road DR1941 road intersecting with the C33 tar road from the mining town of Karibib and the farming town of Omaruru, as well as access roads from the DR1941 road to the process plant area and the mining operations. The section of road from the intersection of the D1941 onto the C33 road all the way up to the mine operations access road is tarred. Thereafter, the road will become a gravel road all the way to where it ties into the existing D1941 road again.

- Water pipelines, storage facilities, and pumps from the borehole pumping scheme required for the process plant operation.

- Fencing for boreholes and water storage tanks as well as the district road.

- Power supply from the national power utility NamPower for the dedicated consumer substation and power requirements of the mine.

- Mining fleet and light-duty vehicle (LDV) fuel and lubrication bulk storage / dispensing system and fuel management facilities, as well as a separate much smaller fuel storage / dispensing facility for the process plant.

- Mining Contractor's establishment.

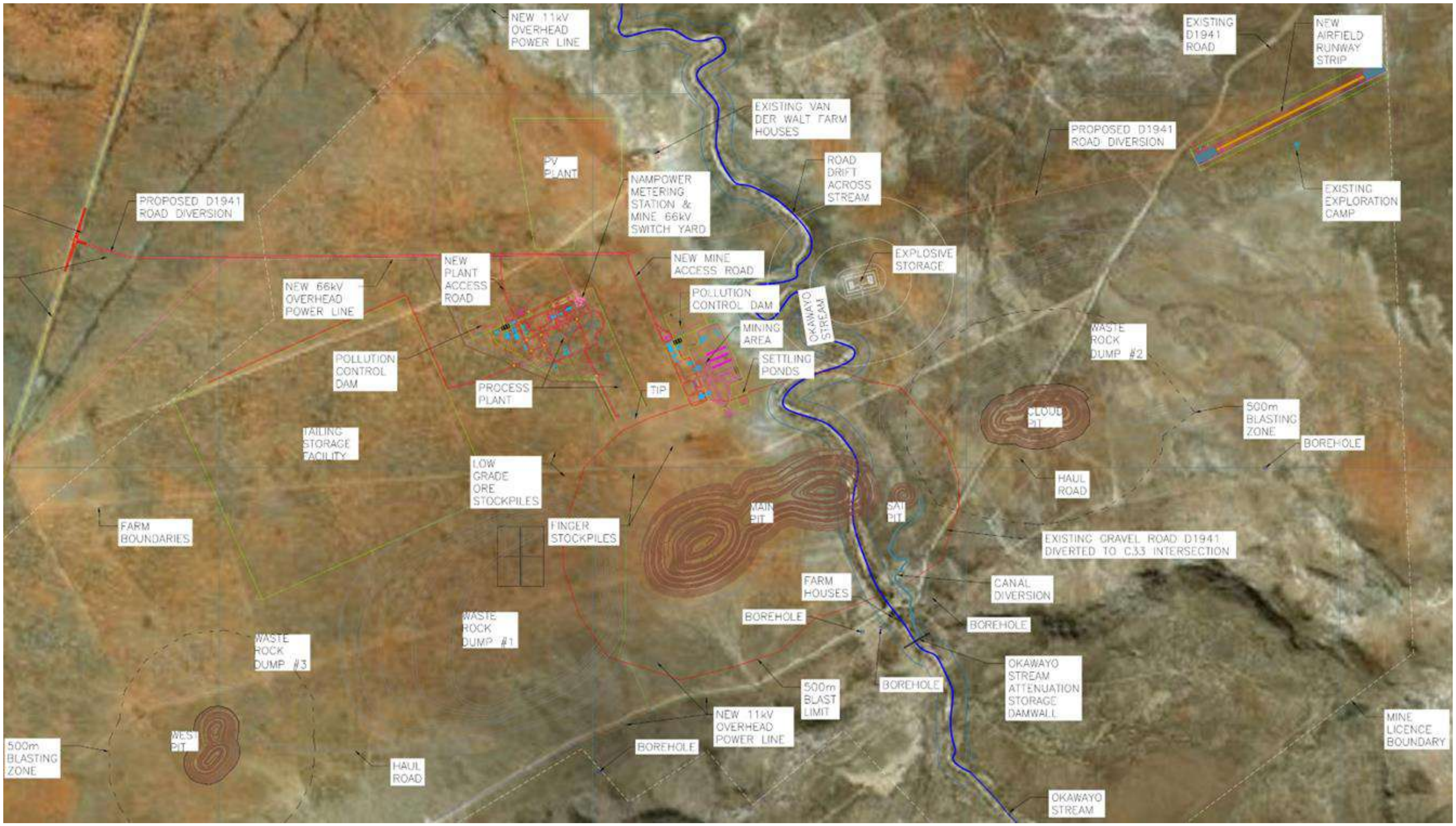
- Photo-voltaic solar power installation to provide approximately 37% of the overall energy requirement for the site. This will be supplied and operated by an independent power producer (IPP), hence designs and capital cost estimates are not included in this project report beyond a general description.

- Filtered tailings overland conveying and dry stacking deposition conveyor system.

- A lined tailings storage facility including any seepage pond and access / maintenance roads.

- A water supply pipeline from the NamWater Kranzberg water scheme has been investigated as a future mitigation measure but is excluded from the initial scope of works since it has been determined that boreholes in the adjacent limestone aquifers are capable of supplying all the make-up water needed by the plant and dust suppression activities, for the entire Life of Mine (LOM).

Figure 18.2.1 Overall Osino Twin Hills Site Plan



18.2.2 Site Geotechnical Investigations and Assessment

Introduction

Osino appointed SRK Consulting Southern Africa (Pty) Ltd (SRK), to provide engineering geological oversight of the civil geotechnical investigations that was conducted for the new Twin Hills processing plant project. Geo-Spectra in Namibia conducted all fieldwork activities, while SRK provided oversight of the work conducted. SRK also interpreted the results of the fieldwork and laboratory campaigns for the new processing plant infrastructure foundations and associated infrastructure such as the rerouted district road and access roads and construction material to be obtained from borrow pits.

The aim of the investigation was to evaluate typical foundation conditions for mine infrastructure and the process plant (crushing, screening, milling, stockpiles, leaching, thickening, etc.) admin offices, stores, workshops, and ancillary building structures.

Field Investigations

<u>Test Pit Investigations</u>

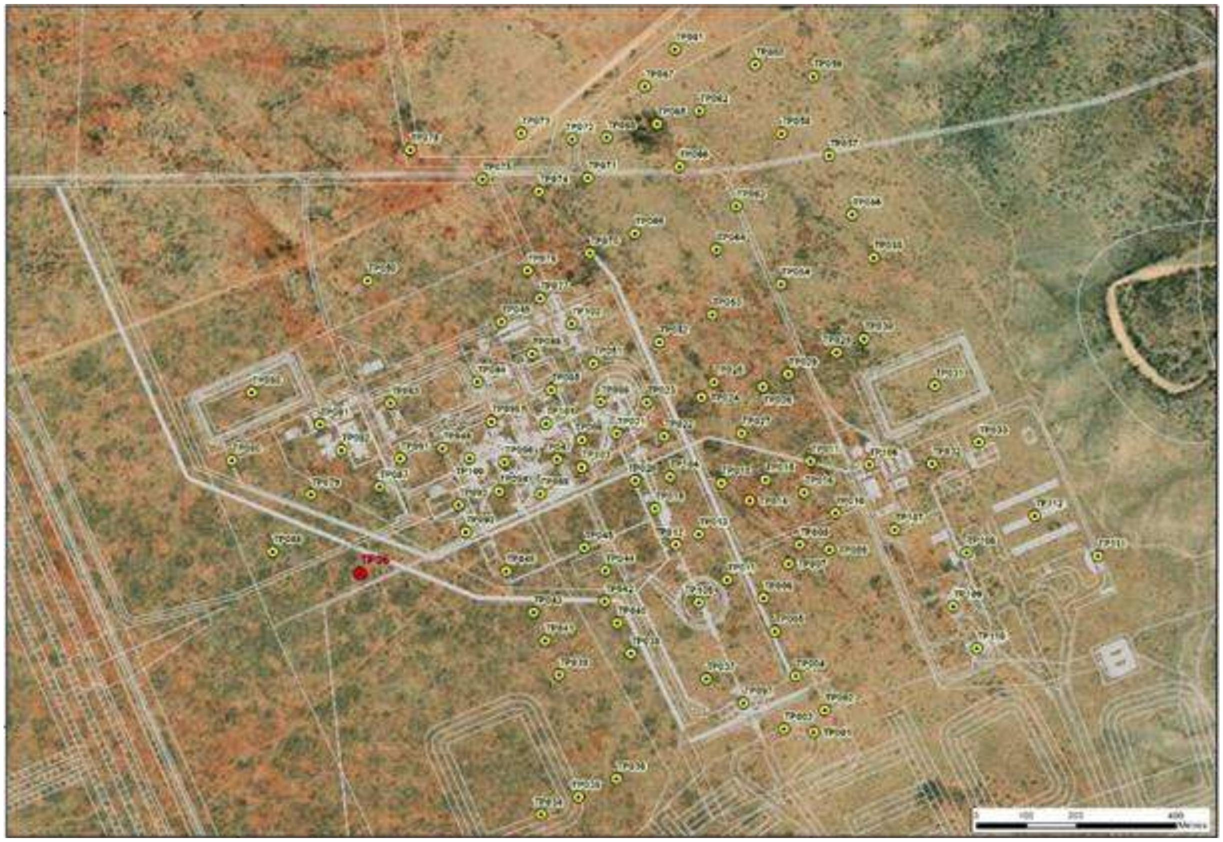
It was attempted to excavate all test pits to the maximum reach of the track mounted excavator, although in the bulk of the test pits, shallow refusal was encountered. All test pits were immediately closed using the arisings after soil profiling and sampling was conducted. The test pits are separated according to their position i.e.: processing plant test pits (TP); road test pits (DR); and borrow potential test pits (CM).

<u>Processing Plant Test Pits</u>

One hundred and twelve test pits positions were excavated in this area. The initial pits TP01 to TP78 were planned and excavated prior to an infrastructure site layout change, while the subsequent pits TP79 to TP112 were excavated to investigate changes in the planned infrastructure areas.

Test pit layout for the processing plant area is contained in Figure 18.2.2.

Figure 18.2.2 Test Pit Layout Map for Processing Plant (TP)



Rerouted District Road Test Pits (DR)

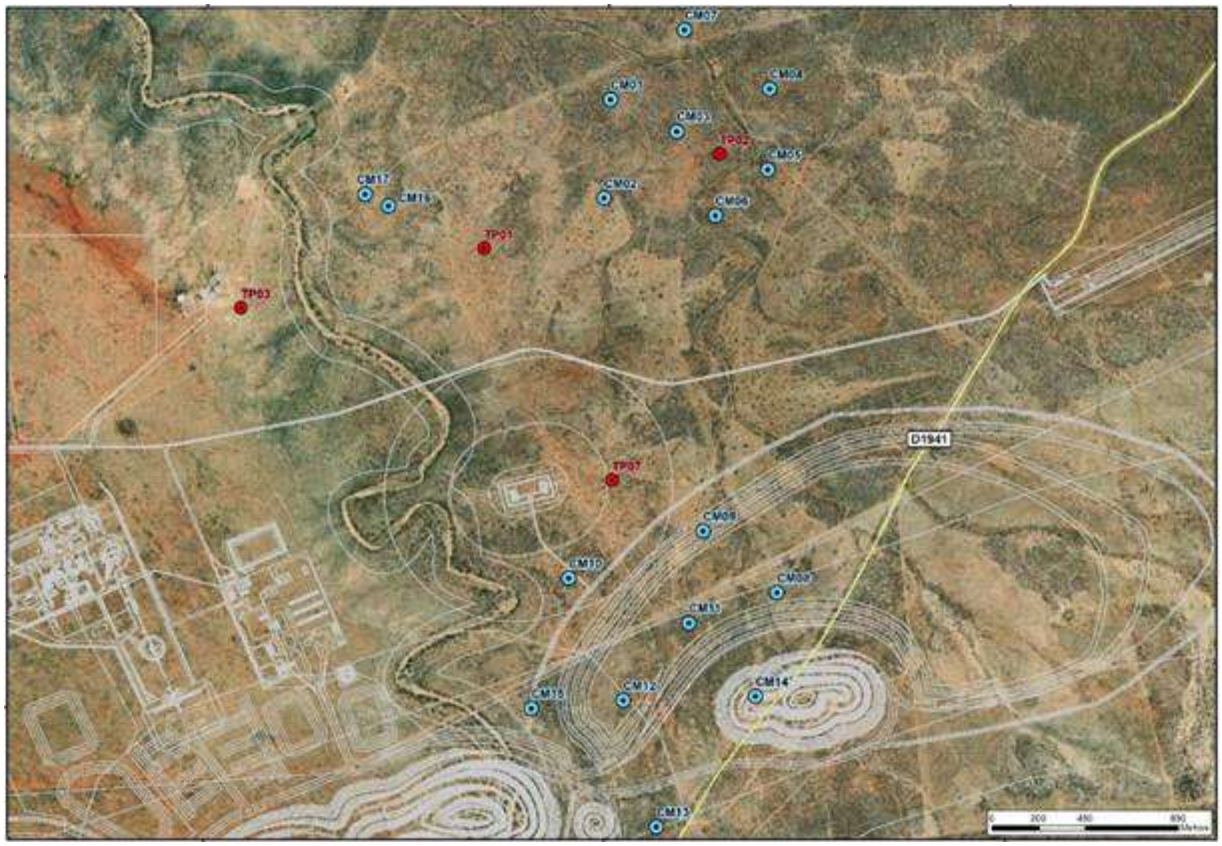
Fourteen test pits (DR01 to DR14) were excavated in the proposed road reserve as shown in Figure 18.2.3.

Figure 18.2.3 Site and Road Test Pit Layout Map

Borrow Pit Potential Test Pits (CM)

Seventeen test pits (CM01 to CM17) were excavated for identification of potential borrow materials in order to characterise their usage for construction material (Figure 18.2.4).

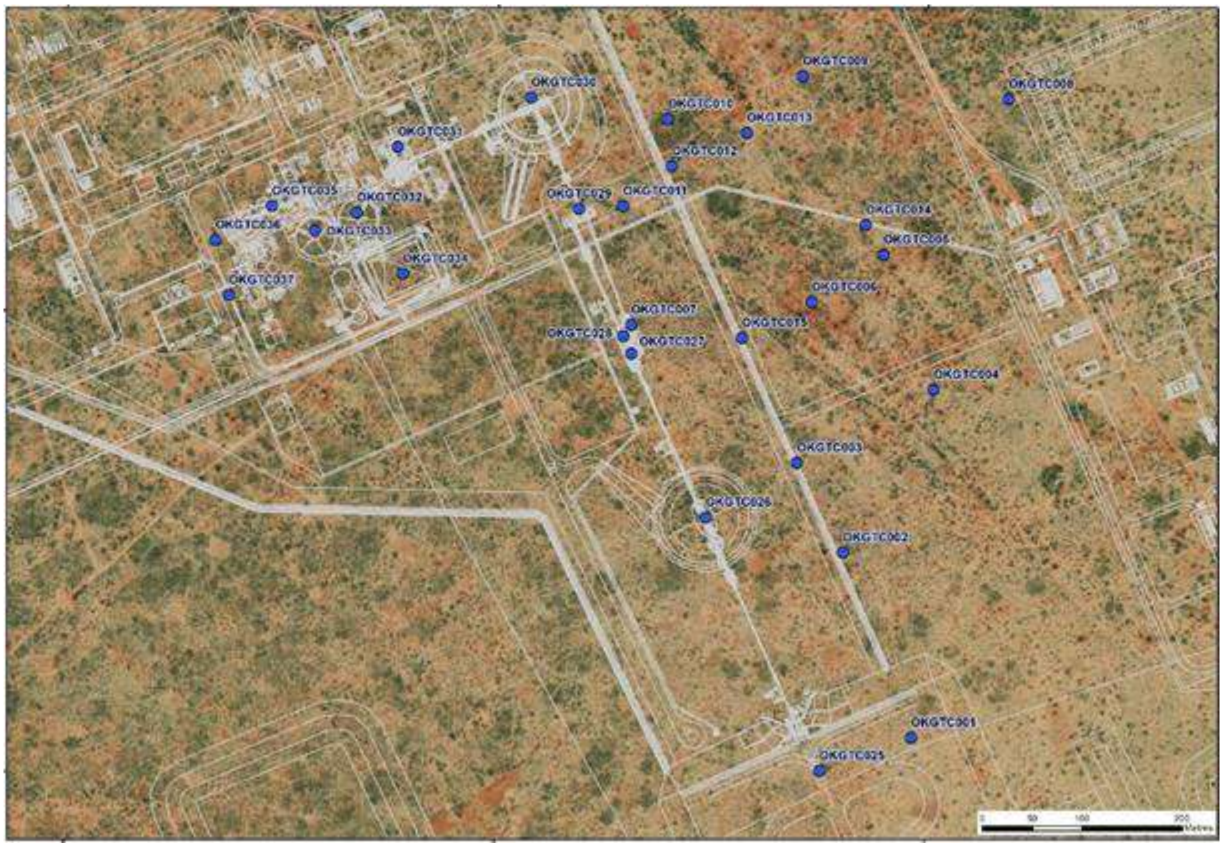
Figure 18.2.4 Borrow Test Pit Map



<u>Rotary Core Logging</u>

Rotary borehole logs were drilled in two phases at the site. Boreholes OKGTC001 to OKGTC015 were drilled during the start of the fieldwork prior to change of the location of the processing plant. The remainder of the boreholes (OKGTC025 to OKGTC037) were set out by Lycopodium during Phase 2, to correspond to proposed positions of structures in the changed infrastructure layout. Boreholes were drilled and assessed up to a depth of generally 30 m. The positions of the rotary core boreholes are shown in Figure 18.2.5.

Figure 18.2.5 Rotary Core Borehole Positions



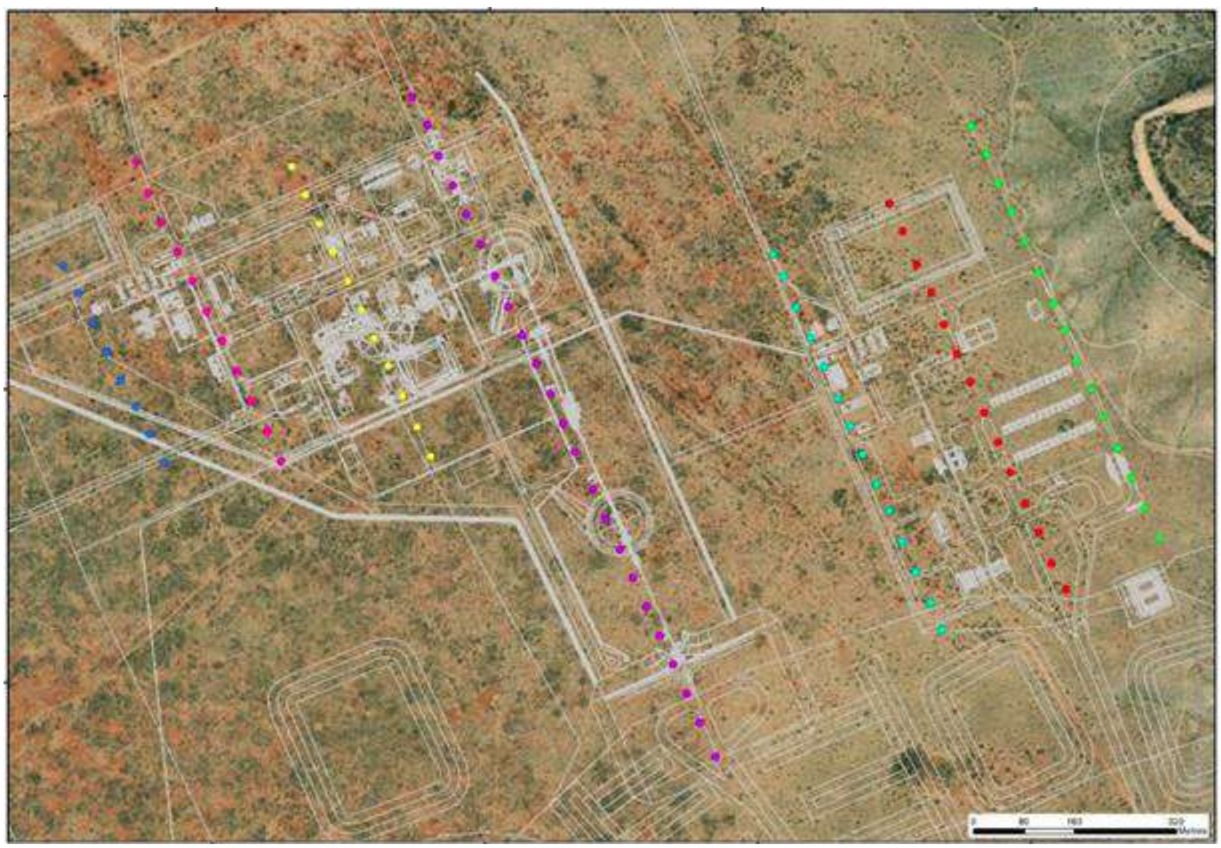
Site observations, supported by photographs, show hardpan calcrete gravel and cobbles scattered across the surface or beneath reddish-brown transported soil.

SRK also inspected the upper 30 m of core derived from boreholes that are located nearest to planned infrastructure areas. The inspection revealed that the surficial harpan calcrete is underlain by bioturbated, variably cemented alluvium that grade into massive, cemented alluvium (with occasional bioturbated zones). The cemented transport material is underlain by calcretized, cemented, weathered schist or greywacke bedrock which is typically very soft rock but grades into more competent soft to medium hard rock with depth. Calcrete is present as joint infill.

Geophysical Investigation

Geophysical survey lines were planned by SRK for the latest processing plant layout. The geophysical investigations were conducted by a geophysical service contractor, Applied Scientific Services & Technologies Pty Ltd Namibia (ASST). The geophysical investigation included multichannel analysis of surface waves (MASW) and electrical resistivity imagery (ERI) geophysical surveys. The purpose of this section is to summarise the results of the MASW and ERI data collected. The MASW and ERI survey lines positions within the proposed processing plant site layout is shown in Figure 18.2.6.

Figure 18.2.6 Processing Plant Site Layout with Line Survey Locations



Using MASW and ERI geophysical datasets, lithological layering, fracture zones, and stiffness were mapped in processing plant area. The main geophysical findings are:

- From the MASW data a slower (Vs <600 m/s) shear-wave near-surface layer mapped to a depth of ~10 – 12 m are indicative of stiff soils. Small instances of non-continuous, isolated instances of NEHRP (National Earthquake Hazards Reduction Program) Class D occurrences are present along traverse lines 1, 2, 4 and 5.

- A faster shear-wave velocity layer is embedded in the slower shear-wave velocity near-surface layer at a depth of ~2 - 5 m.

- A few anomalies with NEHRP class of D were mapped in the MASW models.

- From the ERI resistivity inverse models a resistive overburden layer is mapped to a depth of ~2 – 4 m in the area of interest.

- An electrically conductive layer is mapped at a depth of 5 - 8 m deep, varying in thickness between ~5 - 15 m, while the electrically resistive basement is mapped at ~25 - 50 m deep.

Discussion and Geotechnical Interpretation

The likely civil geotechnical properties of the Project area were evaluated against geotechnical constrains for development (as per SANS 634: 2011). A summary of the anticipated site conditions as compared to typical constraints is presented in Table 18.2.1. Note that Severity Class 1 is the most favourable.

Table 18.2.1 Summary of Expected Site Geotechnical Conditions

Geotechnical Constraints		Site Conditions	*Severity Class
A	Collapsible Soils	Areas with aeolian deposits and powder calcrete should be treated with the initial assumption that the deposits have a collapsible fabric.	2 – 3
B	Seepage	No seepage encountered in test pits. Based on the SLR Consulting report (2020-WG-15): "*High level surface- and groundwater impact assessment for the Twin Hills Gold Project*" dated November 2020, the local groundwater level expected to be approximately 6 to 57 m below ground level.	1
C	Active Soils	The material on site is classified as having a low potential expansiveness. It should, however, be noted that the mica minerals in schist may weather to clay minerals (illite) that may exhibit heave potential.	1

Geotechnical Constraints		Site Conditions	*Severity Class
D	Compressible Soil	Powder calcrete is expected to have a high compressibility.	2
E	Erodible Soil	The site is generally covered with coarse grained materials and calcrete, which tends to be resistant to erosion. It should, however, be noted that in areas with steeper topography, increased water flow velocity during rainfall periods may result in rapid erosion of unconsolidated and soluble material. Schist bedrock tends to slake on exposure and is susceptible to erosion by flowing water.	1 – 2
F	Difficulty of Excavation to -1.5 m Depth	Soft excavation conditions up to variable depths around the site due to undulating hardpan calcrete horizons.	3
G	Undermined Ground	None.	1
H	Instability in Areas of Soluble Rock	The site is underlain by marble at depth. Hardpan calcrete may have localised potholes / solution structures.	2
J	Areas of Unstable Natural Slopes	Localised unstable natural slopes have been created along river channels due to natural processes such as undercutting of riverbanks. Although steep slope angles are associated with the marble ridge, the slopes are considered intact and stable.	1 – 2
K	Seismicity	Based on the recorded earthquake in 2017, as well as nearby mining activities resulting in mine induced seismicity, the site classified as a 2 to 3.	2 – 3
Severity Classes:		*Most Favourable (1)* *Intermediate (2)*	*Least Favourable (3)*

Excavatability

The surficial transported material, which includes aeolian, alluvial, and sands of mixed origins, can be characterised as having soft excavation condition up to depths varying between 0.10 m and approximately 1.0 m below ground level. It should be noted that the thickness of the surficial horizons is variable due to the undulating nature of the underlying hardpan calcrete layer, but on average the unconsolidated overburden is approximately 0.4 m thick in the processing plant area.

Surficial hardpan calcrete, variably cemented alluvium and massive cemented alluvium will typically require the application of blasting or ripping to remove due to predominantly but variable hard rock excavation conditions. The underlying, in-situ rock material (schist, meta-greywackes, and quartzitic sandstone, etc.) will typically require soft rock excavation up to variable depths around the site. Generally, the difficulty in excavatability of the material will significantly increase with depth as the degree of weathering of the material decrease.

Construction Material

Aeolian sand and sand of mixed origin: The laboratory test results show that this material typically classifies as a G9 (varies from G6 to G9) construction material. Given the variability in classification, it is preferred that this material be considered for non-structural bulk fill only.

Alluvium: Alluvial material tends to be highly variable in composition and may contain organic material, therefore alluvium should be carefully selected to ensure only material with a low fines content and without organic material is used use for non-structural fill purposes such as bedding or fill in drains. On site screening may be required to achieve the optimum grain size envelope for filter drains.

Calcrete: The calcrete on site may comprise of nodular and honeycomb calcrete as well as arisings from attempting excavation of hardpan layers. Based on the laboratory results, the material classifies as G4 to G8 construction material with an average MDD of 2,008 kg/m^3 and an average OMC of 9.6%. This material is recommended for use as structural fill in engineered layer-works such as roads and platforms. It should be noted that calcrete may undergo self-hardening and induration with time.

Quartzitic sandstone, schist, and meta-greywacke: Residual and soft rock materials tend to classify as G6 to G9 materials, although the low PI of these materials imply that the material is not ideal for structural layer works, especially if constructed platforms are exposed as it will be vulnerable to erosion.

Foundation Considerations

SRK considered the processing plant area test pits as well as boreholes OKGTC025 to OKGTC037 to be as representative of foundation conditions at the latest location of the processing plant. This area tends to be underlain by shallow hardpan calcrete, encountered at an average depth of 0.4 m below ground level. However, the vertical and lateral continuity of the hardpan calcrete may vary. Below the hardpan calcrete, there may be powder calcrete, which is deemed unsuitable as a foundation material and will necessitate in-situ improvement, if foundations are placed on this zone. Additionally, the variably cemented hardpan alluvium below the hardpan calcrete may be commonly interlayered with both competent and weak zones.

Lightly Loaded Structures

SRK is of the opinion that structures with light loads that are not sensitive to settlement can be placed on strip or pad footings on the hardpan zone. Reinforced strip footings should be used to mitigate for any weak / discontinuous zones in the hardpan calcrete. If powder calcrete is encountered in foundation soils, caution should be exercised as this material tends to be compressible and/or collapsible, potentially leading to differential settlement.

Heavy Load Structures

Based on the data obtained from the rotary borehole drilling in the latest processing plant area, the surficial hardpan, variably cemented alluvium and underlaying massive cemented alluvium may be up to 17 m thick. Given the variable thickness of competent layers in this zone, SRK recommend that special attention be given to the foundations of heavy structures with dynamic loads (such as crushers, mills, etc.), structures with high static loads, or structures that are sensitive to settlement.

It is recommended for the foundation excavation to be extended through the upper hardpan / variably cemented alluvium to a suitable depth where reasonably consistent massive cemented alluvium is found. Excavations should then be filled using blended / stabilized arisings to construct engineered backfill layer works in excavations to foundation depth (for example – 1 m bgl)

If the depth to competent cemented massive alluvium is found to be deep. (e.g., at the primary crusher thickeners, and carbon-in-leach (CIL) tanks), it may be necessary to extend foundations down to competent material by utilizing end bearing, case in-situ piles, which can be achieved through large diameter percussion drilling.

These recommendations were addressed by Lycopodium in the definition and cost estimation of process plant foundations, and appropriate estimates were included in the overall capital cost estimate for the DFS.

General Underground Services

The presence of hardpan calcrete at surface or at a shallow depth (<0.5 m below surface) makes conventional trenching for general services (i.e., plumbing, cabling, etc.) difficult.

Haul and Access Roads

For the construction of new haul roads, it is generally expected that the subgrade conditions across most of the site will be favourable, especially in areas where calcrete is present and has a significant lateral extent. Surficial unconsolidated materials should however be improved by in-situ ripping and recompacting of materials. It is important to note that slakeable schist is not suitable for use in constructed layer works or as wearing coarse aggregate.

Calcrete, in particular, is widely employed in road construction and is often considered for use in both unpaved roads, as well as all structural layers thereof. It is worth mentioning that gravel roads utilizing calcrete as a wearing course tend to generate high levels of dust due to the presence of fines in the calcrete.

Terraces and Earthworks

Site Clearing and De-Bushing

De-bushing will include the bulldozing and removal of flora (trees, bushes, shrubs, etc.). Areas to be de-bushed will only be done for the footprints of the building structures and facilities as required, and for laydown areas and where terracing is required. Trees will be preserved as far as possible. Vegetation that is removed will be tipped in a designated area to be determined.

De-bushing of the following areas has been included in the cost estimates:

- Rerouting of the district road DR1941.
- Process plant access road and mine area access road.
- Borehole pipeline routes and roads.
- Servitudes for main bulk services for the NamPower 66 kV OHL and 11 kV OHL for borehole power supply.
- Process plant area which includes on-site roads and parking areas, storage areas and laydown areas, buildings and facilities, ponds including main intake substation and emergency generator areas, plant areas such as coarse and fine ore stockpiles, ROM pad, overland conveyors, secondary crushing, milling, CIL, tailings, reagents, oxygen plant, diesel storage and dispensation, and filter press areas.
- Mining Contractor site laydown which includes onsite roads and parking areas, laydown areas for offices, workshops, stores, bunds, and bulk fuel storage areas.
- Tailings conveyor and tailings storage facility (TSF) including access roads.

Construction Terraces / Pads

The chosen geotechnical material on site is suitable for foundations and there are no specific problems due to excess precipitation or groundwater. Hard rock is present at varying depths, based on the geotechnical investigation reports. The study made provision for hard rock excavation based on information as received.

Based on the reports, up to G6 quality material is available to use for platforms and roads. Further investigation was done during the DFS to source better filling material on the site. The test results available indicated the presence of better G5 material and the option to do single stage crushing to obtain G4 material. Costs for this crushing and screening for gravel material is included.

The terrace design philosophy is to limit excavation into the topsoil and over burden and up to the calcrete layer. The terraces are, therefore, located on a single sloped terrace comprising mostly G6 fill material, which is available on site and compacted in 200 mm layers to 95% MOD AASHTO. All vegetation, topsoil, and overburden material will be removed down to the cemented laterite layer and the fill material will be compacted above this layer. The engineered gravel material will be sourced from borrow pits located within 2 km of the site.

Terraces or platforms required for the following have been allowed for:

- All buildings structures in the process plant fence boundary.
- Stores yard for items that can be stored in the open.
- Main intake substation, NamPower metering station, and emergency backup generator set.
- All parking areas for employees, delivery trucks and bus drop-off areas.
- Process plant area (a level terrace will be provided for the complete process plant from the Primary crusher at the ROM pad up to the tailings filter building). This includes raised platforms for the coarse and fine ore stockpile tunnels.
- Stores yard.
- Mining Contractor site laydown which includes on-site roads and parking areas, laydown areas for offices, workshops, stores, ponds, and bulk fuel storage and dispensing areas.
- Tailings conveyor.
- ROM pad and tip at primary crusher – mining material will be free issued and delivered by the Mining Contractor to the Contractor responsible for the construction of the ROM pad tip area. Refer to Section 18.1 for details of the ROM pad.
- Terraces for the explosive’s magazine.

Exclusions:

- The solar plant area – the service provider or independent power producer (IPP) will make provision for de-bushing and any terraces.

Parking and Walkways

A fenced off gravel parking area will be constructed close to the main security access control gates for the management personnel, as well as for visitors who arrive in their personal vehicles. Parking bays are 5 m x 3 m wide, and provision is made for walkways between the parking bays.

Parking areas at the main gate are also provided for delivery trucks to be parked out of the roadway. This is to minimise congestion at the gate while truck drivers sort out their paperwork and approval to access the plant area or for trucks that arrive at night.

The security and induction offices are accessible from the parking before entering the fenced off plant and mining areas. Ablution facilities are also provided on the outside of the security fence for people to use while waiting outside the fenced off premises.

Designated walkways will be indicated on site by gravel walkway paths only. No allowance was made for any steel roof covered walkways.

Topsoil Dump

A small topsoil dump will be created on site to stockpile all topsoil removed during the construction phase. To create the topsoil stockpile, the area will be cleared of any shrubs and small trees only.

The topsoil stockpile shall not be constructed higher than 5 m in elevation. Some of the topsoil will also be used on the construction of stormwater berms where applicable.

Borrow Pits for Engineered Fill

Material to be provided for fill will be sourced from a borrow pit. This borrow pit would be established within the footprint of the mine main open pit area and/or where the waste rock dumps are proposed. This would provide the advantage that overburden as classified by the Mining Contractor will be utilised for engineering fill and reduce the amount of overburden to be removed by the Mining Contractor. This will also mitigate additional costs for rehabilitation of the borrow pits once materials are removed as this will become the mining opencast pit.

From the geotechnical investigations report provision was made for opening up and processing borrow pits. The investigations determined that the borrow pit areas are aeolian sand and alluvium of approximately 300 mm. Where materials are of good quality, it would be utilised for non-structural fill and for bedding material for piping in trenches. Provision was made for the clearing and grubbing, and the removal of overburden (aeolian sand and alluvium) in the borrow pit area.

Below the alluvium the hardpan calcrete can be found which is good structural fill material. It was found in the test pitting that the excavator refused at an average depth of approximately 400 mm. As such, the first 200 mm of this hardpan calcrete layer was deemed to be 'soft excavations', and the second portion of 200 mm was deemed to be 'intermediate excavations' in terms of SANS1200 definition. Thereafter, the hardpan calcrete will have to be drilled and blasted and this is deemed to be 'hard excavations' classification.

For the study, it was assumed that an additional 200 mm hard excavations were deemed necessary to ensure that good quality G4 and G5 material can be acquired for the roads base layer works and where else required.

The study indicated an amount of 542,110 m^3 of engineered fill materials. This excludes any waste rock materials, or any fill materials as required for the TSF as this is quantified and provided for by the TSF Consultant. Taking the above layers for borrow pit materials into consideration (600 mm for soft, intermediate, and hard rock excavations), a borrow pit area of approximately 900,000 m^2 (90 ha) is required to be opened up.

Table 18.2.2 Borrow Pit Material Comparison

Borrow Pit Material Comparison	From Geotech Report
Overburden Depth	0.30 m
Depth for Soft	0.20 m
Depth for Intermediate	0.20 m
Depth for Hard Rock	0.20 m
Total Depth	**0.90 m**
Area of Borrow Pit Required to be Cleared	903,517 m^2
Amount of Overburden to be Removed	271,055 m^3
Amount of Soft Engineered Fill	180,703 m^3
Amount of Intermediate Excavations	180,703 m^3
Amount of Hard Rock Excavations	36,141 m^3

Furthermore, as some of the calcrete would be honeycombed or in nodular forms and with the drilling and blasting requirements, a crushing and screening facility will be set up on site during the construction period to provide the required grading on the engineered fill materials.

Table 18.2.3 Drilling and Blasting Requirement

Material Description	Total m^3	Qty. Crushed Screened m^3	% Provided for Crushing & Screening
G4	6,984.00	6,984.00	100%
G5	34,584.00	34,584.00	100%
G6	275,990.00	110,396.00	40%
G7	217,725.00	21,772.00	10%
Sand (<3 mm) (Screened)	6,827.00	6,827.00	100%
Total Volume	**542,110.00**	**180,563.00**	**33.3%**

18.2.3 Road Infrastructure

Re-Routing of District Road DR1941

For future mining activities to proceed, the existing district road DR1941 needs to be rerouted. The D1941 district road intersects the C33 road, which is a sealed road and part of the national road network linking the Port of Walvis Bay to neighbouring countries such as Angola, Zambia, and Zimbabwe. The C33, running between Karibib and Otjiwarongo, links the B2 and B1 routes.

Access from C33 to the mine site will be provided on the rerouted section of DR1941. DR1941 will join the C33 at a newly constructed T-junction intersection, complete with slip lanes, approximately 8.5 km north of the current T-intersection of the D1941 and C33 routes.

The existing DR1941 traverses the Farm Okawayo, and the areas planned for future mining operations. For the Project development, the DR1941 must be rerouted away from the mining activity. The new proposed rerouted section crosses the Farm Spes Bona (approximately 1.2 km) and is located mostly on the Farm Klein Okawayo. Rerouting of DR1941 will affect a section of 17 km of the exiting DR1941, with the new route approximately 9.2 km shorter.

Since personnel will all reside offsite, buses will be carrying personnel from Karibib to and from site. It is further expected that trucks transporting reagents, bulk fuel, spares, as well as abnormal loads, will make use of the DR1941 between the new intersection and the mine plant site.

The new rerouted section of DR1941, from the intersection with the main C33 road up to last turn off for the Mining Contractor's establishment will be constructed to the Namibian Roads Authorities tarred road specifications. From the Mining Contractor's establishment turn off up to where the rerouted district road section joins the existing DR1941 will be a gravel road constructed with a 150 mm thick wearing course layer. The gravel portion of the road traverses rolling topography area with well-defined streams to be crossed. Where the geometric alignment does not allow for gravel crossings, culverts will be placed to accommodate stormwater. The Okawayo tributary of the Khan River will be crossed with a concrete drift and, if the vertical alignment does not allow for the drift, culverts will be provided. This can only be confirmed during the detail design stage when a detailed road survey will be done.

Long sections were produced for this DFS but will need to be refined during the detailed design to balance cut and fill quantities. The Roads Authority will be involved in the detail design stage in order to align Roads Authority expectations with what is proposed.

DR1941 forms part of the National Road Network and rerouting needs to be approved by the Roads Authority. The process includes public advertisements, approval from owners along the route, and approval from the National Road Council who only meets twice yearly. An application report was submitted to the Roads Authority to activate this process during the PFS. The application may be revised during the front-end engineering or execution phase as the rerouting is optimised.

The design standards followed for the rerouted section of DR1941 includes the *Geometric Procedure Manual and Drainage Manual* of the Namibian Roads Authority, together with the standard drawings of the Roads Authority. The pavement design was done in accordance with *TRH 4: Structural Design of Flexible Pavements for Interurban and Rural Roads*. The road from the C33 to the mine and process plant turnoffs are planned as sealed roads. This is mainly due to the amount of traffic which will cause higher maintenance costs for gravel roads, and the safety risks inherent from vehicles travelling in dust kicked up by other vehicles on the roads.

Servitudes of 60 m from the centre of the road will be provided on either side of the road for the NamPower 66 kV and the 11 kV overhead lines, and any possible future water supply pipeline either from Kranzberg or Karibib.

Figure 18.2.7 Layout of Paved Section of the Re-Routed Section of DR1941

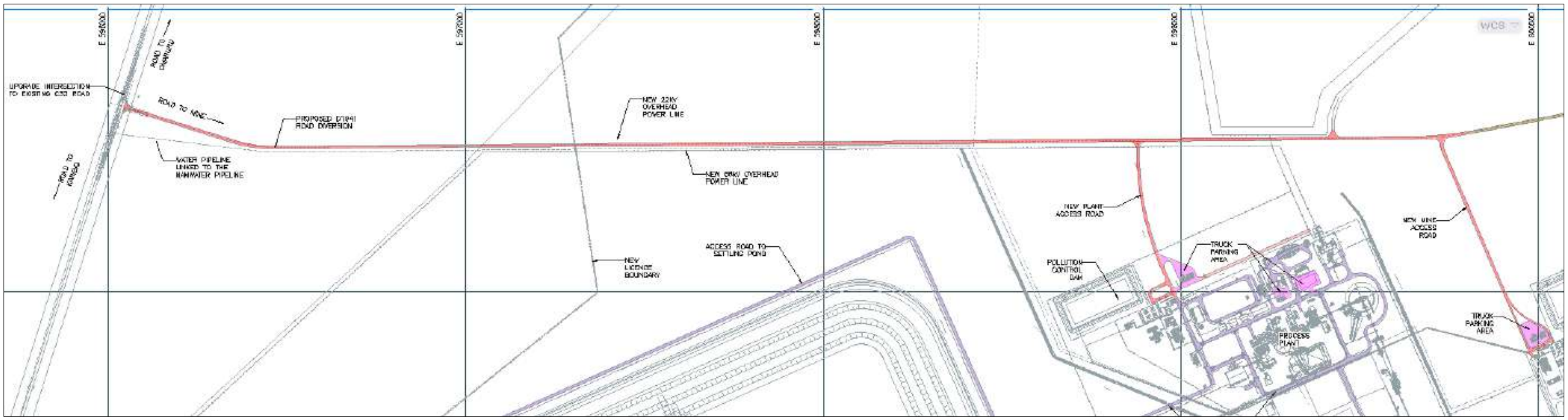
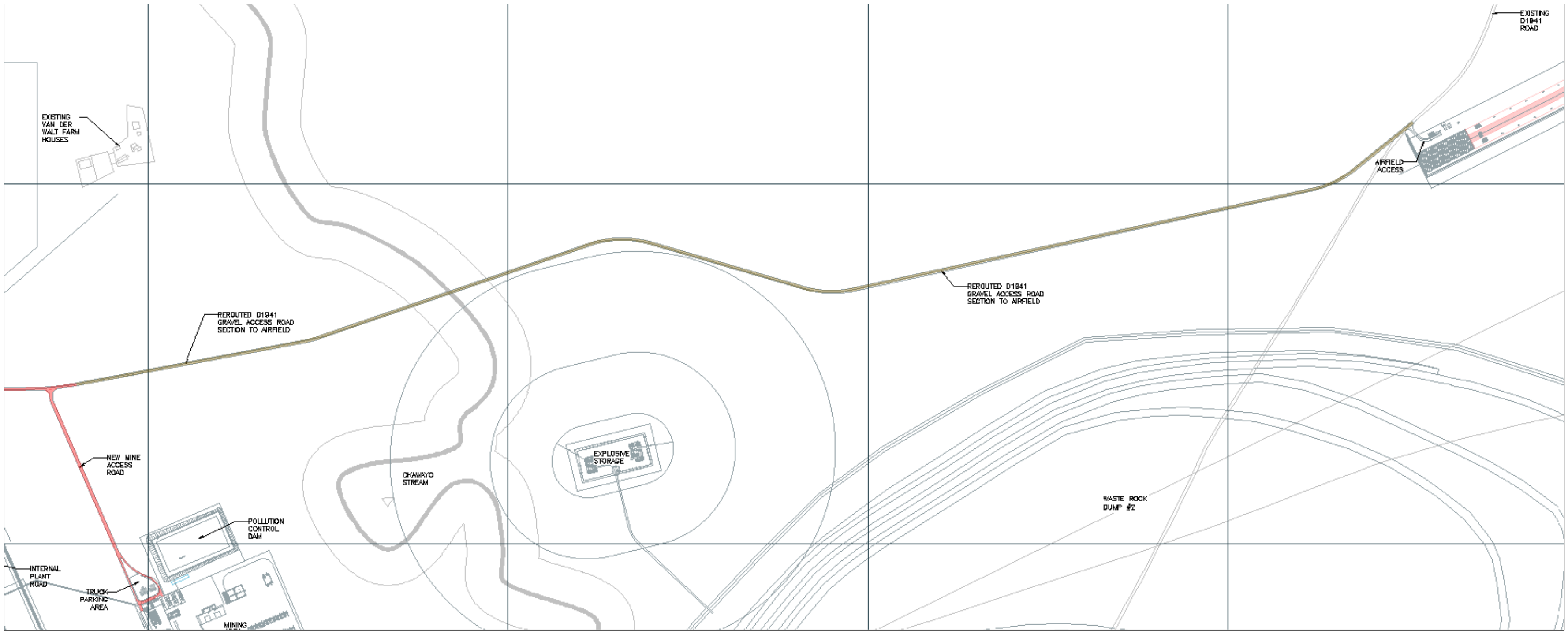


Figure 18.2.8 Layout of Gravel Section of the Re-Routed Section of DR1941



A 1.2 m high stock fence will be constructed along the length of the road. This is in line with the Roads Authority requirement that servitudes need to be fenced off.

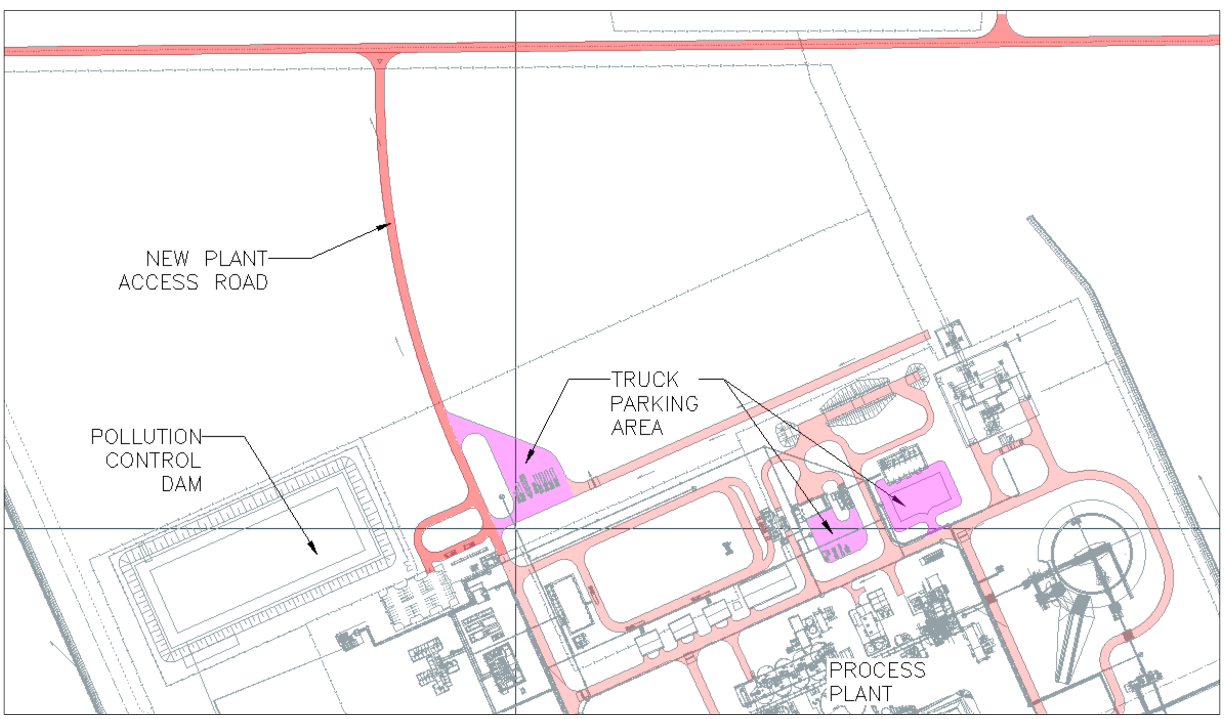
Guardhouses with 24-hour security guards will be placed at the C33 intersection at the farm boundary and on the furthest side of the district road where the road exits the farm boundary. As the road is a public district road, entry onto the road cannot be prohibited, however the purpose of the security is to control poaching, as the rerouted district road is traversing the mine property and game are roaming freely on the property.

Adequate road signage in accordance with the Roads Authority requirements is catered for in the designs and capital costs for the district road.

Access Road from the Rerouted DR1941 to Process Plant Area (Offsite)

The access road will be approximately 0.65 km long and will be a tarred road. The design parameters meet the criteria prescribed by the Roads Authority. Adequate drainage and road signage is catered for in the designs and capital costs.

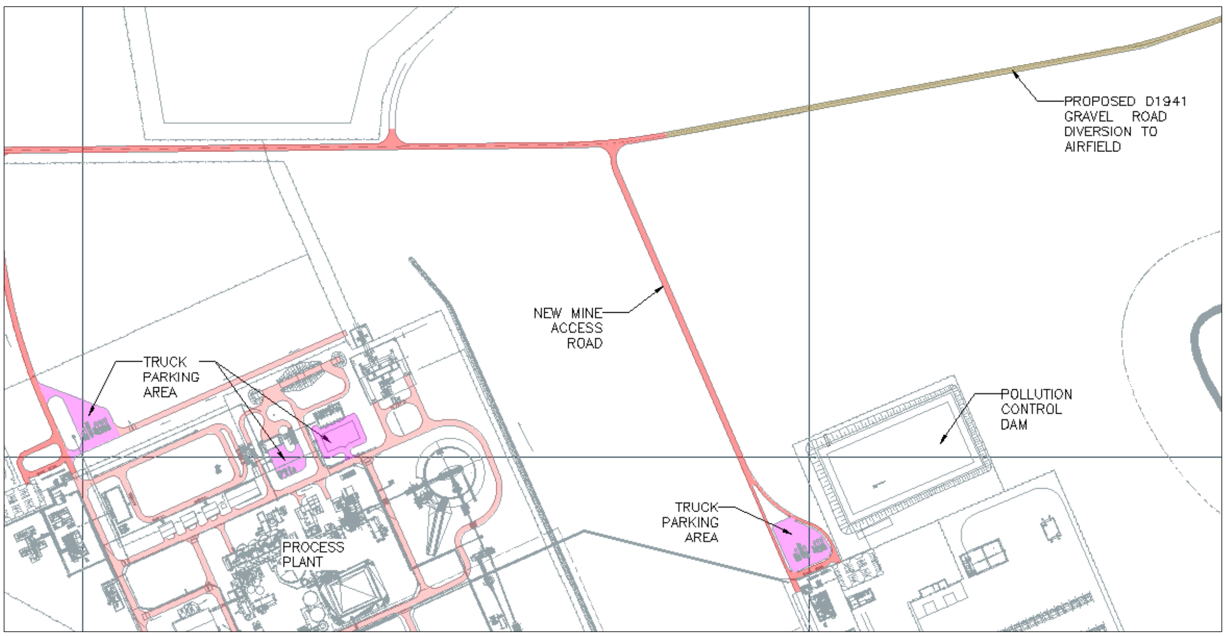
Figure 18.2.9 Layout of Paved Plant Access Road



Access Road from the Rerouted DR1941 to Mining Contractor Establishment (Offsite)

The access road will be approximately 0.71 km long and will be a tarred road. The design parameters meet the criteria prescribed by the Roads Authority. Adequate drainage and road signage is catered for in the designs and capital costs.

Figure 18.2.10 Layout of Paved Mine Contractor's Access Road



Process Plant Internal Access Roads

The onsite roads will be 6 m wide gravel roads and will be constructed by ripping and compacting the roadbed to a depth of 200 mm, and then topping it with engineering fill materials and a 150 mm of gravel all-weather wearing course material.

Drainage ditches (dish drains) and culverts will be placed in accordance with the drainage requirements.

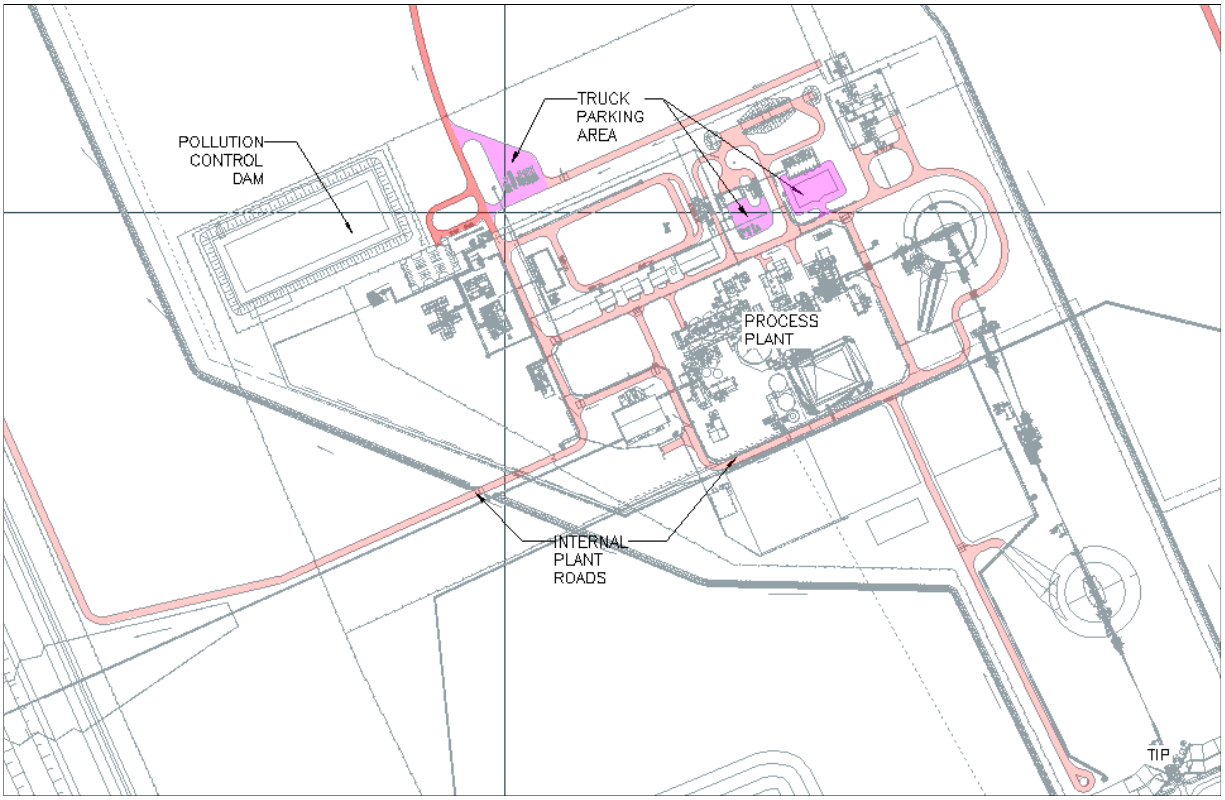
The internal plant roads will provide access to all the supporting facilities such as workshops, stores, waste management, clinic, and emergency response, including access to the process plant.

Access is also provided to the primary crusher, coarse and fine ore stockpiles, conveyors, as well as the mine 66 kV switchyard, and along the filtered tailings conveyor.

Road signage inside the process plant boundary fence have been included in the plant designs and capital cost estimates.

Provision is made for a brake test ramp at the workshop facilities to cater for the maintenance requirements on the plant vehicles.

Figure 18.2.11 Layout of Internal Gravel Plant Roads



Mining Contractor Establishment – Internal Roads and Haul Roads

The onsite roads will be 6 m wide gravel roads and will be constructed by ripping and compacting the roadbed to a depth of 200 mm, and then topping it with engineering fill materials and a 150 mm of gravel all-weather wearing course material.

Drainage ditches (dish-drains) and culverts will be placed in accordance with the drainage requirements as required by the Mining Contractor.

The internal facility roads will provide access to all the supporting facilities such as offices, workshops, stores, wash bays, bulk fuel storage and distribution, including to the emulsion storage facility.

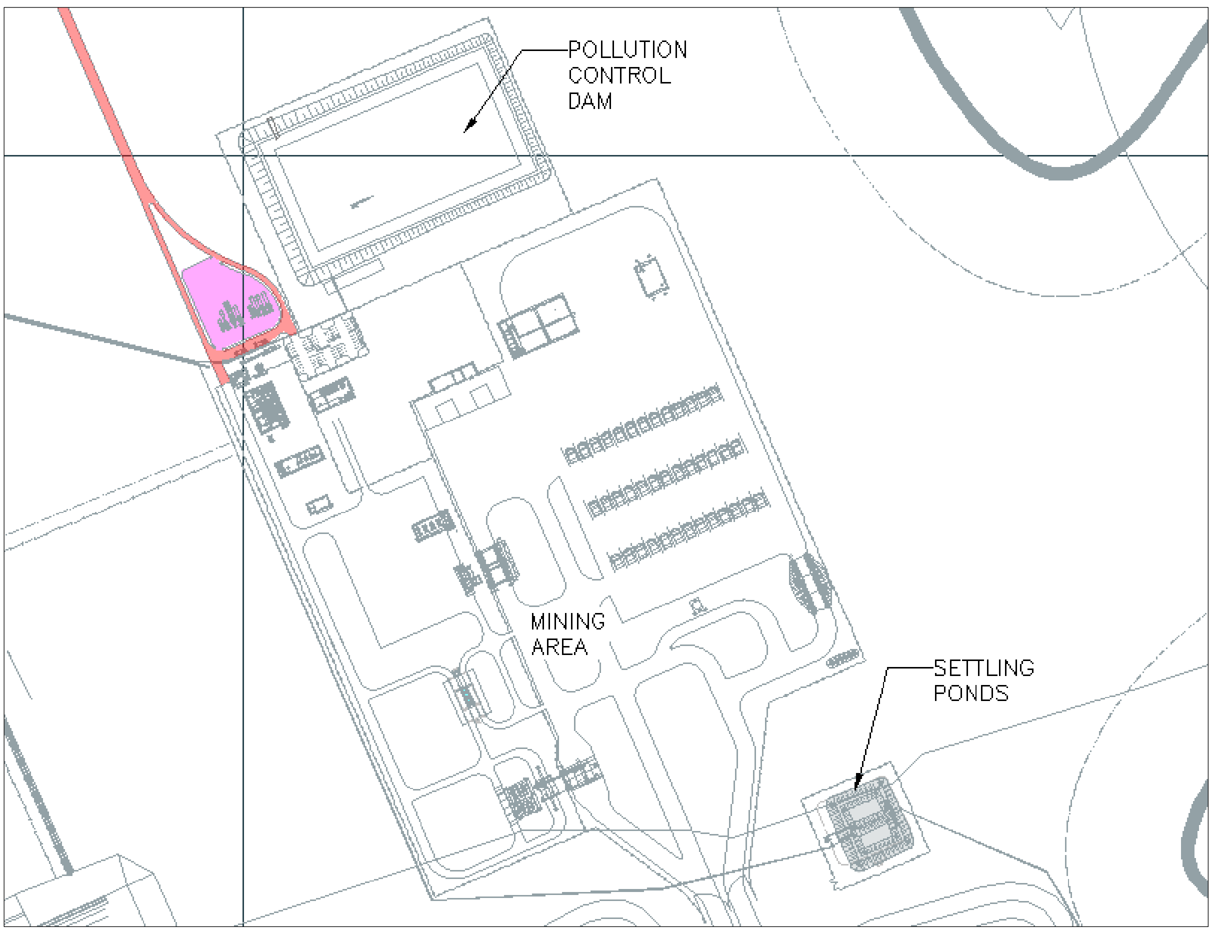
The Mining Contractor has made provision for and will be responsible for all the haul road requirements, including brake test ramp, within the LOM contract value for open pit mining.

Access roads to the explosive’s storage magazine are provided under the Mining Contractor scope.

Road signage inside the Mining Contractor establishment boundary fence has been included in the capital cost estimates.

The drawing below indicates the possible location of a mine infrastructure area pollution control dam for future installation should this be required. In the DFS design, run-off from the mining area is to the surrounding land.

Figure 18.2.12 Layout of Internal Gravel Proposed Mine Contractors’ Roads



Additional Offsite Access and Maintenance Roads

The following additional access and maintenance roads are provided:

- 4 m wide gravel maintenance access road to the NamPower metering yard. This is in line with requests from NamPower that they would require access to the metering yard without having to access the process plant property.

- 4 m wide gravel maintenance access road to the TSF seepage dam ponds for access and maintenance purposes.

- 4m wide gravel maintenance access road alongside the borehole water supply pipelines for ease of accessing it during pipe breakages. It is crucial that the pipelines could be reached timeously as this is the main source of water supply.

- No provision has been made for a road to / from the solar plant. The Service Provider will cater for the photovoltaic (PV) plant area including access to it, with the cost included in the Power Purchase Agreement.

18.2.4 Water and Sewerage Reticulation and Treatment

Site Wide Water Balance

The total water supply of 138.1 m^3/h is supplied by the combined boreholes to the process plant and mine into the raw water storage tanks. The water use is as follows:

- The process plant area requires 9.2 m^3/h of domestic water, ablutions (showering and toilets, etc.).

- Mine water requires 25.0 m^3/h (for wash bays, dust suppression, and domestic use).

- Process plant area requires 2.1 m^3/h for wash bays and for plant wash downs.

- The balance of the water received from the boreholes is used as make-up water to the processing plant which requires 101 m^3/h. The sustainable yield model indicates that a surplus of approximately 10% in excess of the annual demand of approximately 1.1 million cubic metres of make-up water is available.

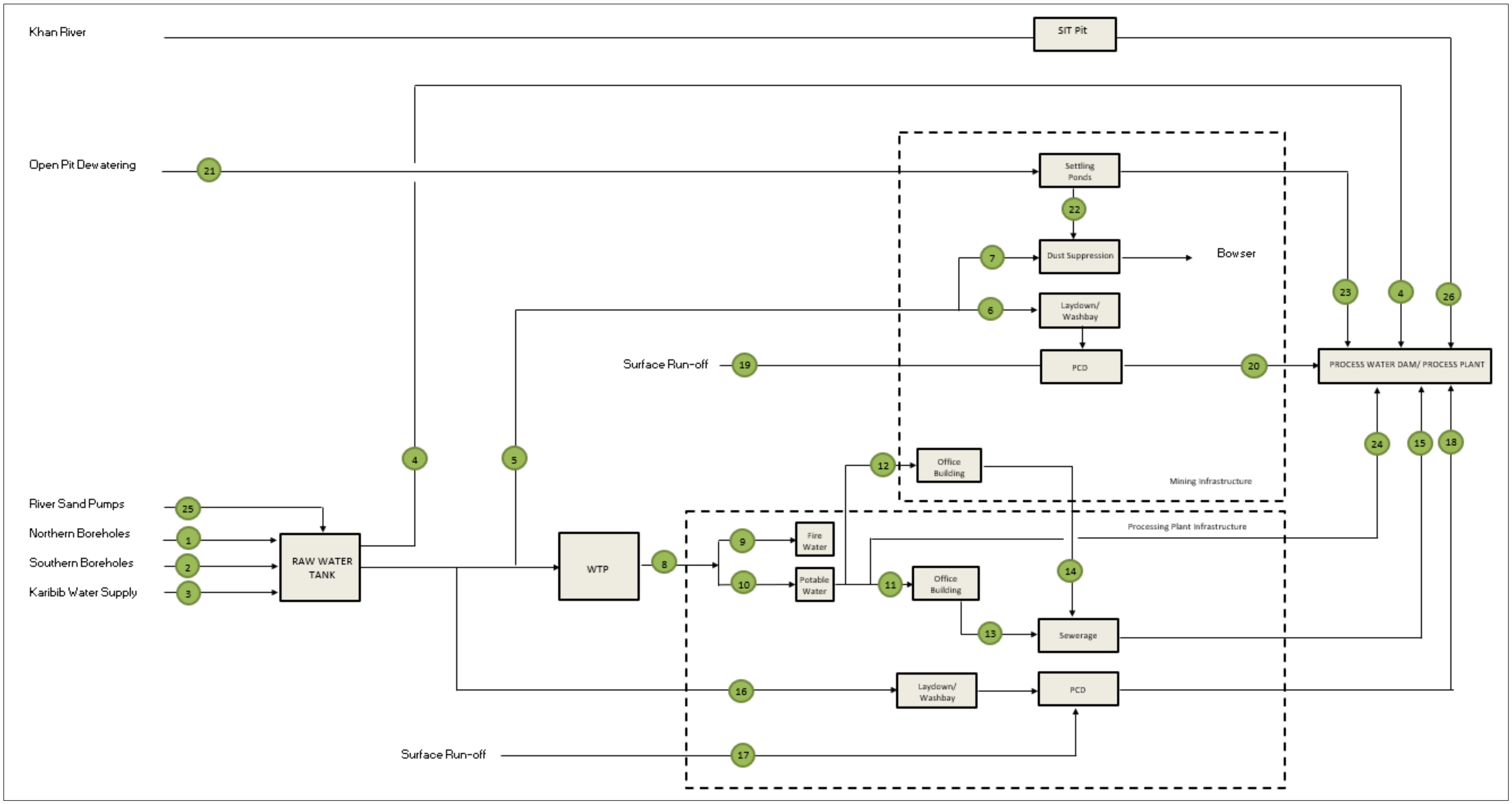
Future water supply from Kranzberg Water Scheme (NamWater) has been indicated on the process flow diagrams (PFDs). Tanks will be provided with nozzles for this future pipe connection if so required.

The water supply from the dewatering of the main Twin Hills open pit mining operations is indicated on the PFDs, as well as allowed for in the cost estimate. The water will be pumped with mobile pumps as the mine operations progress. The water will be pumped into twin settling ponds from where the silt in the water is settled out, and the clear water is then pumped to the process plant for use in the water requirements.

Seasonal stormwater runoff from the Okawayo stream diversion will be diverted into the Clouds West satellite pit once it is mined out. The Okawayo River is almost always a dry riverbed, but in the event of an occasional flood, water that is collected in the satellite pit will be pumped to the process water pond by using the existing dewatering pipelines and through the settling ponds. This water will be used in preference to borehole water until the satellite pit has been drained, to minimise evaporation losses from the pit.

If future mitigation factors are required on site to supplement process water supply from the site boreholes and pit dewatering, a managed aquifer recharge system is being investigated. Water from the Khan River Sand Storage Dam (SSD) would be pumped either into the limestone aquifers or into upgraded borehole supply water collection tanks and then pumped directly to the process plant into the raw water storage tanks. This option is still under investigation and no equipment piping or related installations have been included in the DFS designs.

Figure 18.2.13 Schematic Water Balance Diagram



Raw Water

Raw water will be supplied from the boreholes into the raw water storage tank from two separate northern and southern locations as indicated in Figure 18.2.14.

Four boreholes to the south of the processing plant with a combined volumetric flowrate of 115.0 m^3/h will supply water to a combined 150 m^3 bolted sectional panel collection tank before being pumped to the processing plant.

Two boreholes to the north of the processing plant with a combined volumetric flowrate of 23.1 m^3/h will supply water to a combined 20,000 L plastic JoJo tank before being pumped to the processing plant. No additional provision is made for a pipeline to supply water to the collection tank from the SSD as contemplated for future mitigation measures.

A capacity of 3,600 m^3 of raw water storage is required which will be supplied by two separate 1,800 m^3 bolted sectional panel tanks. Two tanks are provided to ensure that if maintenance is required on one tank, there is still some water reserve during the maintenance for the process plant to function and the process is not interrupted.

Additional inlets will be provided for on the raw water storage tanks if in future the Kranzberg water supply is required to mitigate any water supply risks.

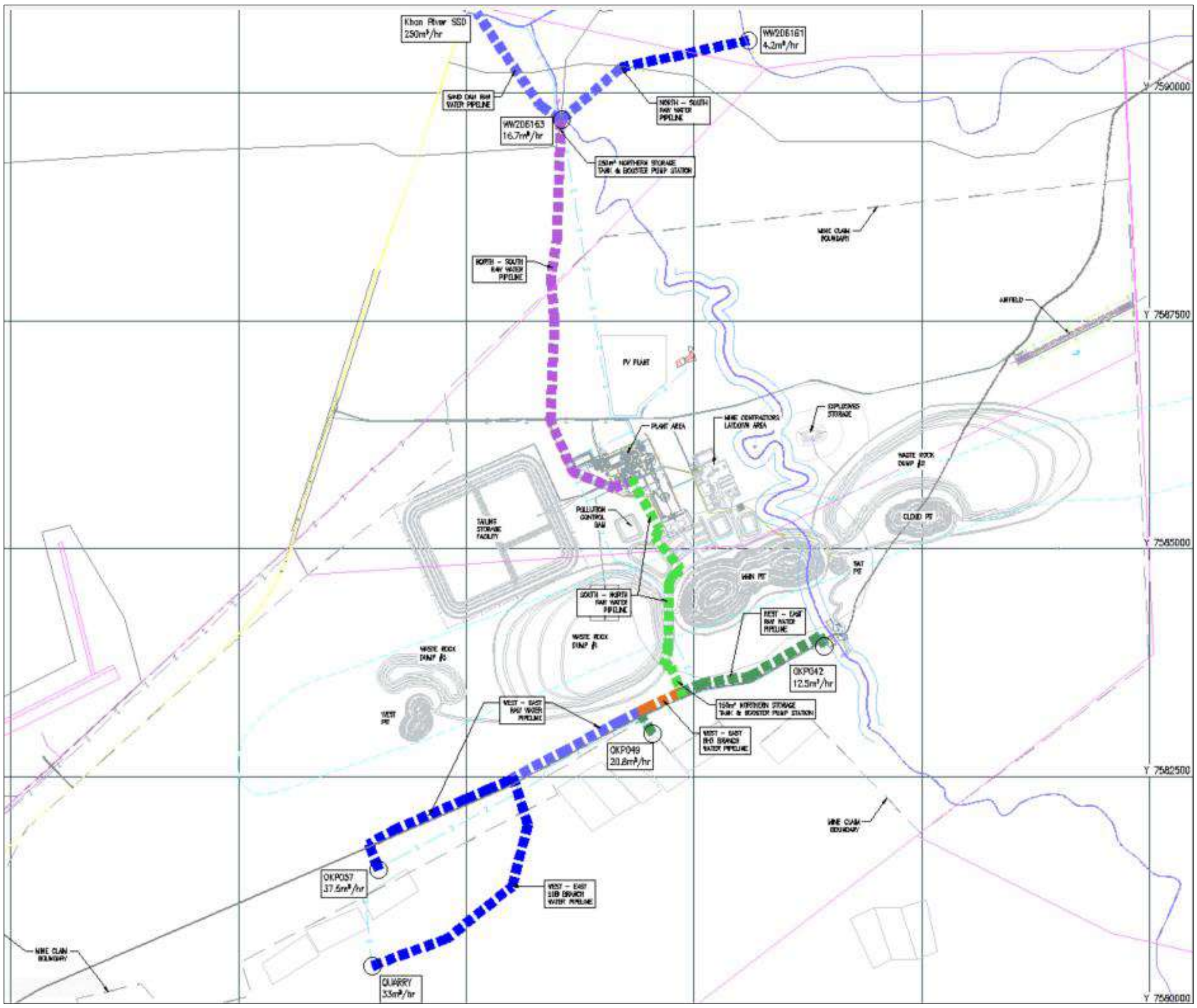
Raw water will be pumped from the raw water tank to the process plant and to the Mining Contractor establishment. Borehole water supplied from the boreholes can be used for the plant process, wash bays and dust suppression without any treatment but is not recommended for any drinking.

An additional raw water pipeline has been reticulated from the pressurised raw water line to maintain the tank level at the PV Yard. The water requirements are for general cleaning of the solar panels with a high-pressure hose. A 5 m^3/h pipeline will be installed with a water storage tank with a capacity of 150 m^3 has been provided for.

The control philosophy for the boreholes pumps is to close the inlet valves to the collection tanks with a mechanical float valve, thus preventing overfilling. The pressure will therefore build back along the pipelines back to the borehole pumps themselves, which will shut down based on a pressure transmitter at the borehole pump discharge. A flow switch will also be used to detect no-flow conditions.

The same principle will apply for the filling of the raw water tank at the process plant from the booster pump stations at the two collection tanks.

Figure 18.2.14 Borehole Locations on Site Blockplan



Potable Water

Borehole water is not recommended for drinking and ablutions because of its hardness and therefore it cannot be used in hot water geysers to be installed for showers.

Borehole water will be pumped from the raw water storage tank to the 12.5 m^3/h (16-h cycle) vendor supplied water treatment plant and then the treated potable water will be pumped and stored in the 600 m^3 fire and potable water storage tanks. The treated water will comply with the requirements of SANS 10241 Class 1, the Water Act of 1956, and the Water Management Act 2013.

From the fire and potable water storage tank, the potable water will then be pumped and kept under pressured in the buried HDPE pipe network to all areas required in the process plant footprint.

Domestic / drinking water will normally be supplied at a pressure of 400 kPa to the buildings, workshops, and plant, including the plant safety showers.

Potable water supply pipeline is included to provide domestic water for the Mining Contractor establishment.

The process plant water treatment works is designed for the following conditions:

- 1,000 employees at 200 L per person = 200 m^3/d.
- 12.5 m^3/h at a 16-h cycle for potable and domestic water use.
- 365 days per year and shall operate with an availability of 100%.
- Domestic drinking water, to comply with the Namibia legislation in order to apply for and obtain a water permit:
  - Water Act of 1956
  - Water Management Act of 2013.

The Namibian Vendor was provided with the borehole water quality reports and upon review has recommended a water softening plant to effectively lower the concentration of the calcium and magnesium in the water. The two softener vessels have been sized and selected for the design flow and will operate based on a 6-h run cycle. While one vessel is softening the water during a 6-h period, the other vessel undergoes a 2 - 3-hour long regeneration cycle. The Vendor has also stated that a reverse osmosis (RO plant) will not be required based on the borehole water quality report information provided.

Should the actual water quality differ markedly from the results provided (either due to water quality changes or differing blending rates), or the number of personnel differs, the design of the treatment system will have to be checked and possibly revised.

It is to be noted that as the softening is an ion-exchange process followed by disinfection, this results in calcium and magnesium being removed from the water and sodium ions in turn being added to the water. The sodium concentration in the product water will therefore increase as a result of this treatment.

Fire Protection & Detection and Hand-Held Fire Appliances

The plant wide fire water protection, detection systems and hand-held fire appliance systems will be designed, supplied, constructed, commissioned, and tested by a specialist turnkey fire risk and installation contractor.

The fire protection including the sprinkler systems and detection will be designed and constructed, tested, commissioned, and certified in accordance with the latest edition of the applicable standards, specification, regulations and fire protection codes of practice. Fire suppression systems designed and selected in accordance with SANS 10400 building regulations and best practice, NFPA 72, SANS 14520 & SANS 10139.

A risk assessment with risk matrix must be done and included in a Fire Risk Assessment Report before the detailed design can commence. The risk assessment will be reviewed and approved by the Client, the Clients insurers, as well as a third-party fire engineer registered with ASIB (Automatic Sprinkler Inspection Bureau) in South Africa and approved by the insurance company.

Included in the Fire Consultants costs are the provision for the risk assessment and design, including (but not limited to) the following key performance areas:

- Risk assessment, design matrix and report to comply with Insurance standards and requirements.
- Detailed design for fire protection, detection and handheld fire systems and installations.
- Detailed drawings including piping ISO for fire protection, detection and handheld fire systems and installations.
- Quality control throughout the design, installation, testing and certification stages.
- Third party engineer risk assessment, design and drawing review, milestone inspections, testing and certification.

The third-party Fire Engineer will be responsible for the issuing of a Certificate of Compliance for the entire fire protection and detections installation.

For the purpose of the study, a combined fire and potable water storage tank, buried fire water ring main reticulation fire hydrants was designed and catered for including the establishment of the fire pump station, which includes a diesel, electric and jockey fire water pumping system and associated equipment housed within a brick structure.

Water Services Tanks

All water services tanks will be fabricated and supplied from a specialist bolted sectional panel tank manufacturer located in South Africa. All tanks supplied will be provided with a concrete base, integrated roof, cat ladders and inlet, outlet and overflow nozzles sized for the respective duty.

The following sectional panel tanks are required for the Project:

- If the SSD is required in the future, a 250 m^3 sectional panel bolted tank for the northern borehole supply will be required. From this tank water will be pumped to process plant. Currently, a 20 m^3 plastic tank would suffice for the requirements of the water balance and the northern borehole pumping duties.
- 1 x 150 m^3 tank for the southern borehole supply. From this tank water will be pumped to process plant.
- 2 x 1,800 m^3 raw water storage tanks.
- 1 x 600 m^3 potable and fire water storage tank (the fire water outlet will be at the bottom of the tank and the potable water further up to ensure adequate water is stored for fire requirements).
- Provision was also made for 1 x 150 m^3 water storage tank for the solar plant panel high pressure pump cleaning requirements.
- The Mining Contractor will make its own provision for water storage requirements.

Water Services – Pumps and Pipework

The water services pumps have been specified, sized and selected based on the requirements of the water balance and will be installed on prepared civils bases and plinths complete with motors, stall fabricated bases, couplings or v-pulleys or gearboxes, and all pump suctions with isolation valves as applicable.

The raw water pumps (installed in a running / standby pumping arrangement) supply water to the mining and process plant infrastructure areas via a pressurized buried pipeline system. The water treatment feed tank is also supplied with raw water before being pumped to the vendor supplied water treatment plant.

A running / standby potable water pumping system has been sized to feed all infrastructure and buildings with potable water. Water required for safety showers installed in the process plant is also fed from this system.

The process plant's Pollution Control (stormwater) Dam is fitted with a single submersible pump complete with a davit providing easy access to the pump. Pumps sized to empty the contents of the Pollution Control Dam within seven days will be installed. It should be noted that the operational team must maintain the level of the Pollution Control Dam as low as possible ensuring maximum capacity is available in the event of a failure / storm.

The dual compartment settling pond is fitted with a single submersible pump complete with a davit allowing easy access to the pump. The pump will be controlled by level switches to run continuously, aiming to pump the clean water to the process water ponds for use.

The Clouds West Pit is fitted with a single submersible pump which will be used to pump the contents of this Satellite Pit to the process plant when required. Once the Okawayo floodwater dam and diversion berm is constructed, any water from the Okawayo stream that overflows the floodwater dam spillway for a 1:50 year flood event will be directed into the Cloud West Pit as additional water storage. It is anticipated that more than 900,000 m^3 of water could be stored in the pit. The same submersible pumps and water pipeline will be utilised or, if necessary, upgraded to pump the stored water to the process water ponds for process utilisation. If the Clouds West Pit overflows during any flood event, the water will continue to flow downstream of the main pit into the existing Okawayo stream. This will ensure that it does not impact any mining and processing activities.

Sewerage Reticulation and Septic Tanks

The current site layout is laid out such that there are no requirements for any rising sewer lines or sewer pumpstation. Sewerage will gravitate directly to the sewer treatment plants septic tank.

Sewerage reticulation piping and manholes will be provided to facilitate the flow of sewerage under gravity to manholes located on the site near to the buildings, from there the sewerage will flow to a main collection manhole located adjacent to the sewage treatment plant. Sewerage reticulation will be installed on the process plant area to cater for all buildings including a gravity line from the Mining Contractor establishment. The Mining Contractor will make provision for their establishment's sewerage reticulation in line with his mining yard layout and will tie into the sewerage gravity line provided.

Three 2,000 Litre buried HDPE septic tanks installed in parallel have been allowed for the treatment of sewerage at the two guard houses at the district road D1941 since less than 50 persons / day are expected to use the ablutions in these areas.

Sewerage Treatment Plant

Effluent water from the sewerage treatment water quality will comply with the Namibia legislation in order to apply for and obtain a water permit.

The sewerage treatment plant (STP) water discharge targets will be in accordance with SANS 10241 Class 1 or 2, and in accordance with international guidelines and Namibian Legislation requirements.

The modular packaged sewerage treatment plants will be installed at the lowest point of the respective terraces. All sewerage pipe reticulation will gravity feed to the sewage treatment plant.

The process plant sewerage treatment works (1 SET) must be designed to cater for the following volumes:

- 1,000 employees at 90% of 200 L per person = 180 m^3/d average dry weather flow (ADWF.)
- 16 m^3/h at a 16-h cycle for potable and domestic water use.
- 365 days per year and shall operate with an availability of 100%.

The sewerage treatment plant inlet works will consist of a screen to remove solid and non-sewerage items such as plastic bags, etc., from the raw sewerage before entering the septic tank. These inlet screens size will be 1,000 x 500 mm consisting of 30 x 4 mm S 304 stainless steel plate strips placed as above with 30 x 30 x 3 SHS crossbars.). The septic tank will have a storage capacity of approximately 180 m^3 from which the sewerage would be pumped into the sewerage treatment plant. The septic tank will be a concrete tank installed underground with a concrete roof.

Sludge from the sewerage treatment plant will be disposed into drying beds. Once the sludge has dried out, it will be mixed with wooden chips and spread onto the tailings dam or waste dump embankments which would act as fertiliser. Sludge will be removed once or twice a year.

The technology selected will be sourced and fabricated in Namibia and is modular, compact, simple, and robust. The integrated fixed film activated sludge containerized wastewater treatment plant is based on a fixed film activated sludge technology, where the biochemical oxygen demand is broken down using air and bacteria that grow in this medium. This system provides optimised nitrification and an effluent quality to a standard that complies with the requirements of the Department of Water Affairs and Forestry for the release of treated effluent back into the environment, in accordance with the values in terms of the Namibia Water Management Act 2013.

The plant will be housed in 2 x 12 m high cube shipping containers with all equipment housed inside and/or on top of the container.

Storm Water Retention and Water Storage Ponds

The following water storage and retention dams/ponds are planned for the Project. These storage facilities are all lined but not covered.

Table 18.2.4 Water Storage Ponds

Description	Capacity m^3	Lined	Cover
Stormwater Pond – Process Plant	43,000	Yes	No
Process Water Storage Pond	2,500	Yes	No
Settling Ponds – Main Pit	2 x 1,000	Yes	No

The classification and disposal of waste is set out according to the Minimum Requirements for Waste Disposal by Landfill, Second Edition 1998, as provided by the Department of Water and Sanitation of South Africa, which states:

- The handling, classification and disposal of hazardous waste, sets out the waste classification system. In this, wastes are placed in two classes, General or Hazardous, according to their inherent toxicological properties.

- Hazardous wastes are further subdivided into the risks they may pose at disposal, using a hazard rating, with hazard rating 1 and 2 are very and extremely hazardous, while hazard rating 3 or 4 are considered moderate or low hazard.

The details of the barrier system provided for the ponds are suitable for the containment of hazardous waste with a rating of three, effectively Class C barrier system, which are considered to include hydrocarbons, chemicals and oil spills contaminating the stormwater runoff from the following areas:

- General plant and workshop areas.

- Waste disposal facilities.

- Product loading areas.

The Class C barrier system minimum requirements in accordance with the Minimum Requirements for Waste Disposal by Landfill include several layers.

The different liners as specified in the lining system is required to fulfill the following functions:

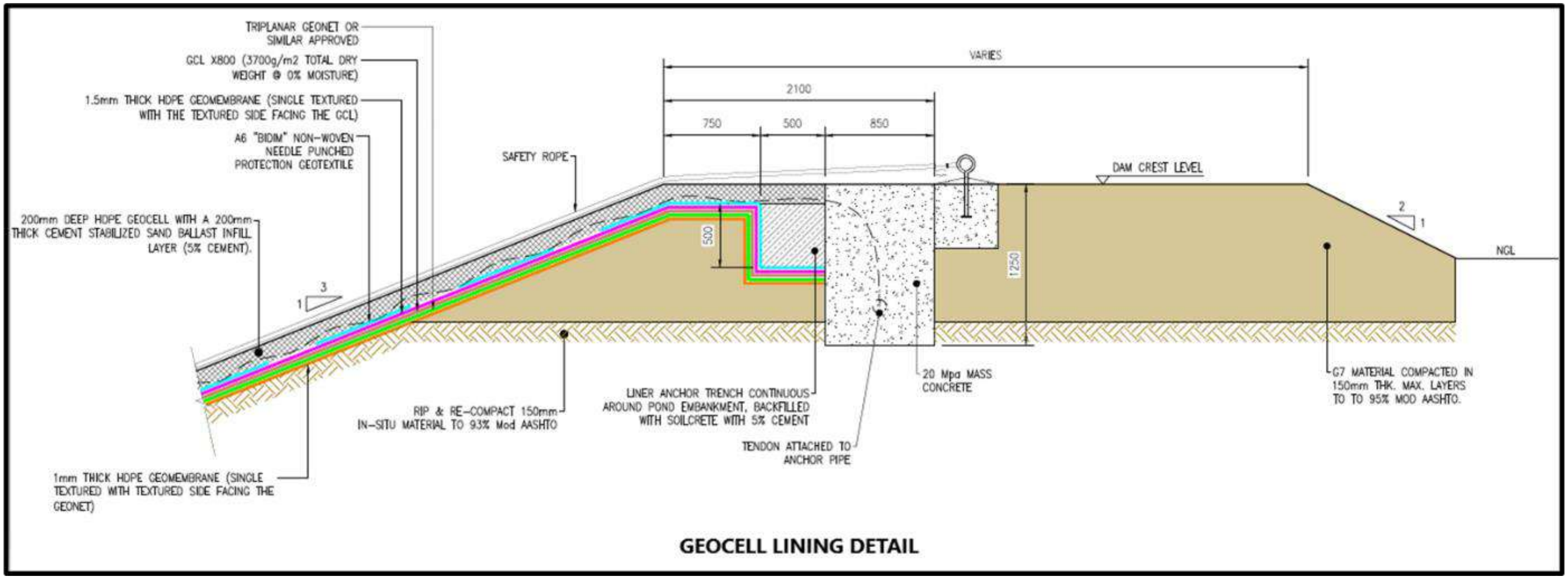
- 150 mm HDPE geocell with cement stabilized infill are required to protects the HDPE geomembrane liner from ultraviolet (UV) damage as well as exposure to any chemicals in the effluent, to minimizes wrinkles forming on the liner as a result of temperature differential, and provide a minimum 4 kN/m^2 containment pressure required to allow the geomembrane and geosynthetic clay liner (GCL) liners to function as a geo-composite layer, and prevent uplift forces which may occur because of a shallow water table or possible leakages.

- The A6 geotextile is used to protect the underlying geomembrane from the ballast filled geocell.

- GCL is used instead of a clay liner. Clay material is not available on site and to the correct permeability criteria, for this reason a GCL (geosynthetic clay liner) is used, which guarantees the performance criteria.

- A final Triplanar geonet and 1mm HDPE geomembrane form part of the under drainage and monitoring system where any leak that seeps through the geo-composite layer (1.5 mm geomembrane and GCL) would be guided by the Triplanar geonet towards the subsoil drainage pipe. The drainage pipes discharge into a monitoring manhole positioned outside the dam whereby any leakages in the dam could be detected timeously.

Figure 18.2.15 Typical Detail of Lining System for Ponds



The storm water ponds will be constructed with silt traps so that any silt from the storm water system and channels can settle and then removed using a skip steer loader.

The slopes of the ponds are based on a 1 to 3 gradient (inside of the pond walls) in order to obtain a stable slip slope and to ensure that if anyone did fell into the ponds that they are able to climb out. The ponds are based on excavating and shaping in-situ material; however, built-up walls are to be formed using competent import material, layered and compacted accordingly so as to produce stable embankments. Ponds are designed with a 0.8 m high freeboard to allow for emergency containment.

No pond covering to prevent evaporation has been allowed for.

Knotted safety ropes will be provided across the ponds so that should a person fall into the pond they can swim to the rope and then climb out. Safety buoys and signage will also be provided. All ponds will be fenced off.

Submersible pumps installed inside concrete champers will be used to pump the water out of these ponds. Stormwater and water from the settling ponds will be pumped to the process water pond.

Storm Water and Site Drainage

<u>Clean Water Berms</u>

Storm water cut-off berms will be constructed around the side of the process plant and the mining establishment on the higher elevation areas to divert any 'clean' stormwater run-off from entering the mining footprint. This will ensure that 'clean' and 'dirty' water are separated. The berms are required to prevent storm water from entering lower lying areas from areas with a higher elevation. The berms will be constructed using material from the bulk earthworks excavations. All dirty water collected inside the process plant footprint will be directed with drains to the storm water control dams. No Pollution control dam is required for the Mining Contractor's laydown area in line with the recommendations of the ESIA. Dirty areas such as the Workshops and the wash bay facilities will be bunded and drained into a oil/water separator system to remove any hydrocarbons and silt from the water. All cleaned water and runoff will be discharged into the environment.

<u>Site Drainage</u>

All areas where buildings or structures are to be erected will be constructed with 1 m wide sloped concrete aprons. to ensure that any water run-off will not pond / settle around the buildings and structures. Stormwater drains will be excavated trapezoidal drains which will be lined with concrete. This will ensure ease of cleaning of silt in the drains during maintenance periods. Drains will be trapezoidal in shape with the bottom section being minimum 200 mm wide and with side slope of 1:2.

Concrete culvert pipes will only be provided where really required. Open concrete dish drains will be utilised where drains cross the stormwater channels.

Security Fencing

The process plant site, which includes the offices, warehouses / stores, workshops and the storm water ponds will be enclosed by a 2.4 m high 50 x 25 x 2.5 mm welded mesh fence with flat wrap razor wire installed on the top of the fence and a 600 mm deep concrete edge beam below the fence to keep out animals and unauthorised people. The main access gate will be a sliding gate and will be kept locked at all times and will only be opened by security. An additional maintenance access gate is provided on the TSF maintenance access road and controlled by Security in a small security hut.

The boreholes and the borehole collection tanks and pump stations will also be enclosed with the high security fence as specified above for the process plant. This is to keep out any unwanted persons and animals. The Mining Contractor has made provision for the fencing requirements of his establishment. This includes any fencing requirements for the explosives magazine area.

A normal 1.2 m stock fence will be constructed along the new rerouted D1941 district road on both sides of the road in accordance with the minimum requirements of the Roads Authority. This will still ensure that game can move unhindered across the mine property.

18.2.5 General Description on the Layout of the Process Plant Infrastructure Facilities

The layout of the process plant, offices, warehouses, workshops, and other supporting facilities is indicated in Figure 18.2.16.

The location of the plant, offices, warehouses, workshops, and other supporting facilities has been located so that it is outside of the 500 m mining blast radius.

The primary crusher and the Mining Contractor site establishment will be located 500 m from the pit rim so that the hauling distance from the main pit to the primary crusher tip is kept to a minimum.

The prevailing winds are from the north-west (NW) in the summer months and from the south-west (SW) in the winter months. The offices, warehouses, workshops, and other supporting facilities have been located taking the prevailing winds into consideration. Soft to mild wind directions are predominantly from the NW. 'Strong' winds up to 30 m/s are from the SW (64% of the time) and from the NW (36% of the time). The administration offices, training facility and change-house facilities are also located the furthest away from the mills and the crushing circuit which create the most noise.

The TSF has been located to minimize the effect of dust being blown from the TSF over the office area.

The bulk services such as the sewerage treatment and main intake electrical substation are located north of the process plant. The offices, warehouses, workshops, and other supporting facilities are mainly situated to the north of the process plant. The main incomer substation is located as close as possible to the process plant area which will use most of the power.

The sewerage treatment plant is located NW of the offices, so that gravity sewer lines can be used.

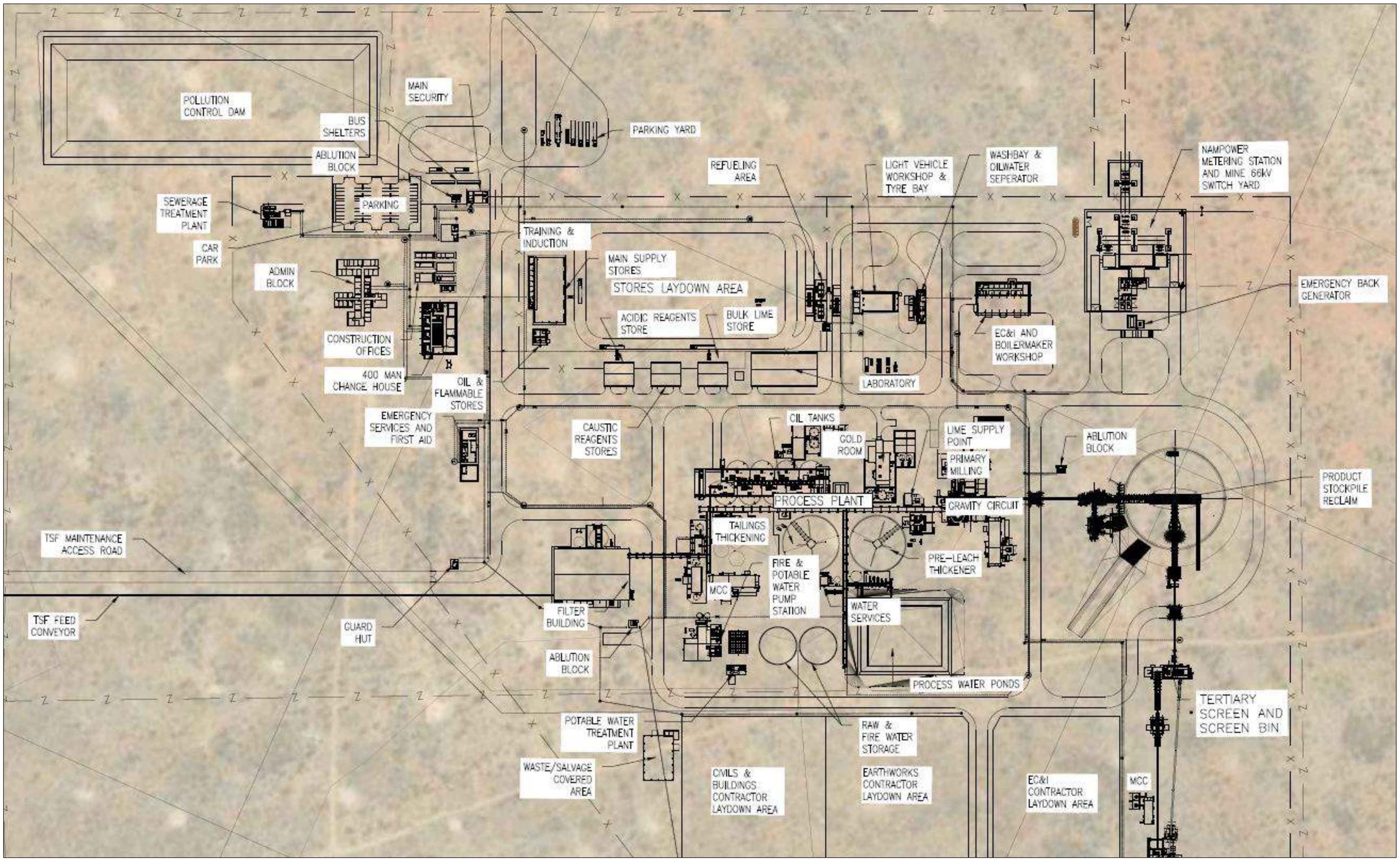
The water storage facilities including the fire pump station and the water treatment plant are located close to the process water storage pond. This is to ensure that all water services are together to distribute water requirements more efficiently.

The materials of construction, positions and orientation of buildings will be finalized during the front-end engineering design stage of the project in accordance with the Owner's sustainability requirements. Office buildings will also be orientated to maximize heating during winter and especially cooling during the summer months.

Green zones will be provided and will be used for the natural storm water drainage of the site, as well as, for dust 'barriers', preservation of natural fauna and flora zones and for aesthetics. Green zones will be watered using recycled treated sewerage water.

All buildings and structures have been based on available drawings from similar sized projects completed in other African countries.

Figure 18.2.16 Process Plant Infrastructure Layout



18.2.6 Buildings and Facilities

A cost comparison was done between prefabricated and brick building structures and difference in costs was negligible. As such, the buildings required on the Project site will generally be brick building structures or cladded steel frame structures on concrete foundations for warehousing and workshops. During the FEED phase of the Project or early in the execution of the Project, the buildings will be revisited from a sustainability perspective to incorporate as much local building material as possible into the designs.

The following brick-building structures buildings were identified:

- Main site administration office including reception, management, administration, human resources, finance.
- Training and induction facility.
- First-Aid and emergency response (including firefighting).
- Gatehouses and access control to site, mine, and plant.
- Safety, health, environment, and security (prefab site construction offices be utilised).
- Change House facility with laundry facility.
- Ablution facilities all around the site (x 6).
- Analytical laboratory.
- Refuse handling and recycle shed with office space.
- Bus stop shelters.

More substantial buildings will be steel framed and sheeted structures on concrete foundations and engineered concrete floor slab, purpose designed, such as:

- Equipment and light vehicle maintenance workshops.
- Electrical, control and instrumentation (EC&I) and boilermaker workshop.
- Main warehouse including a smaller oil and flammable stores facility.
- Process plant refuelling stations and bulk fuel dispensing located at the Mining Contractor laydown area.

- Plant workshop wash bays and silt trap facility.
- The electrical MCC buildings will be containerised or prefabricated e-house units with the MCCs and related electrical equipment pre-installed to minimise site work.

The Mining Contractor will be responsible for establishing and maintaining their equipment on site. Hence, the mining operations office buildings, control rooms, heavy vehicle, mining equipment and mining light delivery vehicle workshops and wash bays, heavy vehicle tyre workshop, heavy vehicle fuelling bays, mining warehouse, emulsion storage facilities, explosives magazine and mining personnel bus stops will be required, but the designs and costs have been included in the mining contract operating or capital cost estimates.

Certain infrastructure buildings such as a core shed, core cutting workshop and offices for Twin Hills exist already in the town of Omaruru. Additional open air core storage racking has been provided for in the Capex estimates.

Onsite infrastructure building structures for the process plant as described will include the following items:

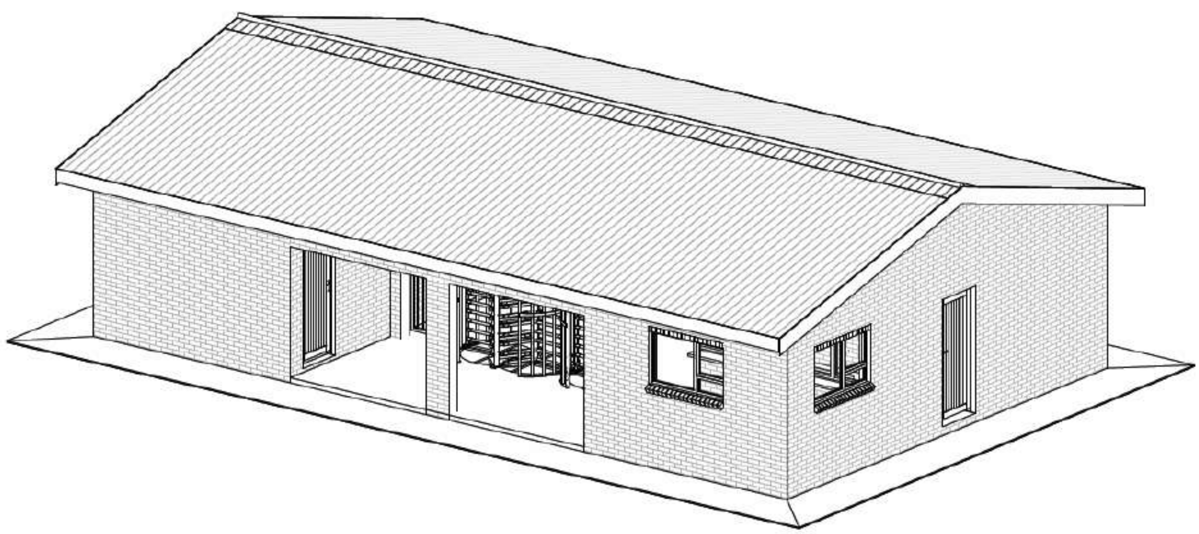
- All buildings will be complete with internal wiring for lighting and power installed inside trunking, distribution boards, fibre optic and Wi-Fi network connectivity, as well as air conditioners.
- All fire detection installations for all buildings and structures with a fire monitoring system.
- All hand-held fire extinguishers, hose reels and signage.
- Office furniture and shelving for all buildings where required and workshop tools for the workshops.

18.2.7 Infrastructure Buildings Provided

Security and Access Control

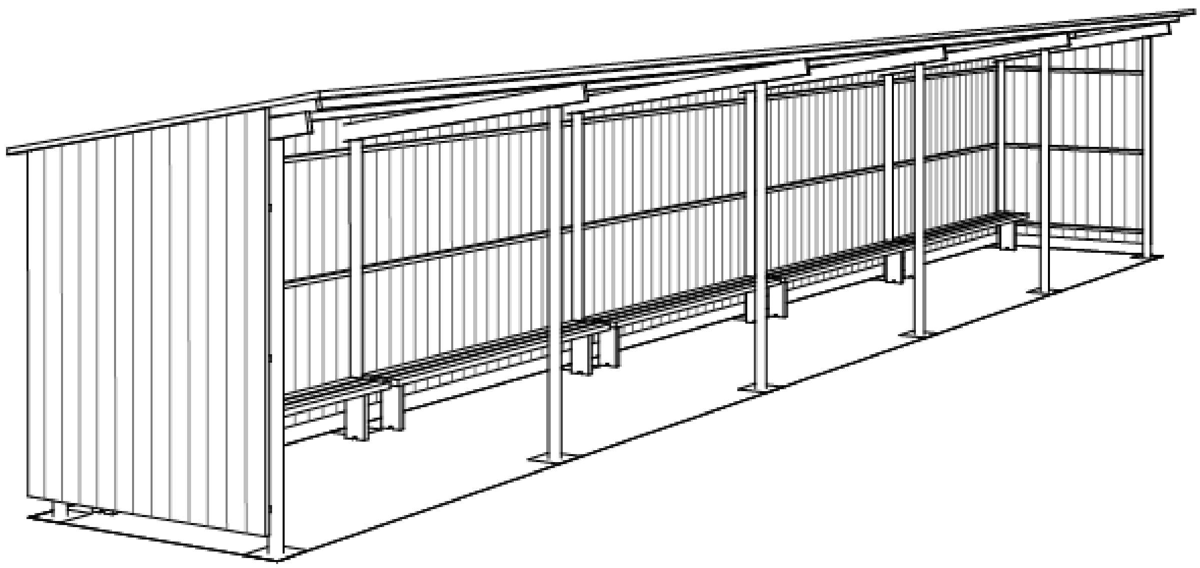
The main security and access control building is 190 m^2 in size. Access to the plant site will be restricted to one access points. This access point will be for personnel complete with access control turnstiles, CCTV (closed-circuit television), and gatehouse security building. It will also include vehicle access control for emergency access, reagent deliveries, maintenance equipment and spares. The gatehouse will be manned 24 h/d.

Figure 18.2.17 Main Security and Access Control Gatehouse



A bus / taxi terminus facility with bus shelters will be provided for employees using public or company transport, i.e., company owned / hired busses at the main security access control building. An ablution will be provided at the bus terminus for the convenience of the commuters. The ablution layout is the same as the internal planned ablution facilities.

Figure 18.2.18 Typical Bus Shelters

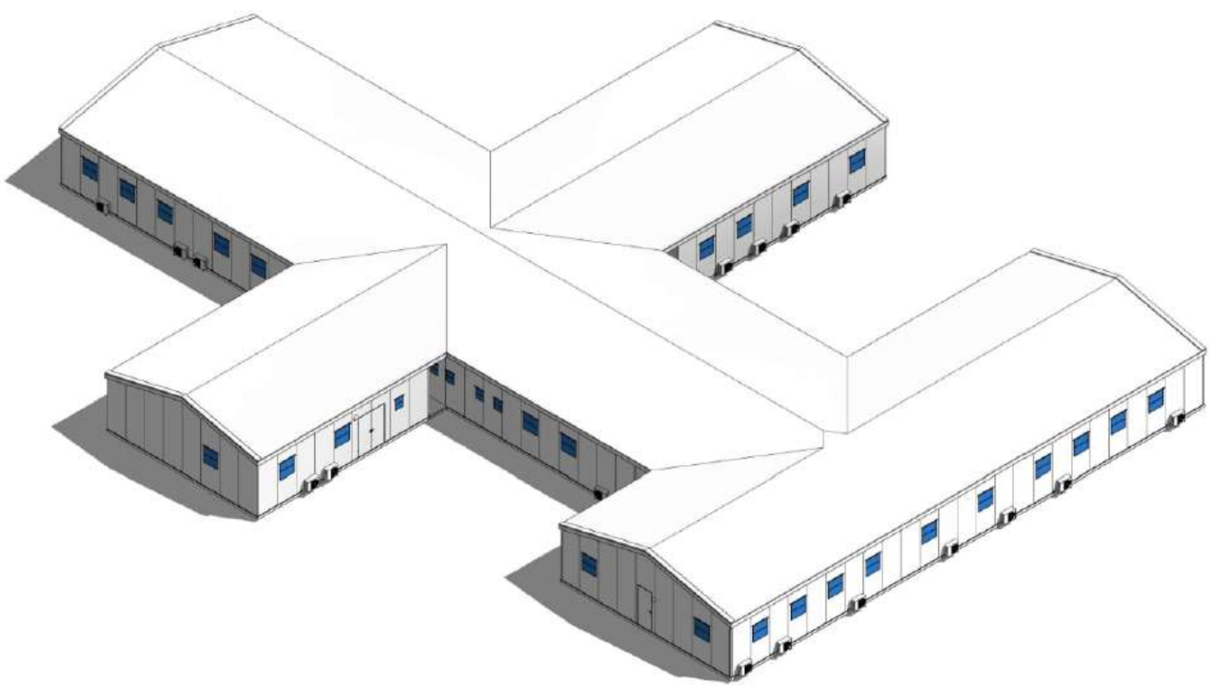


Main Administrative Offices

Only one main administrative office block is planned for the Project. Management for the process plant, the Owner's Mining Technical Services Management team and the General Administrative personnel will all be accommodated at the main administrative building. The building will be a 980 m^2 sized brick and mortar with a wooden roof truss roof structure. The main offices building will cater for:

- Small kitchen facilities.
- Toilet facilities.
- Small stores for paper, cleaning equipment and for filing.
- Open plan and private offices.
- Large board rooms and smaller meet rooms.
- Main entrance will have a receptionist and waiting area.

Figure 18.2.19 Typical Administrative Building



Safety, Health, Environmental and Training Office Facilities

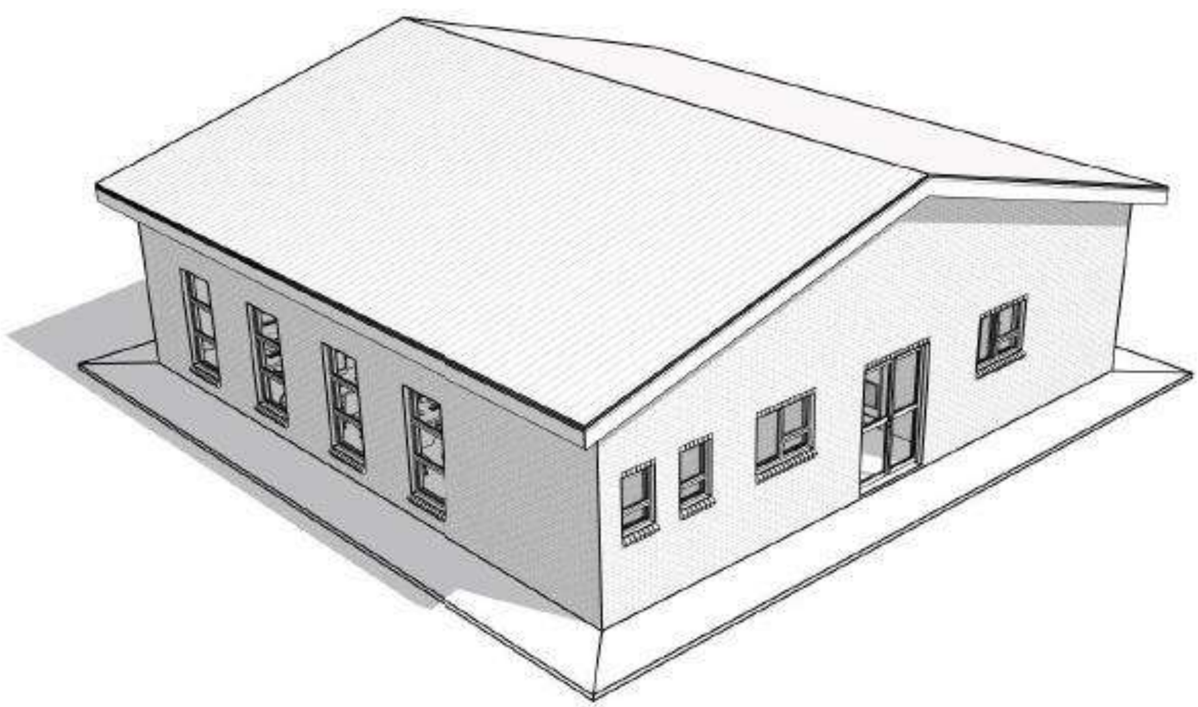
During the construction phase of the project, prefabricated offices will be erected on site which will function as the Owner's team and the Engineer's site construction offices. These building structures are the only structures to be prefabricated buildings. They will consist of 3 m wide x 12 m wide units due to their ease and relatively short time to install. Once the construction works are completed, these units will be handed over for the operations of the process plant and it will then be utilised to provide offices for the safety, health and environmental department and also office space for the training department and additional office space for the security department. This infrastructure is located ideally between the main security access gatehouse and the change house facility. The units will consist of open plan offices, private offices, small kitchen facilities, toilet facilities and a large and small boardroom.

Figure 18.2.20 Prefab Construction Offices Converted to Training, HSE and Security Offices

Training Facility

Provision is made for a 134 m^2 training facility which will consist of one large lecture room, kitchen, and toilet facilities. The offices requirements for the trainers are facilitated in the Safety, Health, Environmental and Training office facilities as described above. The purpose of the training and induction centre is to provide facilities whereby employees on site can be trained or educated on health and safety aspects, other developmental programmes, yearly re-entry inductions, and any other developmental programmes by external companies. The training and induction centre is to be located next to the canteen facility which also provides the opportunity if functions need to be held that these two structures could be used in combination.

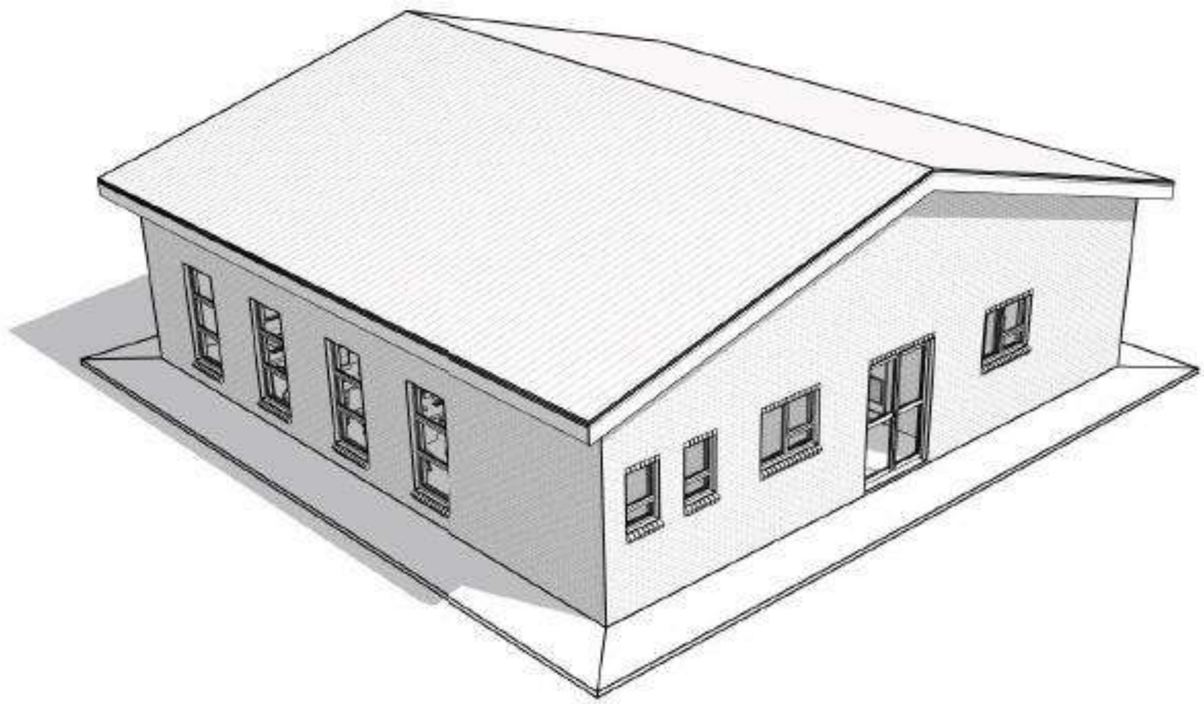
Figure 18.2.21 Typical Training Facility



Canteen Facility

Provision is made for a 134 m^2 canteen facility that can cater for 48 seats at a time. The purpose of the canteen is to provide a facility at which functions can be held on site and to serve food which are prepared by an independent catering services contractor off-site which are then only served on site to employees.

Figure 18.2.22 Typical Canteen Facility



Process Plant Change House Facility

The change house will be a 917 m^2 size steel frame structure with brick infill walls. The structure will cater for 350 process plant employees including provision for visitors and additional contractors that could work / visit the mine during the operational period.

The facility will have the following:

- Separate changing and showering facilities for males and females and for employees and management.
- laundry facility and PPE (personal protective equipment) stores.
- HR and Time attendance offices to cater for any queries by labour.

- Storeroom for cleaning chemicals, equipment and consumables.
- Heat pump facility including hot water storage.

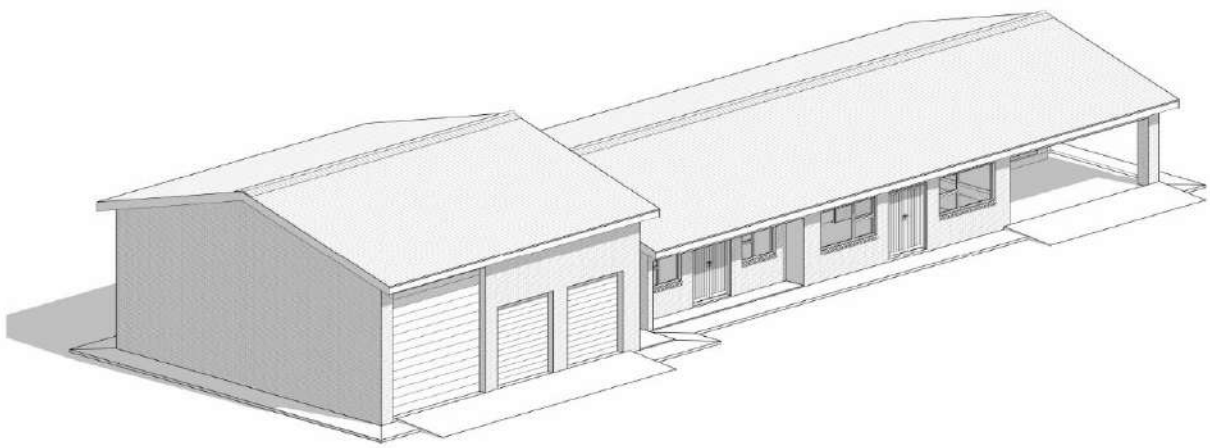
All the employees would receive a locker to store his / her personal belongings if he / she so requires.

First Aid and Emergency Response Building

The building structure which is 315 m^2 in size consists of two separate sections. The one area is the First Aid & Resuscitation building structure. Paramedical services will be brought in as a service contract and they will be located here. Provision is made for an ambulance parking / drop-off area, examination room, ward, storeroom, kitchen, toilets, sluice room and a reception / waiting area.

The second portion of the building structure is a covered enclosed parking area for the fire truck and the Fire Water Trailer. Provisional space is allowed for a storeroom to cater for the fire equipment.

Figure 18.2.23 First Aid and Emergency Response Building



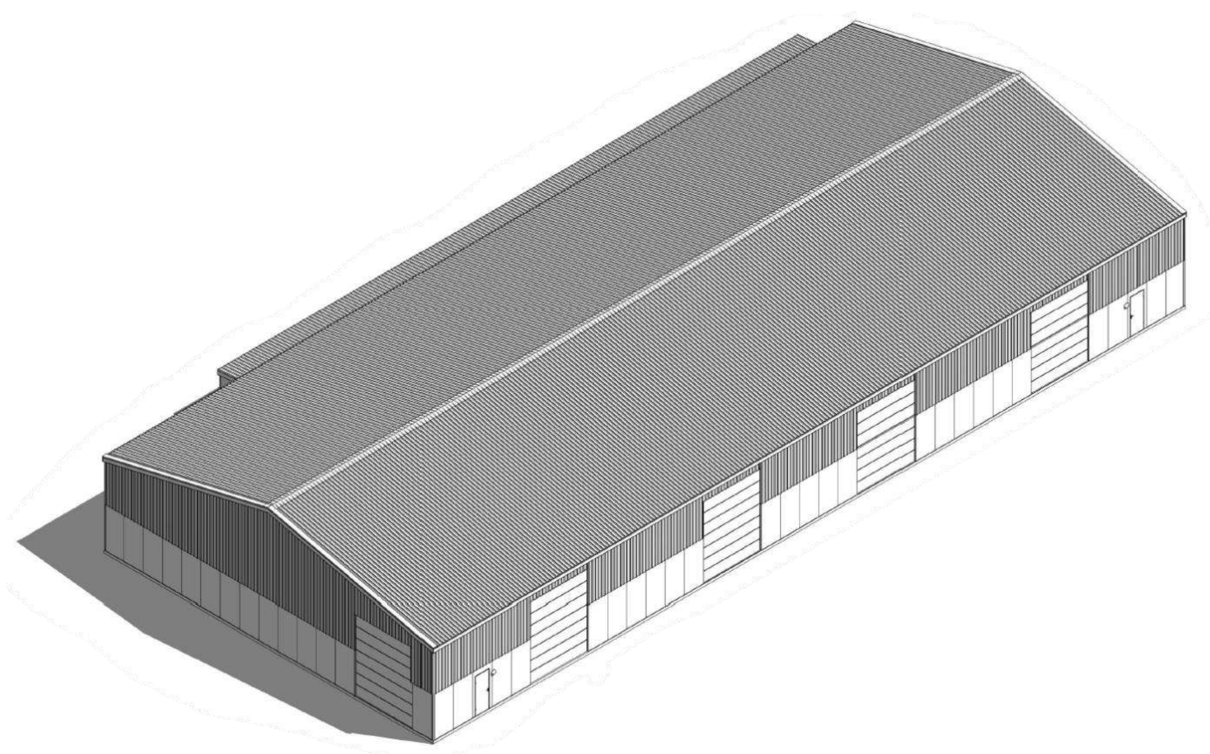
Main Process Plant Stores

The stores building will be a sheeted steel (roof and sides) portal frame constructed on concrete foundations with a concrete floor slab, providing a large open covered store space. The adjoining building structure which would mostly be areas such as offices, kitchen, toilets, storerooms, etc. shall be constructed from brick and mortar on strip foundations and a concrete floor slab. Lightweight galvanized steel or wooden roof trusses and purlins shall be installed and cladded with IBR roof sheeting including the use of Alucushion or similar for insulation purposes.

The main stores will have a storage floor space of 900 m^2 and office space of 122 m^2.

The stores shall be used for storage of all critical and operational spares and shall be situated within the plant infrastructure area. No overhead crane will be allowed for the building.

Figure 18.2.24 Typical Process Plant Stores



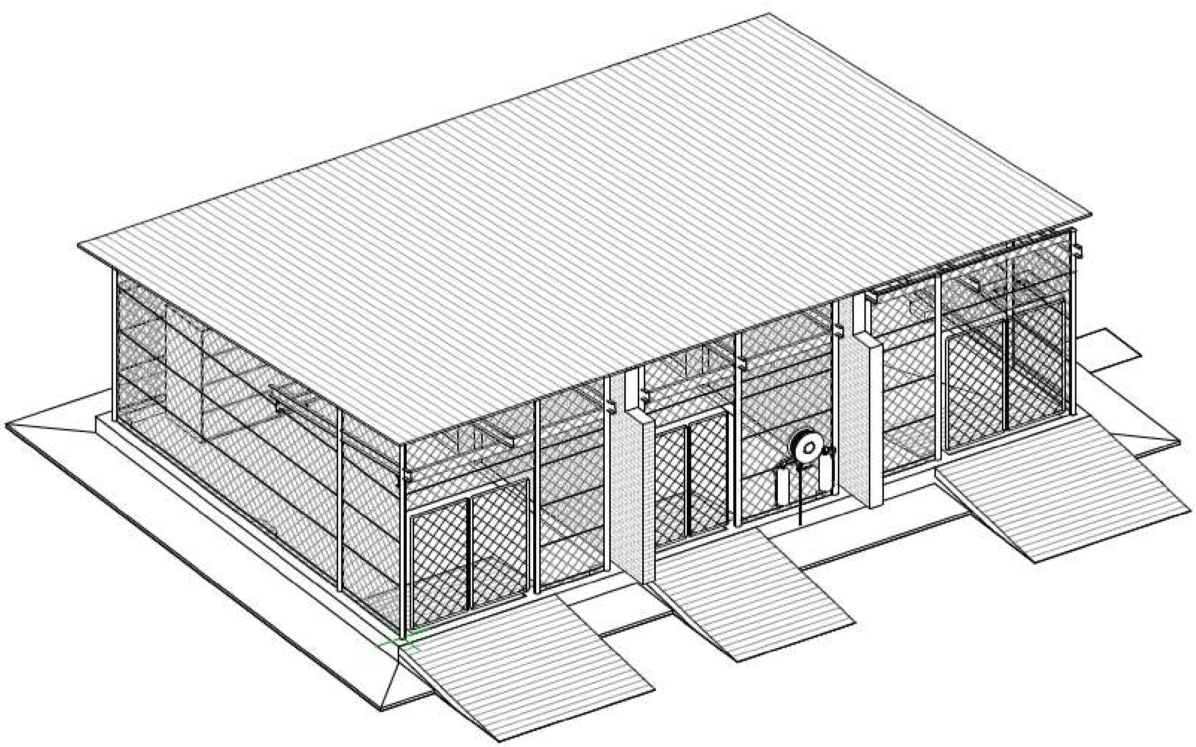
Flammable, Paint and Hazardous Material Stores

This 180 m^2 storage facility will be a sheeted roof steel portal frame structure constructed on concrete foundations with a concrete floor slab. The structure will be well ventilated, and all sides are closed off with welded mesh fence and lockable gates. No overhead crane gantries will be allowed for the building.

The stores will have three compartments each of 60 m^2 size. The compartments will be divided by a 230 mm thick brick fire wall. Each compartment will be able to store flammable goods, paint, and any other hazardous materials separately. The concrete floors will also have a sump in the floor with a drainage pipe that connects it to an oil trap for easy cleaning and maintenance.

This structure will be located in the stores yard close to the main stores (however far enough as required by the fire risk specialist) and will be controlled by the stores manager.

Figure 18.2.25 Typical Flammable, Paint and Hazardous Material Stores



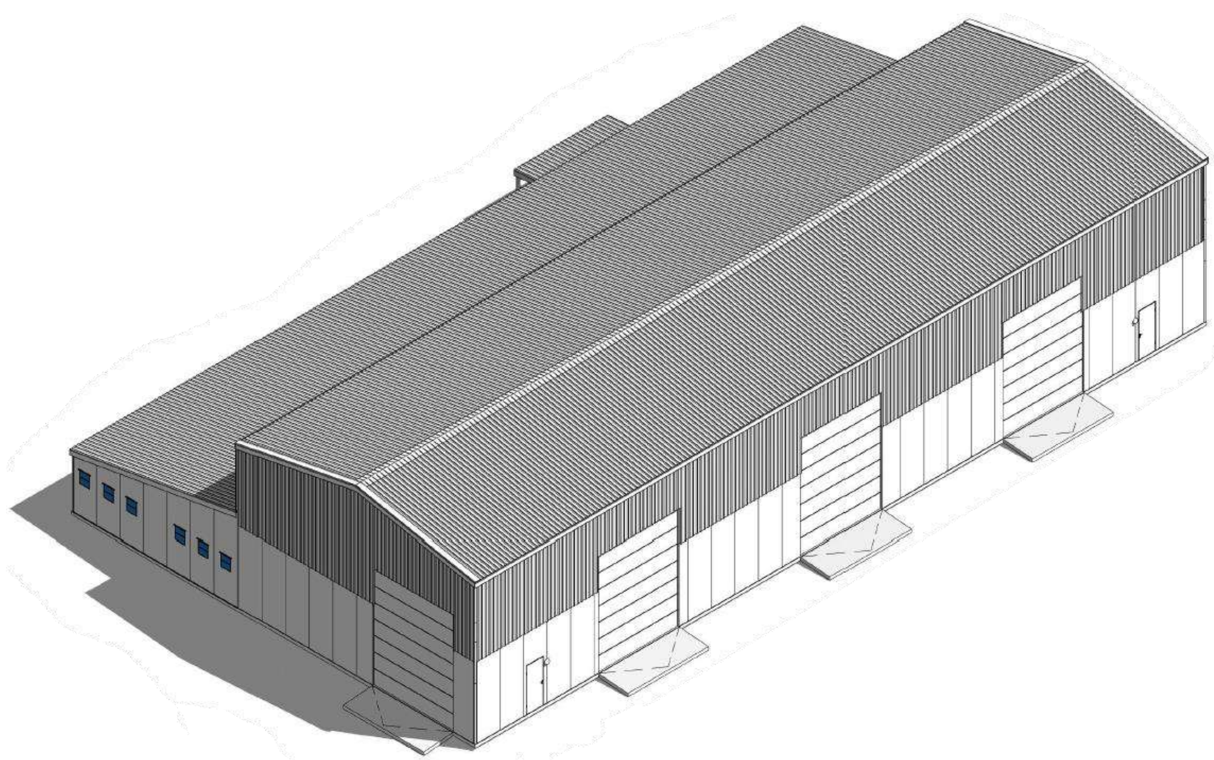
Boilermaker and EC&I Workshop

The workshop building will be a sheeted steel (roof and sides) portal frame constructed on concrete foundations with a concrete floor slab, providing a large open covered workspace. The adjoining building structure which would mostly be areas such as offices, kitchen, toilets, storerooms, etc. shall be constructed from brick and mortar on strip foundations and a concrete floor slab. Lightweight galvanised steel or wooden roof trusses and purlins shall be installed and cladded with IBR roof sheeting including the use of Alucushion or similar for insulation purposes.

The boilermaker and EC&I workshop will consist of a workshop area space of 460 m^2 and building space of 285 m^2. The building structure will have offices for workshop management team, kitchen and green area, toilets, and small spares stores.

The boilermaker and EC&I Workshop shall cater for the maintenance of all related process plant and infrastructure related equipment. A 5-ton overhead crane will be installed for the building to assist with maintenance. Preliminary startup tools, equipment and workshop infrastructure has been included.

Figure 18.2.26 Boilermaker and EC&I Workshop



Light Delivery Vehicles and Plant Equipment Maintenance Workshop

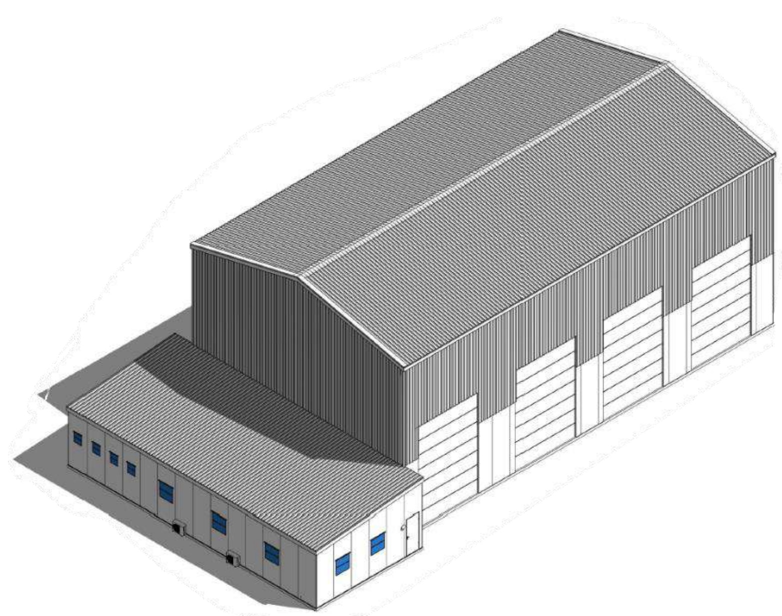
The workshop building will be a sheeted steel (roof and sides) portal frame constructed on concrete foundations with a concrete floor slab, providing a large open covered workspace. The adjoining building structure which would mostly be areas such as offices, kitchen, toilets, storerooms, etc. shall be constructed from brick and mortar on strip foundations and a concrete floor slab. Lightweight galvanised steel or wooden roof trusses and purlins shall be installed and cladded with IBR roof sheeting including the use of Alucushion or similar for insulation purposes.

The workshop will consist of a workshop area space of 460 m^2 and office space of 285 m^2.

The mine machine maintenance workshop shall cater for the maintenance of all related mobile equipment, LDVs and Utility Vehicles. A 5-ton SWL. overhead crane will be installed for the building. Preliminary startup tools, equipment and workshop infrastructure has been included.

It should be noted that this maintenance workshop is not to service the mine management employees' vehicles nor the busses that transport employees during shift changes. This maintenance shall be performed by the vehicle suppliers' workshops as these vehicles will still be under warrantees and service plans. This applies to any of the LDVs, trucks and any other road legal and licenced equipment that will operate in the Process plant area. The above workshop will cater for the basic maintenance and emergency repair of LDVs, delivery trucks, mobile cranes, Front End Loader, TLB (tractor loader backhoe or digger), telehandlers, forklifts, skid steers, etc.

Figure 18.2.27 LDV and Plant Equipment Maintenance Workshop



Wash Bay, Silt Trap and Oil / Water Separator System

A wash bay facility complete with a silt trap and oil/water separator will be provided. Dirty water will be collected in the silt trap facility where the silt / sand will settle to the bottom of the trap and the oily water will be flowing into the oil / water separator compartments. Oil / water separators to be installed to remove most of the oils and grease from the water before the water is reused for washing purposes.

A ramp into the silt trap will provide access for cleaning purposes either by front end loader or skid steer. A drying slab is provided next to the silt trap to dry out any silt before these are disposed of properly by the waste management contractor.

A slab with a steel frame structure and an IBR roofing is provided next to the silt trap for the oil / water separator system. Additional slabs are allowed for the waste oil tanks into which the waste oil is collected and stored. The waste management contractor will the collect full drums from the wash bay facility.

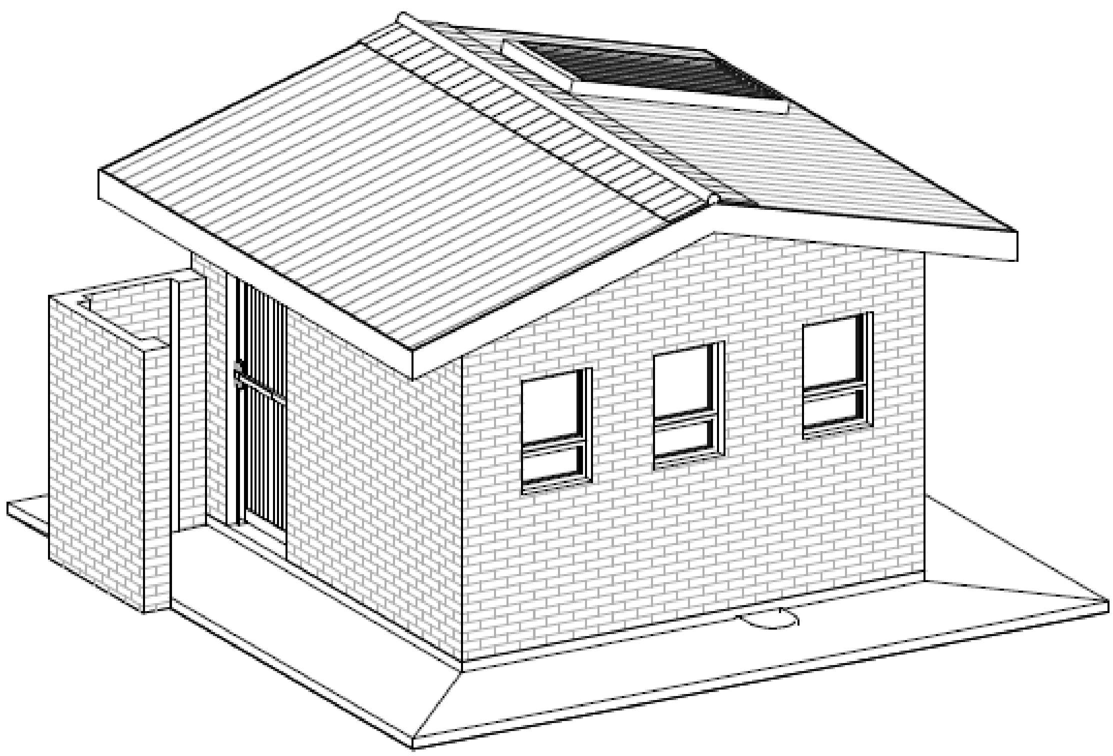
The wash bays will be equipped with high pressure cleaners connected to the potable water supply.

All wash water will be re-cycled by pumping it from the wash bay sump to the dust suppression pond so that it can be re-used for the dust suppression of the roads. Water bowsers will be filled from a goose neck.

Ablution Facilities (x 6)

There will be 6 x ablution facilities constructed around the site from outside the main security access control gatehouse, through the process plant areas all the way to the Primary crusher area. The 20 m^2 ablution building will make allowance for male and female toilets including hand wash basins.

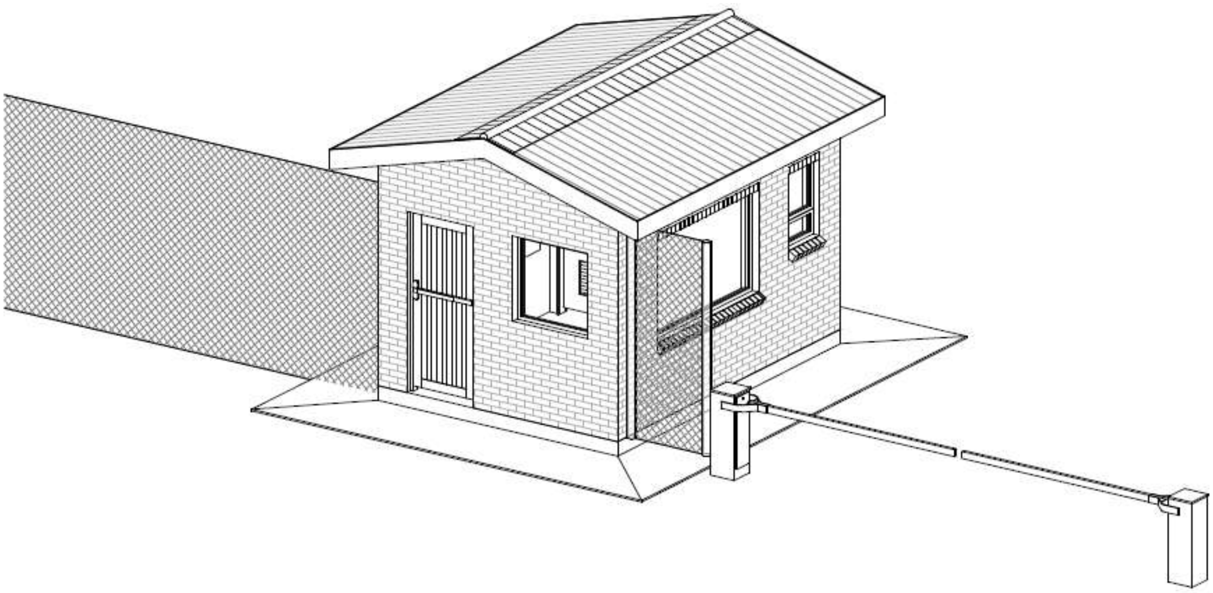
Figure 18.2.28 Typical Ablution Block



Security Access Gatehouses

A 14 m^2 guardhouse to be provided to control vehicle and truck access to the process plant, mine and possibly TSF. These buildings will be manned 24 hours a day by security with a lockable vehicle security gate that is to the same specifications as the fencing.

Figure 18.2.29 Typical Security Guard Hut



Weighbridge Facility

No requirements for a weigh bridge facility are foreseen and as such no provision was made for any weighbridge.

Fire Pump Station

A 49 m^2 Fire Pump station to be provided for the project.

The fire pump station will be a sheeted roof steel portal frame structure constructed on concrete foundations with a concrete floor slab.

The pump station shall be enclosed with wire mesh and lockable gates to provide a secured and tamperproof installation.

The fire water pump station will include the diesel and electric pumps and a pressurising jockey pump with a control panel and instrumentation.

Overhead crawl beams will be allowed for the building to remove pumps for maintenance purposes.

Containerised MCC Buildings Structures

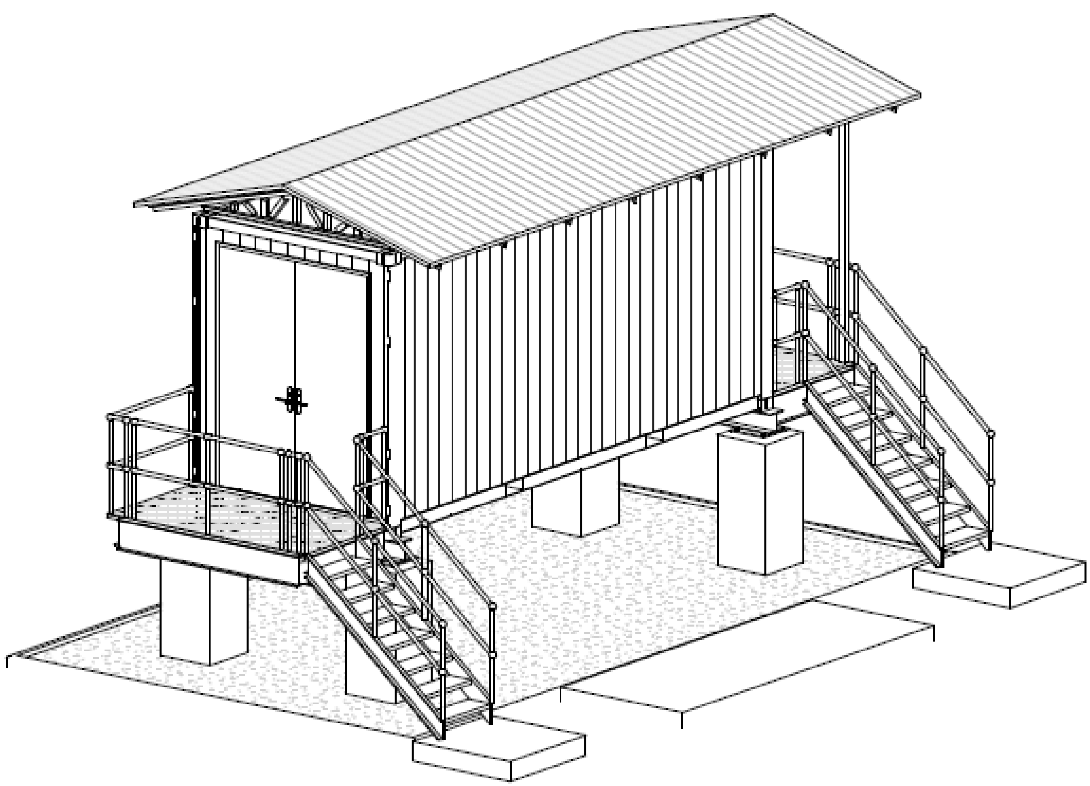
The MCC buildings will be sealed containerised units which will be installed on concrete plinths in an elevated position with steel staircases and landings to designated doors. A sheeted steel roof and roof insulation will be allowed over the container to ensure adequate temperature control within the container.

The containers will be complete with lighting and small power, fire detection and air conditioning systems. Pedestrian access doors will have self-closing mechanisms installed along with emergency escape locksets to facilitate emergency egress.

Cable entry into containerised MCC buildings will be from the bottom.

For the two-collection storage tank booster pump stations on the borehole water supply, the containerized MCC units will only be installed on concrete sleepers slightly above ground level. Cable trenches will be dug to facilitate cable entry.

Figure 18.2.30 Typical Containerised MCC Structures



Bulk Fuel and Lubes Supply, Storage and Dispensing

The Supply, storage and dispensing of fuel and lubes will be outsourced to a reputable service provider in the Namibian fuel industry. The service provider will supply, install maintain and operate all the surface infrastructure including (but not limited to) self-bunded tanks, offloading and dispensing fuel and lubrication pumps, metering systems and all auxiliary equipment necessary to fulfil his operational service agreement including the provision of personnel, operators, maintenance staff, offices, stores, and toilet facilities.

There are currently two separate offloading, storage, and dispensing system facilities of which one smaller facility is at the Process Plant and the main bulk fuel depot is located on the Mining Contractor's yard as more than 98% of the fuel consumption is used by the Mining Contractor's mining fleet.

Excluded from their service agreement is the provision of civils for their requirements. For the civils provision was made for concrete bunds around the storage tanks to contain any spillages or leaks and to provide concrete sloped surface beds with drains and oil trap facilities for the dispensing and refuelling slabs.

The Bulk Fuel service provider will install and maintain a Fuel Management, Control and Monitoring system to minimize losses due theft and other wastage. This will include the facility for the Owner's team to monitor consumption figures.

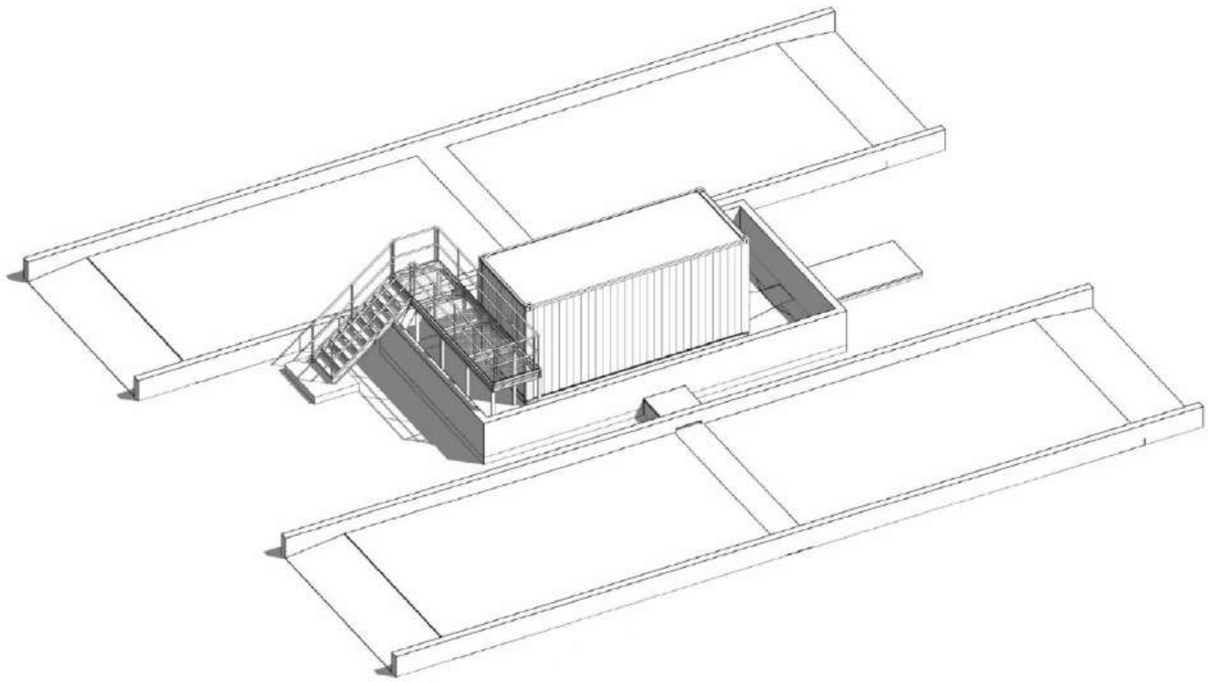
The fuel installation will be designed and fabricated in accordance with the appropriate codes, standards, and specifications.

Process Plant Fuel Storage Facility

The diesel for the process plant usage will be supplied by means of a diesel bowser, to a self-bunded 32,000 litre diesel storage tank inside the plant stores area. The diesel truck will fill the diesel storage tank from the stores facility and would not be required to enter the process plant. The diesel tank would be refilled every four weeks to reduce truck traffic in the process plant area. The vehicles and equipment that is inside the Process plant fenced area will refuel from this fuel storage tank. The layout is set out such that these equipment does not require to enter the stores laydown area. A small office hut is allowed for the fuel attendant at the process plant fuel storage facility. Fuel required in the process plant for the carbon regen kiln and for the elution heater day tanks will either be piped or delivered via a small fuel bowser to the process plant area.

Refuelling of the Owner's team LDVs, and the shift change transportation busses will be done at the main bulk fuel depot which is located at the Mining Contractor site establishment.

Figure 18.2.31 Process Plant Refuelling Bay



Bulk Fuel Dispensing and Storage Facility Including Lubes

As more than 98% of the fuel is being utilized by the Mining Contractor it makes sense to locate the bulk fuel storage and dispensing close to the Mining Contractor site establishment in such a way that it is in a central point whereby the mining fleet can also be refuelled without interfering with the LDVs, Transportation busses, and any other smaller plant and equipment. The facility will also make provision for the storage and dispensing of lubricants based on four weeks of stock holding.

A dedicated offloading slab is allowed for the fuel supply vehicles delivering fuel and lubes to the bulk fuel storage. It is anticipated that there would be as many as 13 deliveries taking place during a week.

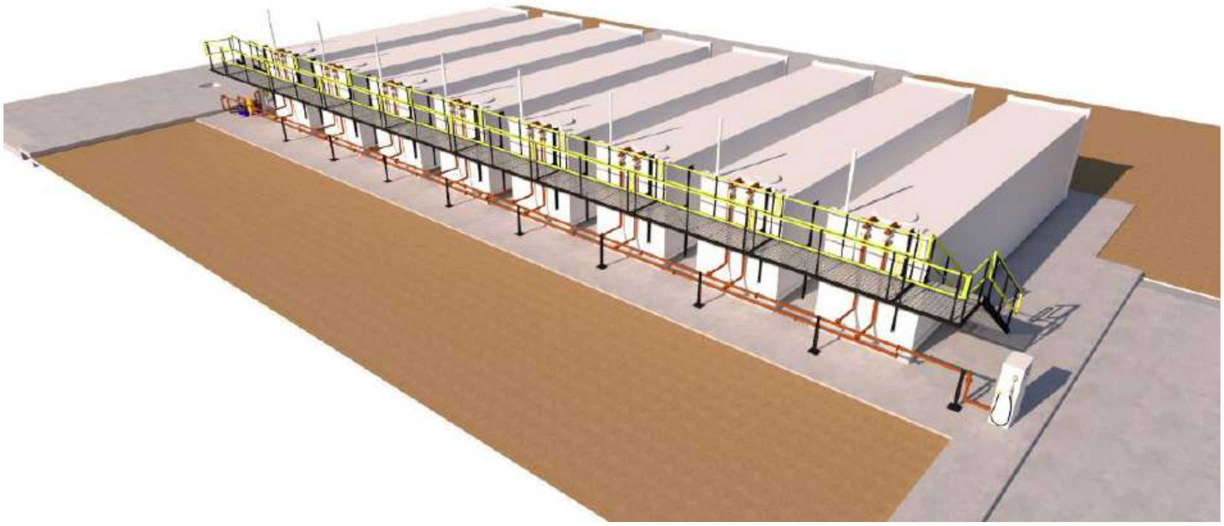
On this basis one storage facility with two separate dispensing stations have been specified and provided for. One for the Mining Fleet and one for the LDVs, delivery trucks, busses, and non-production support mobile equipment. This is to ensure that the mining production fleet and the rest of the equipment, vehicles and busses are separated to ensure high safety requirements.

The Mining Contractor can refuel directly at the fuel dispensing station and will also provide a fuel and lube bowser to re-fuel and lube the heavy mobile equipment (HME) mining vehicles and equipment in the pit and mining areas where necessary.

The Bulk Storage and Dispensing installation will incorporate suitable operational procedures, management systems and fuel management system software and equipment to ensure the following value-added cost improvement initiatives for ongoing monitoring and reporting purposes:

- Condition monitoring of new lubricant through on-line particle counter at the dispensing side of the supplier / owner operated fuel tanks and fuel and used oil analysis systems.
- Technical product training.
- Improvement of refuelling times.
- General housekeeping.
- Spillage and waste control.
- Used oil recovery and reporting.
- Risk and potential risk reporting.
- Lubricant and grease survey – ensuring correct application and continuous improvements.
- Monitoring and reporting on equipment consumption through an approved product reconciliation Fuel Management System (FMS) and/or point of sale flow meter on the bowser.
- Complete fuel supply management from ordering to invoicing including automatic tank gauging, fuel dispensing capturing equipment and software.
- Stock on consignment fuel and lubes consumption measurement and invoicing through an NSI (Namibia Standards Institute) certified custody transfer meter (calibrated twice annually by certified NSI Contractors).

Figure 18.2.32 Typical Bulk Fuel Storage Facility



Lubricants

The lubrication for the process plant and for the Mining Contractor's heavy mine equipment and non-mining equipment will be supplied and stored in bulk lube storage tanks at the facility from which it will be dispensed into drums which will then be transported to the workshops for use or be dispensed into the lube bowser of the Mining Contractor for maintenance of pit vehicles and equipment.

There is also a used oil tank whereby used oils and lubricants can be temporary stored prior to off-site disposal.

Solid Waste Management

Solid waste generated from the offices, workshops, warehouse, stores, plant site, including ancillary buildings, will primarily be domestic and industrial non-hazardous waste.

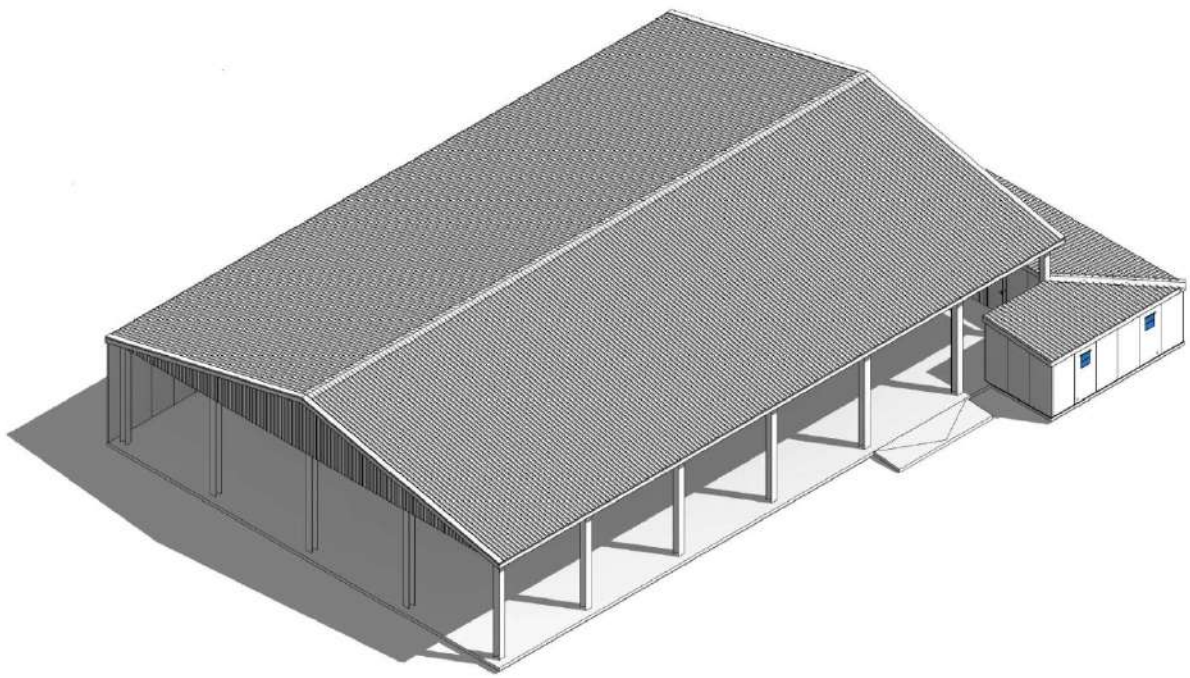
A contractor will dispose of the solid waste for at the Karibib waste disposal dump. A recycling and bailing plant will be erected on site for the sorting, picking and bailing of paper, tins, glass etc. and then transported to existing recycling facilities located in Karibib or Windhoek.

Sludge from the old mobile equipment oils, oil separators and other hydrocarbon spillages, as well as any hazardous waste will be transported to Walvis Bay for disposal at an existing approved facility located in Walvis Bay.

The solid waste management unit will not include an incinerator but a sorting, picking facility with waste shredder and a waste bailing plant for recoverable waste.

The waste management contractor requires offices, ablutions and a roof covered area to work from. A shed with offices was allowed for in the Capital Cost estimate. Ablutions was not included as there is a nearby ablution block which caters for all working in this area pf the process plant.

Figure 18.2.33 Layout of Waste Management Shed and Offices



Explosives Emulsion Plant and Explosive Magazine

The Mining Contractor is responsible for the supply and storage of the explosives and blasting accessories required for the liberation of ore. A pad, as well as access to the emulsion silos and plant for this facility will be provided by the mining contractor. The Mining Contractor must ensure that the facility is properly secured and that it complies with the requirements of the Namibian Mining and Explosives regulations for the construction of explosives storage.

18.2.8 Accommodation of Contractors During Construction

The following philosophy was adapted to ensure that adequate accommodation is available during the construction of the project. Serviced land will be made available in Karibib town for contractors to establish temporary accommodation camps. The contractors' employees will then be transported via busses or LDVs from the contractors' camps to site during the construction phase.

Provision was made by each discipline contractor to establish its own camp accommodation buildings in accordance with the minimum requirements as provided to them when they priced the scope of works.

At the start of the project, a 10-man camp will be established at the Van der Walt's farmhouse to cater for the Owner's team that is involved during the construction of the project. The camp will be established, and the accommodation units will be rented for the duration of the construction of the project.

The Van der Walt's farmhouse will also be upgraded to provide additional rooms, office space, kitchen, dining and entertainment facilities which will also cater for the Owner's team during the construction phase of the project.

The EPCM Consultant will be lodged in accommodation in Karibib. Furthermore the 96-bedroom dormitory at the private school in Karibib will also be rented out to provided additional accommodation for skilled workers and or operators for contractors.

18.2.9 Infrastructure Required for Bus Transportation of Employees

The transportation of Personnel between the site and towns (Karibib and Omaruru) will be outsourced to a bussing company. The service contract will include for the provision of drivers and buses, as well as depots in Karibib and or Omaruru. Maintenance of the busses shall be done at the workshops that supplied the vehicles as they would still be under guarantee and with service plans. The busses will however refuel at the bulk fuel distribution depot located at the Mining Contractor establishment. No further infrastructure requirements are needed.

18.2.10 Non-Production Process Plant Equipment

Mobile equipment, not directly required to maintain production or mining operations, including early works vehicles, plant and equipment has been specified.

The following equipment and quantities have been included:

- Light Delivery (Double Cab) 4x4 Vehicles (LDV) x 8
- Light Delivery (Single Cab) 4x4 Vehicles (LDV) x 5
- 4x4 Enclosed Soft Roader Utility Vehicles (SUV) x 3
- 14-Seater Transporters (Mini-Bus) x 3
- 3t and 5t Forklifts x 4
- 55 t SWL (safe working load) All-terrain mobile crane (Used) x 1
- Telehandlers x 1
- Skid Steer Loader x 1
- Tractor-Loader-Backhoe (TLB) x 1
- Front End Loaders x 1
- Flatbed drop-side truck with 5 t crane x 1
- Fire truck and trailer x 1

The current Roads Authority owed District roads which include the rerouted D1941 is maintained by the Roads Authority through appointed gravel road maintenance contractors. These contractors also do private work and will be appointed for any ad hoc maintenance works on the gravel roads as required.

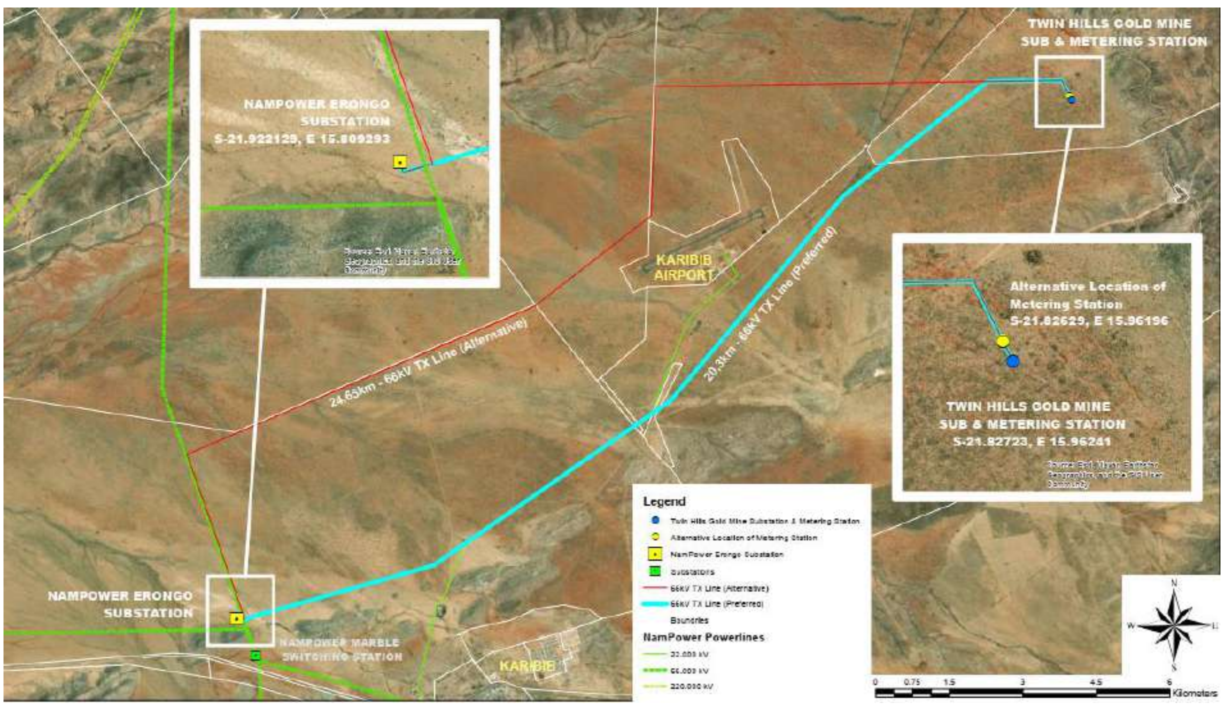
18.3 Bulk Services – Power Supply and Distribution

18.3.1 NamPower Connection

The Project power average demand has been estimated at about 23.5 MW, most of which will be supplied from the Namibian grid by a high-voltage overhead powerline to the site switchyard. The national grid connects to the town of Karibib with a 66 kV line, which also supplies the Navachab gold mine.

NamPower has commenced with the Construction of the new Erongo Transmission Substation, when completed will supply the transmission customers in the area (including the town of Karibib, Navachab gold mine and Twin Hills gold mine) forming part of the Power Utilities Transmission Master Plan.

Figure 18.3.1 Planned 66 kV Line from Erongo Substation to the Twin Hills Intake Substation



In June 2022, Osino signed a power-supply agreement (PSA) with Namibia's parastatal power utility NamPower (Pty) Ltd (NamPower). The agreement is to supply a minimum of 16 MW through a dedicated 66 kV feeder bay and overhead lines from the new Erongo substation at Karibib town, approximately 20 km from the project site. Under the terms of the agreement Osino has an option to pay 30% of the capital costs as an initial deposit and the remaining 70% divided into five equal payments during the supply and construction period, with specific dates to be agreed once the start of the project timeframe has been determined.

The terms of the agreement also stipulate that grid power supply is subject to a 36 to 48-month NamPower procurement and construction lead time, which places the power supply on the critical path of the project. Following the first deposit payment Osino will engage NamPower to shorten the procurement period and manage parts of the construction and implementation of the connection.

Osino intends to fast track the development of the substation and transmission infrastructure in line with the project development timeframe. The DFS processing plant capacity has seen the average power demand grow to approximately 23.5 MW. Discussions with NamPower will also include updating the agreement to cater for the expected maximum demand of 30.5 MVA.

18.3.2 Twin Hills Switchyard and Consumer Station

The Twin Hills Gold Mine switchyard will be designed to accommodate the 66 kV supply from NamPower. The substation shall be implemented in accordance with all IEC and local SANS standards (where applicable) as well as maintaining compliance to the Namibian Transmission Grid Code and NamPower technical requirements.

The 66/11 kV switchyard and associated infrastructure shall be designed for the following:

- Approximately 20 km of 66 kV overhead power line designed and constructed according to NamPower specifications (Steel mono pole design with Pelican conductor and optical ground wire ((OPGW)) shield wire).

- NamPower 66 kV Metering Station as per NamPower specifications and in accordance with the metering code.

- 66/11 kV outdoor type switchyard with the following:

  - 66 kV incomer feeder bay from NamPower

  - 66 kV busbar rated for 800 Amps

  - 2 x 66 kV transformer feeder bays

- 2 x 40 MVA 66/11 kV Transformers (redundant transformers each with NECRT auxiliary transformers (Neutral Earthing Resistors with Auxiliary Transformers) for local consumer station AC auxiliary power station supply and single fault current limitation via appropriately sized neutral earthing compensation)

- 11 kV Type tested indoor type switchboard rated for 40 MVA at 40 kA fault level and required feeder panels for the mines supply

- Power factor correction equipment and control

- 11 kV PV plant incomer feeder panel

- All required substation control, protection, and communication requirements

- All auxiliary AC and DC supply systems

- 11 kV Switch room and control building with smoke and fire detection systems

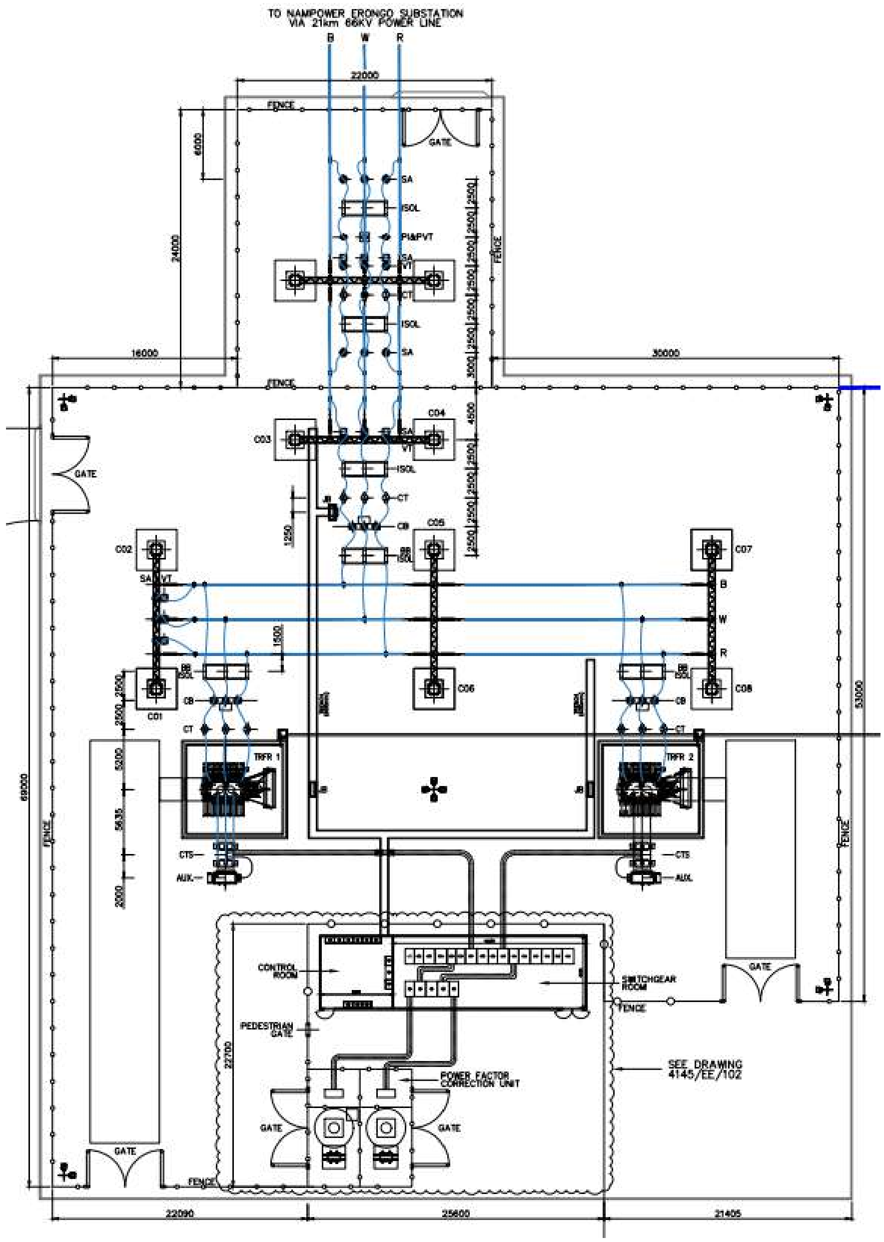
- All earth mat and earthing requirements

- All Lightning protection and lighting requirements

- Fencing, foundation, transformer plinths, oil holding dams and containment bund walls as well as yard stone as required

- Engineered terrace to be provided by others as part of overall plant civil works package.

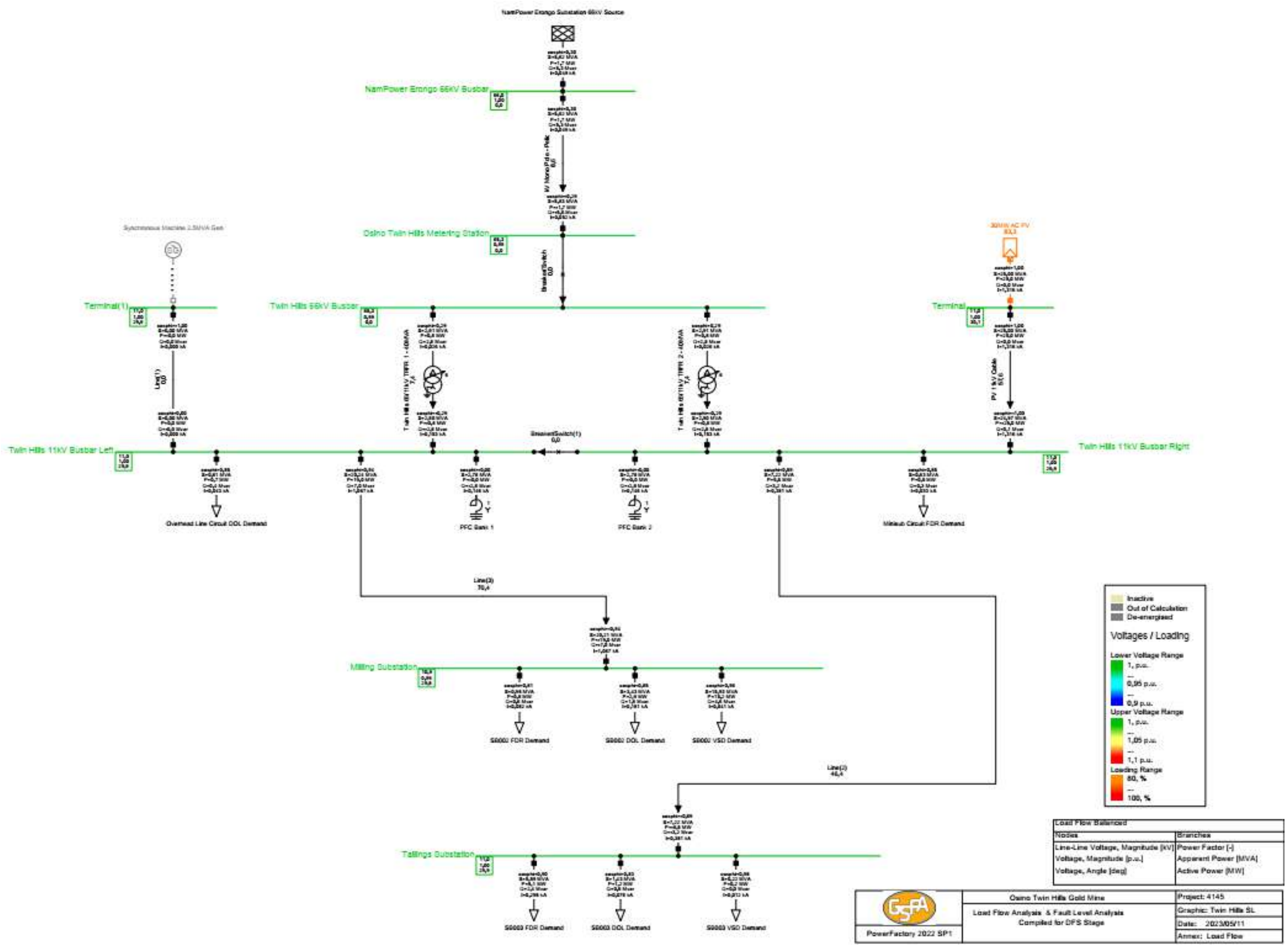
Figure 18.3.2 Planned 66/11 kV Twin Hills Intake Switchyard General Arrangement



18.3.3 Grid Connection Load Flow Confirmation

The source impedance and maximum expected fault levels at Erongo Substation were obtained from NamPower. Load flow and short circuit calculations were performed using Powerfactory DigSilent software, confirming the maximum expected fault levels at key busbar nodes within the Twin Hills electrical network.

Figure 18.3.3 DigSilent Model Single Line Diagram



The load flows identified no voltage or electrical overloading constraints within the planned distribution network on the mine site. The following maximum three phase short circuit results have been identified in Table 18.3.1.

Table 18.3.1 Maximum Three Phase Short Circuit Results

Electrical Node (Busbar)	Peak 3 Ph Short Circuit (Ip)
66 kV Twin Hills Switchyard Busbar	6.075 kA
11 kV Twin Hills Consumer Substation Busbar	29.760 kA
11 kV Twin Hills Milling Substation	28.898 kA
11 kV Twin Hills Tailings Substation	29.451 kA

The maximum three phase fault levels were simulated with the Twin Hills switchyard 40 MVA transformers operating in parallel, which results in the highest expected fault level. Based on the results a standard minimum rating for all 11 kV switchgear should be 31.5 kA.

18.3.4 Distribution of Power

Construction Power

Prior to the commissioning of the NamPower bulk electrical supply, the Mine site will need to be self-sufficient in relation to electrical power. Construction power will therefore be primarily supplied via diesel fuelled generator sets that will be sited next to the Contractor Area. Contractors will also supply small generator sets for construction purposes at remote locations during the construction phase.

A combination of rented generator sets, and use of the emergency generator set will be used for provision of construction power.

MV Switchgear and Distribution

Type-tested metal-clad switchgear installed in the consumer substation building will serve as the main distribution point (refer to Section 18.3.2). Two 11 kV switchboards are planned for installation downstream of the consumer substation for reticulation of electrical power to the milling and tailings handling areas. Reticulation to all plant related loads shall be via the milling and tailings substations; infrastructure related loads are supplied predominantly from the consumer substation.

A mini substation ring fed from the consumer substation shall provide the electrical reticulation to all infrastructure buildings, with the mini substations placed near to the load centers of the infrastructure area. The mini substations shall reduce the voltage to 400 Vac, for onward reticulation to buildings. Cabling to buildings shall generally be directly buried to maximize access around the infrastructure area.

Supply to the Mining Contractor's area has been provided for via the consumer substation through a short section of 11 kV overhead line and a dedicated mini substation at the Mine Contractor's area fence line. The Mining Contractor shall take supply at 400 V for onward reticulation to his infrastructure.

Supply to the borehole pumping system that exists to both North and South of the process plant infrastructure shall be facilitated through 11 kV overhead line – a dedicated feeder breaker has been provisioned for this purpose at the consumer substation. Small pole mount step down transformers have been included at borehole pump locations for the provision of a low voltage supply for the pump control panel.

11 kV Overhead Line Infrastructure

All 11 kV overhead line infrastructure shall consist of wooden pole structures with Hare ACSR (aluminium conductor steel reinforced) conductor. A combination of single and H-pole structure shall be utilised, with H-pole structures being utilized for cable termination and take-off structures, and at very large deviations in direction.

Due to the presence of giraffe in the vicinity of the Mine site, giraffe protection structures have been considered around susceptible pole structures, and the ground clearance distance has been adjusted to suit giraffe passing below phase conductors.

Pole mount transformers shall be installed to supply power to borehole and booster pump locations. Additionally, OPGW comprising single mode fibre optic cores shall be used to facilitate communications to borehole and booster pump control panels and motor starters. Monitoring and control of these facilities can therefore take place from the Mine control room.

Emergency Power

Key process plant infrastructure will require emergency electrical supply in the event of a failure in the supply from NamPower. This is due to safety and operational requirements, such as to prevent settling in agitated tanks, or the unnecessary draining of thickeners. An instrument air compressor is also required to ensure safe shut down of actuated valves. The anticipated emergency power demand is 1.65 MW.

Supply of emergency power shall be provided by a dedicated emergency standby diesel generator set. A containerised 2.0 MW (standby power rated) generator set has been included in the design and cost estimate for this purpose, including an integral 4-hour day tank, fuel piping and a synchronisation control panel to allow for soft-transfer of the emergency load to the grid on restoration of supply and for maintenance activities.

The generator set is tied into the 11 kV consumer substation to allow for wide reticulation of emergency power to applicable consumers.

Transformers and Mini Substations

Step-down transformers and/or mini substations will be installed in close proximity to the areas of use and will reduce the voltages from 11 kV to 525 V or 11 kV to 400 V.

The distribution and power transformers will generally be oil-insulated, double-wounded, 3-phase, 50 Hz, Dyn11 transformers that comply with the relevant standards. 400V transformer windings shall be solidly earthed, whilst 525 V transformer windings will be resistively earthed to limit the maximum prospective earth fault current.

Mini substations shall incorporate a three-way ring main unit inside a robust steel enclosure along with a low voltage distribution section.

Cabling and Cable Supports

Medium voltage cabling shall be steel-wire armoured XLPE (cross linked polyethylene) insulated copper conductor cable, whilst low voltage cabling shall be steel-wire armoured PVC insulated copper conductor cable. Single core cables shall utilize aluminium wire armouring. Flame retardant (red stripe) cabling shall be utilized.

Cable support shall generally be via heavy duty hot-dipped galvanized cable ladder installed to robust steel supports and brackets.

Air Conditioning System

Air conditioning will be provided to all buildings (offices) through split unit (Inverter Type) air conditioning units.

Lightning Protection

A cost provision has been made for all structures and buildings to be protected by lightning protection systems.

MCCs

MCC panels consist of electric fixed starters, a motor circuit breaker, and a contactor. The panels are single-sided, waterproof IP55, even if they are of the indoor type. Intelligent electronic overloads have been considered in the design and cost estimate.

MCC panels and any associated variable speed drives shall generally be installed within a modified intermodal shipping container, converted for such purposed. Lighting and small power, air conditioning and fire detection systems shall be preinstalled within MCC containerised to minimize on site construction duration and risk. No fire suppression systems have been included within MCC rooms.

Where only one motor starter is envisaged within an area (e.g., at borehole pump locations), then standalone control panels have been considered; these include hardware to facilitate remote monitoring and control.

PLC and RIO Panels

Programmable logic controller (PLC) and remote input / output (RIO) panels have been included for facilitating connection between field instrumentation and the plant PLC system. These have been based on the Rockwell Flex5000 range of I/O equipment and Logix5585E controllers in line with the process plant control system.

Communications between PLC and RIO panels, and MCC controllers and variable speed drives shall be by Ethernet IP (Industrial Protocol). The control system communication network shall generally be via ring topology facilitated by CAT6 network cable (where the ring is within the same building or panel), and by single mode fibre optic cable (where the cable leaves a building).

Conventional hardwired instruments have been considered in the design, with multipair cables utilised to collate instrument signals via junction boxes used to transfer signals back to the PLC and RIO panel equipment. Where standalone control panels have been specified, the I/O channels available on the intelligent motor controller (and/or associated I/O expansion cards) shall be utilised for digitization and reporting to the plant PLC system.

Lighting and Small Power

A 400/230 V network shall be utilised for reticulation to lighting and small power consumers.

Provision has been made for LED (light emitting diode) lighting that will be structure-mounted to ensure safe working conditions. Lighting will also be installed to ensure that visual security monitoring can be conducted at all times in and around the process plant and associated infrastructure to maintain a safe work environment.

The minimum average lux levels considered in the design are suitable for the infrastructure and process plant buildings envisaged and comply with or exceed minimum requirements set out in local legislation. Emergency luminaires has been included in the cost estimate and incorporate an integral lithium-ion battery pack and charger to facilitate emergency escape lighting during any prospective block-out events. The luminaires considered in the design consist of LED bulkhead luminaires for process buildings and for external perimeter lighting around infrastructure buildings. 'Fluorescent' style LED luminaires have been considered in 'office' type spaces, whilst LED high bays have been considered for workshop and stores style buildings.

A provision for five high-mast lights have additionally been made on the site block plan for the provision of area lighting. Areas of high pedestrian or vehicle traffic are covered by highmast lighting. Highmasts shall be furnished with lightning finials and aviation warning lights.

230 V socket outlet circuits have been allowed for in office and workshop areas; these circuits shall be protected against accidental contact through the application of 30 mA earth leakage devices. 400 V industrial socket outlets (also protected by 30 mA earth leakage devices) have been included for larger consumers such as welding machines within the workshop area.

18.3.5 Communications

Communications on the mine will be via various means:

- A radio network that both links the Administration, Contract Mining and Plant areas also has separate groupings in these different areas.
- A fibre optic network that will originate in the vicinity of the Administration office block area and connect the different buildings and areas with each other and with the external internet connection (via a dedicated Fibre supplying the mine and/or a wireless connection to the nearest base station of a major Telecoms provider).
- Internal data reticulation within the various buildings. Note that it is envisaged that VoIP telephony is utilized by mine personnel.
- Cellular phone connection via various Cellular network providers (not in the scope of this feasibility to upgrade the coverage on site).

Telecommunications services will be negotiated with one of the Namibian telecommunications operators to set up a dedicated Internet link through wireless link to the site. Initial enquiries have revealed that only Telecom Namibia can presently supply the site with a wireless internet connection. The wireless connection will be from the existing Telecom Namibia Affenberg site and will be used for the construction phase of the project, prior to the installation of a dedicated fibre link.

A fibre optic link is also available from Telecom Namibia along the C33 road running between Karibib and Omaruru. This fibre link will be approximately 6 km long and would be installed overhead or underground. An overhead connection would require 9 m high poles to accommodate the giraffes on the farm surrounding the mine. Paratus Namibia have also indicated that they have an active fibre optic cable along the C33 highway. A fibre optic link will have a bandwidth up to 100 Mbps (either shaped or dedicated). A cost provision for data costs for the construction period has been included in the capital cost estimate.

A firewall will be installed and wide area network optimisation equipment to:

- Secure and protect the network against threats and unauthorized access.
- Block suspicious mail and web sites or those containing viruses or malware.
- Optimie bandwidth and manage the network quality of service.

Internal IT Infrastructure

A fibre optic computer cabling system and network will cover most of the buildings. An internal UTP (unshielded twisted pair) Category 6 cabling and an optical fibre interconnection between buildings will be installed. In addition, a duplicate network with heat resistant cable will be installed for critical services such as Fire Detection.

Hardwired data points will be distributed in the buildings and will be fed from a local network switch in each building. Each network switch will in turn be connected to the abovementioned fibre cabling system. Physical servers and associated software have been included for network management, and to provide file and print services.

Additionally, a Wireless Fidelity (Wi-Fi) network will be installed that will cover office workspaces. Multiple Wi-Fi access points / nodes will be installed to ensure adequate coverage.

To ensure communication between employees, a radio communication network that will cover the admin areas, plant and the pits will be installed. A repeater site position has been selected adjacent to the ROM tip to ensure radio coverage to the mining pits. Handheld radios have been included for site personnel, whilst a base station has been included at the Mine control room. A provision for vehicle radios has also been made for mine vehicles.

Video CCTV Surveillance

CCTV cameras and associated networking and video storage system equipment have been included in the cost estimate. The CCTV system is predominantly for process visualization but will also facilitate security monitoring at key areas such as gate houses and the change house and stores. Video storage will be housed in the engineering server room forming part of the process control building, with monitoring stations located within the control room and the mine manager's offices. A video wall has been included within the entrance lobby of the administration block.

Access Control

An access control system has been included in the capital estimate and will facilitate the control of vehicles and personnel at key entry points. Control shall be via biometric scanners, magnetic door locks, boom gates and turnstiles. Key access control locations are:

- Main security gate house.
- TSF gate house.
- Gold room.
- ILR Area within the mill building.
- Plant Control Room and Engineering Room.
- Change House.

An enrollment station has been included for use in the administration office. The access control system shall be used for time and attendance recording and can integrate into the mine's payroll system.

Computer Hardware

IT hardware and software infrastructure including personnel computers, file servers, printers and networking equipment has been included in the cost estimate for mine personnel.

18.4 Alternative and Supplementary Renewable Power Supply

18.4.1 Provision of Solar Power Supply

In conjunction with the NamPower bulk electrical power supply, a renewable power supply in the form of solar PV has been included in the base case of the DFS study. The purpose of the solar farm is to minimize the carbon footprint of the Mine, and to minimize the effective levelized cost of energy that the Mine will experience over the LOM by creating savings against the NamPower expected tariff. An amount of risk reduction in terms of energy cost escalation (of the NamPower bulk connection) is also another driver for installing a renewable energy plant. At this stage, no tariff escalation was assumed.

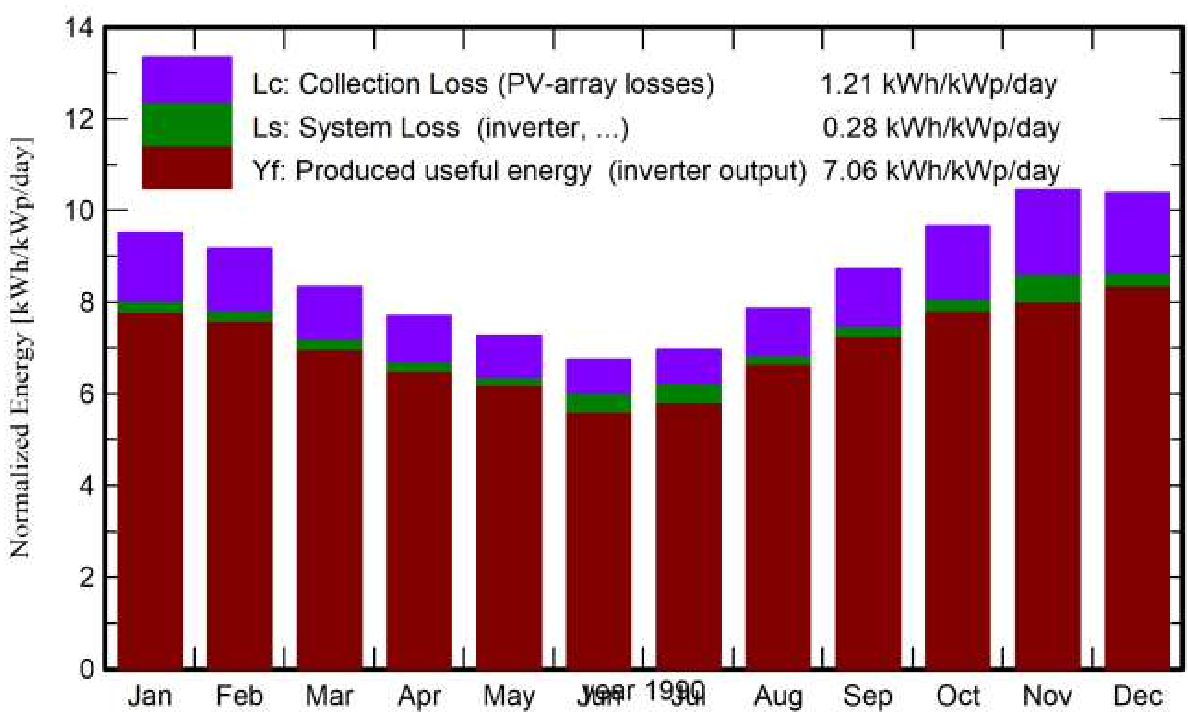
The renewable energy plant will be embedded within the Mine's electricity network, thereby obviating the application of wheeling charges by a transmission line operator.

The Namibian ECB (Electricity Control Board) have generally limited total renewable energy production for each consumer to 30% of their nominal energy demand; Osino applied to the ECB to waive this limitation for this greenfield project and a positive response was received from ECB on 13 June 2023.

Over the course of the previous study phase, as well as the definitive feasibility study, various renewable energy options including solar PV, wind, and battery energy storage systems (BESS) were assessed by specialist consultant Dornier Suntrace to determine the optimum energy mix for the Mine. During the execution of the DFS, Dornier Suntrace issued an enquiry into the market for the procurement of a solar farm on an IPP (Independent Power Producer) basis, with most of the capital required for the solar farm thus falling outside of the DFS capital estimate, which will be repaid over the LOM through the agreed energy tariff with the selected IPP through a 13-year private power purchase agreement.

As an outcome of the adjudication of the bids received from prospective IPP partners, a solar photovoltaic plant in the range of 25.5 – 27.1 MWac has been selected as the optimum solution for the project. For the purposes of the evaluation, it was anticipated that the solar plant will be able to offset approximately 35% of the Mine's annual energy demand (184,861 MWh). The figure below depicts the expected monthly energy production by the renewable energy plant over the course of a year:

Figure 18.4.1 Power Losses



With the inclusion of the renewable energy plant, the anticipated carbon footprint of the Mine shall be reduced by 19.9 kt annually as a CO2 Emission reduction compared to a 100% Coal Generation system.

The tariff proposed by the preferred IPP bidders is in the range of 5.5 – 6.63 USD cents/kWh and is compared to the anticipated cost of energy from NamPower for the 2022 / 2023 financial year of 9.772 USD cents/kWh. The introduction of the solar PV plant is therefore anticipated to create an annual operating cost saving for the mine.

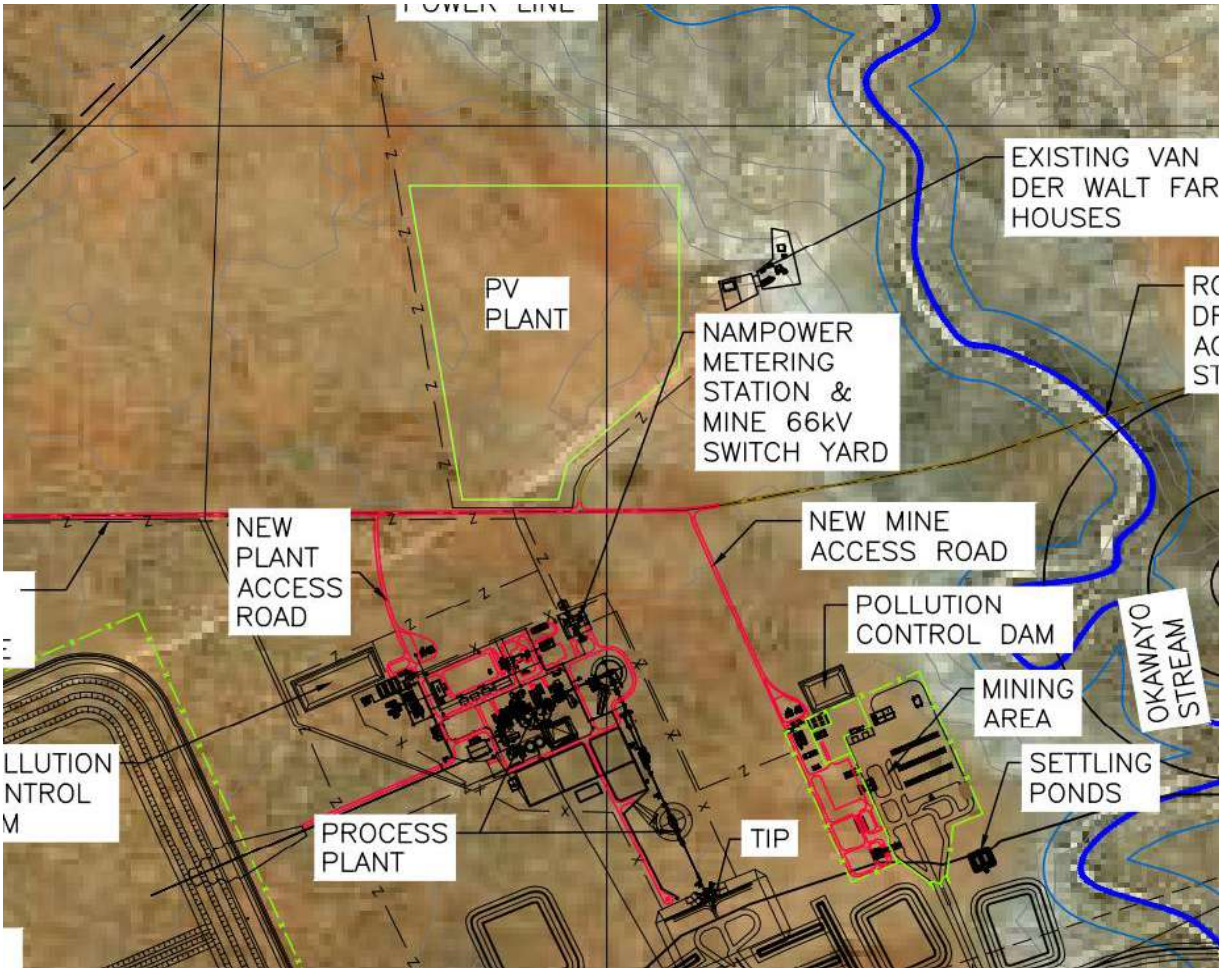
Alternative renewable energy technologies have also been considered during the execution of the study including wind and a battery energy storage system (BESS) and were included as an alternative option in the enquiry issued to prospective IPP bidders.

The initial site investigated showed relatively low mean wind speed of 6.3 m/s at hub height of 155 m and did not yield economically attractive generation cost. However, other sites that are further away from the mine have promising mean wind speed but on the other hand, these sites require land acquisition and electrical connection to the mine. It shall be noted that wind will be operational one year after the solar plant, taking into account the relatively long permitting process, the lead-time of the wind turbines and the local wind-data campaign.

Both wind and BESS can be an attractive configuration in combination of PV, in order to increase the renewable energy share but on the other hand, they reduce the savings since wind energy and BESS are more expensive compared to solar. Wind energy has been proposed as an alternative proposal by one of the preferred bidders.

The selected solar farm location is 300m north of the process plant, as depicted in Figure 18.4.2.

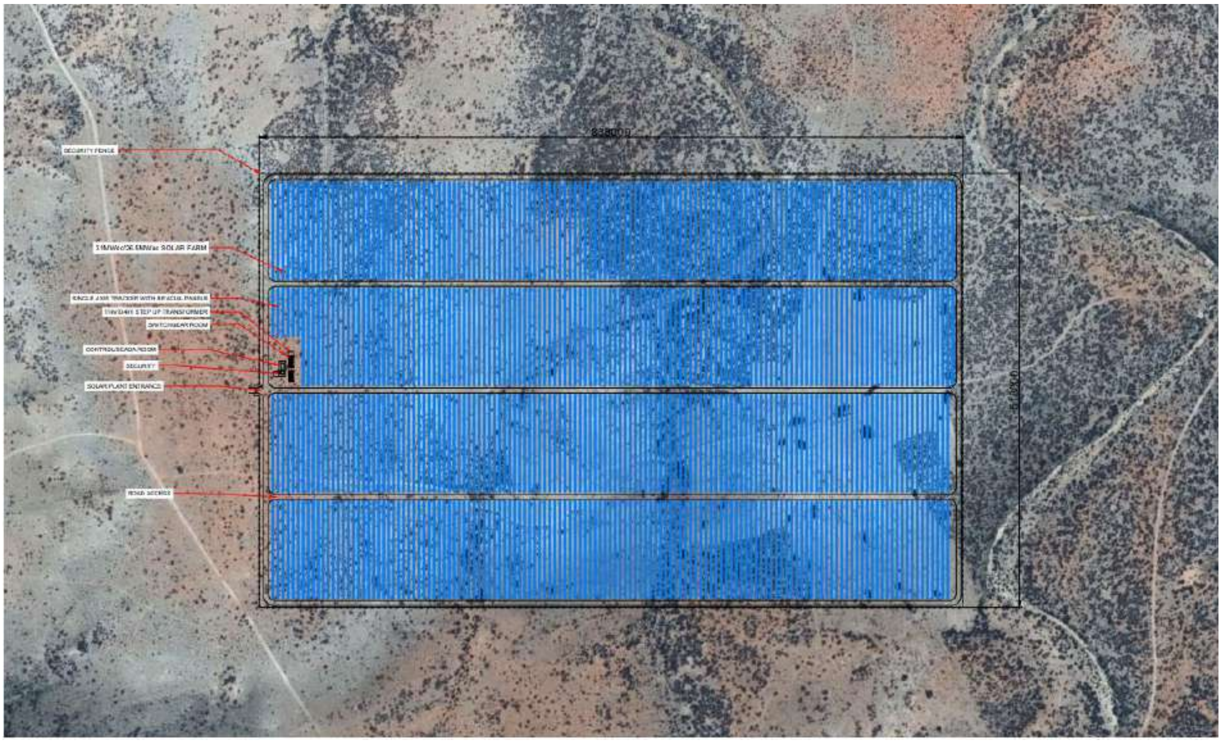
Figure 18.4.2 Solar PV Farm Location



The location of the solar PV farm is preferred due to its proximity to the Mine's 11 kV Consumer Substation, potable water supply availability at the process plant, and due to the comparatively favorable topology.

The solar farm area is approximately 550,000 m^2, yielding an effective ground cover ratio of 40%. The Solar panels shall be mounted to a single-axis tracker structure tracking the sun from east to west to maximize the energy yield.

Figure 18.4.3 Solar Farm



It is planned to utilize string inverters and step-up transformers to connect solar module strings to the solar farm 11 kV substation. Interconnection with the Mine 11 kV Consumer Substation shall be via buried cable. A DC/AC ratio of in the range of 1.07 – 1.2 is considered, allowing for the production of reactive energy.

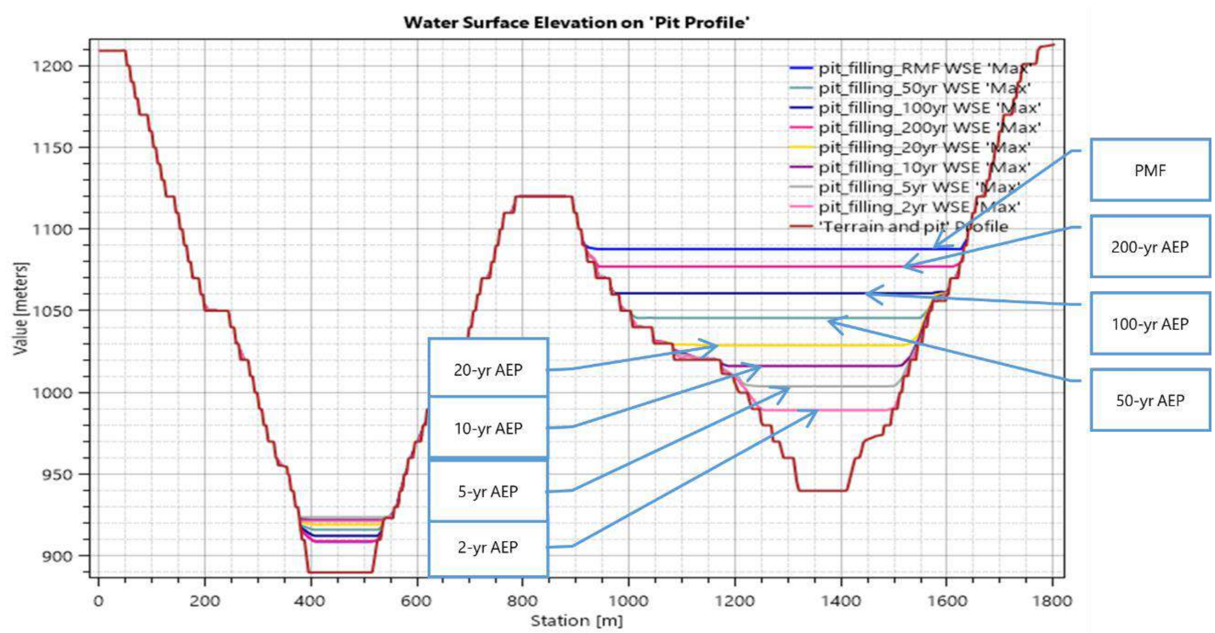
Bifacial monocrystalline solar modules have been included as the base case for the DFS study due to their higher efficiency and improved degradation characteristics when compared to polycrystalline modules.

The preferred IPP bid includes an all-inclusive energy cost, with the IPP partner thus managing the operation and maintenance of the solar farm, as well as the capital repayment of the solar plant facility.

18.5 Okawayo River Flood Attenuation Measures

The Main Pit comprising the Bulge and Twin Hills Central mineralisation will be developed across the natural flow path of the Okawayo River. The Okawayo River is an ephemeral river which experiences occasional stormwater runoff under flash flood rainfall event of high intensity. The catchment area of the river at the pit is estimated to be approximately 92 km^2. The slope of the catchment is relatively flat, with a sand cover and apparent marble outcrops near the marble ridge. Figure 18.5.1 shows water depth reporting to the Main Pit under various flood based on Annual Exceedance Probability (AEP). The Twin Hills Central portion of the Main Pit could be flooded to a depth of up to 50 m owing to runoff originating from only a 2-year AEP flood event (estimated at 0.6 Mm^3 from 42 mm rainfall-runoff generated over the entire catchment) and up to 140 m depth in the case of a 200-year AEP flood event occurring (5.8 Mm^3 from 118 mm rainfall-runoff generated over the entire catchment).

Figure 18.5.1 Flood Depth Estimates Reporting to the Main Pit for Various Annual Exceedance Probability of the Okawayo Catchment Area



Several options were investigated from medium size dams to contain larger flood events to complete diversion channels around the pit. The option retained for the DFS is targeting lower capital expenditures while integrating the surface water management plan and mine development plan to share some of the risk and expenditures. The selected flood mitigation measures include a stormwater intake structure across the Okawayo river above the marble ridge and a diversion canal around the main open pit to the Cloud West pit once mining operations have ceased.

Stormwater from the upstream catchment is considered as non mining contact water (clean water) and the dam classification is made in terms of the RSA dam safety regulations and guidelines described by South African National Committee on Large Dams (SANCOLD), 1991 for selecting spillway design floods and freeboard provisions. The reduced (small) dam size classifies as a low-risk hazard category provided that no persons downstream will be harmed in the event of a dam breach or major flood event arriving. Considering the flat catchment and ephemeral flow regime, effective early flood warning systems can be developed and applied as part of the emergency response and preparedness plans, to ensure that personnel are prevented from access to the main pit in the event of a major flood event. The selected spillway design flood (1/50 AEP) for a dam with a low hazard risk is in accordance with SANCOLD guidelines. A 1/50 AEP is also a typical design return period for considering environmental flows in terms of clean / dirty water separation. Should a flood with a higher AEP be experienced, the weir will begin to safely overtop with its crest shaped as a broad crested weir and the flow rate in the spillway channel will progressively increase. In the extreme case of a PMF (Probable Maximum Flood) arriving, the structure will overtop by approximately 0.75 m and the spillway channel will be discharging the 1/100 AEP, with zero secondary freeboard. This low classification considers the small wall height and the adoption of an effective early warning system (reducing probable loss of life to zero in the event of a dam breach or spillway flow) in the area downstream. This does not consider the economic impact of lost production or pit dewatering requirements, should the Main Central pit flood. The mine must accordingly accept this risk.

It is expected that the small reservoir formed upstream of the dam structure will fill with sand sediment transported during flood events and that little to no flood attenuation can be assumed once this happens. The spillway and discharge channel capacity are therefore sized to accommodate the unrouted design flood peaks (without allowing for attenuation), which is appropriately conservative. A secondary benefit of upstream sedimentation is that the diversion structure will then essentially act as a sub-surface recharge dam that will provide a higher, beneficial, head for groundwater recharge.

The proposed 7 m high dam for the main diversion intake structure considered two wall types, namely a concrete faced rockfill dam (CFRD) wall and a rubble masonry concrete (RMC) weir. Considering the presence of competent marble foundation rock mass at the proposed dam site, an abundance of stone plums that can be sourced for the wall construction and the inherent ability of the structure to pass flood flows directly over the wall, both during construction and after completion, the RMC weir is the preferred option dam type. It is also the most cost-effective option. The discharge from the diversion structure will be controlled through a spillway that discharges water to a spillway discharge channel. The intention is for the channel to convey the water to the Cloud West Pit (see figure below), which will be used as an additional storage facility to balance water supply requirements over the LOM.

The Cloud West Pit can contain approximately up to a fifth of the PMF volume from the 92 km^2 Okawayo catchment area, and excess water will have to be discharge back towards the downstream watercourse. It is expected that a certain amount of water will be loss through infiltration. The construction of the spillway and canal is expected to require excavation in medium to hard rock and would require little to no additional lining to protect against erosion during operation. This assumption will need to be re-evaluated once a more thorough geotechnical investigation along the proposed alignment is carried out in the next stage. Figure 18.5.2 shows the canal alignment to Cloud West Pit. Figure 18.5.3 shows a section of the proposed intake structure.

Figure 18.5.2 Okawayo River Diversion Channel to Cloud Pit

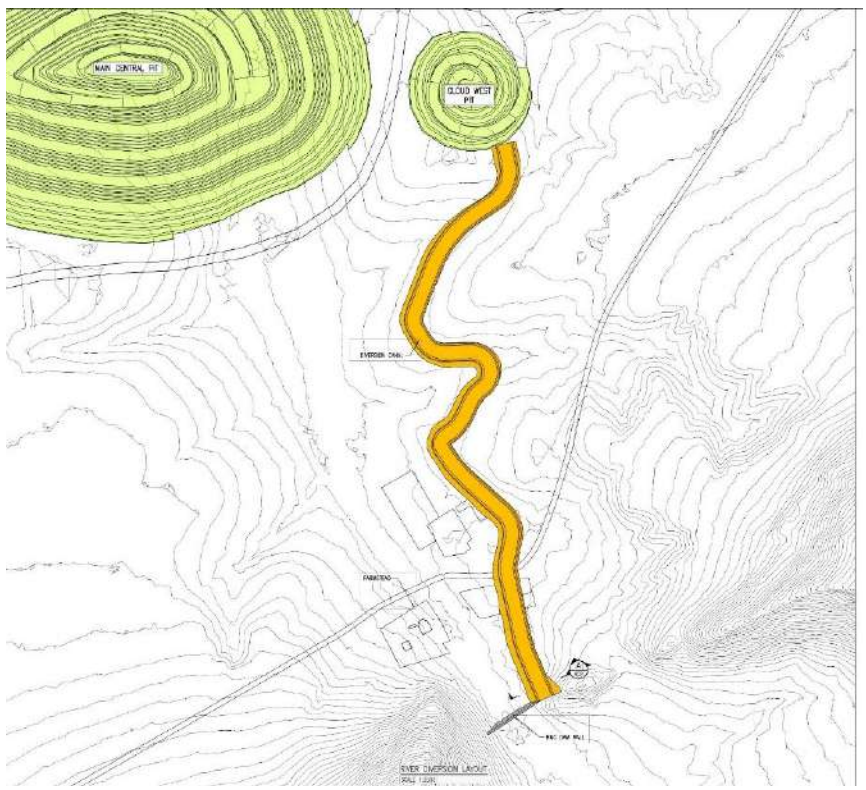
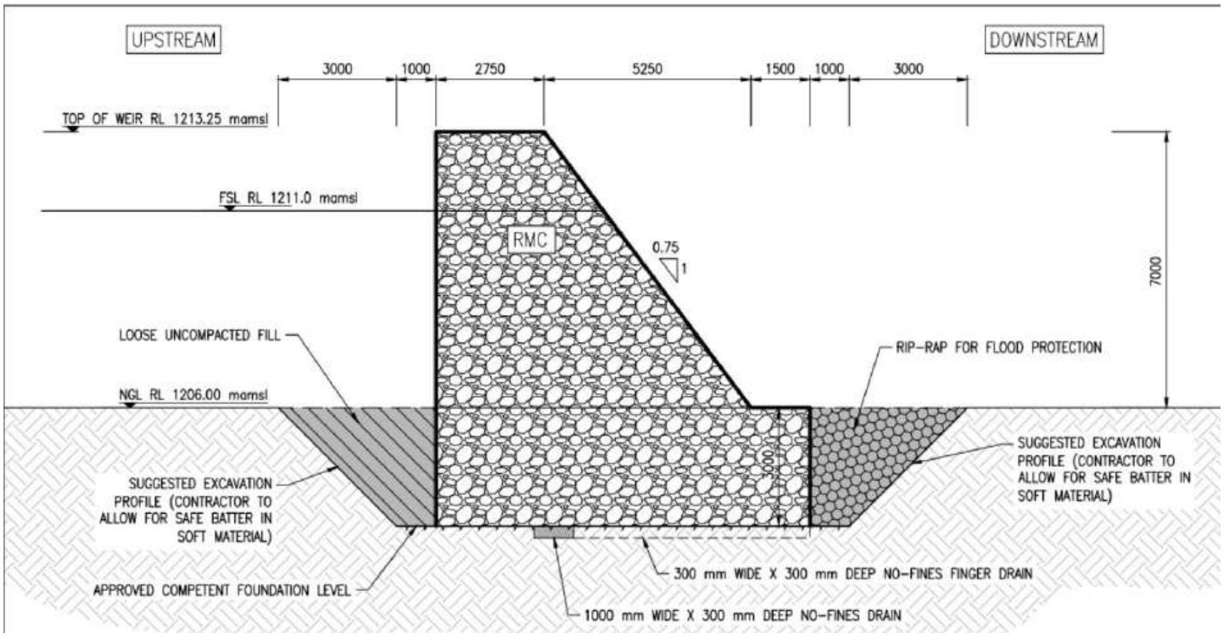


Figure 18.5.3 Section of the Proposed Intake Diversion Structure



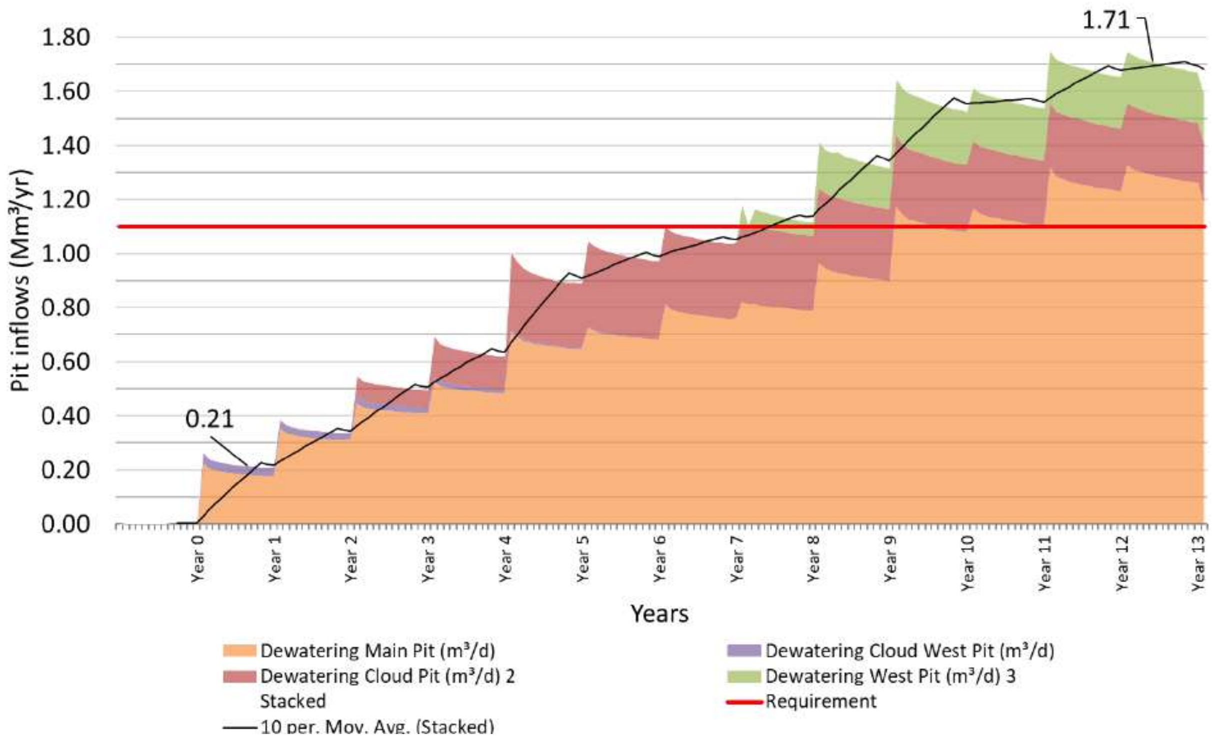
18.6 Bulk Water Supply

18.6.1 Hydrogeological Model and Groundwater Resource

A hydrogeological numerical model was developed to evaluate the potential of groundwater resources to meet the mine water demand estimated at 1.1 Mm^3/year and evaluate key groundwater-related risks and opportunities. The hydrogeological numerical flow model developed in FEFLOW for steady-state and transient conditions is based on the data collected to date and has a 60% level of confidence which is suitable for the bankable feasibility study. A summary of the numerical model detailed in KP Report is provided as follows:

- Estimates of groundwater inflows to the pits were calculated over the LOM as per the mining plans and schedule provided. Estimates of groundwater flow range from 0.21 Mm^3/year in Year 1 increasing to a cumulative maximum of 1.71 m^3/year in Year 10 when all pits (Central, Cloud, Cloud West and West) are in operation. This indicates that during the early years of mining, there will be a water supply deficit until Year 7 in terms of meeting the mine's water demand of 1.1 Mm^3/year.

Figure 18.6.1 Twin Hills Pit Inflows - Passive Dewatering



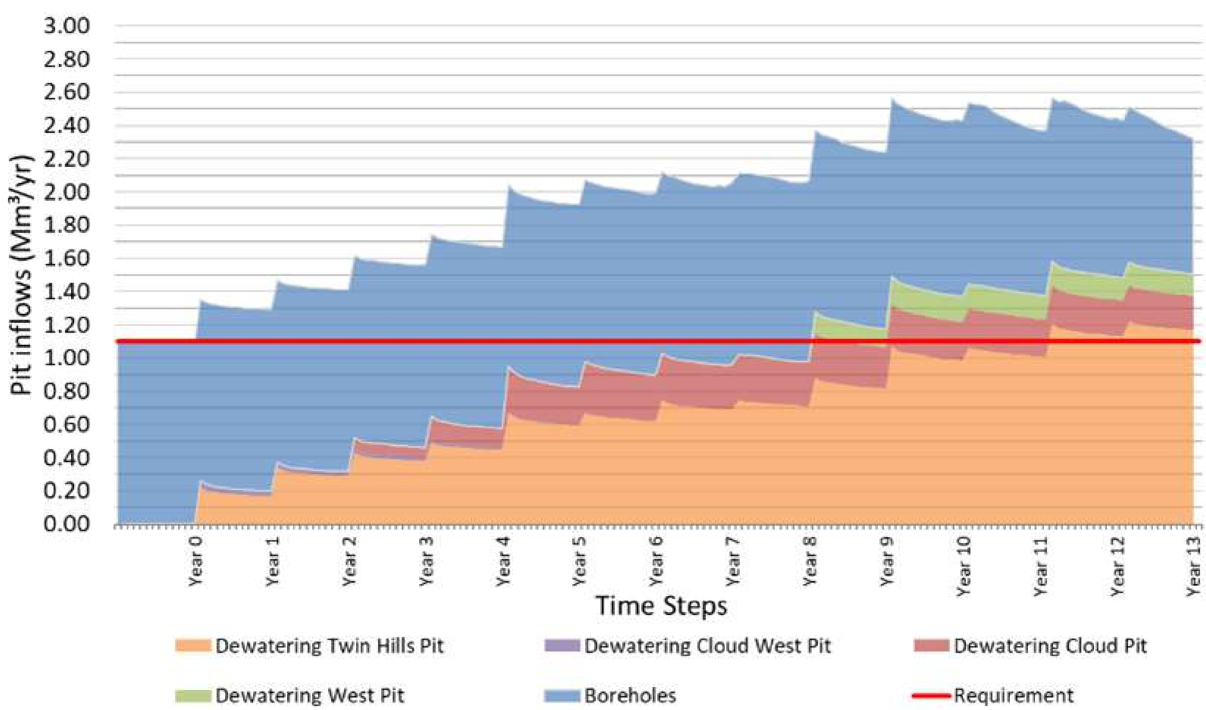
- These inflows can be managed from in-pit sumping providing the dewatering infrastructure is sized appropriately to include direct precipitation as well as predicted groundwater inflows. Active dewatering boreholes have not been included, as the passive inflows can be managed from in-pit sumps and the pore pressures remain at least 50 m behind the pit walls due to passive dewatering but may require localised depressurisation by sub-horizontal drainholes behind disconnected structures or due to transient higher inflows following rainfall events.

- As makeup water to mine water supply, the groundwater exploration boreholes with the highest yields were included in the model, taking into consideration the overlapping impacts between adjacent boreholes being pumped simultaneously and the developing cone of drawdown of the water table induced by passive dewatering from the mine pits. The cumulative total yield of six boreholes is 1.2 Mm^3/year with an additional three in reserve. The mine water requirement of 1.1 Mm^3/year is met from Year 1 to the end of LOM in Year 13 through a combination of the groundwater supply boreholes in the Karibib Marbles and the pit inflows which increase with the deepening pits.

Table 18.6.1 Makeup Water Requirements

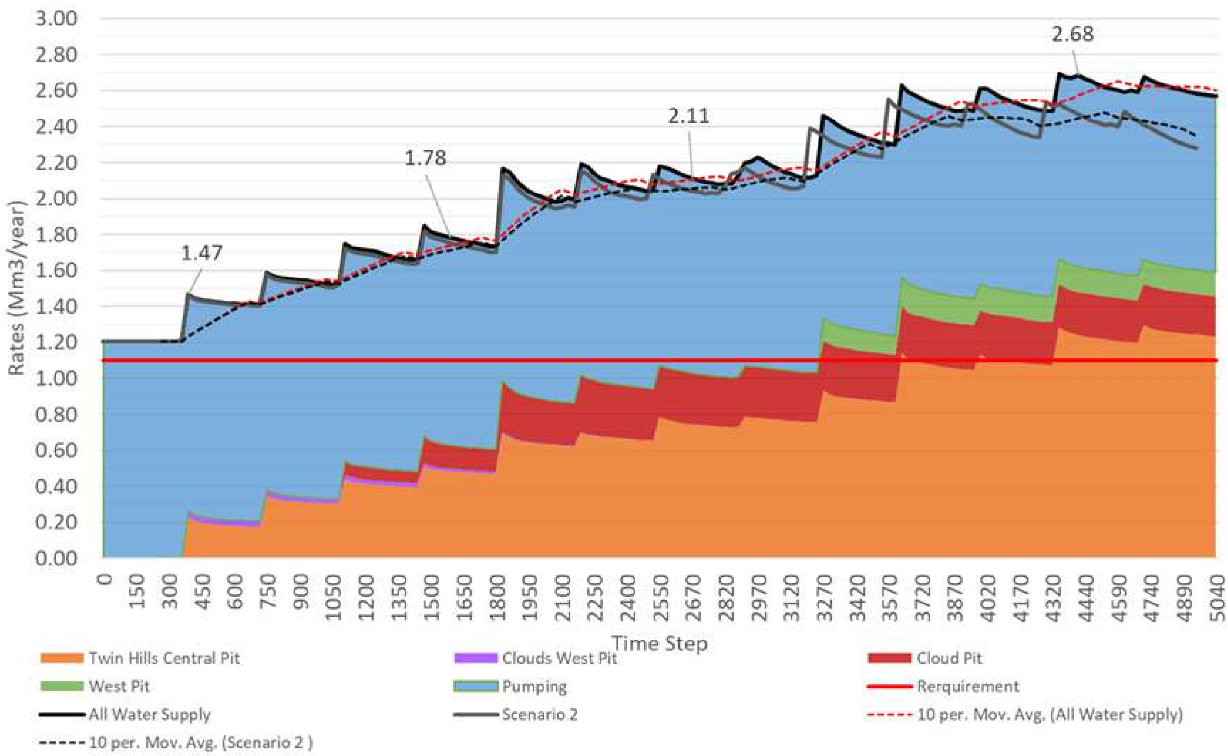
BHID (Bore hole Identity)	Sustainable Mm^3/y	Reserve Mm^3/y
OAK7	-	0.04
OAK12	-	0.01
Quarry BH	0.33	-
206163	0.15	-
OKP002	-	0.04
OKP042	0.11	-
OKP057	0.40	-
206161	0.04	-
OKP049	0.18	-
Total	**1.20**	**0.08**

Figure 18.6.2 Twin Hills Pit Inflows - Passive Dewatering and Water Supply Abstraction



- Most of the successful mine water supply boreholes are along the northeast-southwest striking the south limb of the Karibib marble contact some of which are hydraulically interconnected based on test pumping results. The opportunity to recharge this aquifer via managed aquifer recharge (MAR) upstream along the Okawayo sub-tributary is conceptually under consideration as a mitigation to ensure the long-term sustainability of this aquifer. The model results indicate that MAR could provide an additional 0.2 Mm^3/year that would offset the gradual depletion of aquifer resources from the water supply boreholes towards the end of LOM, due to the developing cone of drawdown around the mine.

Figure 18.6.3 Scenario 5 Water Supply with MAR



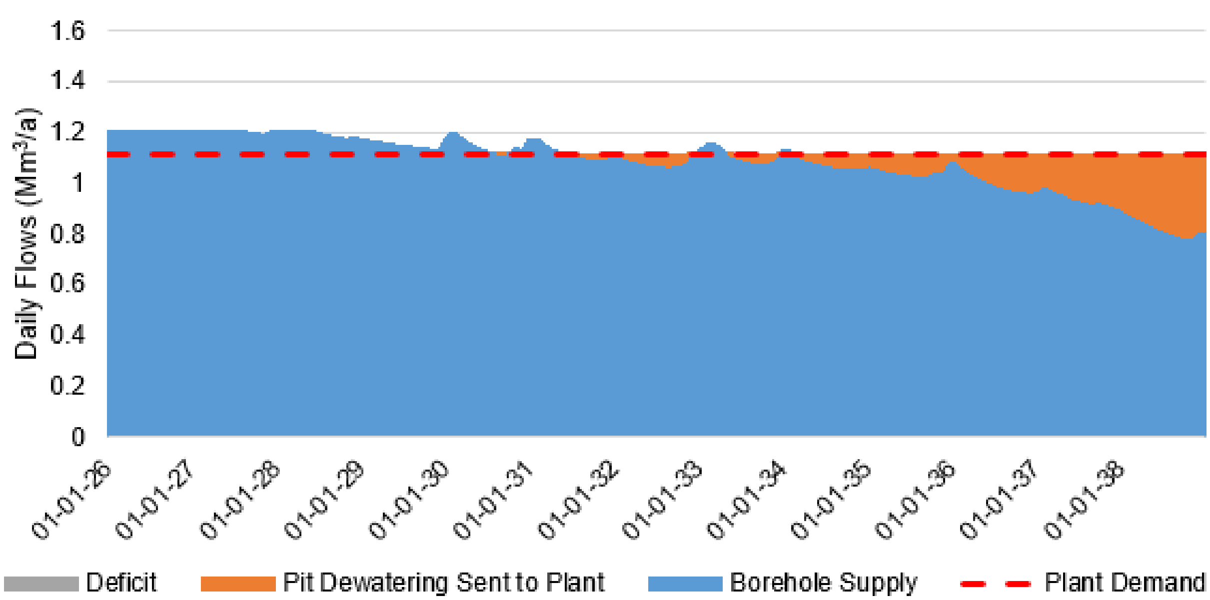
18.6.2 Mine Water Supply

The site water balance is based on a peak process throughput of 5.2 Mtpa and has a water demand of approximately 1.112 million cubic meters per annum (Mm^3/a). The process design aims to maximize the reuse of water by recycling process solutions wherever possible through filtration systems in the plant. A monthly increment was selected for the DFS and includes inflows and outflows to the process operation including the open pits.

The plant demand assumes that approximately 85% of the water contained in tailings is recycled at the plant and the remaining water is lost in the filtered tailings cake sent to the tailings storage facility. This also includes losses to plant operations and glad water. Evaporation from the open pit lake, groundwater inflows, and direct rainfall are considered in the water balance model.

The DFS water balance shows that the estimated groundwater sustainable yield and pit dewatering activities can meet the plant water demand through the life of the project. Figure 18.6.1 shows the groundwater source and pit dewatering supply through time. The supply from groundwater is a main source of water and essential for operations. Occasional surface water runoff will be diverted from the Okawayo river to the Cloud West Pit after mining and is considered as a potential additional water supply. Surface water runoff frequency during the LOM is however uncertain and would not be sustainable over the LOM and would not eliminate the requirement for groundwater supply. The impact of the Cloud West pit as a storage reservoir on the overall groundwater recharge will need to be evaluated in greater detail in the next phase of the study.

Figure 18.6.4 Daily Mean Flows to the Processing Plant



A sensitivity analysis was completed for variables which are affected by climate change or are considered to potentially affect water balance. The water balance sensitivity analysis considered a potential increase in plant water demands (motivated by increased water losses in tailings or process throughput), the reduction and exclusion of borehole supply, an extended drought period, and the exclusion of the Cloud West Pit as a storage reservoir. The assessment showed that the security of water supply relies on the Karibib marble and pit dewatering groundwater supply, with a clear deficit expected during the dry seasons if borehole supply isn't accounted for. If the Karibib marble borehole supply is included in the water balance, the impact of drought is significantly reduced and doesn't compromise overall plant requirement. The use of the Cloud West Pit for storage is not a necessity if the modelled borehole supply is achieved, however, the results show a clear benefit if borehole supply is compromised or if the plant demand were to increase. Other alternative groundwater and freshwater sources, but also managed aquifer recharge schemes on site and at the Khan River, are also investigated as part of the DFS to reduce reliance on the site groundwater borehole supply.

Groundwater borehole pumping along the Karibib marble to supply approximately 3,300 m^3/day, or 1.2 million m^3/yr based on sustainable yields tested during the 2022/2023 field program.

18.6.3 Borehole Water Supply

This section of the report covers the preliminary design of the water supply from identified groundwater sources. Numerous boreholes have been drilled targeting the Karibib marbles approximately 3.0 km south of the mine Plant, and near the Khan River, approximately 4.8 km north of the Plant.

Groundwater information and borehole data was sourced from several reports produced during the PEA, PFS and Feasibility study.

Borehole Water Supply Design

Three groundwater sources have been identified for the water supply as follows:

- The Southern Boreholes.
- The Northern Boreholes.
- The Khan River Well is located at the proposed Sand Storage Dam (SSD).

The data and sustainable yield used for design of the water supply scheme are summarized in Table 18.6.2 below. The total estimated yield sums 138 m^3/hr for all mine water supply boreholes combined.

Table 18.6.2 Summary of Recommended Sustainable Yield for the Water Supply Boreholes

BHID	Geology	Static Water Level mbgl	Drawdown Below Static WL m	Borehole Depth mbgl	Pump Inlet Depth mbgl	Recommended Sustainable Yield m^3/h
OKP049	Marble High	63.82	36	130	110	21
OKP057	Marble, Biotite Schist	48.92	51	120	110	46
Quarry PH1	Marble	48.26	42	130	100	37.5
OKP042	Marble	32.82	67	120	110	12.5
Northern Boreholes						
BHID	**Geology**	**Static Water Level mbgl**	**Drawdown Below Static WL m**	**Borehole Depth mbgl**	**Pump Inlet Depth mbgl**	**Recommended Sustainable Yield m^3/h**
206163	Marble	12	78	121	100	17
206161	Marble	10	120	150	140	4

The Khan River managed aquifer recharge assessment and design are still being finalized. Partial data available at the time of reporting and preliminary assumptions were made for sizing potential supply equipment and pumps from the Khan River scheme. The Khan River scheme is considered as an additional potential supply source but wasn't included in the site water supply boreholes sustainable yield estimate.

Table 18.6.3 Khan River Boreholes

Khan River Boreholes*						
BHID	**WW**	**Blow Yield**	**Combined Abstraction Rate m^3/h**	**Water Level**	**Depth**	**Comments**
Line15	206132				13.5	Drilled
Line16	206133		250			**
Line14	206134					

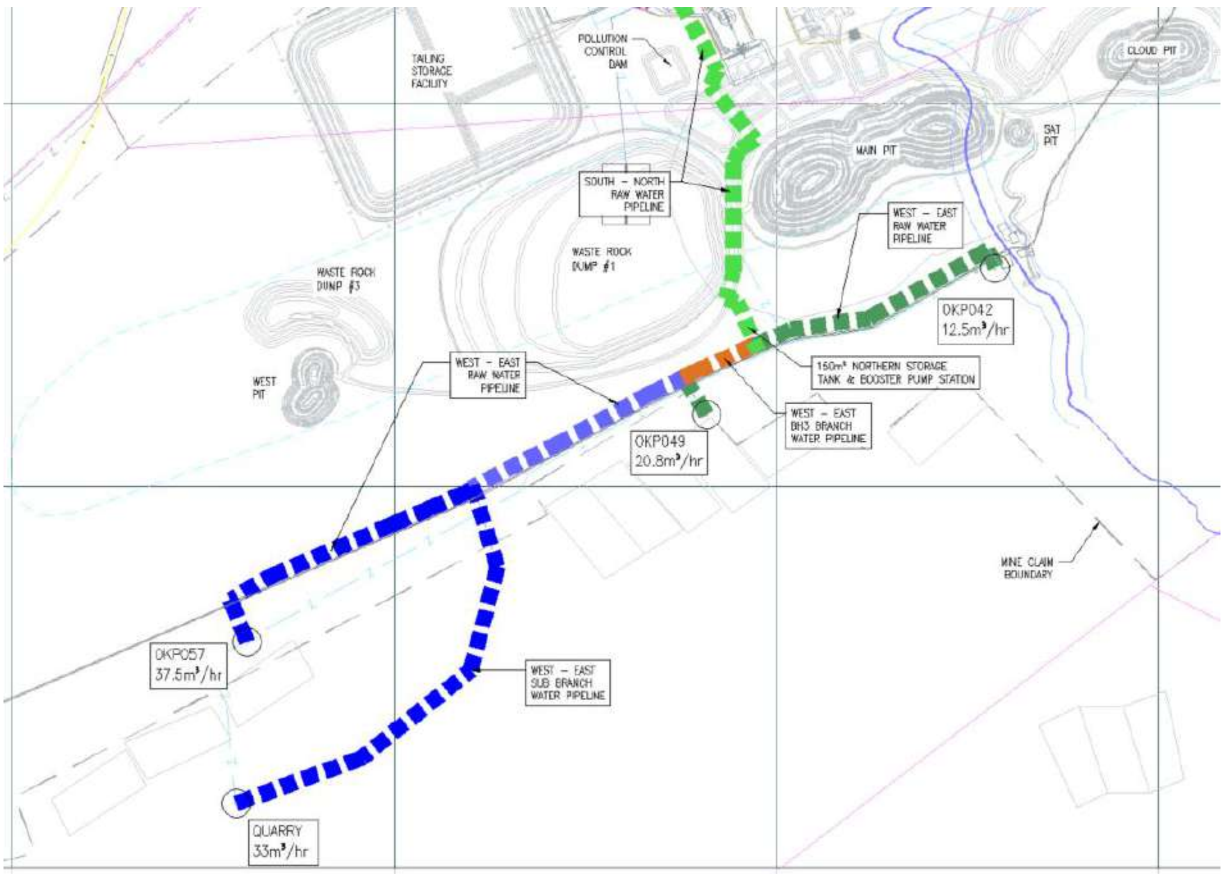
***Data incomplete.**

****Abstraction rate of 250 m^3/h estimated from at the Khan River managed aquifer.**

The Sothern Boreholes

The southern boreholes are located in a line along the northern side of a marble ridge, close to the contact between the marble and sedimentary deposits. The location of the boreholes and the connecting pipework is shown in Figure 18.6.5.

Figure 18.6.5 Location of Southern Boreholes



Four boreholes to the south of the processing plant with a combined volumetric flowrate of 103.8 m^3/hr will supply water to a combined 150 m^3 collection tank before being pumped to the processing plant. Boreholes to be pumped for 24 hours at the sustainable yield provided.

Each borehole is fitted with a submersible pump with depths ranging between 125 – 224 mbgl (metres below groundwater level).

A 150 m^3 collection tank sized for 90min residence time is used as a centralized collection tank. The collection tank ensures that a single line, as opposed to four individual lines, is routed to the processing plant.

A running / standby pumping arrangement is then used to deliver the water to the raw water storage tank constructed within the processing plant perimeter.

The pipelines were sized to not exceed a flowrate of 1.5 m/s ensuring the frictional losses are kept to a minimum resulting in lower operational costs.

The Northern Boreholes and the proposed Khan River Well

The Northern Boreholes are located on a marble ridge close to the Khan River. These boreholes and the proposed Khan River Well are close together.

The two boreholes to the north of the processing plant with a combined volumetric flowrate of 20.9 m^3/hr will supply water to a combined 20 m^3 plastic JoJo collection tank before being pumped to the processing plant. Boreholes to be pumped for 24 hours at the sustainable yield provided.

Each borehole is fitted with a submersible pump with depths ranging between 122 – 167 mbgl.

For future and further mitigation factors, the Khan River managed aquifer recharge at the Sand Storage Dam is being investigated and still in the process of being finalized. It should be noted that the yield of the Sand Storage Dam in the Khan River was not yet finalized, and provisional estimates were made to be able to pump water from the SSD at a rate of 250 m^3/hr. It is anticipated that this pumping would only be done during the rain seasons when adequate water runoff is expected in the Kahn River. This water will then be utilized at the process plant and to recharge the underground water table.

In future the 20 000 litre JoJo tank for the northern boreholes needs to be replaced by a 250 m^3 collection tank dedicated to the northern and Khan River sand storage dam pumps, sized for 60-minute residence time is used as a centralized collection tank. The collection tank ensures that a single line, as opposed to three individual lines, is routed to the processing plant. This pipeline will have to be upgraded from a 90 mm diameter to a 250 mm diameter pipeline to be able to cater for the flows.

From the collection tank a separate gravity line will be installed to the recharge well close to the collection tank. This line will actively supply recharge water from the Khan River Sand storage dam during the rainy season into the injection well.

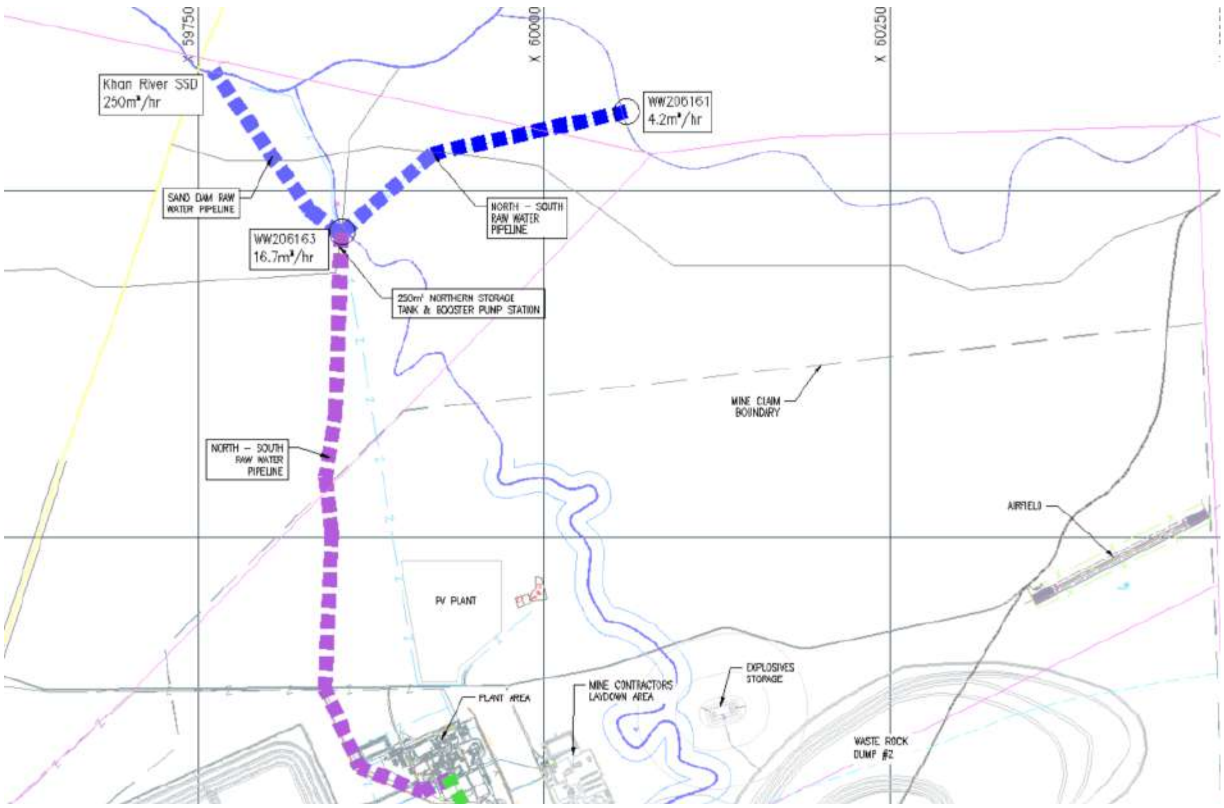
A running / standby pumping arrangement is then used to deliver the water to the raw water dam constructed within the processing plant perimeter.

The pipelines were sized to not exceed a flowrate of 1.5 m/s ensuring the frictional losses are kept to a minimum resulting in lower operational costs.

The location of the boreholes and the connecting pipework is shown in Figure 18.6.6.

It should be noted that the position of the Sand Dam and the yield of the Khan River well are not yet available and have been estimated for preliminary design purposes.

Figure 18.6.6 Northern Boreholes – Location and Layout



18.7 TSF Including Conveyors

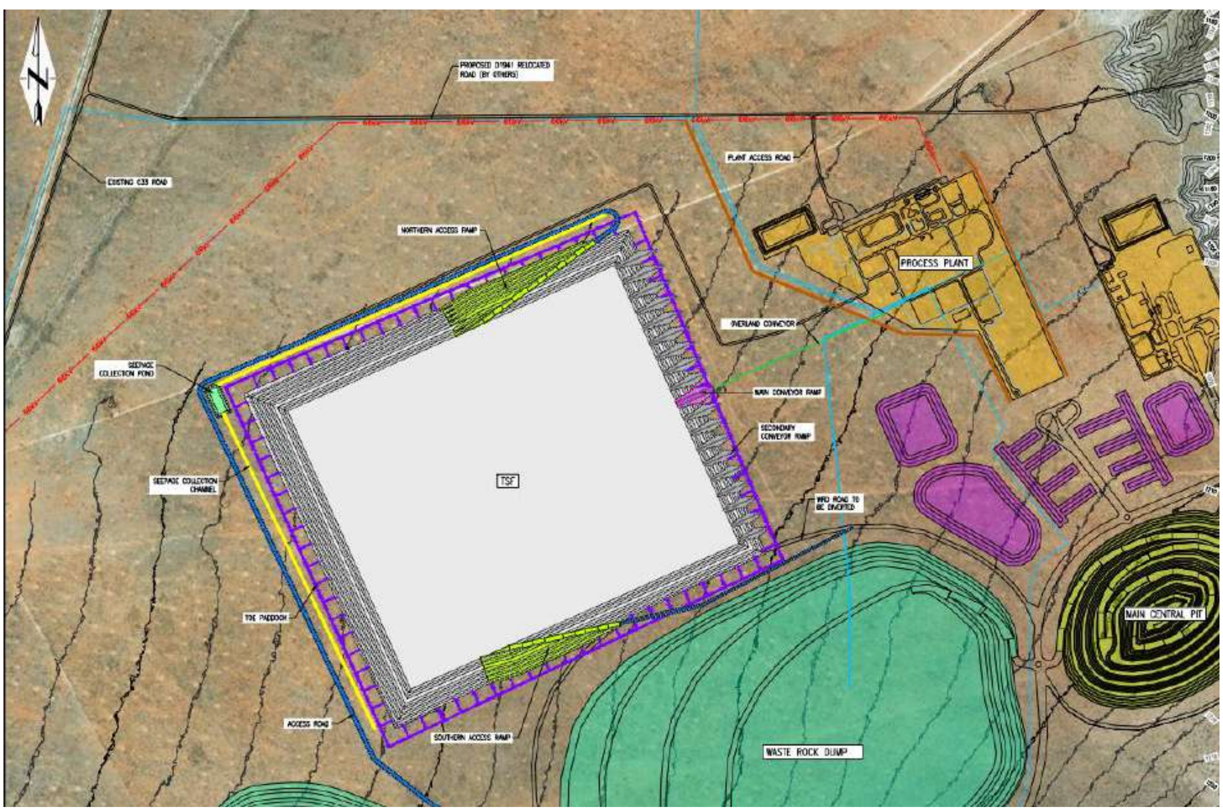
18.7.1 Project Description

The mine plan for the Twin Hills gold includes the storage of 65 million tonnes (Mt) of filtered tailings in the Tailings Storage Facility (TSF) ore over a 13-year LOM period. Filtered tailings from pressure belts will be conveyed to the TSF located approximately 600 m from the processing plant. The TSF length dimensions are 1.6 km x 1.4 km. The site location, key design criteria and design summary are presented in the following sections.

18.7.2 Site Location

The TSF will be located approximately 600 m west from the processing plant operation. The TSF site slopes gently at approximately 1% in the northwestern direction. The elevation ranges from 1,205 mamsl at the highest point to 1,186 mamsl at the lowest point. The TSF general arrangement is illustrated on Figure 18.7.1.

Figure 18.7.1 Tailings Storage Facility General Arrangement at Final Elevation



18.7.3 Meteorological Data

Climatic conditions are arid but with periodic seasonal high precipitation events. Rainfall events are characteristic of flash flood event, with high intensity and short duration. According to the air quality baseline study [Airshed, 2021], the wind field is dominated by winds from the southwest and the east to south-east, with the strongest winds from the southwest.

18.7.4 Geotechnical Conditions

Geotechnical site investigations were completed at the TSF site in December 2022 by Knight Piésold and comprised a desktop study to review available geology, aerial photography and previous investigations, a test pitting program for foundation characterization and potential borrow sources, as well as a drilling program to confirm depth to bedrock and rock mass quality, and a sampling and laboratory testing program. In total 49 test pits and nine rotary boreholes were competed over the TSF area for the Definitive Feasibility Study (DFS).

The Project site area is covered by shallow reddish brown gravelly / silty sand colluvium, underlain by pedogenic soils comprising nodular, honeycomb and hardpan calcrete, and calcretized alluvium and colluvium with depth before encountering the schist bedrock. The pedogenic soils (nodular and honeycomb calcrete) are anticipated to vary both in distribution, thickness, and quality across the site. The nodular calcrete is sporadic in distribution and typically observed as less than 0.5 m thick horizon below the colluvium. Refusal conditions were encountered during the test pit investigation on hardpan calcrete from surface to depth of 1.0 m on very dense calcrete to strongly cemented soft to medium hard rock strength with an allowable bearing capacity of more than 500 kPa.

Where the hardpan calcrete is penetrated during the drilling, the underlying calcretized alluvium and colluvium with very soft to soft rock strength capable of producing an allowable bearing capacity of more than 500 kPa.

18.7.5 Tailings Characteristics

The tailings will largely be from a hard rock source but if some mineralization is also in the calcrete there may be some softer tailings. The tailings are being planned to have a relatively fine grind with 80% passing the 63 microns size and with most of the material expected to be largely silt sized particles. The clay content is expected to be low, however this should be confirmed since the hard rock ore is from a faulted and folded source and thus it is possible that some shear zone clay may be present.

Filtered tailings of which 80% passes the 63 micron particle size will be produced at a target moisture content of 14% to 16 %, with a transportable moisture limit estimated at 16.1% moisture by mass. A portion of the ore will be made of transition material which has a moisture content of about 16% to 18% once blended with fresh ore material.

Geotechnical test work on the tailings showed an average compacted dry density for the tailings was estimated to be 1.5 t/m^3 and the optimum density of 1.6 t/m^3 at 12% moisture content. Tailings are contractive in undrained conditions and minimally compacted tailings show a drained strength of 33 degrees friction angle.

The tailings are potentially acid forming and a significant risk for acid generation with a neutralization potential ratio below 1. Short term leaching experiments identified arsenic, aluminium and iron as potential pollutants of concern in high water to rock leaching ratios. The level of arsenic and aluminium was identified as a concern and requires a lining system and mitigation measures.

18.7.6 Design Basis

The design basis and operating criteria are based upon accepted national and international standards for mining dam design and operation (Canadian Dam Association - CDA, 2014/2019, 2022 Mining Association of Canada (MAC) Tailings Guideline; Global Industry Standard on Tailings Management – GISTM, 2020) and applicable local guidelines. Local applicable guidelines include the Best Practice Guide for Mining in Namibia, 2019 and legislation in place such as the Namibian Environmental Management Act, 2007, the Water Act of 1956 and Water Resource management Act of 2013.

The results of the dam classification assessment for the TSF suggest that this facility be classified between Significant and High due to the toxicity of tailings (High) but could be rated significant because the impacted area from a slope failure is relatively small. It is recommended to use a high classification for cautionary measure but to consider reviewing this classification during detailed with confirmation of a detailed failure analysis. The Earthquake Design Ground Motion (EDGM) and Inflow Design Flood thresholds used for the design reflect this classification:

Inflow Design Flood: Temporarily contain runoff from the 1 in 2,475-year, 24-hour storm event.

Design Earthquake: The Earthquake Design Ground Motion is the ground acceleration that is generated from the 1 in 2,475-year earthquake (10% probability of exceedance in 50 years).

18.7.7 Phased Development

The TSF DFS design level includes a phased development of the TSF to defer capital expenditure (Phase 1 to Phase 3) over the initial six years of the LOM. Geosynthetic lining and underdrainage systems have also been included in the design based on a review of the existing geochemical data. These systems will protect the environment from the tailings' geochemistry, reduce seepage from the facility and help maintain drained conditions in the tailings mass. The TSF slope will need to be cladded progressively during operation with hauled and placed selected waste rock to mitigate dust generation. Additional dust suppressant polymer will be required on the tailings surface following tailings placement. Compaction of tailings with dozers will also reduce oxidation of the tailings, improve the tailings bearing pressure for the advancement of conveyors and slope stability, and support dust and erosion mitigations.

Phased development of the TSF offers the following advantages:

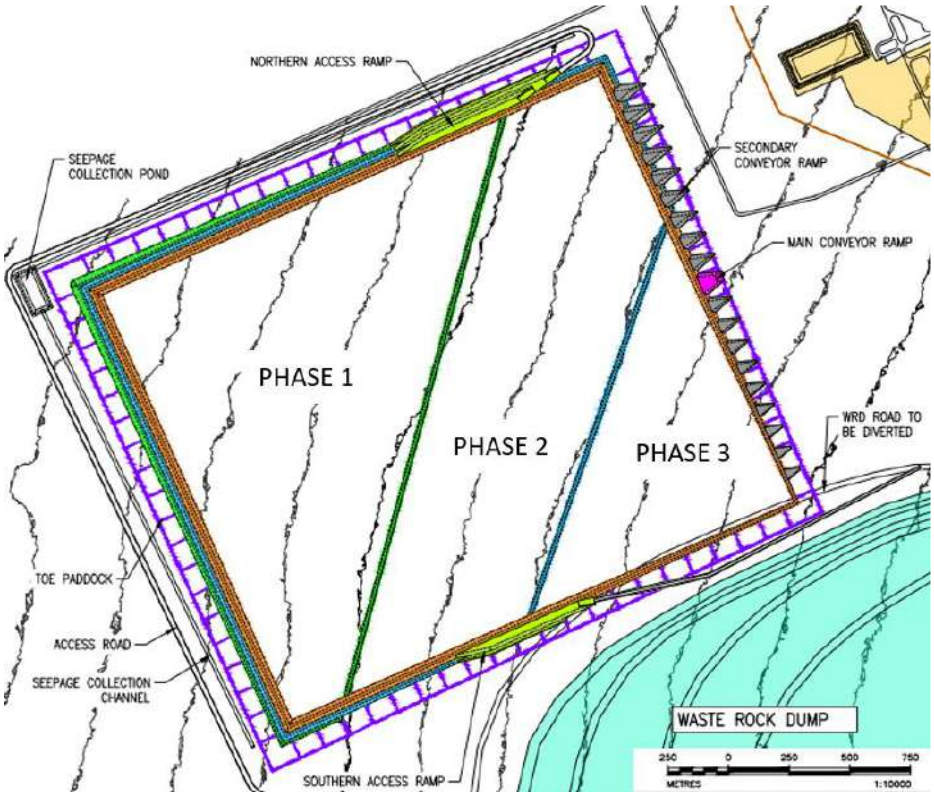
- Reduction of initial capital expenditures.
- Refining of design and construction methods as experience is gained with local conditions and/or as operating criteria change.
- Adjustment of plans at a future date in order to remain current with future engineering and environmental practices, etc.

This phased approach will be used for the future design, construction, and operation of the facility as part of a continuous and integrated process to identify cost savings and mitigate risks. The approach requires construction controls, monitoring, and review to improve the understanding of site-specific conditions.

The deposition capacity for Phase 1 is approximately 4 Mt, which equates to nine months of storage based on the current deposition strategy and possibly longer depending on the commissioning period outcome. It would be possible to double that capacity by building a second lift over Phase 1 and deferring Phase 2 liner construction and reducing Phase 2 capacity. Phase 2 has approximately 11 Mt of capacity which equates to 2.2 years of storage and Phase 3's capacity is approximately 15 Mt which equates to three years of storage.

Figure 18.7.2 shows the arrangement of the three phases of development base footprint area.

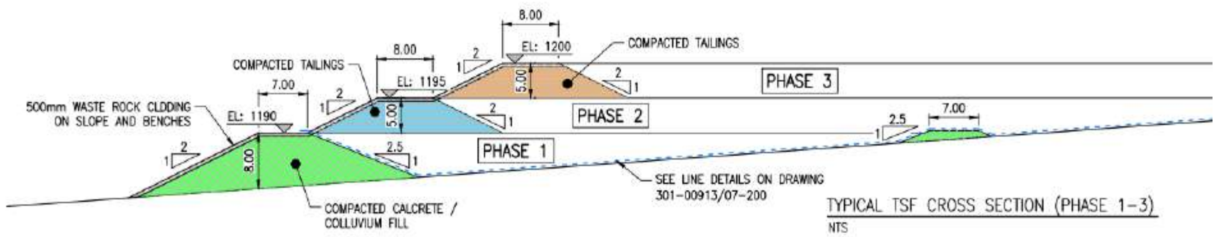
Figure 18.7.2 Tailings Storage Facility Phases of Development



18.7.8 Phase 1 Starter Embankment

The Phase 1 starter embankments comprise compacted colluvium / calcrete gravel sourced in the TSF basin and in nearby borrow pits, as well as from pre-stripping waste rock from the Main open pit. The Phase 1 embankment will vary in height and will be approximately 8 m at the highest point from crest to downstream toe with an average height of about 4.5 m. The crest elevation of the Phase 1 starter embankment is at 1,190 meters above mean sea level (mamsl) and the deposition area ties into the natural ground contours, with a perimeter berm to anchor the liner system and divert runoff water. The crest width is sized to accommodate light vehicle, dozers, up to 40 tonnes trucks and excavators during the construction and operation. Provision during the LOM has been made in Phase 3 to amplify a section of the eastern embankment width with selected waste rock hauled directly from the open pit, dumped and pushed with dozers in layers. Each subsequent vertical lift will be cladded with waste rock preferably from calcrete sources to mitigate dust generation, provide for erosion protection and advance progressive closure.

Figure 18.7.3 Phase 1 to Phase 3 TSF Cross Section



18.7.9 Storage Capacity

Phase 1 stores the initial nine months of tailings production; Phase 2 extends to the south-east and above Phase 1 to stores 11 Mt of tailings for two years and Phase 3 extends east towards plant and above the full facility to store 15 Mt for three years of storage. Each subsequent lift after Phase 3 is constructed upstream in 5 m lift increments. The final height of the TSF stack is 33 m.

18.7.10 Composite Liner System

The TSF design includes a composite geosynthetic liner system over the tailings basin footprint to reduce seepage that has potential for acid generation and metal leaching through a geomembrane and fine granular calcrete barrier system. The geosynthetic lining system will be installed during initial construction of each phase. It comprises the following material from top to bottom:

- Geotextile Bidim A6 for liner protection.
- 1.5 mm mono-textured HDPE geomembrane for seepage reduction.
- Geochemical stabilisation underliner layer to reduce acid leaching and heavy metals precipitate. This made of in-situ compacted and smoothed calcrete layer and in sections of unsuitable foundation 150 mm crushed compacted calcrete layer overlaying the in-situ natural calcrete.

18.7.11 Underdrainage

A Basin Underdrain system is positioned in key areas of the facility basin to enhance consolidation of the tailings mass, and to collect leachate to the seepage pond. The seepage collection pond is sized to maximize evaporation of the leachate water.

18.7.12 Stability Assessment

Stability analyses for long-term static and post-earthquake loading conditions were completed using SLIDE©, a two-dimensional Limit Equilibrium stability analysis software package (Rocscience, 2019). Post liquefaction loading condition.

Both global failure along the liner system and shallow slip failure in the upstream slope were analysed for drained conditions and undrained conditions in the case of a rapid change in pore pressure and loading condition. The minimum Factors of Safety against slope failure objectives are achieved for the TSF under the considered operating conditions but are sensitive to the level of the phreatic surface, should it develop in the facility over time. Adequate adherence to the tailings target moisture content, combined with some compaction of the perimeter of the facility and drainage will be important to maintain slope stability of the upstream raised facility throughout operations.

18.7.13 Stormwater management

Clean stormwater runoff from external catchment area will be routed and diverted around the facility by the 1 m perimeter paddock walls and access road. Stormwater runoff from the TSF Inflow Design Flood (IDF) will be contained in the toe paddocks while rainfall that seeps into the TSF will be routed to the solution trench and to the seepage collection pond sized to contain the IDF.

18.7.14 Water Balance and Sizing the Seepage and Sediment Pond

Following the assessment of the water balance it can be concluded that under normal operations and average annual monthly rainfall, no over spilling over the paddocks is expected. The seepage, and sediment collection, pond will primarily collect seepage from operations but will also contain runoff water from the TSF direct tailings catchment area. It is sized to contain both maximum seepage monthly volume and the Inflow Design Storm (IDF) over the TSF. Diluted runoff water is available for dust suppression or process recycle. Non used water can be evaporated in the shallow pond.

18.7.15 Monitoring

Instrumentation, including vibrating wire piezometers and surface movement monuments will be installed within the TSF to monitor the performance of the embankments during operations. Monitoring of the TSF will be carried out at specified regular intervals to evaluate the performance of the TSF and to refine the operating practices. Key monitoring requirements will include:

- Daily recording of the tailings’ placement details in accordance with the filling schedule, including moisture content and density testing.

- Weekly monitoring of piezometers to measure the pore pressure in the tailings during ongoing placement and compaction.

- Monthly monitoring of the embankment crest and surface movement monuments to confirm that embankment displacement has not occurred.

- Quarterly surveys of the placed tailings surface to estimate the tailings dry density and confirm that filling of the TSF is occurring according to the schedule.

The monitoring data will be reviewed on regular basis by the TSF manager, and the data will be submitted to the Design Engineer for review.

18.7.16 Closure and Progressive Rehabilitation

The closure measures at the TSF will include construction of a closure cap on the final filtered tailings surface of compacted calcrete material to seal the surface, provide additional neutralization potential and divert runoff water away from the TSF. Stockpiled topsoil removed from the TSF area will be added to the cladded wall protection to develop a rock / soil mixture for long term slope rehabilitation. The closure measures for the surface water management measures will include the removal of sediment and flattening and recontouring of sediment basin berms and diversion / collection ditches / berms. A growth medium and vegetation will then be established in these disturbed areas.

18.7.17 Dry Stacking Deposition Conveyors

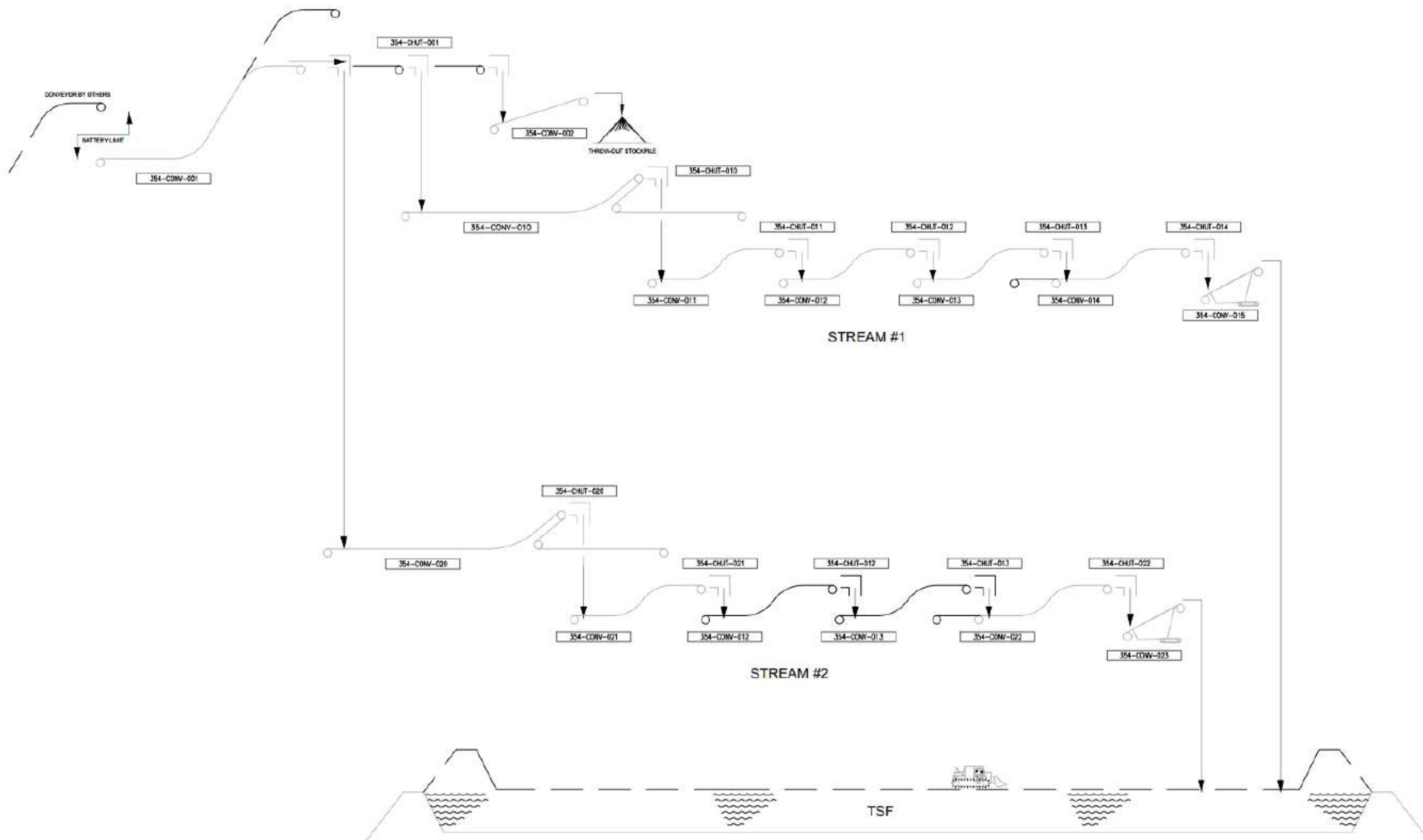
The tailings filter cake will be conveyed by a 1,050 mm wide overland conveyor to the tailings storage facility where it will be deposited in predetermined layers using a series of stacking conveyors. Deposited tailings material will be left to dry and later will be covered with capping material for environmental protection (to prevent washing out and erosion). No water is expected to be recovered and recycled to the processing plant in the base case.

Table 18.7.1 Filtered Tailings Conveying System Design Criteria

Item	Unit	Value
Nominal Dry Capacity	Dry t/h	653.2
Design Dry Capacity	t/h	783.8
Filter Cake Moisture Content	%w/w	16%
Filter Cake Solids Concentration	%w/w	76%
Filter Cake Specific Gravity	SG	1.96
Maximum Lump Size (P80)	µm	63
Nominal Wet Capacity	t/h	859
Design Wet Capacity	t/h	1,031
Bulk Density	t/m^3	1.27
Material Angle of Surcharge	°	3 to 5
Suggested Conveyor Size	mm	1,500.0
Suggested Belt Speed	m/s	1.5

Forward and retreat stacking methodologies were considered. A forward stacking conveying system was selected based on overall availability and production reliability. The forward stacking design solution offers a simplified, cost-effective design which incorporates commonality and standardization of equipment and spares on for the selected equipment and process reliability through life cycle cost.

Figure 18.7.4 Filtered TSF Forward Stacking Conveyor Schematic



A waste handling system that is capable of forward stacking has been developed and will offer the following:

- A purpose build forward stacking system that will adhere to the process requirements of the TSF dry stacking methodology explained elsewhere in this report.
- A functional design that considers a high level of redundancy, and, in the event of unforeseen stoppages, the system will switch over almost instantaneously to an emergency and/or next stacking stream.
- A flexible design which offers less double handling of equipment therefore high availability on TSF operations.
- A design that allows advance planning for i.e., stacking, movement of equipment and uninterrupted safe access during the pad lining process.
- Equipment that is reliable, interchangeable, maintenance friendly with commonality in spares keeping.

Table 18.7.2 Forward Stacking Conveyor Selection Summary

Conveyor No.	Description	Length m	Lift m	Power Required kW	Belt Width mm
354-CONV-001	Pad Feed Conveyor	733.4	5.2	200	1,050
354-CONV-002	Emergency Conveyor	29.8	3.7	37	1,050
354-CONV-010	Tripper Conveyor	790.6	0	230	1,050
354-CONV-011	Extendable Conveyor	442.3	2.6	90	1,050
354-CONV-012	Extendable Conveyor	442.3	2.6	90	1,050
354-CONV-013	Extendable Conveyor	442.3	2.6	90	1,050
354-CONV-014	Shuttle Conveyor	122.7	5.2	65	1,050
354-CONV-015	Spreader Conveyor	35	1.2	90	1,050
354-CONV-020	Tripper Conveyor	790.6	0	230	1,050
354-CONV-021	Extendable Conveyor	442.3	2.6	90	1,050
354-CONV-022	Shuttle Conveyor	122.7	5.2	65	1,050
354-CONV-023	Spreader Conveyor	35	1.2	90	1,050

The complete TSF pad system will comprise of a 6-layer configuration. The first layer will be up to 8 m high, and 6 layers will be at 5 m increments with a total pad height of 38 m. The conveyor and maintenance access ramps will be designed at 9°.

The Pad feed, emergency and Tripper conveyors will be installed on top of the waste Pad berms and will be relocated to the next level layers as required.

The complete tailings disposal system will comprise of a plant feed, emergency, and forward stacking streams #1 and #2. One stream will always work as the primary stream and the other stream will then follow as the emergency stream. These two off streams will alternate in function as either-or stream comes to the end of the stacking at the far side berm.

The Pad feed conveyor, Tertiary emergency conveyor and dozer will initially be used to build platforms for the Spreader conveyors.

On completion of the 1,600 m long stream the system will comprise of six in series conveyor systems i.e., Tripper conveyor, three Extendable conveyors, one Shuttle conveyor and a Spreader conveyor. The complete extension will comprise out of 44 stages as illustrated in the Proposed Staking Philosophy drawing. The design allowed for streams #1 and #2 which are in the same orientation (parallel) with each other.

Both the streams can operate in waste stacking or as an emergency configuration. The emergency stream (stream #2) will comprise of Tripper conveyor, Shuttle and Spreader conveyors.

Both the Shuttle and Spreader conveyor will be self-driven and can advanced at a maximum ramp angle of 9°. The Shuttle conveyor will advance by means of a hydraulic creep function and the Spreader conveyor will be track driven and will be able to move both the movable conveyors during horizontal advancements. The track driven Spreader conveyor will move forward at increments to suit the dozer advancements. The Shuttle will be coupled with the Spreader conveyor with a A-frame configuration. At the 9° the Shuttle conveyor will assist the Spreader conveyor during forward movement by means of the hydraulic assisted creeping device.

The system design consists of the following key mechanical elements:

Pad Feed Conveyor

The Pad feed conveyor will be of a standard type of incline conveyor. The conveyor will have ground run modules with a horizontal tail gravity take-up and a moving headend. The Moving head will distribute waste to the Tripper conveyors #1 and #2 and the Tertiary emergency conveyor respectively. This conveyor will be extended to suit the pad 6-layer configuration.

Tertiary emergency conveyor

The Tertiary emergency conveyor will be of a standard type of incline conveyor and will receive waste material during unforeseen stoppages, short maintenance durations, and building of equipment access on top of the pads.

Tripper conveyors #1 and #2

These conveyors are of a standard overland configuration with a rail mounted Tripper car. The Tripper car will travel 576 m at ±64 m increments and will transfer on to the Extendable and Shuttle conveyors respectively. The Tripper cars will travel in the opposite directions and will come equipped with storm brakes that will be manually engaged and disengaged.

Shuttle conveyors

The Shuttle conveyor will be of a skid rail mounted type with a cantilever head end configuration and come equipped with storm brakes that will be manually engaged and disengaged. The Shuttle conveyor will be coupled to the Spreader conveyor by means of a A-Frame. The system will comprise of rail mounted cantilever system and a skid rail mounted overland modules.

The conveyor has a motorized winch assist horizontal take-up at the tail end. The system will be designed to move forward by means of a hydraulic creep cylinder. At the end of travel the skid mounted ratchet system will be removed at the back end of the Shuttle conveyor head and re-installed at the front-end of the Shuttle conveyor. The system will be designed with a positive lock rack and pinion and a forward creep hydraulic system. The system will be interlocked with each other The system will creep forward after an interlock engagement has been confirmed. This conveyor transfers onto a Spreader conveyor via an inline feed chute.

Spreader conveyor

The Spreader conveyor will be of a forward and radial stacking configuration. The Spreader conveyor will be track driven and will be controlled by means of a manual joystick configuration. The tracks will be design with a ball type slewing configuration with a transverse trolley system. The ball slew type system will allow for adequate movement with specific save tolerances in any direction. The transverse trolley system allows the system to move forward during forward and radial stacking with the tracks in a stagnant position which complement the safe edge distance.

Extendable conveyors

The Extendable conveyors will be of a typical overland configuration with a ±25 m belt saver configuration at the take-up. The front end and take-up section will straddle over the Shuttle conveyor and will share the skid systems. During the extension of the conveyor the head end, straddle stringers and belt saver take-up will move forward by ±74 m and overland stringers will be installed at the tail end. The initial length of the conveyors will be 77 m and will extend to 490 m.

Figure 18.7.5 1st, 2nd and Final Waste Fill – Proposed Forward Stacking Conveyor Layout

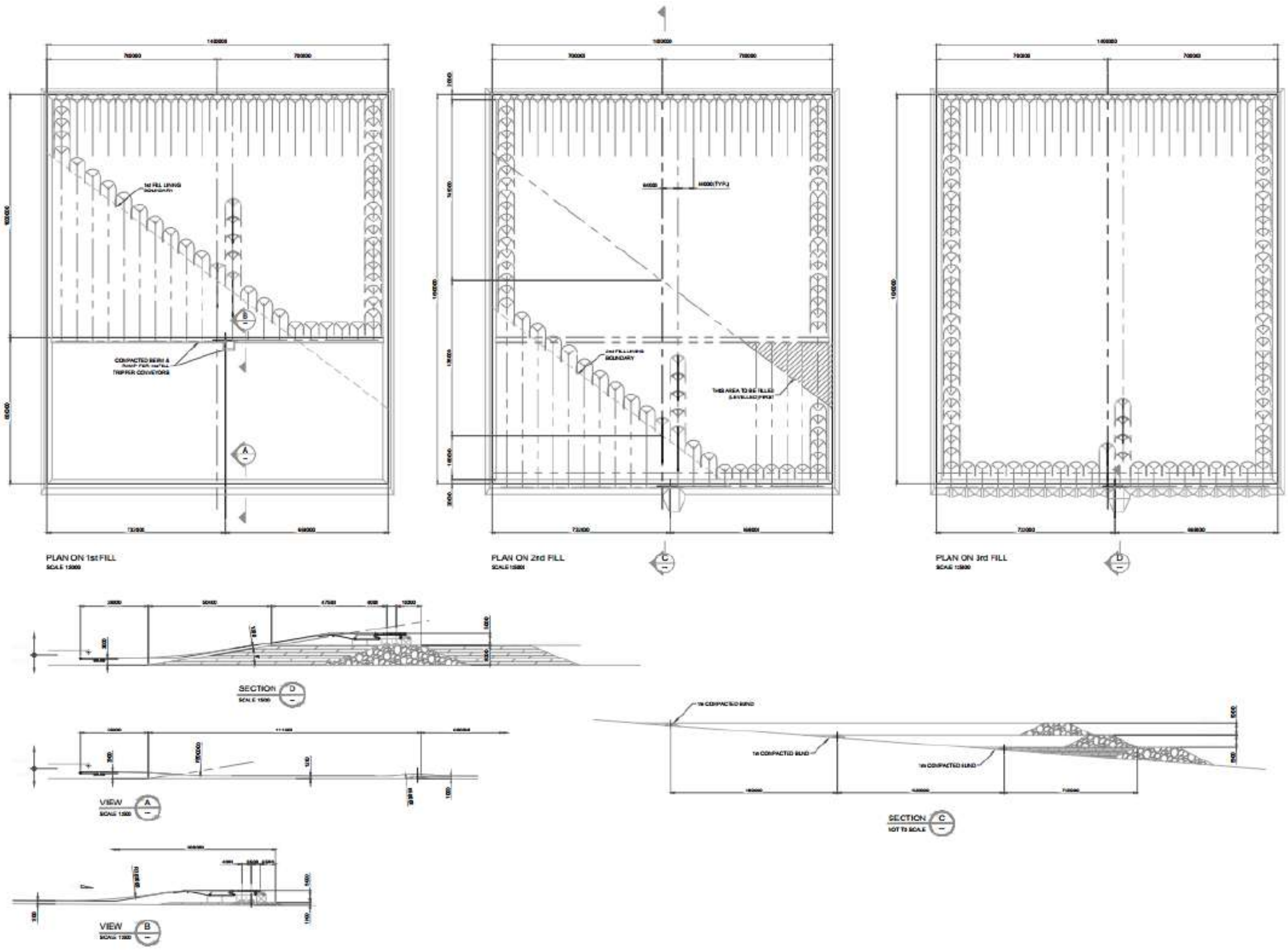
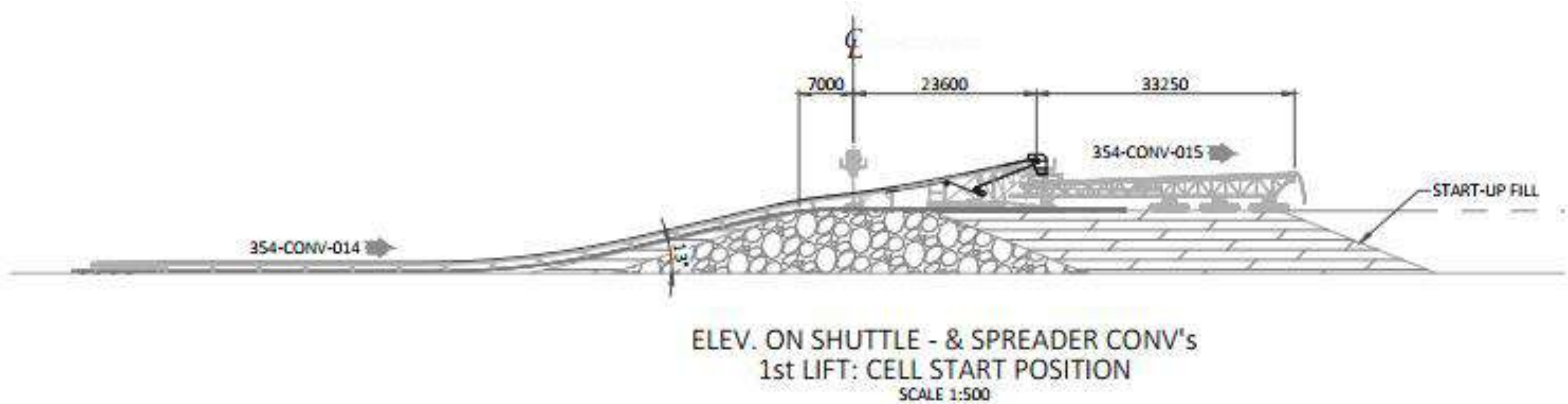
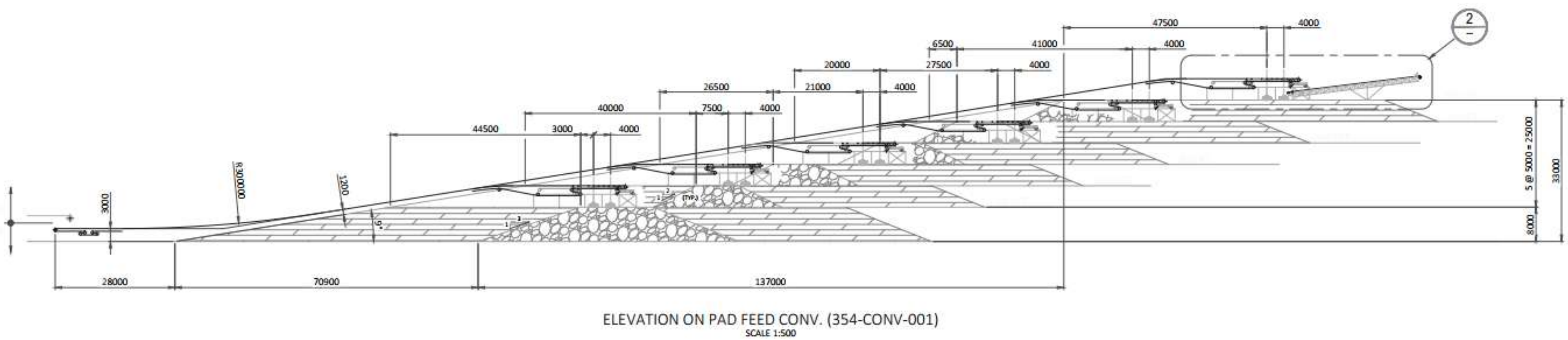
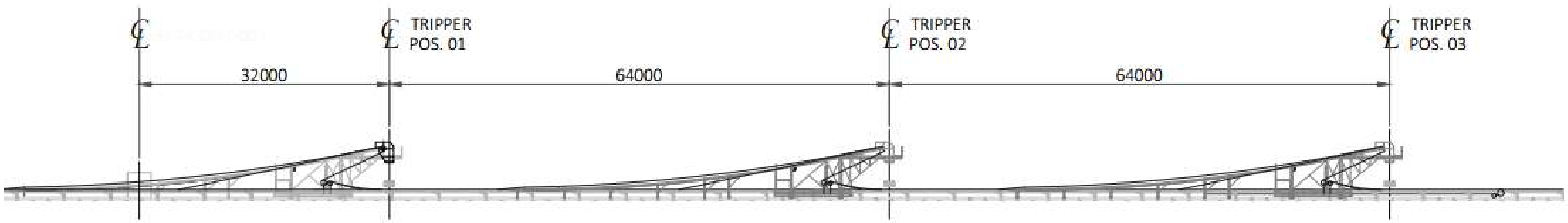


Figure 18.7.6 Typical Forward Stacking Conveyor Elevations







SECTION A
SCALE 1:500
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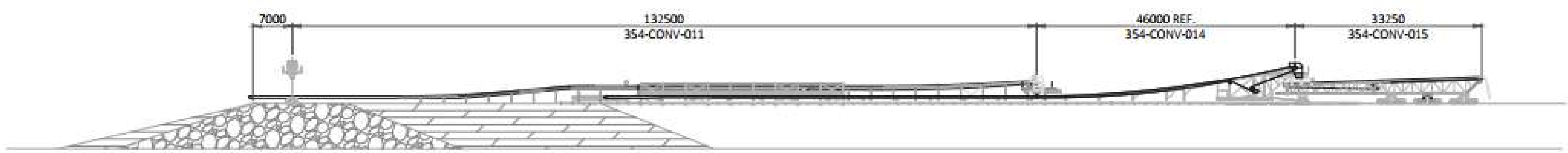

ELEVATION B
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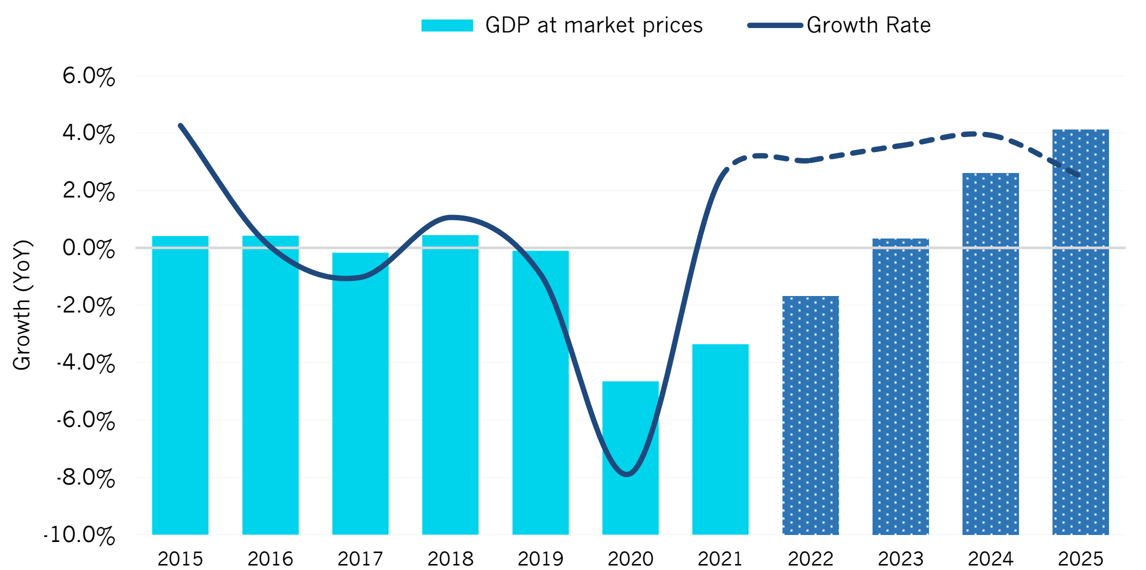
STACKING
STAGE "1-04"

19.0 MARKET STUDIES AND CONTRACTS

19.1 Namibia Economic Overview

Namibia posted a strong growth recovery of 4.6% in 2022, well above initial estimates, after revised estimates of 3.5% for 2021. The primary industries (particularly mining and quarrying) led growth in both years, while secondary industries recovered from the contraction in 2021 and growth accelerated marginally in the tertiary industries. This puts real GDP at N$144.1 billion, just 0.5% below the pre-COVID level (2019: N$144.9 billion) and 1.4% below the peak in 2018. Nominal GDP increased 12.1% to N$206.2 billion, well above estimates and causing material improvement in many fiscal and other metrics (such as debt-to-GDP).

Figure 19.1.1 Growth Forecast



Source: Cirrus Securities

Growth is expected to moderate hereafter, but still largely carried by the primary industries (mining) and ongoing recovery in the tertiary industries. Namibia's growth trajectory has diverged from global trends over the past decade, particularly now as Namibia's outlook is positive while there are material recession concerns elsewhere (regionally and abroad).

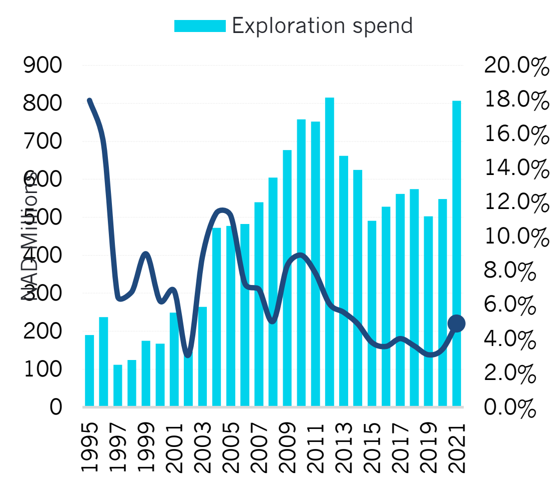
The primary industries posted real growth of 12.9% in 2022, as the agriculture expansion improved to 2.6% but mining and quarrying posted a healthy 21.6% expansion. This was entirely driven by diamond mining, up 45.1% thanks to the Benguela Gem's contribution to Debmarine Namibia's production. This will continue to drive strong growth in 2023 and 2024, however we anticipate the pace to moderate. Gold and uranium output were hit by production challenges – uranium due to ongoing water constraints and gold due to delays in B2Gold's underground development. We anticipate some improvement, particularly given the effect of exchange rate weakness and spot market prices.

Published historical Mining industry exploration spend data are shown below.

Figure 19.1.2 Exploration Spend (Nominal and by Type)

Exploration Spend (Nominal)

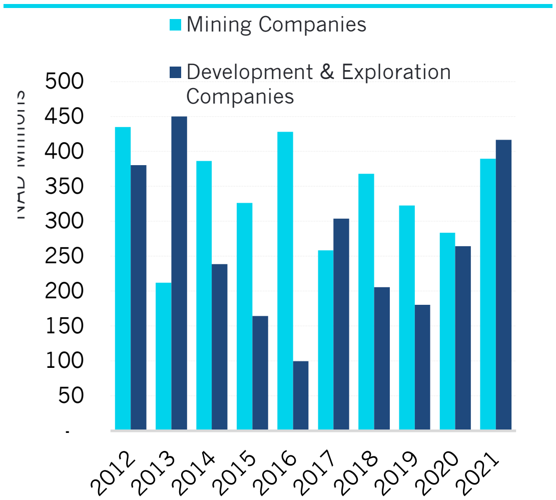
Exploration spend increased to 4.9% of mining GDP in 2021



Source: Chamber of Mines of Namibia

Exploration Spend (by Type)

Exploration spend by development and exploration companies recovered sharply in 2021, to levels last seen in 2012



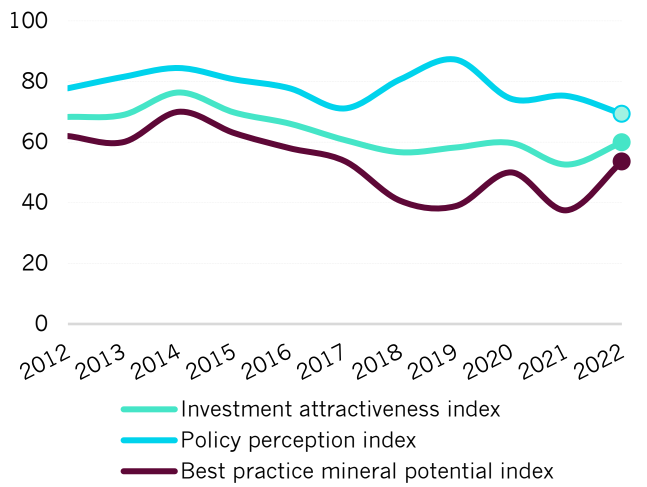
Source: Chamber of Mines of Namibia

The mining sector remains a vital part of the Namibian economy and its growth prospect. A high rate of exploration activity is currently evident across the precious and base metals, nuclear fuels, and rare earth and battery minerals sectors. The ongoing mining and exploration activity have provided a key source of employment, fiscal revenues, hard currency earnings and foreign direct investment. This is expected to continue, particularly given Namibia's relative attractiveness as a mining jurisdiction in the region (as seen in Fraser Index ratings).

Figure 19.1.3 Fraser Survey of Mining Companies Scores and Investment Attractiveness Index

Fraser Survey of Mining Companies Scores

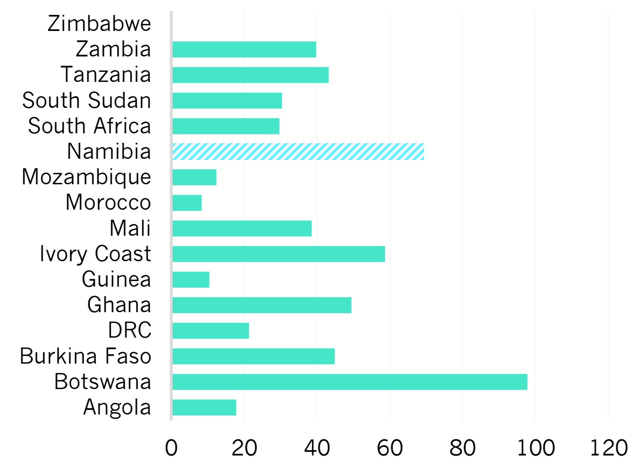
After a few years of decline, Namibia's scores are improving.



Source: Fraser Institute

Investment Attractiveness Index Ranks (Africa – 2022)

Namibia ranks as the second most attractive jurisdiction.



Source: Fraser Institute

Namibia's scores on the Fraser Institute's Survey of Mining Companies investment attractiveness and best practice mineral potential indices improved in 2022, although policy perception index decreased slightly. Globally, Namibia's overall PPI ranking has improved from 29th in 2021 to 26th in 2022. However, there were negative responses regarding Namibia's policy environment, including concerns about the lengthy permitting process and proposed non-deductibility of royalties (subsequently withdrawn), which hinder project development.

The outlook for agriculture is less optimistic, as erratic rainfall during the 2022/23 rain season and likelihood of E*l Niño* from mid-2023 pose serious challenges. After devastating droughts during the 2010s, the better rainfall of the last few seasons has seen material improvement in the agriculture sector – both in crop harvests and livestock farmers gradually restocking. However, the risk of moving into below-average rainfall for the season(s) ahead are a concern for crop and livestock farmers alike. There has been an increase in crop area under irrigation, however most of Namibia's core crops are still rainfed. The E*l Niño* will thus likely lead to lower global prices, but lower domestic and regional production necessitating increased imports.

The secondary industries are incredibly mixed. Manufacturing has seen a broad recovery, tied to increased demand for staple foods, more livestock processing off a weak base, beverage manufacturing recovering from the pandemic lows, and increased diamond mine output benefitting downstream diamond processing (cutting and polishing). Growth here will continue to be mixed but will moderate. The construction sector is expecting another bad year, as most major construction projects have been completed (beyond ongoing road construction) and the pipeline looks thin.

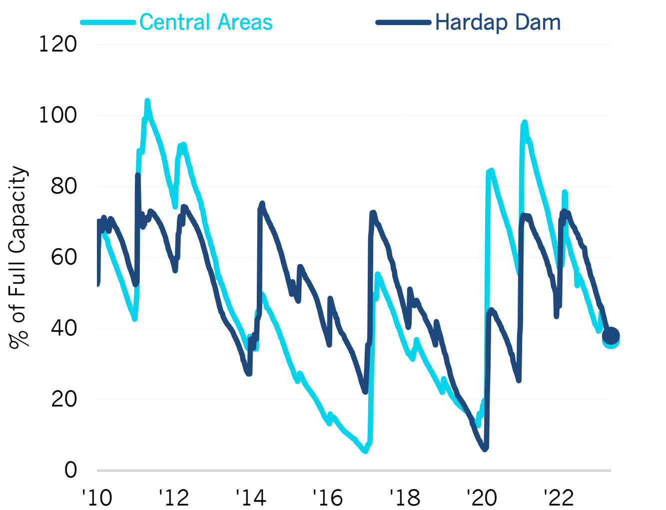
Electricity and water supply should benefit from increased water levels at Ruacana, after a record low season last year. This will materially increase Namibia's power generation compared to the prior year, reducing the need for imports. However, with the risk of below-average rainfall for the next season, this is likely a once-off until substantial generation capacity (especially firm / baseload capacity in addition to renewables) is added. While the regional generation challenges pose a threat, we do not foresee this as too material a risk for Namibia, particularly over the long-term. Namibia's Power Purchase Agreements are firm, and each individual agreement is relatively small compared to the deficits in the respective generating countries. Additionally, NamPower maintains a healthy balance sheet and has several planned generation projects, while there is also substantial promise around the nascent oil and gas discoveries.

Water levels present a concern. Rainfall this past season has not been in many of the core catchment areas, especially for the central parts of Namibia. This will likely necessitate water restrictions from mid-2023 (although arguably needed sooner) for the central areas. This will not only impact Windhoek and towns such as Okahandja, but all entities reliant on water from the central lines – including some mines such as Navachab. After the severe water crisis in 2016, little effort has been made to mitigate its recurrence – such as relocating industries that are heavy users of water (where plausible) or upgrading / building infrastructure (to cater for population and economic growth). Water challenges will pose a more material challenge in the short and medium term than energy challenges.

Figure 19.1.4 Dam Levels and ENSO Probabilities (2023)

Dam Levels

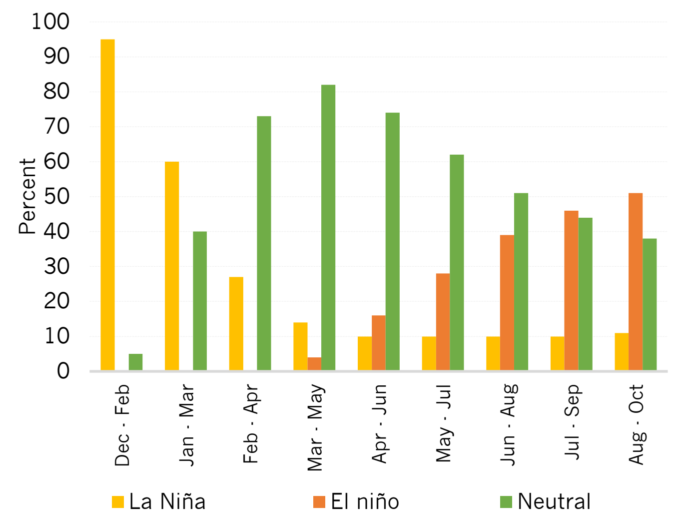
No real dam recharge has been seen by the end of the 2023 rainfall season – a concern for the next year.



Source: Namibia Statistics Agency, Statistics South Africa, Cirrus

ENSO Probabilities (2023)

During the months of Feb - Mar, neutral weather conditions will start to prevail when *La Niña* is passing, shifting to *El Niño* as the year progresses.



Source: Namibia Statistics Agency, Ministry of Finance, Cirrus

There has been some growth in the tertiary industries, with growth accelerating from 1.8% in 2021 to 2.2% in 2022 - the fastest since 2016 (2.3%). However, growth in the tertiary industries was not uniform, as two out of 13 components showed a decline. Key sectors such as hotels and restaurants, transport and storage, and financial services played a major role in driving growth here during 2022, continuing the recovery from the COVID-19 pandemic. Nevertheless, these sectors are expected to return to a more moderate growth trajectory in the near future.

Namibia's tourism sector has experienced a robust recovery and continues to show positive progress. While tourism has not yet recovered to pre-pandemic levels, there is steady and continued growth. Full recovery is hampered by supply-side destruction during the pandemic, such as fewer international carriers servicing the route, closure of some accommodation offerings, and a material decrease in the national rental fleet (currently at 50-60% of pre-pandemic levels). Current Rand / Namibian Dollar weakness bodes well for future travel, with a clear relationship between a weaker Rand and increased international arrivals the following year.

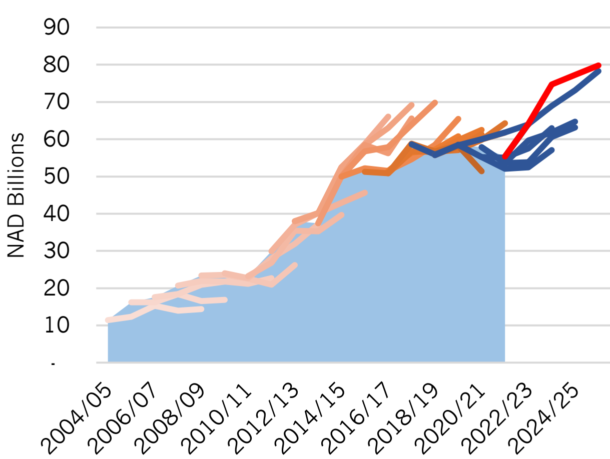
Growth in the financial services industry was moderate at 1.7% in 2022, marking the first year of growth since 2019. This should improve as the broader economic recovery lifts the tide, and with the improving medium and long-term outlook favours credit extension. While private sector credit extension remains subdued, this should improve as economic conditions continue improving and once interest rates hit the expected maximum terminal level. Bank appetite for lending is improving, as the conditions of the crowding out of the last few years reverse. Additionally, the property market has started stabilizing, while the outlook for increased government employment and wage increases are positive for lending conditions – moderated only by the South African Reserve Bank's hawkish stance.

The fiscal situation has improved dramatically, owing to stronger receipts – especially from the Southern African Customs Union (SACU) transfers. The expenditure ceiling has subsequently been lifted, but nonetheless sees the deficits narrowing over the medium term. Revenue forecasts, particularly from SACU, appear conservative – providing some leeway for fiscal slippage. Nonetheless, there is a strong likelihood that fiscal deficits will be less than official forecasts – a welcome change from the prior decade.

Figure 19.1.5 Total Revenue and Budget Deficit

Total revenue

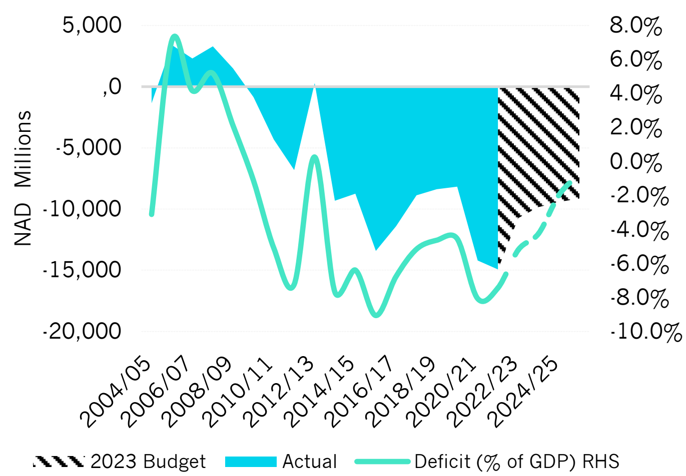
Similar trajectory as the 2022 mid-year budget, but FY 2023/2024 has been revised up substantially.



Source: Ministry of Finance

Budget deficit

Gradual decrease in the deficit, but forecasts appear conservative and will likely be surpassed.



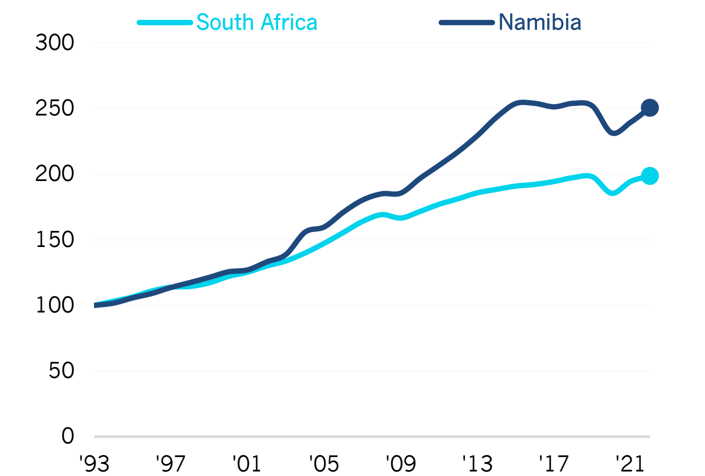
Source: Ministry of Finance

Overall, growth is anticipated to moderate over the medium term, but this will be a material improvement from the 2015-2019 era. This will largely be driven by the extractive industries, further supported by the tertiary industries as the financial services see growth, and an improving fiscal situation provides the state with some firepower. Namibia's outlook has improved substantially, particularly setting itself apart from many states in the sub-region – particularly South Africa.

Figure 19.1.6 Comparative GDP and GDP Growth

Comparative GDP (indexed: 1993 = 100)

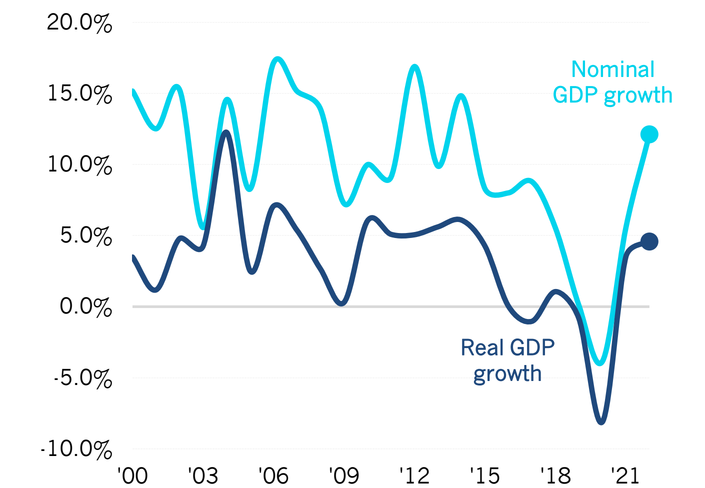
Despite growth challenges in recent years, since 1993 the Namibian economy has performed better than its southern neighbour.



Source: Namibia Statistics Agency, Statistics South Africa, Cirrus

GDP Growth

Nominal GDP growth was materially higher owing largely to improved commodity prices.



Source: Namibia Statistics Agency, Ministry of Finance, Cirrus

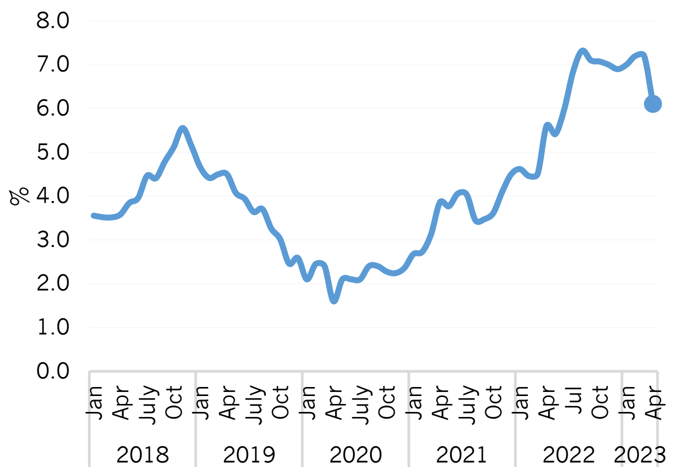
The South African Reserve Bank (SARB) raised its repo rate by 50 basis points in its March 2023 meeting, taking the rate to 7.75%. This is the highest rate since May 2009, when the SARB was responding to the Global Financial Crisis. The increase in interest rates, surpassing Jan 2020 levels, is in response to the Rand weakening and persistent inflation in South Africa. However, the sharp hikes will have limited impact on exchange rate weakness driven by political events, while such high interest rates will adversely impact growth (already impacted by rolling blackouts) and non-performing loans for the banking sector.

The Bank of Namibia's Monetary Policy Committee has been less hawkish, opting to hike to a lesser degree than the SARB – seeing Namibia deviating to the downside for an extended period. This is the first time since 2008/09 that Namibia has deviated materially for any period. This can be sustained over the short term, given sufficient international reserves sustained by large SACU inflows, diamond receipts, and improving inward investment.

Figure 19.1.7 Namibia Annual Inflation and Repo Rates

Namibia Annual Inflation

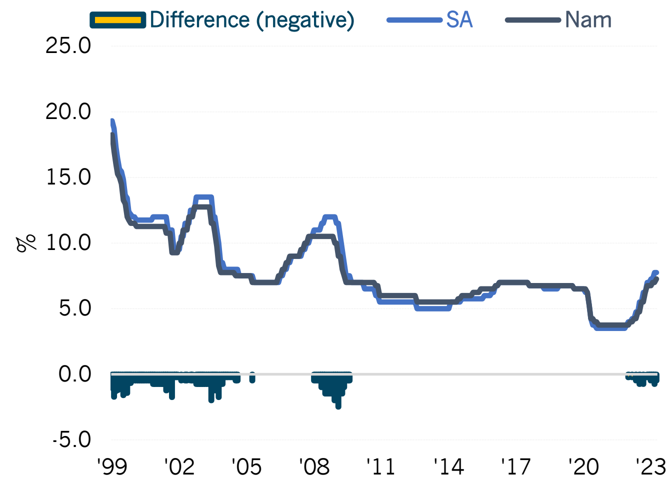
Annual inflation was 6.1% in April 2023, up from 5.6% recorded in April 2022 and down from 7.2% in March 2023.



Source: Namibia Statistics Agency

Repo Rates

This is the first time since 2009 that Namibia has elected to maintain a sizable and sustained lower repo rate than South Africa.



Source: Namibia Statistics Agency, Statistics South Africa

In 2020, Namibia experienced relatively low inflation, but this has subsequently risen due to exchange rate weakness and rising global prices. Namibia's inflation is largely driven by imported goods, such as food and fuel inflation. Services inflation, which is largely domestic, has remained subdued but has started to rise due to increasing prices of imported goods and services. While inflation is anticipated to moderate over the remainder of 2023, Rand weakness will reduce the anticipated moderation. Nonetheless, inflation is expected to average around 6.1% for 2023.

Notably, the relief seen in global food inflation is lagging the situation in Namibia and South Africa. This delay can be attributed to several factors. Food producers in the region implemented price increases only after global prices had already been high for several months, leading to margin compression. As global prices start to drop, producers are likely to seek to recover some of their losses before passing on full relief to consumers.

In early 2022, Namibia garnered global attention following light oil discoveries in ultra deep water by Shell and Total Energies within Namibia's territorial waters. These discoveries in the Orange Basin are speculated as being some of the largest crude findings in Africa in recent years, positioning Namibia as a highly promising region for hydrocarbon exploration. While Shell initiated its appraisal campaign in December 2022 and Total Energies commenced its appraisal program in March 2023, with plans to involve a second drill ship in the second quarter of 2023, there has not yet been any official announcement around commercial viability. The potential around oil and gas could be transformative for Namibia. Further details are expected in the second half of 2023, especially after media outlets reported in May 2023 that flow rates at Shell's Graff-1 well were above expectations.

19.2 Gold Markets

The gold market is highly liquid and benefits from terminal markets on almost a continuous basis. Gold prices were in general downward trend from 1980 to the Year 2000 where it traded down to approximately US$250/oz. From the Year 2000 the price increased annually, with additional demand created by the 2008 financial crisis, until 2011 and 2012 where the price peaked at just under $1,800/oz. There was a sharp correction to the gold price in 2013 with the end of Quantitative Easing monetary policy by the US Reserve Bank.

Gold continued to move lower over the next three years but could have possibly found a bottom in 2016 with prices below $1,100. Although it remains to be seen, gold's declines from the 2011 highs could simply prove to be a pullback within an even longer-term uptrend.

The advent of the global health pandemic in 2020 may have already initiated this trend. Before breaking out above $1,400 in mid-2019 gold had remained range bound between $1,350/oz and $1,050/oz for five years and the upward momentum was further carried in 2020 on market fears around the global pandemic.

Covid-19 significantly increased uncertainty by compounding existing risks and creating new ones. The rollout of vaccine policies has fuelled optimism that the threat has passed, yet the pandemic, alongside policy responses from government, will most likely create structural changes in the market and changes to asset allocation strategies.

In 2023, global and regional geo-political uncertainties have probably contributed to gold price increases. The gold market has been trading this year between US$1,800 and US$2,000/oz.

19.3 Contracts

After completion of the feasibility study, it is Osino's intention to evaluate the trade-off of outsourced mining activities to contractors, versus owning and operating the mining fleet, for the proposed Twin Hills Mine.

If a mining contract route is chosen, then prior to start-up suitable mining contractors will be requested to tender, and the most appropriate tender accepted, thereby ensuring that the best competitive current pricing is achieved. Care will be taken at the time of finalizing contracts to ensure that the rise and fall formula is representative of the build-up of the quoted price per unit. In all instances, Osino will ensure that the mining operation can purchase the equipment at the end of the contract period at its depreciated price or should the contractor default at a predetermined pricing mechanism.

The contract mining costs are very dependent on when tenders are issued as the price of major equipment varies dependent on demand as well as the cost of finance. Rise and fall can be negatively affected by currency fluctuations as well as price squeeze due to scarcity.

During the Feasibility Study of the Twin Hills Project, Osino has entered negotiations with international engineering and construction firms with Namibian subsidiaries to provide the front-end engineering design (FEED) ahead of detailed engineering and procurement for the processing plant and associated surface infrastructure. Osino will also secure a contract for an Engineering, Procurement and Construction of a load supply connection to the national power grid in the Karibib region. A contract with NamPower to supply the proposed Twin Hills Mine with national grid power has been established and regular progress payments are being made to NamPower. The application and design for an increase in the quantity of power required by Twin Hills, from 16 MW maximum demand to approximately 30 MW has been submitted with the assistance of an accredited electrical engineering firm familiar with connection requirements for mines in Namibia.

Preliminary investigations of alternative renewable (solar and wind) power supply options have been carried out during the Feasibility Study and the intention is for Osino to continue assessments with 2-3 short listed companies after the study is complete. A life of mine power purchase agreement with an Independent Power Producer located adjacent to the mine site is the preferred contractual approach.

The product being produced for sale from the proposed Twin Hills Mine will be doré gold bars. No contracts are currently in place for the transportation, refining and sale of gold from the proposed mine. A contract will be put in place with a recognized international refinery and sales will be made based on spot gold prices. These contracts will typically include fees for transportation of the product from the site, insurance, assaying, refining and an allowance for metal losses during refining. There are no gold hedges in place, and at this time none are contemplated. Being able to get contracts in place for the sale of doré gold bars prior to the start of production is not seen as a risk to the Twin Hills Project.

It is also expected that the future operation of the Twin Hills Mine will contract the following services to specific subcontractors or associates.

- Drilling services.
- Analytical Laboratory services.
- Supply of diesel and lubricants.

- Security services provider.
- Accommodation camp and cleaning services.
- Medical emergency response services.

20.0 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

This section provides an overview of the environmental legislation and guidelines applicable to the Twin Hills Gold Project as well as a summary of the permitting process and stakeholder engagements conducted in respect of the mine.

20.1 Introduction

The Twin Hills Gold Project is located near the town of Karibib (Figure 20.1.1) in the Erongo region of Namibia and is approximately 140 km directly north-west of Windhoek, the capital. The mineralization is characterised as 'a large, sediment-hosted, structurally controlled, orogenic gold system, buried under approximately 20 m of calcrete and windblown Kalahari sand'.

Open pit mining will be conventional drill and blast, with mineralized material and waste rock being shovelled and transported by a fleet of mobile equipment. Waste rock will be dumped, and ore will be sent to the plant for crushing, leaching, carbon-in-pulp (CIP) processing, electrowinning and then smelting in an induction furnace to produce Doré bars. Tailings will be filtered and will be conveyed to the TSF located approximately 500 meters (m) from the processing plant. Selected waste rock will be used to clad the TSF embankments and used as a layer material between lifts. The full project description is found within various sections of this report.

20.2 Statutory Requirements

20.2.1 Current Project Approvals and Status

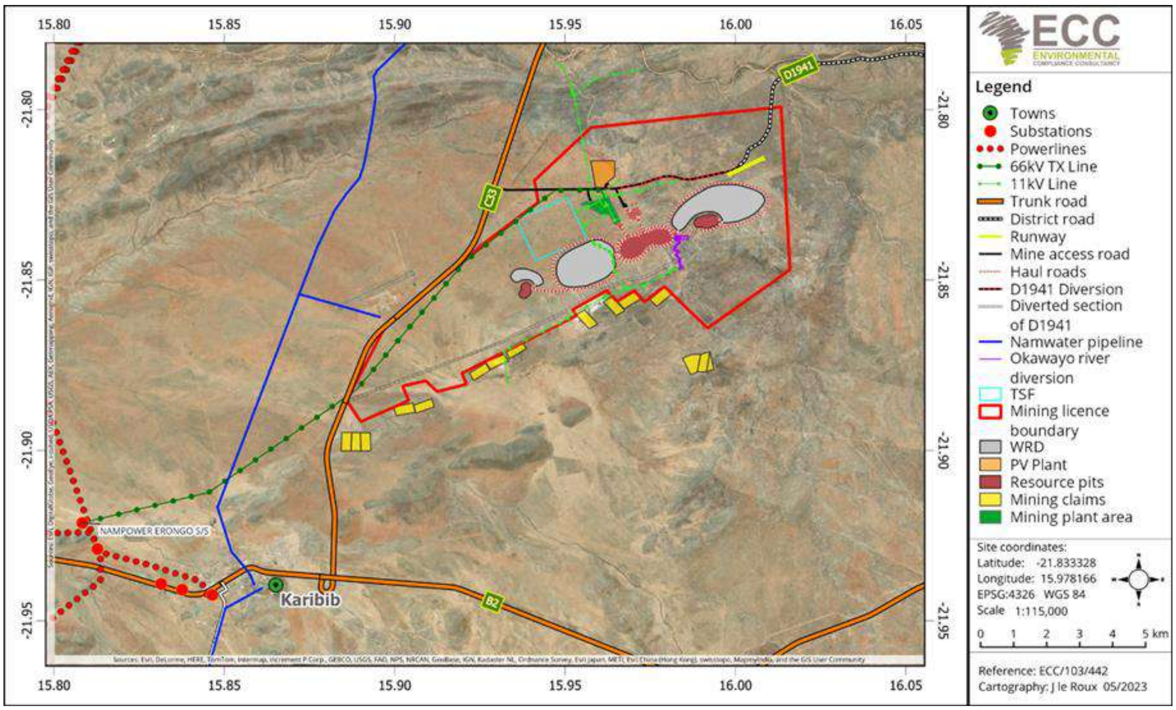
The Twin Hills Gold Project site operates in accordance with its current and approved environmental clearance certificate issued for ML 238 in terms of Environmental Management Act, No. 7 of 2007 and approvals for the Exclusive Prospecting Licences (EPLs) as listed in Section 4. All licences have approved environmental clearance certificates in terms of the Namibian legal requirements.

A full environmental and social impact assessment (ESIA), undertaken to international finance corporation (IFC) lender standards, and complete with an environmental and social management plan (ESMP), was completed by Environmental Compliance Consultancy (Namibia) for the Twin Hills Gold Project. The ESIA report detailed the assessment process, legal requirements, baseline studies, design considerations related to environmental, social, and economic aspects of the Project, related impacts of the Project activities on the area, and notes mitigation strategies to manage those impacts.

It was prepared to obtain an environmental clearance certificate (ECC) for the project from the Namibian authorities and to supplement this NI-43-101 technical report providing environmental, permitting, social and compliance components for the project feasibility study.

Environmental approval was received for the project from the Namibian government on 3 November 2022 and remains valid for legal duration of the Namibian environmental approvals which is three years (3 November 2025). The environmental approval is renewable every three-year cycle through demonstration project compliance to the approval granted.

Figure 20.2.1 The Osino Twin Hills Gold Project Site Area



20.2.2 Namibian Environmental Permits and Legal Requirements

The Environmental Management Act, No. 7 of 2007 necessitates that an environmental clearance certificate is required to undertake any of the listed activities identified in the act and its associated regulations. Listed activities triggered by the proposed Twin Hills Gold Project are listed in (Table 20.2.1) and were included in the ESIA impact assessment process.

A list of permits, licences and clearances required for the Twin Hills Gold Project are provided in (Table 20.2.2) with the estimated time to secure the necessary approvals.

The Environmental Management Act, No. 7 of 2007 and its associated regulations guide the environmental and social assessment processes in Namibia. The Twin Hills Gold Project scoping study was completed in 2021 as a first step in the Environmental and Social Impact Assessment (ESIA) process which allowed for wide public consultation and information gathering and ensured the most applicable aspects and associated impacts were identified for the ESIA. The ESIA and a detailed ESMP was completed in early 2022 with approval granted in the form of the clearance certificate for mining on 3 November 2022.

An amendment to the current ESIA and subsequent environmental approval is currently underway in terms of the Environmental Management Act, No.7 of 2007. This amendment makes provisions for the following project changes:

- The addition of an 11 kV powerline route assessment.
- The inclusion of the new Twin Hills West pit.
- Addition of a geosynthetic lining and underdrainage systems to the TSF facility (thereby reducing impacts).
- General site layout updates.
- Updated and confirmed plans for the D1941 road diversion.
- Update and confirmed plans for the Okawayo stream diversion.

In relation to the site's legal obligations towards closure, the MME together with the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development has drafted a Namibia Mine Closure Framework which will become a legal requirement when the Minerals Act, 1992 revisions are reviewed and gazetted.

The Minerals Act revisions and feedback suggested by the Chamber of Mines and other stakeholders is currently being addressed by MME, who anticipate the bill to be finalised and in Parliament by the end of 2023.

The Twin Hills Gold Project detailed conceptual mine rehabilitation and closure plan was prepared in June 2022 consistent with the above-mentioned mind closure framework and submitted to supplement the mining licence application.

Table 20.2.1 Listed Activities Triggered by the Twin Hills Gold Project

Listed Activities	Description	Relevance to the Project
Energy Generation, Transmission and Storage activities	(a) The generation of electricity. (b) The transmission and supply of electricity.	The Twin Hills Gold Project will need to generate and/or transmit electricity for its operations, including renewables such as PV solar.
Waste Management, Treatment, Handling and Disposal Activities	2.1 The construction of facilities for waste sites, treatment, and disposal of waste. 2.2 Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976.	The proposed project will require waste sites for the disposal of mineralised and non-mineralised waste. Hazardous waste may also be disposed of on site, in a specifically designed facility. Induction furnace (generally covered under the mine accessory works permit)
Mining and Quarrying Activities	3.1 The construction of facilities for any process or activities which requires a licence, right or other form of authorisation, and the renewal of a licence, right or other form of authorisation, in terms of the Minerals (Prospecting and Mining Act), 1992.	The Twin Hills Gold Project and associated infrastructure.
Forestry Activities	4. The clearance of forest areas, deforestation, afforestation, timber harvesting or any other related activity that requires authorisation in term of the Forest Act, 2001 (Act No. 12 of 2001) or any other law.	Large areas of vegetation will need to be removed prior to earthworks and construction and mining. A land clearing permit will be necessary for the project infrastructure and mining landforms. Protected species that are to be removed will require a permit. Both permits have been applied for.
Land Use and Development Activities	5.1 The rezoning of land from – (c) agricultural use to industrial use;	Current land use is predominately agricultural.
Water Resource Developments	8.1 The abstraction of ground or surface water for industrial or commercial purposes. 8.2 The abstraction of groundwater at a volume exceeding the threshold authorized in terms of the law relating to water resources. 8.4 Construction of canals and channels including the diversion of the normal flow of water in a riverbed and water transfer schemes between water catchments and impoundments. 8.5 Construction of dams, reservoirs, levees, and weirs 8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline system.	The Twin Hills Gold Project requires water for mining and processing; if either surface or ground water is to be used, or dewatered, abstraction permits must be obtained. Discharge permits are required for industrial effluent and wastewater discharge. The option of a diversion of the Okawayo Stream and any other significant streams affected on site needs an approval. The options of dams may be required as part of the water supply and the proposed stream diversion. The sewage treatment plant, pollution control dams, processing ponds etc. require approvals.

Listed Activities	Description	Relevance to the Project
	8.8 Construction and other activities in water courses within flood lines. 8.9 Construction and other activities within a catchment area.	The open pit straddles a water course, and the mine and related infrastructure are situated in the lower reaches of a large catchment area.
Hazardous Substance Treatment, Handling and Storage	9.1 The manufacturing, storage, handling, or processing of hazardous substance defined in the Hazardous Substances Ordinance, 1974. 9.2 Any process or activity which requires a permit, licence or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence, or authorisation or which requires a new permit, licence or authorization in terms of a law governing the generation or release of emissions, pollution, effluent or waste. 9.4 The storage and handling of dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin, in containers with the combined capacity of more than 30 cubic meters at one location. 9.5 Construction of filling stations or any other facility for the underground and aboveground storage of dangerous goods, including petrol, diesel, liquid, petroleum, gas, or paraffin.	The mining operations and proposed process plant triggers this activity as both fuel and hazardous substances are required for mining and processing. Bulk fuel storage facilities will be required for the onsite generation of electricity, and for fuelling the mining fleet. Consumer installation certificates are required for bulk fuel storage and dispensing.
Infrastructure	10.1 The construction of: (b) public roads. (d) airports and airfields. (f) cableways. (g) communication networks including towers, telecommunication lines and cables. (j) masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission. 10.2 The route determination of roads and design of associated physical infrastructure where - (a) it is a public road; (b) the road reserve is wider than 30 meters; or (c) the road caters for more than one lane of traffic in both directions.	Powerlines and telemetry for water and tailings pumping arrangements will likely be constructed as part of the project. Cell phone and radio communications towers. Road diversion

Table 20.2.2 Approvels, Permits and Licences for the Twin Hills Gold Project, Application Status and Expected Processing Time

Permit or Licence	Act/Regulation	Related Activities Requiring Permits	Relevant Authority	Timeframe for Approval
Environmental Clearance Certificate	Environmental Management Act, No. 7 of 2007	Required for all listed activities listed in Table 20.2.1	Ministry of Environment, Forestry and Tourism (MEFT)	The Twin Hills Gold Project ESIA and ESMP has been approved with environmental clearance being granted on 3 November 2022. Environmental clearance certificates renewed after three years. An amendment to the current ESIA and subsequent approval is currently being undertaken, this is expected to be completed in June 2023. Amendment approvals typically taken three months for Governmental approval depending on their workload and priorities.
Mining Licence	Section 90 (2) (a)	Written permission from Mining Commissioner.	Ministry of Mines and Energy (MME)	Mining Licence 238 has been obtained and granted on 3 November 2022 valid for 20 years until 2 November 2042.
Surface rights agreements (mine, infrastructure corridors)	Section 52(1)(a) of the Minerals Act 33 of 1992	Included in the Mining Licence Application Also required in application of accessory works areas	Ministry of Mines and Energy (MME)	Undetermined
Exclusive Prospecting Licences	Section 68 (2) (a) of the Minerals Act 33 of 1992	Written permission from Mining Commissioner before prospecting can commence.	Ministry of Mines and Energy (MME)	Two months
Accessory Work Permit	Section 90(3) of the Minerals Act 33 of 1992	Written permission from Mining Commissioner before Accessory Works can be erected on an EMP or Mining Licence area	Ministry of Mines and Energy (MME)	Two - three months
Permit for boreholes (exploration and water boreholes)	Permit is issued under the Water Act, No. 54 of 1956 (enforced)	Required before the drilling of boreholes for exploration and abstraction of water.	Ministry of Agriculture, Water and Land Reform (MAWLR)	Three - four months

Permit or Licence	Act/Regulation	Related Activities Requiring Permits	Relevant Authority	Timeframe for Approval
Tailings waste disposal permit and wastewater discharge permit	Permit is issued under the Water Act, No. 54 of 1956 (enforced) forms of the Water Act, No. 24 of 2004 are used. The Water Resources Management Act, No. 11 of 2013 (not enacted).	Required for disposal of tailings, effluent, and wastewater. Required for discharge of sewage and/or excess industrial or mine wastewater.	MAWLR	The permit application has been compiled and submission to MAWLR is expected before the end of May 2023. Once submitted, MAWLR will prepare a technical report, upon completion and typically within six month a permit is issued, the permits remain valid for three – five years with relevant conditions.
Permit for construction of river diversion	Permit is issued under the Water Act, No. 54 of 1956 (enforced) The Water Resources Management Act, No. 11 of 2013 (not enacted).	Construction of canals and channels including the diversion of the normal flow of water in a riverbed and water transfer schemes between water catchments and impoundments	MAWLR	This approval was granted with the issuance of the environmental clearance certificate, as the diversion of riverbeds is considered a listed activity 8.4 of the Environmental Management Act, 2007.
Permit for the clearing of land	Forest Act, 2001 (Act No. 12 of 2001).	Removal of vegetation within 100 m of a water course, or removal of more than 15 ha of woody vegetation, or Removal of any protected plant species.	MEFT	A motivation for a consolidated permit for land clearing has been submitted to the MEFT. This is pending a decision from the Director of Forestry to inform the next step of the application. This consolidated permit would cover land clearing for all the infrastructure areas of the project and would be valid for one year. Failing the above the standard land clearing permit process will be followed and each permit is valid for 3 months; and must be applied for in advance of each clearing activity.

Permit or Licence	Act/Regulation	Related Activities Requiring Permits	Relevant Authority	Timeframe for Approval
Permit for destruction of heritage objects and artefacts	The Heritage Act, No. 27 of 2004.	Interference with heritage artefacts during the project life. Heritage sites potentially located within proposed mining landform footprints, or along proposed pipeline or powerline routes.	National Heritage Council (NHC)	Reapplication for heritage approval lodged pending consent from family for relocation of graves. Approval to relocate partial heritage building granted to Twin Hills Gold Project July 2022 – however is now on hold pending resolution on an approval to follow due process for relocation of existing grave sites, as this will form one permit for the site.
Certificate for bulk fuel storage	Petroleum Products Regulations	Consumer installation certificate for bulk fuel storage and dispensing.	Ministry of Mines and Energy (MME)	An application has been compiled and will be submitted to MME in June 2023. 60 days is indicated in the guideline (however this may take between two - six months)
Licence for explosives magazine	Minerals (Prospecting and Mining) Act 33 of 1992, Mine Safety Regulations	Also covered under accessory works application	Ministry of Mines and Energy (MME)	An application has been compiled and is being finalised upon award of successfully tendered and will be submitted to MME upon conclusion of the tender process estimated to be completed in H2 2023. MME require approx. one month for processing and approval.
Permit for storage & use of explosives, plus burning of packaging	Regulations made under section 138a of the Minerals (Prospecting and Mining) Act, 33 of 1992 as amended: Health and safety of persons employed or otherwise present in or at mines, 1999 (10th draft)	Part X - Explosives and blasting	Ministry of Mines and Energy (MME)	An application has been compiled and is being finalised upon award of successfully tendered and will be submitted to MME upon conclusion of the tender process estimated to be completed in H2 2023. MME require approx. one month for processing and approval.

Permit or Licence	Act/Regulation	Related Activities Requiring Permits	Relevant Authority	Timeframe for Approval
Emissions stack(s) and towers	Civil Aviation Act 6 of 2016	55 Regulations relating to safety and security near aerodromes	Civil Aviation Authority	Unknown
Airstrip	Civil Aviation Act 6 of 2016 Section 90(3) of the Minerals Act 33 of 1992	Also covered under accessory works application	Civil Aviation Authority	Unknown

20.3 Stakeholder Engagement

The Environmental Management Act, 2007 and international funding standards prescribe the public participation process that Osino has undertaken for the ESIA for the Twin Hills Gold Project. The original list of known stakeholders was expanded, through advertising of the Project in local and national newspapers. Stakeholders were invited to comment, and or attended public meetings during which the project, its baseline conditions, and potential impacts were presented. Meetings were held in the Capital city, Windhoek, Karibib and Omaruru.

Important stakeholders include the landowners that are directly and indirectly affected by the mine and its associated linear infrastructure corridors as well as the proposed stream and road diversions. Focus meetings were held with directly affected stakeholders.

There are minerals claims for dimension stone held over some parts of the project area (marble ridge) and Osino continues to engage and negotiate with the owners to achieve an amicable working relationship. Consideration of the cumulative potential impacts was provided and assessed in the ESIA.

The Karibib Military Airforce Base is located close to the project area and were consulted together with the Civil Aviation Authority to discuss potential impacts on air traffic.

Relevant government departments and local authorities have been consulted, particularly in Omaruru and Karibib as the centres where permanent employees will live. The construction camp will either be situated on site or established in Karibib.

Public perception of the project is largely positive, and no significant opposition has been identified and is not anticipated other than potential resistance from the neighbouring mining claims rights holders currently mining dimension stone.

The proposed road diversion will directly impact farms along the Khan River, and mitigation measures will be employed to ensure these potential impacts are minimized as discussed in Section 20.7.4.

The impact assessment and approval for the required powerline infrastructure has commenced, public participation for this assessment has been positive and route options discussed with landholders. No objections have been raised. Two route alternatives have been assessed and the preferred option taken forward is the route that only intersects one landholder and avoids the military airbase. Servitudes are being negotiated with the landowner by the suppliers as part of their development contracts with the Project.

Once determined, any water supply pipelines outside of the project area will require a public participation process, as well as an ESIA for route approval.

20.4 Environmental Baseline

The following environmental baseline description has been developed from available literature and studies and specialist studies undertaken for the Twin Hills Gold Project. The following specialist baseline and impact studies were completed as part of the ESIA:

- Terrestrial Ecology – Peter Cunningham.
- Hydrology – SLR, and Knight-Piésold.
- Groundwater – SLR, and Knight-Piésold.
- Air quality – Airshed.
- Noise and sense of place – Airshed, and ECC.
- Soils and land use – ECC.
- Traffic – ITS Global.
- Heritage and culture – Dr. John Kinahan and Dr. Alma Nankela.
- Visual and tourism – ECC.
- Social and economic – Deon Wessels.
- Geochemistry – ECC:RGS.
- Blast vibration – Blast Management and Consulting.
- Climate Change Assessment - RDJ Consulting Services CC.

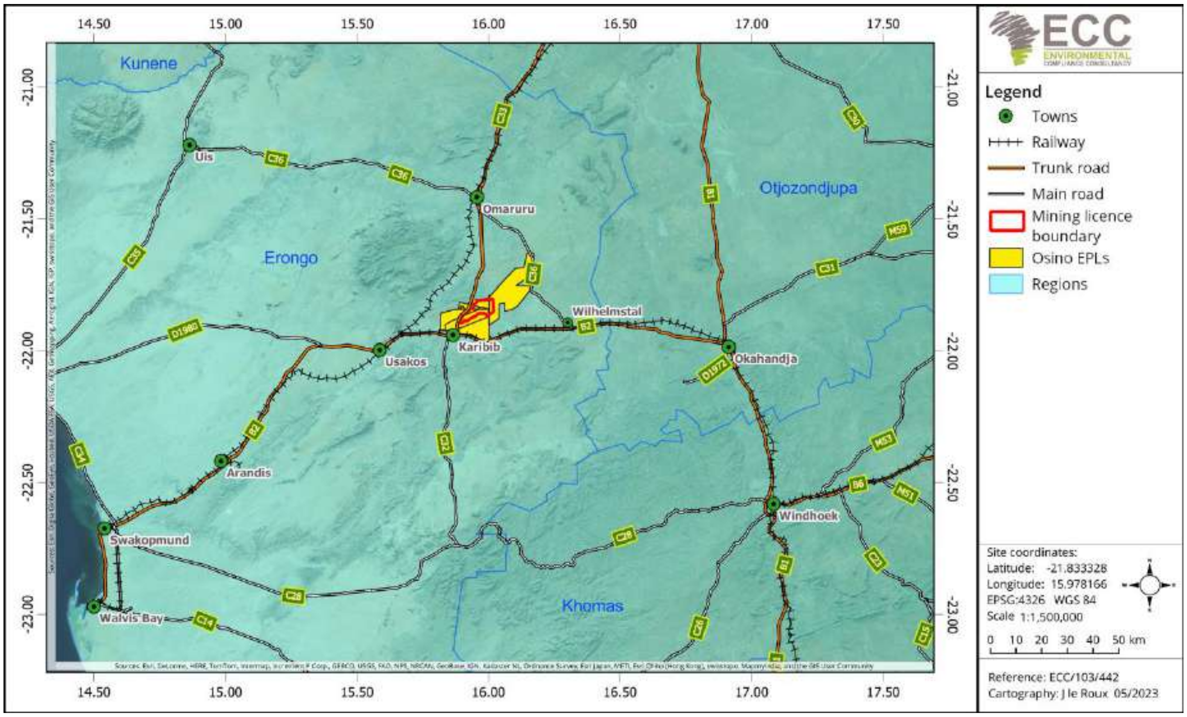
20.4.1 Location and Infrastructure

Location

The Twin Hills Gold Project is located approximately 180 km inland from the Atlantic coastline in the southern area of a roughly triangular area bounded by the towns of Omaruru and Karibib and the small farming settlement of Wilhelmstal in the east. The Khan River defines the most northern part of the project area, and the B2 road between Windhoek and Swakopmund forms the southern border. The two sides are formed by the C36 running north-westwards to Omaruru from Wilhelmstal, and the C33 road from Karibib that runs north to Omaruru.

Omaruru is 45 km north of the project site. Karibib is the closest town approximately 15 km to the south-west.

Figure 20.4.1 Locality Map



Infrastructure

The wide tarred B2 road south of the project area, also known as the Trans Kalahari Highway, carries large traffic volumes between Windhoek and Walvis Bay, and is considered the regional trade route servicing Southern Africa. The tarred C33 road running north from Karibib to Omaruru is likely to be the primary access route to the site.

The D1941 gravel road traverses the proposed mine site across the proposed open pit area. This road will be diverted, probably to the north of the mine. On the south-west of the site the D1941 is used to access the quarry and other claims along the marble ridge.

ITS Global (2021) engineers determined that all the intersections currently operate with a good level of service and have spare capacity. No upgrades are required. ITS's reports shows that the introduction of increased traffic volumes associated with the Project would is possible.

The Transnamib railway line parallel the B2 in the south with a line branching north eastwards at Krazenberg towards Omaruru, Otjiwarongo and on to Tsumeb. Powerlines (132 kW) run loosely parallel to this rail line, but not in the same corridor.

Bulk water to Karibib is pumped by NamWater from the Swakoppoort reservoir to a treatment plant in Karibib. The town is supplied by a 66 kV overhead powerline by Erongo RED, terminating at the Karibib 66/11 kV, 2.5 MVA substation. The power supply for the mine will be a combination of solar energy and base case power supply strategy. The powerline for the power supplied to the mine by NamPower and the solar plant are both currently being included in assessments for the project for environmental approval.

The Karibib Air Base approximately seven km southwest of the proposed mine is supplied by a 33 kV line from Karibib. The need for an airstrip on site is still being determined.

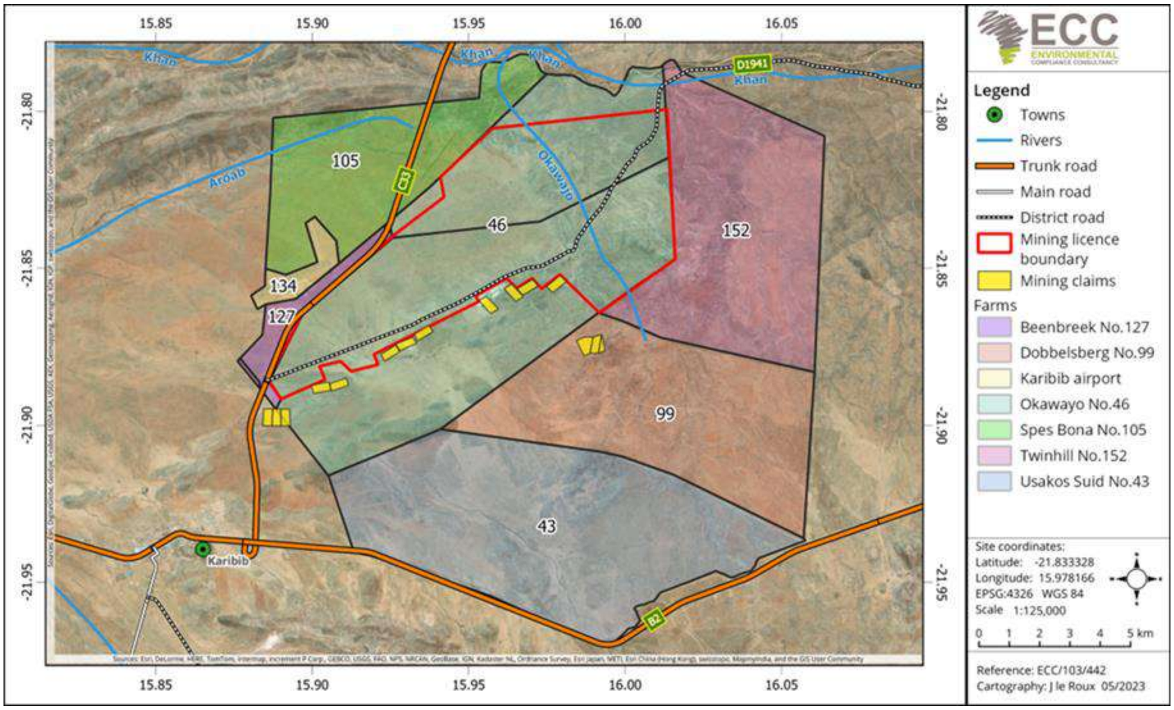
20.4.2 Land Use

The proposed development is situated in a commercial agricultural region and land use is dominated by cattle, game, and small stock farming activities. Farm's locations are shown in (Figure 20.4.1). One farm has a remnant orchard, and no large-scale irrigation farming was identified. The farm Klein Okawayo has been described as a wildlife and hunting farm by the ESIA ecologist. Portions of the directly impacted farms will no longer be available for current farming practices, but farming activities on surrounding properties will be able to continue relatively undisturbed by the proposed mine.

A dimension stone quarry is located on the limestone or marble ridge that occurs on the farm, Klein Okawayo, and several mining claims are held along portions of this ridge. (Figure 20.4.1)

The project area is not part of a communal conservancy, the closest is Gaingu located in the Spitskoppe area to the west of Karibib. The project area is also not situated within a freehold conservancy (Mendelsohn et al. 2002, NACSO 2010).

Figure 20.4.2 Neighbouring Farm



20.4.3 Climate

Namibia is a hyper-arid country and, regionally, there is a growing demand for water because of climate change, population growth, economic development and urbanization that increases pressure on existing surface and groundwater resources. The Project is located in central Namibia in an area that experiences generally hot daytime temperatures throughout the year, while the nights are mild to cool in winter. The mean annual rainfall is highly variable, ranging between 200 to 300 mm. Generally, evaporation exceeds precipitation, especially during the winter months of April to August, when there is little to no rainfall. The hot and dry season from September to December has characteristic high daytime temperatures. Namibia's rains tend to fall between January and April, although potential changes in weather patterns are expected due to climate change. Runoff in the ephemeral streams can be expected when the water deficit ratio is near neutral in January through April.

The prevailing wind is dominated by winds from the north-eastern and south-west quadrants. Hot dry and strong Berg winds occur during the winter months. Consideration must be given to the placement of dwellings, offices, and plant in relation to prevailing winds and dust that emanates from mining processes and related infrastructure, e.g., acidic dust blowing off the TSF.

20.4.4 Geological Setting

The local geology is summarised from a collection of reports compiled by Osino during exploration activities. (See Geology section of PEA). The Twin Hills Gold Project is situated within the Southern Central Zone of the Damara Supergroup and comprises continental margin carbonates and silts that grade into turbidite sequences representing continental shelf and basin deposits. The regional mapping and re-interpretation of the available aeromagnetic data undertaken by Osino resulted in the identification of a large deep regional structure, the Karibib Fault, which strikes ENE and has several 'splays' associated with it. The Twin Hills deposit lies in the Kuiseb Formation, which is the uppermost portion of the Swakop Group, a sequence of turbiditic marine sediments several kilometres thick, that was folded during the neo-Proterozoic Damaran orogen. The gold mineralization is hosted within a meta-greywacke unit, which has been tightly folded into an overturned syncline, underlain by biotite schist and cordierite schist. The host rocks are overlain by red Kalahari sands 1 to 2m thick and calcretes between 10 and 25 m thick.

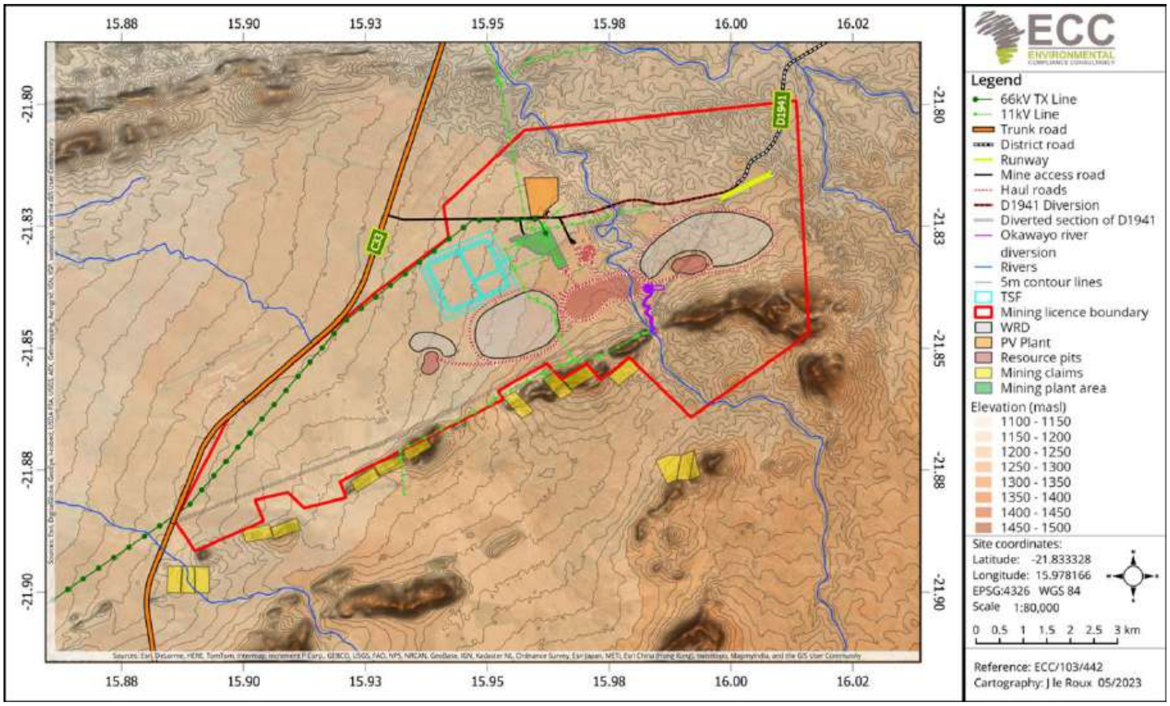
Faults and lithological contacts between the marble and the greywacke/schist are considered potential targets for groundwater supply investigations.

20.4.5 Topography

The ground in the project area is dominated by calcisols, (commonly called calcretes) regisols and rocky outcrops (Figure 20.4.3). The eastern portion of the project area is moderately rough, with steep hill slopes. Conversely, on the west the land is relatively flat, covered by reddish sands and slopes gently toward the northwest.

The southern half of the project area is traversed by a ridge of marble hills that tend NE-SW across the property. North of the marble ridge the topography slopes toward the Khan River approximately 8 km away. The marble ridge is bisected by the ephemeral Okawayo stream that drains northwards across the proposed open pit to the Khan River. The Okawayo is no longer going to be diverted in the revised site layout.

Figure 20.4.3 Contour Map



20.4.6 Surface Water

The project area falls in the Khan River catchment which is in turn a sub-catchment of the Swakop River. Drainage in the area is dendritic with ephemeral streams, often steeply incised, forming small tributaries of the ephemeral Khan River, which flows south westwards towards the Swakop River. Major surface drainages lines in the project area include the Aroab in the west, the Okawayo in the centre and Slang in the east. (Figure 20.4.4). These rivers flow either south-westwards (Araob), or northwards towards the Khan River (Okawayo and Slang), depending on the topography. Small streams also flow southwards off the marble ridge into a stream that flows parallel to the ridge, before turning north-westwards to dissipate in the south of the airfield.

As per SLR (2020), the local surface water resources have not been significantly impacted by the current farming land use, although small dams and boreholes are expected to have supplied the farmsteads. There is neither urbanization nor industrial development in the larger catchment areas south of the proposed mine, so the local surface water resources are unlikely to be significantly polluted.

20.4.7 Groundwater

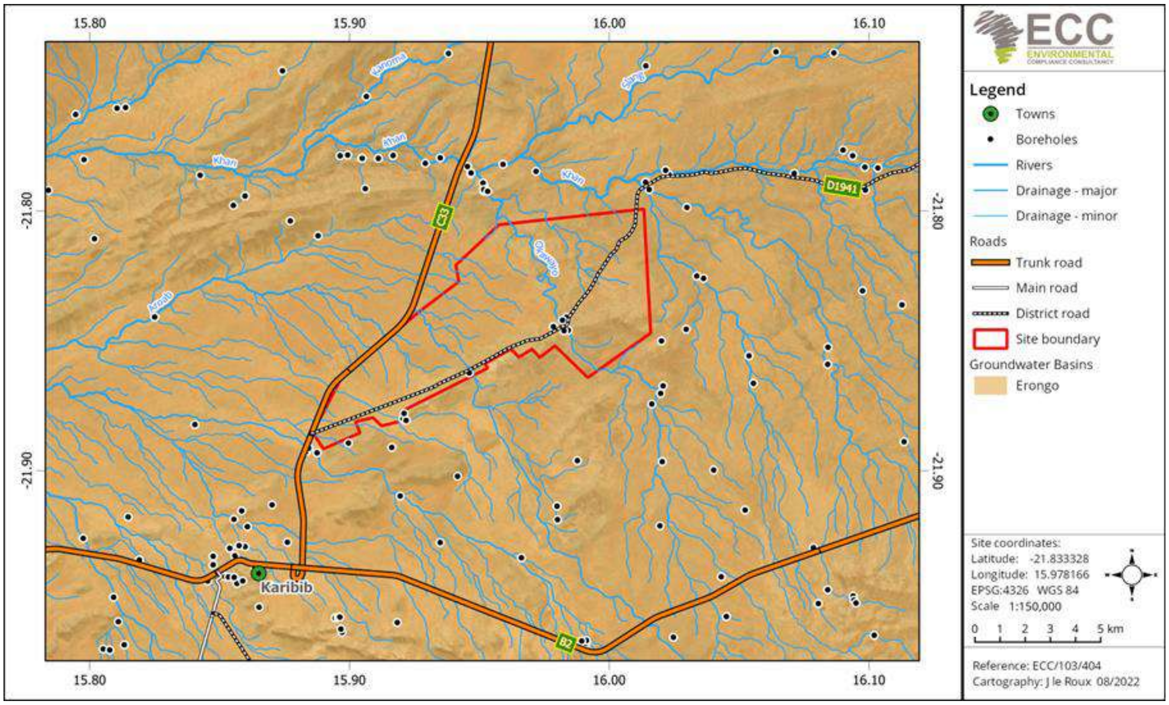
The project site area is in the Erongo groundwater basin. The local groundwater table is relatively shallow with water levels ranging from six to 57 m below ground level. Borehole yields are variable. The regional general groundwater flow, interpolated from the GROWAS database produced by SLR, flows in a north-westerly direction from the high ground (Otjipatera Mountains) south-east of the B2, across the proposed mine pit zone and towards the Khan River.

Three aquifer types may occur in the area based on their geology and perceived groundwater potential. The first type is a porous aquifer of moderate groundwater potential that will be confined to the Khan River channel. The second type in the area is the fractured aquifer that occurs in the Kuiseb Formation greywacke and shales, and which generally has low to locally moderate groundwater potential. The third type is a fractured aquifer confined to the marbles in the southwestern part of the project site. Water in the latter two types generally occurs in faults and fractures.

Groundwater is the main source of water supply to the farmers and quarry operations in the area and is supplied from local boreholes. During the hydro-census conducted in 2020, 24 active boreholes were found in the project area (SLR High level ground and surface water impact assessment, 2020).

The proponent continues to assess whether sufficient groundwater is available to supply the mine and processing plant, including Knight Piésold detailed groundwater supply and sustainable yield investigations. To date, the focus for groundwater supply is on the silicified marble contact of the Karibib Formation. Due to its porosity, and exposure along the marble ridge, recharge is expected during rain events and yields are expected to provide sufficient supply to the mine and processing facilities. The borehole supply can be supplemented by retention dams, however, due to the risk, this option is not among the top options. If sustainable yields from groundwater and potential surface water retention dams are insufficient for the Project operations, then water will need to be sourced from NamWater, which would require detailed engineering study and an ESIA for a pipeline to site.

Figure 20.4.4 Hydrology Map



20.4.8 Vegetation (Flora)

Peter Cunningham (2021a; 2021b) undertook a rapid assessment study (screening initial project options) and a baseline study (fixed project scope) of the vertebrate fauna and flora. His baseline, which incorporated existing literature, forms the basis of the ESIA.

The area around Karibib is commonly referred to as the Semi-desert Savannah and Transition Zone (Giess 1971, Van der Merwe 1983) or as the Western Highlands as described by Mendelsohn et al. (2002). This zone is typified by shrubs such as Blepharis pruinosa, Leucosphaera bainesii and Monechma genistifolia. Larger woody species such as Acacia erioloba are confined to the drainage lines.

It has been estimated that at least 74 to 101 larger trees and shrubs species and up to 80 grass species occur in the general Karibib area, of which a high proportion are endemics.

Summer field studies have been undertaken for the Twin Hills project. Vegetation was lush following exceptional rains during December and January 2021. Three zones of vegetation were defined, the plains, hills, and rivers. Protected tree species that occur within them include: Acacia erioloba, Albizia anthelmintica, Aloe litoralis, Boscia albitrunca, Cyphostemma currorii, Faidherbia albida, Ziziphus mucronata, Commiphora glaucescens, Commiphora virgata, Euphorbia guerichiana, Euphorbia avasmontana, Ficus cordata, Maerua schinzii, Moringa ovalifolia, Sterculia Africana, Combretum imberbe and Euclea pseudebenus.

These trees provide habitat or food for much of the fauna that is found in the area. Big specimen trees are to be found along the drainage lines and should be protected. The greatest biodiversity will be found on the marble ridge, and although some of its length is cut from the mine site. Cumulative impacts associated with the quarrying activities of the neighbours must be considered.

Seventeen grass species were identified during the field study as were several invasive and alien vegetation types, mainly in the vicinity of the farmhouses. The invasive species will need to be removed, particularly where they are invading along drainage lines.

The most important areas identified were the following:

- The limestone / marble hills and ridges.
- The ephemeral watercourses.
- The ephemeral pans.

20.4.9 Fauna

The Project is in an area of high biodiversity according to The Atlas of Namibia (Mendelsohn et al, 2002). Distribution maps show a high probability for the occurrence of leopard, brown hyena, and African rock python. Various endemic reptiles and scorpions are also expected to potentially occur in the area. The area is also known for high levels of endemism for birds. Peter Cunningham's 2021 investigations covered fauna as well.

The variety of geomorphological units (hill slopes, marble ridge, grasslands, and streams) provides a number of diverse habitats, making it likely that there will be an equally high level of faunal diversity in the area. Literature studies estimate that at least 75 species of reptile, seven amphibian, 88 mammal, and 217 birds occur in the general / immediate Karibib area of which a high proportion are endemics (e.g., reptiles approximately 45.3 %).

The summer field investigation and results of similar studies in the same area confirmed that at least 34 species of mammals are present, including leopard and African wildcat. Another three species that were observed, are impala, Burchell's zebra, and eland but these were not included in the count as they are probably introduced to the game / hunting farm Okawayo.

Of the reptiles, only 12 species were confirmed from the area which included one terrapin, four skinks, three Old World lizards, two agamas and two geckos. The farm manager confirmed another eight species which includes tortoise, python, four typical snakes (including black mamba), monitor lizard and a chameleon. Thus 20 species are confirmed from the area. A total of ± 26 species are confirmed if one includes species identified by the ecologist in other studies in the surrounding area.

The recent rains contributed to standing bodies of water on the farm and in the drainage lines. Most were unfortunately muddy and Phrynomantis annectens tadpoles were only seen in one drinking trough. Seven species of amphibians, of which two are endemic, are expected to occur in the area.

Fieldwork confirmed the existence of 56 bird species of the 217 expected from the literature reviews. A total of at least 108 species are confirmed from the general area with the inclusion of the farmer's sightings and other studies by the ecologist. The most important species confirmed from the area during the fieldwork are Monteiro's hornbill (endemic), Kori bustard (NT), white-backed vulture (E), lappet-faced vulture (V), and secretary bird (V).

20.4.10 Archaeology

The archaeological field survey and assessment was carried out on the Twin Hills Gold Project area in early February 2021. Several minor archaeological sites were located, and colonial era structures that merit protection under the National Heritage Act (27 of 2004) were assessed. The ruined colonial farm building appears to be vulnerable, as is the well-constructed Okawayo farmstead established in the late 19th century and in relatively good condition. Both may potentially be affected by vibrations from mine blasting that will take place nearby. The ruined building warranted further investigation, in early 2022 a thorough proposal to "remove for the benefit of all" to the National Heritage Council (NHC). The proposal has been approved by the NHC.

The field survey discovered several precolonial sites resembling historical Ovaherero settlements on the south side of the marble ridge. The archaeological report indicates that the Twin Hills Gold Project area is considered moderately archaeologically sensitive. As the field study focussed on areas undisturbed by farming and prospecting activities, a Chance Finds Procedure devised for mining projects has been incorporated into the environmental management plan (EMP) in case archaeological remains are encountered during earthmoving operations.

Included in the assessment and the management plan are provisions that any archaeological finds must be reported to the National Heritage Council ("NHC") for review, guidance, and management. Following the discovery of some historical grave sites within the Twin Hills Project area, Osino conducted a field review and documentation of the burial sites in November 2022 as an addendum to the archaeological baseline study. Following this, an additional reconnaissance fieldwork program was carried out in the area to confirm that no other graves exist (Nankela, 2022). All documents have been submitted to NHC for review and it is anticipated that the graves will have to be relocated, with consent from the descendants.

20.4.11 Visual – Sense of Place and Tourism

The proposed Twin Hills Gold Project is situated in a sparsely populated area, with few farmsteads or other possible receptors. Apart from the hunting farm Okawayo, no other tourist sites are known in the immediate vicinity of the mine. The sense of place of the Project area has already been disturbed by farming activities and the marble quarry, as well as the presence of the nearby airfield. A viewshed survey was completed by ECC in 2021 for the Project baseline and the ESIA.

The limestone (silicified marble) ridge running north-east south-west across the property may block the view of the mine from Karibib, but it could be visible from sections of the B2 and may detract from the view of the Erongo Mountains further north. The Project operations will be seen from the C33 road and airfield and any residents to the northeast.

Project construction and operational processes may lead to excessive dust and the waste rock dump and tailings storage facility will permanently alter the landscape.

20.4.12 Socio-Economic

The socio-economic baseline study has collated information from a variety of resources, including the 2011 Census, Labour Force surveys, Namibian demographic, and Health Survey, amongst others. An overview of the two towns closest to the proposed Twin Hills mine is presented (Table 20.4.1). Karibib will be affected by the traffic bringing equipment and supplies to the mine and is an option for both the construction camp, and for permanent employee residences.

Karibib is some 20 km by road from the mine, whereas Omaruru is 52 km by road. The proponent is further considering Karibib for housing mine employees, based on both financial and socio-economic implications. Omaruru is a well-serviced town, with well-established stores, banks, and restaurants. Karibib is known as a stop off on the way to the coast and to Windhoek, and for the Navachab Gold Mine and over 750 employees live in the town, contributing to Karibib's economy.

Table 20.4.1 Social Study Summary

	Erongo region	Omaruru	Karibib
Population estimate 2018	195 652	10 115	15 183
Gender ratio	53 % male, 47 % female	52 % male, 45 % female	48 % male, 52 % female
Average age	26	25	24
Number of households	57 000	2 400	3 500
Formal houses	65 %	70 %	67 %
Informal houses	33 %	28 %	31 %
Schools	19	Six schools:	Five schools:
			2 Gvt secondary

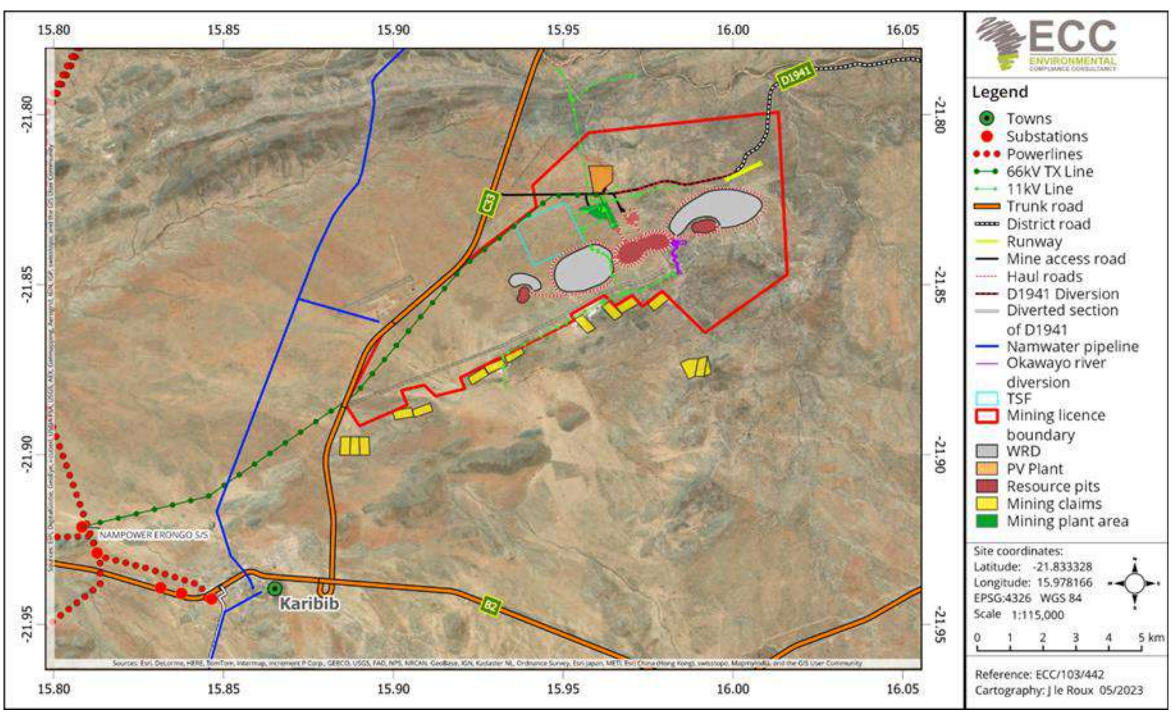
	Erongo region	Omaruru	Karibib
		2 Gvt secondary and boarding 3 Gvt primary 1 private primary	2 Gvt primary 1 primary & secondary
Health facilities	-	1 District hospital 2 private health care	1 District hospital 3 clinics

20.5 Environmental and Social Impact Assessment

20.5.1 Site Layout

- The Twin Hills Gold Project will be an open pit mining and processing operation like other Namibian gold mines at B2Gold's Otjikoto and QKR's Navachab near Karibib. The development project will transition into a full-scale mining operation with open pits, waste rock dumps, processing plant, tailings storage facilities, internal power lines, water pipelines and road networks. Run of mine waste rock will be placed on site and ore will be sent to the plant for crushing, leaching, CIP processing, electrowinning and then smelting in an induction furnace to produce gold bars. The latest site layout plan for the proposed Twin Hills Gold Project mine and related infrastructure is shown in (Figure 20.5.1) below.

Figure 20.5.1 Site Layout



The site layout options are constrained by the ML boundary, national roads and the prospecting claims held over the marble ridge. In addition, there are constraints with respect to the strike of the ore body, blue sky (possible future economic ore), a 500 m blast zone around the pits, the volumes of waste rock and tailings to be disposed, pit slope stability, etc.

Several site layout alternatives were considered in developing the feasibility studies; each option influenced the potential economic return of the project. The two primary site layout issues were the potential of pit flooding by the Okawayo stream, and consideration of the alternative to divert it, and diversion of the gravel D1941 road. Both the stream and the road cross the deposit and projects open pit area. The diversion of the district road was not considered a significant obstacle as the diversion of this road is relatively straightforward. The application to the road authority for the diversion of this road has been submitted and is currently under authority review. Road diversions of this nature and for similar projects in Namibia have successfully been completed in recent years, the process is understood and is not considered a risk or complication for the project. The stream diversion required significant further consideration and additional studies, with input from environmental specialists, mine design engineers, and the proponent. The team have determined that the diversion of the Okawayo stream is the better solution for the project than first considered, and the project plans for this diversion are now being included in the amended assessment for authority review.

From an ecological perspective, the marble ridge and other nearby hilly areas are considered the most environmentally sensitive because of their richer biodiversity and diverse habitat types, as well as the number of endemics. The indigenous riparian vegetation alongside the ephemeral streams and rivers is also considered important habitat for several faunal and avifaunal species. Infrastructure layout alternatives have preferentially avoided these areas. Apart from the positions of the waste rock dump and tailings storage facility and the potential for, and impact of, acid rock drainage sourced from these structures, other alternatives requiring consideration are the location for the construction camp, where permanent employees may reside (such as on-call staff), and the cost and safety risks related to transportation or travel to site.

For every alternative option there is a trade-off, or an impact on another aspect of the project. The detailed ESIA baseline studies provided further information to the decision-making process discussed thoroughly among the designers, proponent, and ECC onsite the first week of February 2022 and during the whole assessment process.

20.5.2 ESIA Process

The ESIA for the Twin Hills Gold Project was completed for submittal to Namibian authorities early in 2022. It included detailed environmental and socio-economic baseline studies and impact assessment by specialists in the fields of biodiversity, archaeology, socio-economic aspects, noise and air quality, geochemical sampling and analysis, hydrology and geohydrology, visual and tourism study, traffic, local municipal services capability assessment, and soils surveys. An update to the ESIA is currently being undertake that addresses the changes to the site layout and expansion of the ore body.

On site baseline monitoring for fall out dust, groundwater level and water quality and the local weather conditions remains ongoing.

The baseline and project description, as well as assessment inputs from specialists, were used to complete the impact assessment using ECC's process which is compliant both with IFC standards and Namibia legislation. The process is described below (Figure 20.5.2). The stakeholder consultation process began in 2021 after providing notification and an invitation to register as an interested party and attend public meetings. The meetings were advertised in the local and national press. Issues raised from the public and focus meetings were provided to the environmental specialists to include in their respective reports.

After compiling the reports and conducting the assessment, a detailed environmental and social management plan (ESMP) was developed in which recommendations for the avoidance, mitigation and management of potential environmental impacts was provided. A detailed conceptual rehabilitation and closure plan was developed in June 2022 and submitted to MME to supplement the mining licence application.

The full ESIA report with ESMP was completed and submitted early March 2022 to the authorities in support of the Mining Licence application for the Twin Hills Gold Mine, with the mine closure plan following in July 2022.

20.6 Impact Assessment Findings

Based on the environmental and social assessment, the Twin Hills Gold Project and its activities are of negligible impact to the following aspects:

- Climate change, adaptation due to considerations in mine design.
- Noise, vibration from construction, operations on neighbours due to distance.
- Dust on local air force base due to wind direction.
- Land ownership due to purchase of farms.
- Noise due to nearby farmhouses being purchased by proponent.
- Light disturbance on diverted D1941 not considered a hazard.
- Temporary road disturbance while the alternative route is being made available as a replacement for the closure of the D1941.

The environmental and social management plan and related mitigation is consistent with Osino's high standards as reflected in their establishment of the Twin Hills Trust and environmental stewardship in all their activities. The mitigation noted below, as well as consistency with all legislation and international industry good practice, and the IFC performance standards, are all reflected in the ESMP. Osino is a supporter and corporate sponsor of the Namibian Chamber of Environment (NCE).

Figure 20.6.1 ESIA Method Flowsheets

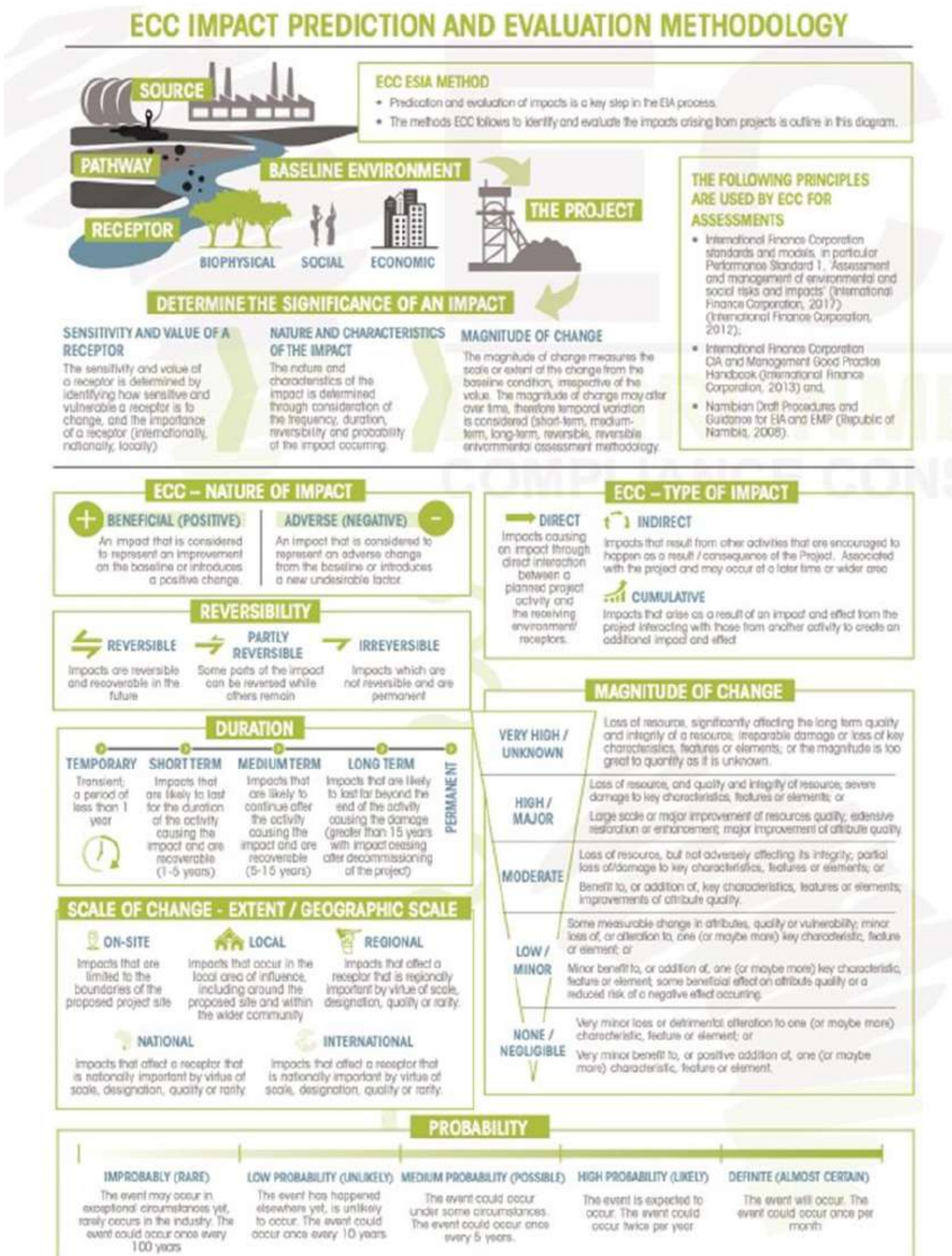
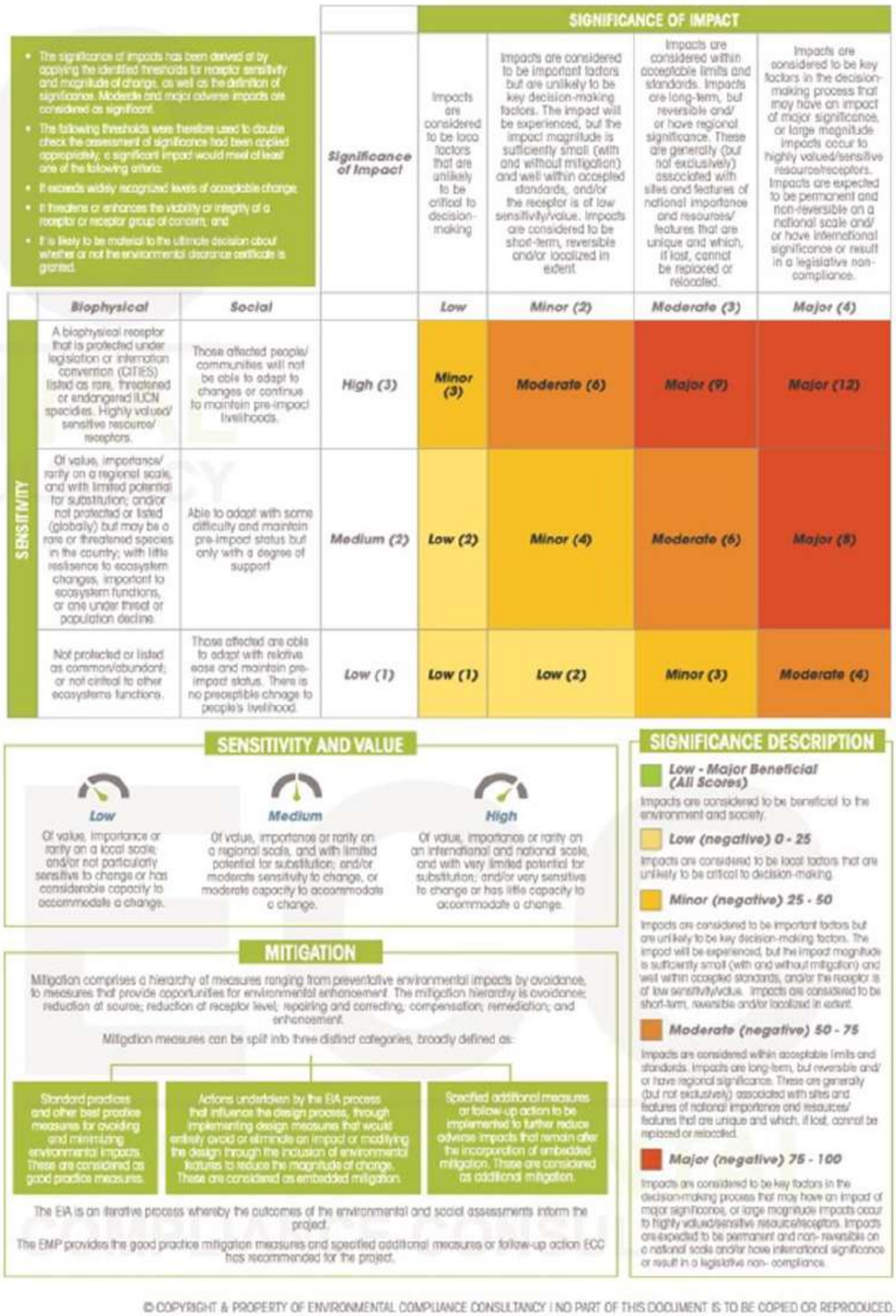


Figure 20.6.2 ESIA Method Flowsheet Continued



20.6.2 Social and Economic Impacts

The following table lists the socio-economic impacts of the Twin Hills Project on the area. Mitigation is discussed below (Table 20.6.1)

Table 20.6.1 Summary of Impacts Socio Economic Impacts for the Twin Hills Project

Socio-economic Impacts						
Activity	**Receptor**	**Impact**	**Nature of impact**	**Value & Sensitivity**	**Magnitude of change**	**Significance of impact**
Social and economic impacts						
Construction works - general	Community Job seekers	Creation of 1500 jobs	Regional Short Term	Medium	Moderate	Beneficial Moderate (6)
Downstream job creation	Community Local economy	Creation of 3rd party jobs (services, supplies)	Regional, Indirect Medium Term	High	Moderate	Beneficial Moderate (6)
Operations	Community Job seekers	Creation of 750 - 800 permanent jobs	Regional Medium Term	High	Moderate	Beneficial Moderate (6)
Skills transfer Namibians	Community	Transfer mining and pro skills to Namibians	Onsite Short term	High	Moderate	Beneficial Minor (3)
New workers and families	Community	Changes to community cohesion	Local Short Term	Medium	Moderate	Adverse Minor (4)
Decommission and closure	Community	Reduction in workforce size.	Regional Permanent	High	Moderate	Adverse Moderate (6)
New workers and families	Community Local economy	Influx of contractor stimulates economy	Local Medium Term	Medium	Moderate	Beneficial Moderate (6)
Direct Procurement	Local economy	Purchasing of goods and services locally	Local Medium Term	Medium	Moderate	Beneficial Moderate (6)
Corporate Responsibility	Community	Vulnerable communities support Twin Hills Trust	Regional, Indirect Medium Term	High	High	Beneficial Major (9)

Socio-economic Impacts						
Activity	**Receptor**	**Impact**	**Nature of impact**	**Value & Sensitivity**	**Magnitude of change**	**Significance of impact**
Social and economic impacts						
Decommission and closure	Local/regional economies	Decline in local economic activity	Regional Long term	Medium	High	Adverse Moderate (6)
Visual and sense of place impacts						
Construction and operations	Motorists Tourists	Poor visual amenity for the site from pits	Local Permanent	Medium	High/ Major	Adverse Moderate (6)
Construction and operations	Motorists Tourists	Visual amenity impacts due to the waste rock	Local Permanent	Medium	High/ Major	Adverse Moderate (6)
Construction and operations	Motorists Tourists	Visual amenity impacts due to the tailings	Local Permanent	Medium	High/ Major	Adverse Moderate (6)
Construction and operations	Motorists Tourists	Impacts due diversion dam	Local Permanent	Medium	High/ Major	Adverse Moderate (6)
Plant construction	Road users of the D1941	Visual amenity and sense of place	Local Short term	Low	Moderate	Adverse Low (2)
Operations	Road users of the D1941	Visual amenity and sense of place	Local Medium term	Medium	Minor	Adverse Minor (4)
Decommission phase	Road users of the D1941	Visual amenity and sense of place	Local Short term	Low	Minor	Adverse Low (1)
Industrial Lighting	Insects, birds, and bats	Industrial lighting impacts construction and ops	Local to regional Short term	Medium	Moderate	Moderate (6)
Roads – traffic, degradation, and diversion Impacts						
D1941 accident increase	Community Tourists	Increased D1941 traffic increase dust/accidents	Local Short term	Medium	Low/ minor	Adverse Minor (4)
Traffic flow	Community Visitors	Disruption to normal traffic flow	Regional Medium term	Medium	Moderate	Adverse Minor (4)

Socio-economic Impacts						
Activity	**Receptor**	**Impact**	**Nature of impact**	**Value & Sensitivity**	**Magnitude of change**	**Significance of impact**
Social and economic impacts						
Road degradation	C33 road	Increased maintenance requirements	Regional Medium term	Medium	Moderat e	Adverse Minor (4)
Blast Vibration and heritage						
Construction and operations	Cultural heritage	Loss of heritage objects or place	Onsite Permanent	High	High	Adverse Major (12)

Major socio-economic benefits are the local spend of the new workers and their families boosting the local economy, and skills transfer to local and regional workers.

Conversely, the negative and moderate social impacts are pressure on the local housing for permanent employees, impacts related to a construction camp, and in-migration of job seekers. Although purchases of local goods and services are beneficial, the documented increase in substance abuse, prostitution, and related health problems and burdens are negative. Such impacts affect community cohesion and social well-being. To counter these negative impacts, a variety of activities are underway or are being planned. The proponent set up the Twin Hills Trust in 2021, which is funded by Osino and key service providers, contractors, and investors to address socio-economic development needs in its host communities.

The Trust supports social, economic, and environmental development and has since 2021 contributed about N$ 3.5 million of funding to a range of social projects, mostly in its host communities of Karibib and Omaruru. Key projects include:

- Support for early childhood development centres in the informal settlements of Omaruru and Karibib (currently benefiting over 600 children between the ages of 0 and six).
- Bulk sewage line installation and upgrade in the informal settlement of Usab in Karibib (which will eventually give over 700 households access).
- Development of low-cost serviced plots for low-income earners in Karibib.
- San artisan food security and sales improvement with online marketing support.

Many of the visual impacts remain at a moderate adverse level after mitigation, including visual amenity reduction due to borrow pits or quarry, tailings, waste rock, dam, and light impacts on insects, birds, and bats. Progressive rehabilitation of the mining and mine waste related facilities and limiting their height and size lessens the impact, although could impact other aspects related to larger footprint. The use of light deflectors or directional lighting lessens the impact to insects, birds, and bats. As a greenfield mine, the project has a permanent impact on the area and affects the locals' and tourists' sense of place, whether due to visual amenity, light, noise, vibration, change in water accessibility, or air quality. The above-mentioned mitigation lessens such impacts.

The diversion of D1941, increase in traffic to local roads, and related degradation impacts are minor and adverse after applying mitigation. The proposed diversion of the D1941 is likely to disrupt traffic while it is being diverted. It will also have more traffic due to the presence of the mine and movement of personnel, goods, and related services, which produces more dust and could pose motor vehicle accidents. The proponent will have to implement a practical traffic plan to manage the impacts.

Additional traffic along surfaced road C33 is likely to amplify maintenance requirements, and the traffic management plan should cover this road as well. Mitigation can include shared maintenance with roads authorities, which lowers the impact to minor.

Local traffic will increase. Embayments and lighting will mitigate impacts, as will employee buses. Intersections will function acceptably and have sufficient capacity for the coming two decades. The approach and entrance to the mine will be tarred to manage dust. After mitigation, the magnitude of change is moderate, and the impact is minor.

Although blast vibration will affect farms, boreholes, ecosystems, fauna, heritage sites, and possibly the small quarry operators, the major impact will be to one of the heritage sites, while all other impacts are considered low to negligible. A partial heritage building is in the high sensitivity area within 500 m of the open pit edge, and will be exposed to air blast, ground vibration, and fly rock. The magnitude of change is high resulting in an impact level of major. It will require protection or active mitigation, as per the Heritage Act, 2004 and approval by the Namibia Heritage Council. Approval to relocate and remove the components of the heritage building was granted to the Twin Hills Gold Project July 2022 – however is now on hold pending resolution on an approval to follow due process for relocation of existing grave sites, as this will form one permit for the site.

Included in the assessment and the management plan are provisions that any archeological finds must be reported to the National Heritage Council ("NHC") for review, guidance and management. Following the discovery of some historical grave sites within the Twin Hills Project area, Osino conducted a field review and documentation of the burial sites as an addendum to the archeological baseline study. Following this, an additional reconnaissance fieldwork program was carried out in the area to confirm that no other graves exist. All documents have been submitted to NHC for review and it is anticipated that the graves will have to be relocated, in accordance with Namibian law and due process.

Other mitigation to manage other sites and boreholes includes the use of electronic detonators, not shock tubes, and modified stemming, as well as consideration for these features in the drilling pattern.

20.6.3 Biophysical impacts

The following table lists the socio-economic impacts of the Twin Hills Project on the area, the significance of which is reported after mitigation. Mitigation is discussed below.

Table 20.6.2 Summary of Impacts Bio Physical Economic Impacts for the Twin Hills Project

Biophysical Impacts[1]						
Activity	**Receptor**	**Impact**	**Nature of impact**	**Value & Sensitivity**	**Magnitude of change**	**Significance of impact**
Air quality and emission impacts						
Construction operations	Birds, tourism Airforce base	Visual impairments due to dust pollution	Local Medium term	Medium	High/ Major	Adverse Moderate (6)
Construction operations	Flora, fauna habitat	Dust contamination from mine site	Local Medium term	Medium	Moderate	Adverse Moderate (6)
Operations	Flora, fauna habitat, people	Air contamination from labs/furnace exhausts	Local Medium term	Medium	High/ Major	Adverse Moderate (6)
Climate change						
Construction operations	Air quality, flora, fauna, habitat and people	Greenhouse gases and CO2 emission contributions	National Medium term	Medium	Minor	Adverse Minor (4)
Soils and geology						
Construction operations	flora, fauna tourism, habitat	Scarring of pristine landscapes	Local Medium term	High	Moderate	Adverse Moderate (6)
Construction operations	Land and soil (agriculture)	Loss of potential agricultural land	Local Permanent	Low	Moderate	Adverse Minor (3)
Construction operations	Environment	Enviro protection	Regional Permanent	High	Very High	Adverse Moderate (6)

[1] It should be noted that the list includes impacts associated with potential alternatives, in the event these alternatives do not materialize these impacts would also not materialize.

Biophysical Impacts[1]						
Activity	**Receptor**	**Impact**	**Nature of impact**	**Value & Sensitivity**	**Magnitude of change**	**Significance of impact**
		system loss (tremors)				
Mine drainage impact						
Construction operations	Soil and water	Contamination of soils, or water, groundwater	Regional Permanent	High	Moderate	Adverse Moderate (6)
Water availability impact						
Extract from boreholes	Water (availability)	Temporary lowering of the groundwater	On-site Temporary	Low	Minor	Adverse Low (2)
Groundwater depression	Water (availability)	Lower groundwater in zone of influence	On-site Medium term	Minor	Moderate	Adverse Minor (3)
Groundwater / water use	Water, fauna, ecosystems	Impact on the Kahn River Catchment	On-site Long term	Low	Moderate	Adverse Minor (3)
Water quality impact						
Seepage from TSF and WRD	Groundwater quality	Potential acid mine drainage or salt load	On-site Long term	Low	Minor	Adverse Minor (3)
TSF and WRD contaminants	Water quality	Precipitation of salts in runoff to local soils	Local Long term	Low	Moderate	Adverse Minor (3)
Flood and overflow pit	Water quality	Collected contaminants to pit overflow in flood	Local Temporary	Low	Moderate	Adverse Low (2)
Okawayo stream diversion impact						
Okawayo Diversion	Reptiles	Ecological functioning reduced	Local Permanent	High	Moderate	Adverse Moderate (6)
Okawayo Diversion	Amphibians	Ecological functioning reduced	Local Permanent	High	Moderate	Adverse Moderate (6)
Okawayo Diversion	Mammals	Ecological functioning reduced	Local Permanent	Medium	Moderate	Adverse Minor (4)

Biophysical Impacts[1]						
Activity	**Receptor**	**Impact**	**Nature of impact**	**Value & Sensitivity**	**Magnitude of change**	**Significance of impact**
Okawayo Diversion	Birds	Ecological functioning reduced	Local Permanent	Medium	Moderate	Adverse Minor (4)
Okawayo Diversion	Riparian trees and shrubs	Ecological functioning reduced	Local Permanent	High	Moderate	Adverse Moderate (6)
Dam construction	Plants and animals	Biodiversity reduced	Local Permanent	Low	High	Adverse Minor (4)
Dam construction	Plants and animals	Ecological functioning reduced	Local Permanent	High	High	Adverse Major (9)
Weir construction	Plants and animals	Ecological functioning reduced	Local Permanent	Medium	Moderate	Adverse Moderate (6)
Mine wastes impact						
Waste Rock Dump (WRD)	Amphibians	Potential loss of habitat in Okawayo	On-site Permanent	High	Moderate	Adverse Major (9)
Tailings Facility		Loss of existing habitat, ecological functioning	On-site Permanent	Medium	Moderate	Adverse Moderate (6)

20.7 Biophysical Impacts

20.7.1 Emissions

Dust and fumes from the laboratory exhaust are considered of moderate impact after mitigation, such as dust suppression measures, paved roads and/or reduced speed, early rehabilitation, etc. all detailed in the ESMP. Fume hood and effective emissions control maintenance mitigate the impacts of their related exhausts to moderate.

CO_2 and other greenhouse gas (GHG) scope 1 emissions derived from various construction and operation activities such as the loading and hauling of ore and waste rock, drilling, crushing, and milling and processing are estimated to reach a maximum limit of 65 286.21. tCO_2e. While the Project's scope 2 emissions from electricity generation, heating and cooling are expected to reach a maximum limit of 186 529.27 tCO_2e. In comparison to other major global carbon and GHG emitters, the impact of the Project on the nation's contribution to climate change has been rated minor. Due to the fact that Namibia is a net sink, combined with the implementation of mitigation measures such as the use of renewable energy and flood risk management, the project is not likely to pose a high risk to climate change.

20.7.2 Soils and geology

The construction, operation, and closure of the mine will permanently affect the agricultural land and tourism opportunity in the area, including the local soils and scarring of the landscape. The impact on soils and related ecosystems, flora, and fauna are moderate, similarly with the loss of agricultural land. The local marble ridges south of the site are of high value for habitat and have high agricultural value due to water supply. Progressive rehabilitation helps to mitigate the impacts, as does the layout.

The area moderate geohazard zone prone to earthquakes and tremors that can be felt and may cause damage to infrastructure, including foundations of mine waste or hazardous waste storage and environmental protection facilities. Design consideration is the most crucial mitigation. Maintenance, operations, and considered emergency and incident response plans must include geohazard risk is managed to post closure.

20.7.3 Mine Drainage Impact

The Twin hills deposit contains iron sulphide minerals. The mine rock characterization study identified that unaltered and unmineralized waste rock is not acid generating, has neutral to alkaline pH, and could be used for construction and rehabilitation activities. Altered and mineralised rock contains pyrrhotite, in concentration up 2 to 5 % and if left unmanaged is likely to be a source of acid and metalliferous drainage (AMD). Groundwater resources at the site are highly sensitive to potential impacts from AMD, and there is a risk that potential impacts to groundwater could be regional and irreversible, making this a moderate to high impact. Identifying the risks and potential impacts to groundwater resources from altered and mineralized waste rock materials helps to mitigate these risks prior to mining and facilitates the appropriate design of management systems and storage facilities.

Waste Rock

Waste rock materials will be excavated from the open pits on the Twin Hills project to allow access to ore mineral for ore processing and subsequent gold production. Waste rock materials will report to the WRD located to the east and west of the open pit areas.

Representative samples of the waste rock materials during operations will be collected on a regular basis by the Twin Hills Geology team, up to two months in advance of mining operations, using a site standard operating procedure for ARD pit and waste rock monitoring and the geochemical characteristics of the waste rock samples will be tested by Project laboratory personnel using a metallurgy ARD standard operating procedure. A visual assessment of the acid potential of a sample will be completed in the field and any samples with visual sulphides and a gold grade below the cut-off grade (plus 50 %) (i.e. 0.3 g/t) will be identified, tagged and logged for ARD analysis at the metallurgical laboratory.

The waste rock sampling and testing program will also include exploration drill core materials further in advance of mining (i.e., greater than two months) and use existing and future geochemical data to produce an ARD block model. This could simply be an extension of the existing ore block model and introduce geochemical source terms to delineate NAF and PAF waste rock materials.

The ARD pit and waste rock monitoring procedure will determine that baseline sampling and testing of Potentially Acid Forming (PAF) material occurring outside the broad ore-zone and that any PAF material will most likely report to a low-grade ore or ore material streams.

Any waste rock materials identified as PAF will be encapsulated within Non-Acid Forming (NAF) waste rock at a designated area in the WRD.

Tailings

Tailings also contain pyrrhotite and the tailings are potentially acid forming and have a significant risk for acid generation with a neutralization potential ratio below one. Short-term leaching experiments identified arsenic, aluminium and iron as potential pollutants of concern in high water to rock leaching ratios.

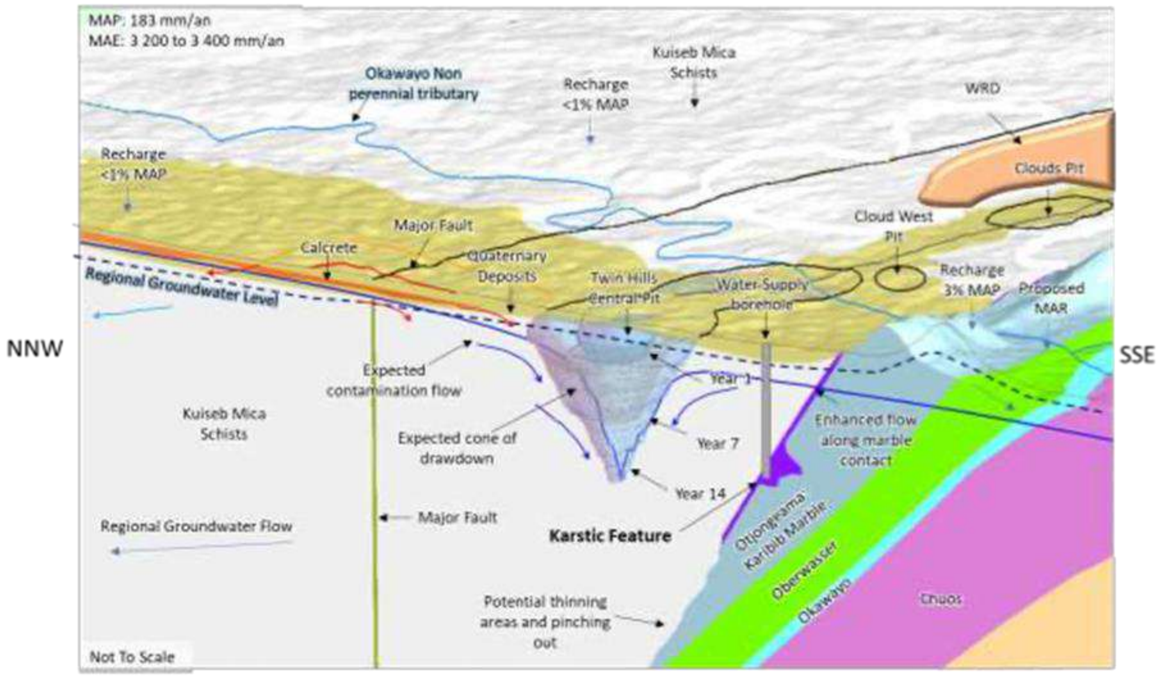
As a result of the findings of the test work on the tailings material and based on a review of the existing geochemical data, the TSF design now includes a geosynthetic lining and underdrainage systems. The liner will include a composite geosynthetic barrier / liner system over the tailings basin footprint to reduce seepage that has the potential for acid generation and metal leaching. The geosynthetic lining system will be installed during the initial construction of each phase. It will comprise the following material from top to bottom; a geotextile bidim A6 for liner protection; 1.5mm mono-textured HDPE geomembrane for seepage reduction; and 150 mm crushed compacted calcrete layer (3mm maximum particle size) for geochemical neutralization. The underdrainage system will comprise of a basin underdrain system positioned in key areas of the facility to enhance consolidation of the tailings mass, and to collect leachate to the seepage pond. The seepage collection pond is sized to maximize evaporation of the leachate water.

These systems will protect the environment from the tailings' geochemistry, reduce seepage from the facility and help maintain drained conditions in the tailings mass. The TSF slope will need to be cladded progressively during operation with hauled and placed selected waste rock to mitigate dust generation. Additional dust suppressant polymer will be required on the tailings surface following tailings placement. Compaction of tailings and potential wind rowing will also improve control dust generation.

20.7.4 Water Availability Impacts

The conceptual hydrogeological model is shown in a cross-section from north-northwest to south-southeast below and includes the proposed mine infrastructure (Central Pit, and waste rock dumps) located on the Kuiseb Schists with the south limb of Karibib Marble syncline to the south of the Twin Hills) where the main water supply boreholes have been located.

Figure 20.7.1 The Osino Twin Hills Project Conceptual Hydrogeological Model



Knight-Piesold (2021a) assessed surface water supply options and noted:

- Drought of up to 7 years, or critical periods, are common to Namibia.
- Critical periods limit recharge, cause the groundwater table to drop; boreholes go dry.
- Stressed surface sources cannot support priority users; restrictions prevent failure.
- Dam options take +5 to 10 years for acquisition, assessment, design, construction.
- Developing water resources is costly due to the aforementioned factors.
- Using existing infrastructure to Karibib is an intermediate solution, pending others.
- A pipeline link from Karibib to may be required if excess capacity is available and permission obtained from the Authorities.
- Exploration drilling and groundwater abstraction has affected area water levels however the impact appears to be localised and temporary. It should not affect receptors.
- Pit excavation, and subsequent dewatering, will produce a Cone of Drawdown (COD).

- The modelled COD is 1.7 km in a NW-SE direction and 5 km in a NE-SW direction.
- The modelled COD extent is expected to reduce in size after refining the model.
- This preliminary COD does not extend beyond the proposed mine boundary.
- Marble contact aquifer abstraction will extend the COD in a NW-SE direction.
- This could affect DC Mines and vice versa by dropping the groundwater levels.
- DC Mines operations may have an impact by reducing the marble aquifer recharge.
- Borehole abstraction impacts are minor, but wellfield management is suggested.
- Preliminary modelling suggests impact on the greater Khan River are negligible.

Knight-Piesold concluded their risk assessment as follows. First, a basic assessment scheme determined the reliability and risk of supply options. Three overarching categories compared the five water supply options: accessibility, lifecycle costs, and reliability and yield. It is therefore advised to consider the development of groundwater sources, if readily available, in combination with a NamWater connection to the existing Karibib Scheme. The Twin Hills Gold Project's overall water demand will be approximately 2 million cubic meters (Mm3) per annum. Sourcing local available water to supply the mine included the assessed considerations in the table below. (Table 20.7.1)

Table 20.7.1 Water Supply Risk Assessment for the Twin Hills Gold Project

Option		Accessibility Concerns	Overall Lifecycle Cost	Reliability and Yield Concerns	Overall Risk
Local Dams	Khan River (1-3 Potential Sites)	High	High	Low – Medium	High
	Storm Attenuation	High	High	Medium - High	High
NamWater Pipeline		Low	Low	Medium	Medium
Desalination		High	High	High	High
Groundwater		Medium	High	Medium	Medium

Further studies over the period of 2021-2023 have seen the advancement of several options to supply additional mine make-up water to compensate for the water deficit but also to alleviate reliance on a single source supply. The following options are envisaged for groundwater supply to the mine:

- Groundwater borehole pumping along the Karibib Marble is estimated to supply approximately 1.2 Mm3/year (3,300 m3/day), assuming constant discharge which could be used to supplement the water supply requirements for the mining operations. Additional groundwater supply will be obtained from the pit inflows.

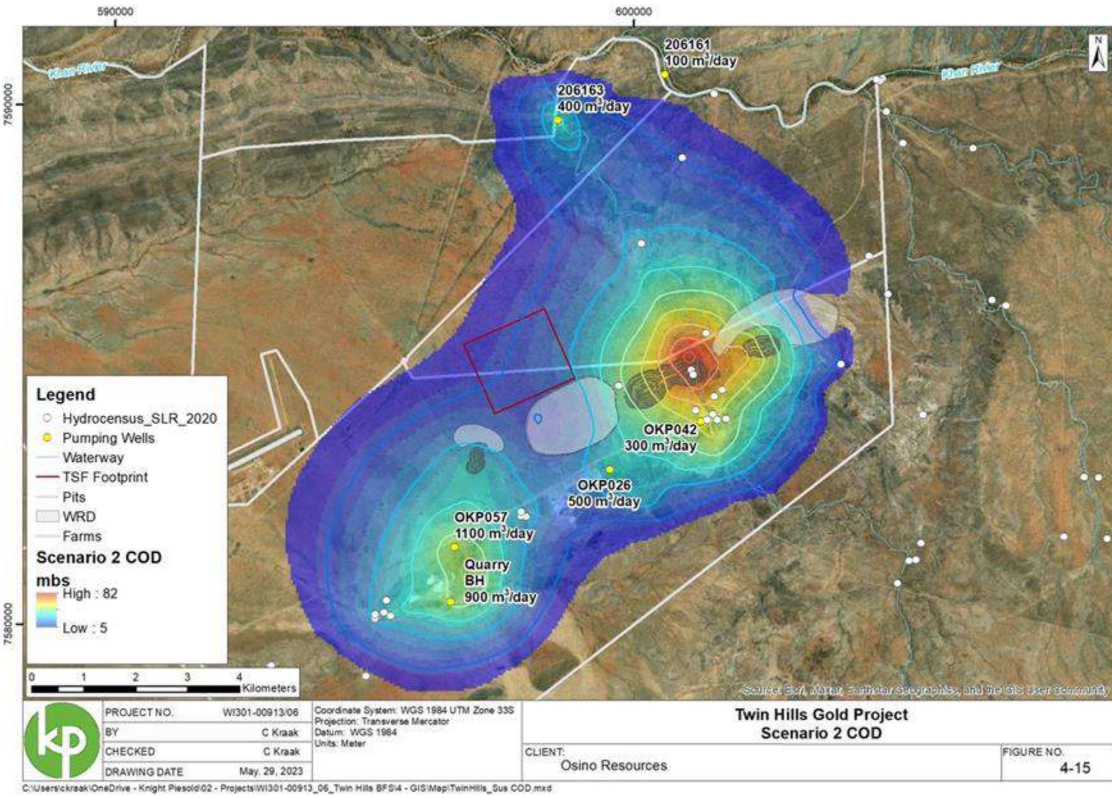
- Okawayo flood mitigation structure and groundwater managed aquifer recharge (MAR) along Okawayo River: The potential long-term yield of this option is still to be investigated and is also likely to increase the sustainability of the groundwater options while supporting pit dewatering and mitigating risks to the open pit under flash flood conditions. Vibrating wire piezometers are being installed to support this opportunity and provide pore pressure data seasonally along the Okawayo stream in the vicinity of the pit.

- Water management and scheduled abstraction may allow for aquifer recovery and a higher potential yield, with the addition of the water supply potential in a conceptual managed aquifer recharge (MAR) scheme in the Khan River alluvials and Okawayo tributary.

20.7.5 Impacts related to Water Quality

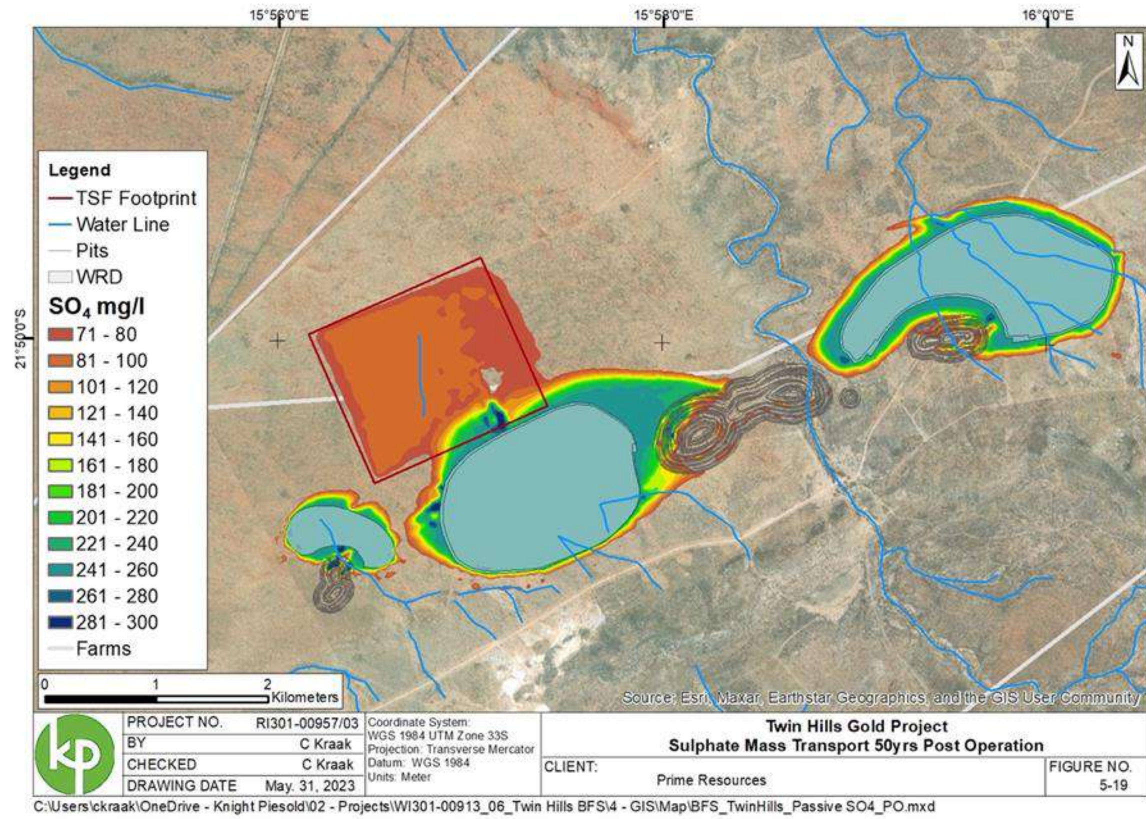
The cumulative cone of drawdown due to passive dewatering of the open pits and the water supply boreholes will be elongated towards the northeast-southwest along the strike of the orebody and parallel to the southern limb of the Karibib Marble. Two of the water supply boreholes are located on the northern limb of the Karibib Marble anticline and close to the Khan River. Managed aquifer recharge (MAR) of the water supply boreholes is under consideration to increase the sustainability of the aquifers due to the cone of drawdown but there are no boreholes used by farmers that will be impacted as shown in (Figure 20.7.2)

Figure 20.7.2 The Osino Twin Hills Gold Project Cumulative Cone of Drawdown



Contaminant transport modelling of sulphate representing possible plume migration from the lined tailings storage facility (TSF) and waste rock dumps (WRDs) indicates the drawdown cone development around the pits effectively captures the plume during operations and post-closure due to the pits being terminal sumps (meaning that due to the low rainfall, high evaporation rate and the low permeability of the pit rock types, the static groundwater table will not fully recover to pre-mining level and groundwater will continue to flow towards the pits). The plume extent from all the WRDs over LOM extends less than 180 m from the WRD footprints. Following 50 years post-operation, the plume will have migrated less than 250 m from the WRD footprints and the simulated seepage from the lined TSF is within 35 m from the footprint as shown in (Figure 20.7.3)

Figure 20.7.3 The Osino Twin Hills Gold Project Sulphate Mass Transport Model



20.7.6 Impacts Related to the Okawayo Stream Diversion

The geotechnical stability and geochemical changes of the pit, associated with the option of allowing the seasonal flow (if any) of the Okawayo Stream flow in its current course, designing systems to provide management options when it's flowing and to flow into the pit, as initially considered, has now been determined as an unviable option for the management of the Okawayo Stream water.

Continued studies to determine the most suitable option for managing the intermittent flow of water, have determined that the diversion of the Okawayo Stream is the most viable and effective solution for the water.

A risk that has been identified is that the Okawayo Stream passes directly through the Central Pit eastern wall, and it is possible that there could be a zone of weakness in this sector of the pit, with a seepage face that may require depressurization / dewatering.

- The tracer testing and installation of VWTs along this structure will be undertaken to collect the data to quantify and mitigate this risk.

- The overflow during flood events will be directed to the Cloud West pit once it has been mined out (year 4) for storage.

Attenuation dam and diversion canal on Okawayo proposed as mitigation could have the following opportunity and risk:

- Enhanced recharge of marble aquifers via karstic connections

- Potentially higher pore pressures and water levels on southeastern corner of the main pit due to higher groundwater flow along fault structures

The impact assessment for previous options of diverting the stream or constructing a diversion dam / subsurface dam to enhance aquifer recharge to the mine wellfield supply, or a weir, or a combination of these options, was assessed. The assessment was conducted using a worst-case methodology, therefore the options potentially most disruptive to the river system were assessed and subsequently approved with the issuance of the environmental clearance certificate. The MME Chief Inspector of Mines approval will be required for the final mine layout plan, which may require an amendment to the environmental clearance certificate to reflect the final plan with the MEFT.

20.7.7 Impacts on flora and fauna

Of all the impacts, those to amphibians are the most adverse. Impacts to reptiles, mammals, birds, and flora is minor to low, typically with a moderate to low magnitude of change. Reptile mitigation will include covering the natural landscape with rock and other excavated material and the removal of all flora on site. All vehicle activities (including long hauling) should abide by the speed limits to avoid road mortalities. However, the overall low densities of all reptile species in the mining area would negate the problem.

Active mitigation to avoid mammal fatality will include all vehicle activities (including long hauling) should abide by the speed limits to avoid road mortalities. The overall low densities of all mammal species in the mining area would negate the problem.

Avian impact mitigation should include all vehicle activities to avoid road mortalities. Most birds are very adaptable to disturbances and mostly avoid disturbed areas. Raptor breeding trees should be avoided during layout and construction during the breeding season. Avian impact mitigation includes managing levels of residual chemicals.

Amphibians' habitat will be affected by layout of waste rock dump tailings storage facility. The artificial habitat of the TSF could potentially attract amphibians to the area, which is an issue of habitat and related ecological functioning. Lastly, the Okawayo Stream, pans, ground dams, and farm reservoirs are potential amphibian habitats potentially affected by the mine layout, especially the north of WRD2 which covers part of the stream.

Amphibian impact mitigation will include that all vehicle activities (including long hauling) should abide by the speed limits to avoid road mortalities. However, the lack of open surface water and overall marginal amphibian habitat in the mining area would negate the problem. The covering of parts of the northern tributaries of waste rock dump 2 should be avoided and an alternative alignment direction of this facility should be considered.

Flora impact mitigation includes offsets such as planting of endemic tree species in the vicinity of the ML. All vehicles should abide by the speed limits to minimize dust pollution on vegetation and inhibition of photosynthesis.

20.8 Rehabilitation and mine closure

The Namibian Chamber of Environment, in collaboration with the Chamber of Mines (CoM) and Government, has produced a best practice guide including mine closure for its members, and since then has supported the MME's development, along with the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development, of the Namibia Mine Closure Framework. The Framework is written into the draft revised Minerals Act, currently under review. The Twin Hills Gold Project detailed conceptual mine rehabilitation and closure plan was developed in June 2022. It is consistent with Namibia Mine Closure Framework, NCE / CoM best practice guide and the ICMM Integrated Mine Closure Good Practice Guide and integrates the site ESMP.

20.9 Conclusion

In conclusion, the Twin Hills Gold Project demonstrates a commendable commitment to environmental protection, integrating it into the project's culture right from the outset and throughout each phase of the mine life plan. By considering environmental factors during feasibility studies, designing for closure, and implementing stringent measures during construction and operation, the project aims to minimize its impact on the environment and foster sustainable practices.

This environmentally conscious approach brings numerous benefits. Firstly, it cultivates a positive public perception, demonstrating the project's commitment to responsible resource extraction. Additionally, it enhances the project's appeal in the commodities market, as stakeholders increasingly prioritize sustainability and ethical practices. The incorporation of environmental protection measures also facilitates approval from international banks, which are more inclined to support projects that align with environmental standards.

Moreover, the proactive management of environmental and social aspects reduces the costs associated with clean-up and closure in the long term. By preventing and mitigating potential impacts, the project avoids the need for extensive remediation efforts, thereby safeguarding both the environment and financial resources.

The comprehensive environmental and social management plan, which encompasses mitigation strategies, legislative requirements, and best practices, serves as a blueprint for responsible operations. This plan ensures that environmental protection remains a priority throughout the project's lifespan, fostering a sustainable approach that benefits not only the surrounding ecosystems but also the communities and stakeholders involved.

In conclusion, the Twin Hills Gold Project demonstrates a model for integrating environmental stewardship into mining operations. Through its proactive measures and commitment to sustainability, the project sets a positive precedent for responsible resource extraction and demonstrates that economic development and environmental protection can go hand in hand.

21.0 CAPITAL AND OPERATING COSTS

21.1 Summary

21.1.1 Introduction

The Twin Hills Gold Project comprises a processing plant and associated infrastructure with process parameters according to the Project Process Design Criteria discussed in Section 17 of this Feasibility Study Technical Report.

Estimate Classification and Accuracy

The Capital Cost Estimate (CCE) meets the required level of accuracy that will facilitate a Feasibility level study (DFS) and complies or exceeds the typical industry standard of a Class 3 Estimate as defined by the Association for the Advancement of Cost Engineering (AACE). The expected estimate accuracy allowance for a Class 3 estimate is 10% to 20%, with an expected accuracy range of: L: -10% to -20%.

Table 21.1.1 Industry Estimate Class Definition Based on AACE Recommended Practice

Project Study Estimate Class	Maturity Level of Project Deliverable Definition	End Usage (Typical Purpose of Estimate)	Methodology (Typical Estimating Method)	Expected Accuracy Range Typical Variation in Low (L) and High (H) Ranges
Class 3	10% to 40% (Of complete definition)	Funding Authorization	First principles quantification and detailed unit costs for major equipment. Mix of preliminary Material Take-Offs (MTOs) with semi-detailed unit costs for the balance	L: -10% to -20% H: +10% to +30%

Lycopodium's estimate of accuracy range for the overall DFS Capital Estimate is +15% -10%. The tighter range than a standard Class 3 estimate is possible because of the partial reference to actual constructed quantities and costs from other recent Lycopodium projects, for several elements of the process plant. The CCE has a base date of March 2023.

21.1.2 Capital Cost Estimate Summary

The Project capital cost estimate (CCE) for this definitive feasibility study (DFS or FS) was compiled by Lycopodium Minerals Canada (Lycopodium) with input from DRA Global (DRA), Knight Piésold, Qubeka, GSFA, ECC, Dornier Suntrace and Kuchling & Associates (KCA).

The respective qualified persons or third-party experts of these companies contributed to the preparation of this report for the general infrastructure, tailings storage facility, mining infrastructure and establishment costs, bulk power supply, closure, renewable power supply and water infrastructure. Osino provided project specific Owner's team and facility capital cost estimates.

The CCE reflects the Project scope as previously described in this study report, particularly in Sections 16, 17 and 18. The estimated capital cost is summarized in Table 21.1.2.

Table 21.1.2 Plant CCE Summary (US$ millions (m), 1Q23, range –10% to +15%)

Main Area	Capital US$ million
Treatment Plant	118.8
Reagents & Plant Services	23.9
Infrastructure	65.2
Mining	8.3
Construction Distributables	36.3
Logistics and Transportation	15.9
Subtotal	**300.7**
Management Costs	23.8
Owners Project Costs	22.8
Subtotal	**46.6**
Project Total (Including Contingency)	**347.3**

Table 21.1.3 shows the capital cost breakdown by discipline.

Table 21.1.3 Capital Cost Estimate Summary by Discipline (US$M)

Discipline Code	Project Total Cost US$ million
A General	8.31
B Earthworks	24.08
C Concrete	18.05
D Steelwork	24,40
E Platework	8.16
E Tankage	6.93
F Mechanical	114.70
G Piping	11.37
H Electrical	42.76
J Instrumentation & Control	4.81
M Buildings & Architectural	8.61

Discipline Code	Project Total Cost US$ million
N Mining	5.37
N TSF	20.38
O Owners Costs	24.75
P Indirects	24.58
Grand Total	347.3

In addition, the Project will incur US$18 million of waste rock and ore mining pre-stripping costs before the process plant commences production, which will be capitalised to bring total Capital requirement in the cash flow schedules to US$365 million.

All costs are expressed in millions of US dollars (US$m) unless otherwise stated and are based on Q1 2023 pricing. The estimate is deemed to have an accuracy range of + 15 / - 10%.

Where costs used in the estimate were provided in other than US$ the following exchange rates have been used (Note: The Namibian Dollar [NAD] is linked at parity to the South African Rand [ZAR]). Overall, the consultants preparing the estimates determined that approximately 77% of the process plant estimate and 40% of the infrastructure estimates were sourced from US dollar-based prices with the remainder being costed by vendors or Osino in ZAR or NAD.

1 US$ = 18.5 ZAR/NAD

- 1 EUR = 1.09 US$.
- 1 CAD = 0.73 US$.

The costs in Table 21.1.2 and Table 21.1.3 include contingency. A total contingency of US$34m has been included in the financial model which is 9.8% of total project construction capital cost of US$ 347 million.

The Monte Carlo workshop prompted broad discussion on expected ranges and potential outcomes for the major cost elements and packages that make up the project CCE.

The Monte Carlo results provided confidence that the contingency included in the estimate, previously calculated by deterministic assessment, is sufficient for a P80 (or better) confidence level with event modelling turned off and a P50 (or better) confidence level with the event modelling turned on.

Therefore, it can be concluded that the estimated amount of contingency currently in the CCE is sufficient to service the project, and the expectation should be that most of the contingency will likely be spent.

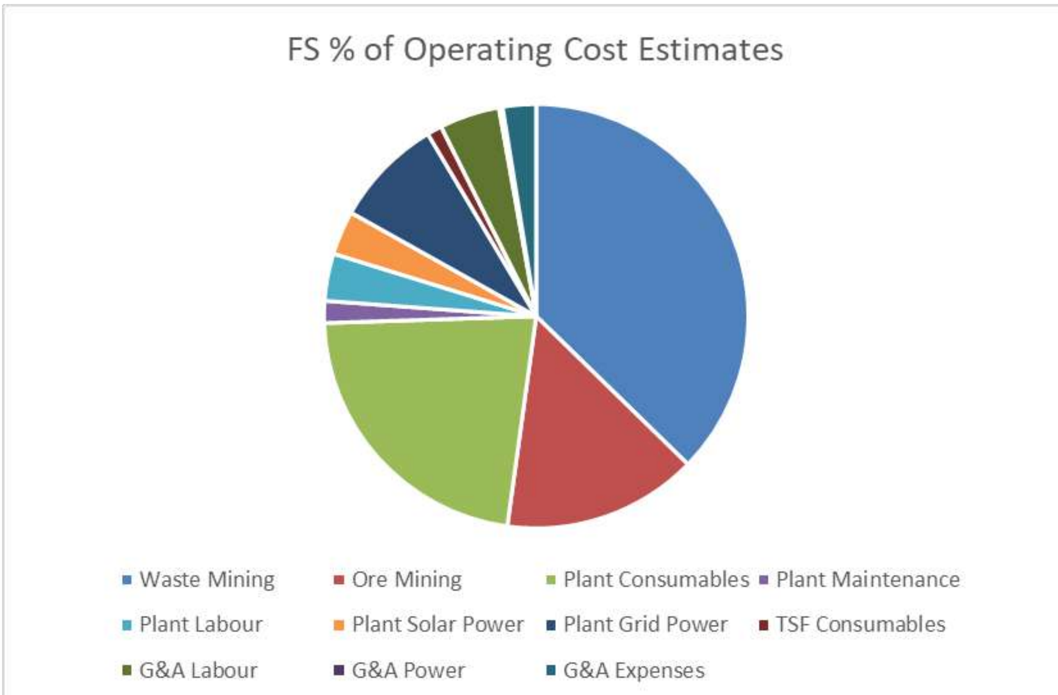
21.1.3 Operating Cost Estimate Summary

Table 21.1.4 and Figure 21.1.1 illustrate the total operating cost estimate over the life of mine expressed as US$/t waste rock or ore, and US$/oz gold produced.

Table 21.1.4 Mining, Processing and Total Operating Cost Estimates

Average Au Production pa (first 4 years)	koz pa	176
Average Au Production over life of mine (LoM)	koz pa	162
C1 Cash Operating Cost (LoM)	US$/oz	918
AISC All-In Sustaining Cost (LoM)	US$/oz	1011
Unit Mining Cost (LoM)	US$/t mined	2,64
Unit Processing Cost	US$/t milled	8,05
General & Administrative Cost	US$/t milled	5,52
Total Cost per tonne milled	US$/t milled	28,16

Figure 21.1.1 Proportion of Operating Costs Attributable in the Value Chain



21.2 Project and Process Plant Capital Cost Estimate

21.2.1 DFS Scope and Responsibilities

The scope of the feasibility study consists of a gold processing plant and associated infrastructure with process parameters according to the Project Process Design Criteria discussed in Section 17 of this DFS Technical Report. The companies making up the team responsible for design and cost estimation of key elements of the DFS are shown in Table 21.2.1. All consultants used a very similar approach to design and cost estimation during the DFS, and subsequent sub-sections are applicable to all areas unless specific descriptions of the approach used for one area or element of the estimate are included.

Table 21.2.1 Responsibility Matrix for DFS Design and Capital Cost Estimate

Major Scope Item	Responsibility
Geology & Metallurgy	
Geology / Resource Estimate	CSA Global
Geotechnical	SRK and KP
Metallurgical Testwork	Osino / Lycopodium
Maps and Surveys	Osino

Major Scope Item	Responsibility
Process Definition	
Process Selection	Lycopodium
Process Design Criteria	Lycopodium (DRA for tailings conveying & water services)
Process Flow Diagrams	Lycopodium and DRA
Process Control Diagrams	Lycopodium and DRA
Mass and Water Balance	Lycopodium and DRA
Mechanical and Electrical Equipment List	Lycopodium and DRA
Project Facilities	
Plant Site Owner's Team Accommodation	Osino
Tailings Storage Facility	Knight Piésold
Diversion of National Road	Osino
Bulk Power Supply substation	NamPower, GSFA and Osino
Possible Khan River or Kranzberg water supply	Future
Okawayo Stream diversion wall and channel	Knight Piésold
Earthworks (including plant and mining areas)	DRA
Process Plant	
Plant Access Road	DRA
Process Plant ROM Pad	Qubeka & DRA
Process Plant Internal Road	Lycopodium
Feed Preparation, Crushing, Stockpiles	Lycopodium
Milling and Classification	Lycopodium
Gravity Concentration / Intensive Leaching	Lycopodium
Carbon-In-Leach	Lycopodium
Acid Washing / Elution	Lycopodium
Carbon Regeneration	Lycopodium
Electrowinning	Lycopodium
Goldroom	Lycopodium
Tailings Detoxification	Lycopodium
Tailings Dewatering (Thickening/Filtration)	Lycopodium
Services Plant	
Reagents Storage / Mixing / Distribution	Lycopodium
Plant Ablutions / Change Room	DRA
Projects Office	DRA
Plant Office	DRA

Major Scope Item	Responsibility
Plant Mess	DRA
Plant Ablutions	DRA
Main Control Room	Lycopodium
Primary Crusher Control Room	Lycopodium
Analytical Laboratory	DRA
Plant Warehouse and Office	DRA
Plant Workshop	DRA
Electrical Switchrooms	Lycopodium
Plant Security Fencing	DRA
Fuel Storage and Distribution	DRA
Water Services (potable, effluent, sewerage)	DRA, reticulation in the plant area by Lycopodium
Stormwater Pond	DRA
In-Plant Air Services	Lycopodium
Oxygen Plant	Osino
Renewable Power (Solar PV) Plant	Osino & Dornier Suntrace
Bulk Power Supply 66kV line	Osino & GSFA
Electrical and Instrumentation	Lycopodium in plant, DRA outside plant
Tailings Belt Conveyor / Grasshopper Conveyors	DRA
Mobile Equipment	Osino & DRA
Administrative Structures outside the Plant	DRA
Off-Site Infrastructure	Osino
Mining	
Open Pit Mining including pre-strip	Qubeka
Mining Equipment	Qubeka
Mine Development Infrastructure including Explosives Magazine	Qubeka
Ore and Waste Rock Haul Roads	Qubeka
Waste Rock Dumps	Qubeka
Strategic Low Grade Ore Stockpiles	Qubeka
Owners Costs & Related Information	
Mining and Mineral Technical Services	Osino
Osino Staff Costs During Project	Osino
Duties and Taxes	Not in CCE, is in the Project Cash Flow Estimates
Working Capital	Not in CCE, is in the Project Cash Flow Estimates
Sustaining Capital	Not in CCE, is in the Project Cash Flow Estimates

Major Scope Item	Responsibility
Project Permits	Osino
Land Compensation	Osino
Community Relations	Osino
Escalation	Excluded
Project Sunk Cost (including drilling, studies, FEED)	Osino
Withholding Tax	Excluded

21.2.2 Further Details of Capital Cost Estimate

All capital cost estimates in this sub-section have been compiled in Lycopodium's overall project CCE. In some cases, items in the tables below have been re-allocated to more appropriate elements of the work breakdown structure. Lycopodium was responsible for confirming that all costs received from third parties were included in the overall estimate and also that no overlaps or gaps occurred.

Process Plant (Lycopodium)

The capital cost estimates for individual processing sections of the plant are shown in Table 21.2.2.

Table 21.2.2 Capital Cost Estimate Showing Main Plant Sections

Main Area CCC Code	Plant Area CCC Code	Supply Cost	Labour Installation Cost	Freight Cost	Subtotal Cost	Project Contingency	Project Total Cost (US$m)
000 Construction Distributables Total		**35.34**	**0.98**	**0.58**	**36.90**	**4.00**	**40.90**
	110 Treatment Plant - General Total	7.12	1.59	-	8.71	0.45	9.16
	120 Feed Preparation Total	25.14	6.00	3.72	34.87	5.17	40.03
	130 Milling Total	27.89	3.90	3.64	35.42	5.07	40.49
	140 Trash Removal & Thickening Total	3.28	0.57	0.50	4.35	0.62	5.00
	160 Leaching Total	8.32	2.20	1.47	12.00	1.84	13.83
	170 Elution & Gold Room Total	4.21	1.12	0.58	5.91	0.89	6.79
	180 Tails Handling Total	22.85	3.17	2.75	28.78	4.13	32.90
100 Treatment Plant Costs Total		**98.82**	**18.54**	**12.65**	**130.01**	**18.17**	**148.18**
200 Reagents & Plant Services Total		**19.32**	**4.27**	**1.71**	**25.30**	**3.14**	**28.44**
300 Infrastructure Total		**58.27**	**6.85**	**0.89**	**66.01**	**4.24**	**70.25**
400 Mining Total		**8.29**	**-**	**0.01**	**8.31**	**0.66**	**8.96**
500 Management Costs Total		**23.09**	**0.67**	**-**	**23.76**	**1.95**	**25.71**
600 Owners Project Costs Total		**22.79**	**0.01**	**0.01**	**22.81**	**2.01**	**24.82**
Grand Total		**265.91**	**31.34**	**16.86**	**313.10**	**34.16**	**347.26**

General Infrastructure Capital Cost Summary (DRA)

The capital cost estimate for the general project infrastructure includes the items shown in Table 21.2.3.

Table 21.2.3 General Infrastructure Capital Cost Estimate (without contingency)

WBS AREA	TOTAL US$ million
310 - Infrastructure - General	3.73
330 - Water & Sewerage	5.61

WBS AREA	TOTAL US$ million
340 – Site Power Distribution, Emergency and Standby Generators	3.03
360 - Buildings - Outside Plant	3.79
370 - Buildings – Inside Plant Boundary	2.29
220 - Water Services	1.50
230 - Plant Services	0.20
250 - Fuels	2.21
260 - Electrical Services	1.37
110 - Treatment Plant and Infrastructure Earthworks	7.84
180 - Tailings Conveyor Supply	10.68
010 - Construction Distributables – Tailings Conveyor Contractors	5.00
020 - Site Construction Distributables General	0.42
030 - Site Construction Laydown Areas and Site Offices	0.90
040 - Site Construction Facilities –Borrow pits, crush/screen, QA/QC	6.41
050 - Construction Operations	1.67
060 – EPCM Contractor Construction Accommodation	1.29
610 - Owners Costs - General	0.16
640 - Spare Parts	1.04
540 - Specialist Quantity Surveying Consultants - Construction	0.66
550 - Vendor Representatives	0.05
410 - Mining Area Earthworks and Terraces, Settling Ponds	2,23
420 - Mine Establishment Pit Dewatering Pipelines	0.19

Contract Mining Capital Cost Summary (Qubeka)

The contract mining company will need to purchase some new equipment and construct site offices and other facilities before commencing pre-strip operations about six months before commencement of production. Table 21.2.4 summarizes the capital expenditure requirement directly for the Contract Mining as well as specific Owner’s mining technical services team costs which have been captured elsewhere in the CCE, or in the LOM OPEX schedules for mining.

Table 21.2.4 Contract Mining Establishment Capital Cost Estimate

Total Mining CAPEX	TOTAL US$ million
Grade Control	0.08
Mining / Geology / Survey Software	0.22
Survey Hardware	0.13
Truck Dispatch System	1.35

Total Mining CAPEX	TOTAL US$ million
Total Owner Team Capital	2.38
Mobilisation and Establishment of all Mobile Plant	1.95
Mobilisation and Establishment of all Fixed Facilities	1.80
Mobilisation of Personnel	0.92
Total Contractor Mobilisation & Establishment Capital	4.67

Tailings Storage Facility Capital Cost Estimate (Knight Piésold)

Table 21.2.5 Estimated Cost of Phase 1 of the Filtered Tailings TSF

	SUMMARY OF SCHEDULES	US$ million
SCHEDULE	**DESCRIPTION**	
1	SCHEDULE 1: PRELIMINARY AND GENERAL - FIXED	1,40
1	SCHEDULE 1: PRELIMINARY AND GENERAL - TIME RELATED	2,99
2	SCHEDULE 2: SITE PREPARATION	0,73
3	SCHEDULE 3: TSF EARTHWORKS - PHASE 1	2.67
4	SCHEDULE 4: TSF DRAINAGE AND LINING SYSTEM	7.30
5	SCHEDULE 5: SEEPAGE COLLECTION POND	0.62
6	SCHEDULE 6: STORMWATER DIVERSION BERM	0.41
7	SCHEDULE 7: BORROW PITS & CRUSHING AND SCREENING	2.79
	MEASURED WORKS SUB TOTAL	14.52
	ESTIMATING ALLOWANCE (@ 5% OF MEASURED WORKS)	0.73
	PRELIMINARY AND GENERAL N$ (% OF MEASURED WORKS TOTAL AMOUNT N$)	4.39
FINAL AMOUNT US$ @ US$1=NAD18,5		19.64

Table 21.2.5 only includes the TSF costs that will be incurred in the project development phase before operations commence. There will be two additional phases of TSF containment wall and lining construction that will only be undertaken much later. These are included in the sustaining capital for the project.

Okawayo River Diversion Capital Cost Estimate (Knight Piésold)

In the event of occasional major rainfall on site, the ephemeral Okawayo river could flow into the main Twin Hills open pit. Provision has been made in the CCE to construct a dam wall and a diversion channel during project development. This channel will be directed to the small Clouds West pit after this has been mined out in Year 1 of operations. If this pit overflows, the stormwater will be directed back into the Okawayo river channel downstream of the Twin Hills operations. The estimated costs are summarized in Table 21.2.6.

Table 21.2.6 Okawayo River Diversion Capital Cost Estimates

Totals converted to US$ @ US$1-NAD 18,5	**US$ millions**
Okawayo Diversion Stream P&G's	0.10
Okawayo Diversion Stream Construction Costs	0.89
5% on design development	0.04
TOTAL OKAWAYO STREAM DIVERSION	**1.03**

Bulk Power Supply Capital Cost Estimate (NamPower and GSFA)

The Twin Hills project intends to source the majority of its electrical power requirement from the National grid in Namibia. NamPower is currently in the process of designing, procuring, and constructing a new substation on the main transmission line at Erongo, about 10km from the town of Karibib. This will be used to deliver power to several users in the area including Twin Hills. Osino has entered into a power supply agreement in terms of which capital contributions to the Erongo substation have already been made. These payments will continue to an agreed maximum amount, during the period when the Twin Hills project is being implemented.

In addition to the substation, a 66kV transmission line from Erongo to the Twin Hills site as well as a switchyard and consumer substation at site will also be required. The design and construction of these can be carried out by commercial entities, subject to NamPower's approval of the designs. GSFA has prepared capital cost estimates for all of the work required, as summarized in Table 21.2.7.

Table 21.2.7 Estimated Capital Cost of Bulk Power Supply to Twin Hills

	OSINO TWIN HILLS ELECTRICAL GRID CONNECTION SWITCHYARD, CONSUMER SUBSTATION AND TRANSMISISON LINE INFRASTRUCTURE CAPEX	
	Description	**CAPEX in US$m**
1	PRELIMINARY AND GENERAL	0,14
2	LINELINKS / ISOLATORS / CIRCUIT BREAKERS / CT / VT - 66kV RATED	0,17
3	STEEL LATTICE STRUCTURE FOR ISO / CB / CT'S / VT'S / COLUMNS / GANTRIES AND BUSBARS - 66KV RATED	0,05
4	CIVIL WORKS / EARTHING / ASSOCIATED GROUND WORKS	0,15
5	MV FEEDER, RMU'S, TRANSFORMERS, SWITCHGEAR AND WORKS (CABLES, CONDUCTORS, TERMINATIONS AND COMMISSIONIN)	0,81
6	DISTRIBUTION AND SUBSTATION BUILDING	0,15
7	LOW VOLTAGE DISTRIBUTION SYSTEM - PVC SWA SWA 6000/1000V UNDERGROUND CABLES AND TERMINATIONS	0,03
8	SWITCHGEAR PROTECTION AND CONTROL (Design, Supply, Delivery, Dnstallation, Test and Commissioning)	0,22
9	AUTOMATION / DATA AND SCADA IMPLIMENTATION (IEC 61850, IEC 60870-5-104 and IEC 60870-5-101	0,06
10	GENERAL ITEMS , PC ITEMS AND CONTINGENCIES	0,11
11	OSINO SWITCHYARD 66/11KV - 40MVA TRANSFORMERS (2 OFF INSTALLED AND COMMISSIONED)	1,73
TOTAL CAPEX AMOUNT FOR OSINO TWIN HILLS SWITCHYARD AND CONSUMER SUBSTATION (INCL. ALL TAXES & DUTIES, EXCL. VAT)		**3,61**
12	NAMPOWER 66KV METERING STATION COMPLETE AND COMMISSIONED	0,26
13	ERONGO - OSINO 66KV TRANSMISISON LINE COMPLETE INSTALLED AND COMMISSIONED AS PER NAMPOWER SPECIFICATION	2,25
14	NAMPOWER POWER SUPPLY AGREEMENT CAPITAL CONTRIBUTION FOR ERONGO SUBSTATION AS EXPECTED FOR 30 MVA POWER SUPPLY	2,24
15	LESS OSINO CAPITAL CONTRIBUTIONS PAID TO NAMPOWER AS PER POWER SUPPLY AGREEMENT (SIGNITURE DATE UP TO JULY 2023)	-0,80
TOTAL CAPEX AMOUNT FOR OSINO TWIN HILLS NAMPOWER GRID CONNECTION (INCL. ALL TAXES & DUTIES, EXCL. VAT)		**3,96**
	TOTAL	**7,57**

Comparison Between PFS and DFS Capital Cost Estimates

Table 21.2.8 presents a comparison between the prefeasibility study capital cost estimate of 2022 and the current CCE, quantifying the maim differences and explaining the reasons for these briefly.

Table 21.2.8 Comparison of Capital Cost Estimates Developed for the PFS and DFS

Main Area CCC Code	Project Total PFS in millions of US$	Project Total DFS in millions of US$	Notes
000 Construction Distributables	26,2	39,1	The infrastructure team in the PFS did not use the project WBS. Items estimated by DRA in the DFS are now included under the correct cost code
100 Treatment Plant Costs and Freight	147,0	147,8	DFS replaced vacuum belt filters with filter presses and added a covered fine ore stockpile. These increases were offset by significant reductions in all other mechanical equipment cost estimates
200 Reagents & Plant Services	25,1	26,4	
300 Infrastructure	94,2	72,7	TSF costs including the conveying system were more expensive in the DFS than in the PFS. In spite off this increase, reductions in other items (eg power supply) enabled the overall infrastructure plus construction distributable estimate to be unchanged
400 Mining	12,8	9,3	Some costs were added for infrastructure in DFS,but mining equipment establishment costs were less
500 Management Costs	24,0	26,4	
600 Owners Project Costs	22,7	25,3	The DFS makes provision for Operational Management to be hired sooner, and includes housing allowances
Grand Total Plant and Infrastruct	**352,1**	**347,1**	
Pre-strip of waste rock and ore	22,9	17,9	Capitalised but under the control of the Operations Departments. Quantity of pre-strip reduced for the DFS
TOTAL INITIAL CAPITAL	**375,0**	**365,0**	
Contingency (included in totals above)	*40,8*	*34,2*	*Contingency ranges have decreased due to better design definition at DFS stage*
Discipline Code	**Project US$m-PFS**	**Project Total US$m - DFS**	**Notes**
A General	2,9	8,2	Re-allocation from PFS "On and offsite Infrastructure" as per DFS w ork breakdow n structure (WBS)
B Earthworks	4,5	24,7	Re-allocation from PFS "On and offsite Infrastructure" as per DFS w ork breakdow n structure (WBS), increased compacted support for the spine of the plant, after receiving the geotechnical drilling results
C Concrete	13,5	18,6	Re-allocation from PFS, addiitonal TSF conveyor and Fine Ore Stockpile support
D Steelwork	18,5	24,0	Re-allocation from PFS, addiitonal TSF conveyor and F/O S/Pile support
E Platework	4,2	8,0	Three new surge tanks for tailings thickener underflow , PFS estimate w as factored
E Tankage	9,1	6,9	Stormw ater and raw w ater tank capacities reduced, PFS duplication eliminated
F Mechanical	108,8	113,9	Four filter presses, additiuonal tailings grasshopper conveyors added, but cost of all other mechanical equipment items decreased by 5-10%
G Piping	9,9	11,2	Factored from mechanical equipment in both estimates
H Electrical	55,6	42,5	PV plant all in opex in DFS, reduction in capex for NamPow er main pow er transmiossion line
J Instrumentation & Control	4,9	4,8	Factored from mechanical equipment in both estimates
M Buildings & Architectural	6,5	8,7	Preliminary designs and cost estimates supported by quotation, in both PFS and DFS
N Mining	12,7	5,3	Re-allocation from PFS, the earthw orks for mining are now show n under item B above
N TSF	12,7	21,1	Additional TSF lining costs in Phase 1, required during project implementation. Phase 2 and 3 costs are low er in the DFS but are in sustaining capital, not project capital
O Owners Costs	18,3	25,0	More spares, higher labour complement & rates w irh housing, re-allocation of some PFS costs
P Indirects	21,8	24,1	Increased EPCM, construction vehicle and consultant costs in DFS estimate, re-allocation of some costs
On and Offsite Infrastructure	48,1		PFS Infrastructure estimate did not use project w ork breakdow n structure
Grand Total	**352,0**	**347,1**	
Plus Pre-strip of waste rock and ore	*22,9*	*17,9*	*Capitalised but under the control of the Operations Departments. Quantity of pre-strip reduced for the DFS. This brings the totals to 375 and 365 million US dollars repectively*

Potential Future Capital Cost Items

Apart from sustaining capital items that have already been mentioned and thar are included in the Project cash flow schedules, such as Phases 2 and 3 of the tailings storage facility, several items have not been included in the DFS CCE for the project. These items may be added after operations commence, if they are found to be needed, A short list of these items follows:

- Arsenic precipitation circuit, following cyanide detoxification (destruction).
- Second intensive leach and gold recovery circuit for gravity concentrate from Ondundu.
- Air strip.
- Stormwater pond in the mining area.
- Water pumps and pipeline from the Kranzberg aquifer.
- Water pumps and pipeline from the Khan River managed aquifer recharge system.

21.2.3 General CCE Estimating Methodology

Quantity

The Capital Cost Estimate (CCE) has been generated by applying an appropriate blend of quoted package or equipment costs based on engineering designs, quoted rates for bulk material take offs (MTOs) and bills of quantity (BOQs) and in-house benchmarks. The level of accuracy and detail in each section of the CCE varies based on the engineering progress of the given scope and discipline.

Process plant DFS designs were developed using 3D modelling and material take-offs were developed making use of this package. Where applied, benchmarks were from specific sections of constructed Lycopodium process plants. Consequently, these quantities can be expected to be accurate. Table 21.2.9 confirms the source of each element of the CCE.

Table 21.2.9 CCE Sources of Information and Quantities

Item	Source of Information
Mechanical Equipment List	Developed for DFS
Electrical Equipment List	Developed for DFS
Bulk Earthwork MTO	BOQs developed for DFS
Concrete MTO	BOQs developed for DFS
Structural Steel and Conveyor MTO	BOQs developed for DFS
Manufactured Platework MTO	BOQs developed for DFS
Process Piping	Benchmarked except for main water make-up pipes
Electrical and Instrumentation Bulk Materials	Benchmarked against similar designs
Instrumentation	Benchmarked against similar designs
Buildings List and Sizes	Developed for DFS

Design Growth Allowance

Design growth allowances were made in the Process Plant sections of the DFS design to cover undefined items of work within the defined scope. The design allowance is intended to make allowances for the final quantities between the current known definition and the final design. These allowances are often referred to as 'known unknowns.'

Lycopodium's lead engineers were involved in workshops with the estimators as well as with the DRA infrastructure team to evaluate the design development growth to be included in the direct cost of the CCE. Table 21.2.10 shows the allowances included in the CCE according to each discipline.

Table 21.2.10 Design Development Allowances

Discipline	Calculation Method
Earthworks / Geotechnical	15% applied to quantities
Concrete	10% applied to quantities
Structural Steel and Platework	8% applied to quantities
Electrical Bulks	10% applied to benchmarks
Instrumentation	10% applied to benchmarks
Piping	Not applicable - factored

A similar approach was applied by DRA and the other consultants for the infrastructure areas. Contingencies were not built into quantities and rates, in preference to this an Estimating Allowance was applied due to the level of engineering deliverables being only 10% to 40% of basic and detail engineering. This allowance represents the gap between what is derived from DFS design documents and what is likely to occur as the Project proceeds, based on experience. Allowances have been included in the estimate as a percentage of each cost component.

Common estimating allowances, specific to identifiable uncertainties for an item in the estimate, such as material take-off allowances (e.g., connector plates not designed yet for structural steel measurements), overbuy allowances, waste allowances, productivity allowances, design growth allowances, congestion allowances, location, or country allowances, working height allowances, refinement of specifications, etc. are covered by this factor.

With reference to Table 21.2.10, an Estimate Allowance of 5% has been applied to most infrastructure items.

Pricing Basis

Table 21.2.11 identifies the sourcing of costs included in the CAPEX.

Table 21.2.11 Pricing Basis

Discipline	Allowance / Factored	Historical / Estimated Pricing	Budget Quote
General	X	X	
Earthworks			MTO & rates
Concrete			MTO & rates
Steelwork			MTO & rates
Platework			MTO & rates
Mechanical		X	X
Piping	X		MTOs for water supply
Electrical		X	X
Instrumentation & Control	X	X	
Buildings & Architectural		X	X

21.2.4 Direct Cost Estimating Methodology

Geotechnical Basis

Geotechnical parameters for foundations from previous project phases were used as an initial guide to the estimating and design of the scope of works while the geotechnical investigations were underway during the DFS. The assumptions made for the designs were validated, and estimates updated to correlate to the final civil Geotechnical report produced by SRK which was an outcome of geotechnical testing during the DFS. For the TSF, a similar approach was applied based on geotechnical test pits, drillholes, laboratory tests and a report commissioned directly by Knight Piésold.

The geotechnical reports indicated that structures with light loads that are not sensitive to settlement can be placed on strip or pad footings on the hardpan zone. Reinforced strip footings should be used to mitigate for any weak / discontinuous zones in the hardpan calcrete. If powder calcrete is encountered in foundation soils, caution should be exercised as this material tends to be compressible and/or collapsible, potentially leading to differential settlement.

Lycopodium estimated the quantity of work to be done along the spine of the process plant to upgrade the foundations to compacted calcrete and included an allowance for this in the final project CCE. As all the plant services areas and infrastructure buildings are lightly loaded structures, except for the workshops, the founding of the buildings was already aligned with the recommendations of the geotechnical report and no cost adjustments were required in these areas.

For the primary crusher area as well as all the buried services such as electrical cables, water, sewerage lines, etc. the volume of the hard rock excavations was increased to cater for the shallow hard pan calcrete materials.

Bulk Earthworks

<u>Engineering Design Basis</u>

The Bulk Earthworks capital estimate covers the following scope:

- Site Clearing and grubbing.
- Terraces for various areas including parking areas and laydown areas for contractors.
- Borrow pits and crushing and screening facilities for engineered fill.
- District Roads, access roads, internal plant roads and maintenance roads.
- Fill for surface stockpile tunnels.

Bulk earthworks requirements were determined for the process plant as the following infrastructure areas:

- Potable Water and Fire Water.
- Sewer reticulation.
- Raw water reticulation and borehole water supply.
- Pollution control dams, settling ponds and process water ponds.

- Plant and access road fencing.
- Stormwater concrete lined drains and culvert structures.
- Mining infrastructure / support area.

Quantities for clearing, stripping, cut, fill, drainage, etc. for the Process Plant site were developed from preliminary engineering based on the plant model and on Lycopodium standard earthworks design principles.

Other earthworks and Infrastructure works quantities were estimated from layout drawings and used to populate the Bill of Quantity (BOQ). These quantities were derived taking the conditions as described in the geotechnical report into consideration.

Supply and Installation Cost Basis

An enquiry was issued into the market to obtain updated market rates / costs. The enquiry was issued to six contractors of which four contractors are Namibian Companies and two companies are South African companies. Bids were received and rationalised to derive a set pf project rates based on the lowest (modified) bid from a Namibian contractor.

Concrete Civil Works

Engineering Design Basis

Civil works for all areas of the process plant were quantified from first principles and costed based on the mechanical layouts that were produced for the DFS. Quantities of concrete were estimated based on preliminary building sizing, previous project equipment loads and sizes where available, and engineering judgment based on past projects.

Infrastructure Civil Structures allowed for include:

- Wash bay and silt trap facility.
- Emergency generator & fuel storage tank.
- Fire water pump station.
- Pollution control dam silt trap facility.
- Plant fuel dispensing facility.
- Bulk fuel depot - Mining area.

- Mini substation civils.
- Containerized MCC concrete sleepers.
- Filter tailings conveyor transfer tower.
- Filter tailings conveyor.
- Highlight masts.

All concrete was assumed to be 30MPa. All exposed surfaces to be wood floated. The rebar to concrete ratio varies between 85 kg/m^3 and 110 kg/m^3.

Supply Cost and Installation Cost Basis

A combined enquiry (Civils and Building Works) was issued into the market to obtain updated market rates / costs for supply and installation. The enquiry was issued to four Namibian companies. Bids were received and rationalised to derive a set pf project rates based on a the lowest (modified) bid.

The installed pricing estimates include delivery of concrete constituents, formwork, rebar supply and installation, placing concrete and any finishing requirements.

The mobilization, demobilization and operation of a Batch Plant has been included under contractor's indirect costs.

Buildings

Engineering Design Basis

A Building List defining the buildings size and type of manufacture was developed.

The buildings capital estimate includes:

- 5 x Plant Ablution Blocks.
- Main Plant Admin Office.
- 2 x Bus Shelters.
- Carports.
- Process Plant Change house.

- EC&I & Boiler Workshop.
- LDV & Equipment Workshop.
- First Aid & Resuscitation Building & Fire Vehicle & Equipment Store.
- Main Store Building.
- Main Access Control Security Building.
- Tailings Storage Facility Access Gate Security Hut.
- Training Facility.
- Waste Management Shed.
- Oil & Flammable Store.
- Fire Water Pump Station.
- 2 x D1941 Guard houses on Road.
- Small Canteen.
- Prefabricated Construction Site Offices.

Supply and Installation Cost Basis

Bills of quantity were produced from first principles for all buildings and structures from layouts produced for the DFS. The costs for the building structures included the steelwork of the workshops, stores, etc. as it was deemed that the building contractor would also erect the plant steel structures.

Modular buildings supply cost estimates with the installation costs were considered or included in SMP scope in a few cases where these were found to be more cost effective than brick-built structures. Buildings were specified complete with all structures, electrical and plumbing fixtures, and cabling / plumbing, as well as communication and fire protection systems.

Prefabricated raised Electrical rooms with lighting, HVAC, fire detection and fire suppression were specified based on previous Lycopodium projects in Africa.

A combined enquiry (Civils and Building Works) was issued into the market to obtain updated market rates/costs both for brick-built structures and prefabricated buildings. The enquiry was issued to four Namibian companies. Bids were received and rationalised to derive a set pf project rates based on a the lowest (modified) bid.

Structural Steel

Engineering Design Basis

Quantities for steel required for structural support in the process plant were estimated based on the DFS 3D model and preliminary building and equipment sizing.

Conveyor structural steel, platework and lining quantities for all the Tailings Overland and Dry Stacking Conveyors were established, based on the conveyor profiles, layouts, and conveyor design drawings.

A BOQ suitable for an SMP Contractor's scope of works for the conveyors was compiled on the following basis:

- Quantities for conveyor steel fabrication, delivery and installation were categorised by conveyor steel member such as either head frame, tail frame, stringers and supports, gantries, trestles sections etc.
- Specified items such as shop detailing, corrosion protection, guards and rails were included in the schedule of quantities to complete the scope of works associated with steelwork fabrication.
- A schedule of quantities for bought-out items such as handrailing components, flooring components, fasteners was also included.
- Quantities for conveyor platework items were categorised as chutes and general platework.
- Note: The SMP included for structural steel, platework, mechanical installation (free issued), shop detailing, corrosion protection, supply, fabrication, transportation to site, off-loading, erection, and commissioning assistance, which includes all their associated costs for induction, medicals, accommodation and meals, PPE, PPC, travelling, etc. to complete the works in full.

The Steelwork for infrastructure building structures such as workshops, stores etc was priced and allowed for in the building packages.

Supply and Installation Cost Basis

Representative Bills of Quantities were compiled for the SMP Contractor scope of works (Steelwork, Mechanical Installation, Platework). The BOQs included preambles to guide the contractors on the pricing basis.

A request for quotation (RFQ) was issued for competitive tender to four Namibian based SMP Contractors. All four companies provided compliant Tenders and thus were shortlisted for further rates interrogation and Clarifications. The four shortlisted tenderers are experienced in the size, nature, and location of the Project, have completed similar sized projects in the recent past, and have a strong Namibian and South African supply base.

Bids were received and rationalised to derive a set pf project rates based on a the lowest (modified) bid.

The SMP capital estimate includes for shop detailing, corrosion protection, supply, transportation to site, off-loading, installation of free issued conveyor mechanicals and general installation / erection on site including all their associated costs with respect to induction, medicals, accommodation and meals, PPE, PPC, travelling, etc. to complete the works in full.

The rates for surface preparation, priming and painting have been included in the CCE as part of the ex-works fabrication and supply rate. An allowance has been provided for the touch-up of steelwork and platework on site after installation. The Corrosion Protection P&G (Preliminary and general) costs have been included in the steelwork and platework P&Gs.

Rates for structural steel fabrication, packaged ready for sea freight were validated against Lycopodium recent historical data from fabricators in Southern Africa (in or neighbouring Namibia) and Asia (low-cost manufacturing centres).

Platework

Engineering Design Basis

Quantities for specialized platework (chutes, bins, etc) were derived from the MTOs extracted from the preliminary DFS 3D model and experience on similar projects. Liner material has been specified for each item and included in the estimate as a separate commodity.

Supply and Installation Cost Basis

Rates for platework fabrication based on Lycopodium recent historical data as well as budget quotes from fabricators in Southern Africa (in or neighbouring Namibia) and Asia (low-cost manufacturing centres) were used in the CCE.

Rates for installation are included under the SMP contractor budgetary quotes.

Shop Fabricated and Field Erected Tanks

Engineering Design Basis

Tank volumes and dimensions were calculated from process design criteria and flowsheets. Sizes and plate thicknesses were calculated based on the volumes, retention time, mechanical layout, and standard design principles.

Ancillaries were based on Lycopodium typical design principles and quantities in the estimate were based on the DFS tank list.

Supply and Installation Cost Basis

Budgetary quotes were received and evaluated from tank suppliers used on previous African Lycopodium projects as well as referring to benchmarked Southern African supply rates.

Rates for installation are included under the SMP contractor budgetary quotes.

Mechanical Equipment

Engineering Design Basis

All major mechanical process plant equipment was quantified and specified by Lycopodium as per project specifications indicating technical data. Each piece of equipment has been identified in the Mechanical Equipment List and on the Process Flow Diagrams by its unique tag number.

A similar approach was applied by DRA in the infrastructure area. The mechanical equipment list (MEL) and definition was established from the process mass and water balance as well as the Process Flow Diagrams (PFDs). Mechanical equipment items included in the infrastructure portion of the CCE included the following items:

- Water Pumps.
- Sectional Panel Water Tanks.
- Plastic Water Tanks.
- Workshop and Stores Electric Overhead Travelling Cranes (EOT).
- Workshop Tools, Equipment and Compressors.
- Shelving and Racking.

- Water Treatment Plant.
- Sewerage Treatment Plant.
- Oil / Water Separators.
- Firewater Pump System, Handheld Appliances, and Detection Systems.
- Bulk Fuel & Lubrication Storage and Dispensing Facilities.

Supply and Installation Cost Basis

Equipment data sheets and schedules were prepared and issued to multiple prospective vendors for quotes as part of the enquiry process. vendors as per the approved project vendor list and MEL were approached to submit pricing with a 90-day validity. Bids were received, adjudicated and used to populate the capital estimate. The mechanical equipment supply costs include associated vendor commissioning (for major equipment only), construction support and critical spares.

Conveyor mechanical items were established from the design sheets and conveyor schedules. The conveyor designs specify and include all mechanical equipment schedules i.e., drives, pulleys, belting, scrapers, idlers, and take-up winches. Enquiries for 90-day validity were issued to the market, for current pricing.

All mechanical equipment prices are based on vendor budgetary quotations obtained by Lycopodium or DRA, except that prices of occasional minor miscellaneous equipment items have been estimated using historical data from previous African Lycopodium or DRA projects.

Pricing is inclusive of all costs necessary to purchase the goods ex-works, generally excluding delivery to site (unless otherwise stated) and including operating and maintenance manuals. Vendor representation and commissioning spares have been allowed for separately in the estimate.

Rates for installation are included under the SMP contractor budgetary quotes.

Piping and Valves

<u>Engineering Design Basis</u>

In plant piping and valve bulk quantities have been factored as a percentage of the mechanical supply cost in each plant area. No major civil work is required to install the pipelines in the process plant.

The overland buried HDPE Piping for the main water supply from site boreholes was based on sizes and quantities established from the Water Balance and included in the Earthworks BOQ which were sent out to Tender by DRA as part of the infrastructure scope of work.

Supply and Installation Cost Basis

Unit rates from previous Lycopodium projects in Africa were applied for the in-plant piping estimates.

DRA allowed a provisional sum for pump suctions per pump set, for the water supply pipelines. Rates for water piping and valve supply and installation were included in the Earthworks contractor budgetary quotes.

Electrical

Scope of Supply for the DFS

Capital costs for the provision of bulk electrical supply include:

- Costs for the application for connection of the bulk electrical supply to NamPower.
- Costs for development of a 66kV overhead line to the Mine site.
- Cost for development of a 66/11kV substation located at the Mine site, including a metering station, in accordance with NamPower specifications.
- Cost for development of an 11kV consumer substation, consisting of metal clad switchgear within an elevated brick-built building, for the reticulation of power to the process plant, infrastructure areas, and the solar PV plant.

Capital costs for the infrastructure portion of the Mine, include for all equipment, materials, installation, and preliminary and general costs for the following electrical infrastructure:

- Construction power requirements.
- Reticulation of electrical supply, and provision of motor controls to all borehole and booster pump locations.
- Reticulation of electrical supply and motor controls to the tailings overland conveying system, as well as the tailings deposition conveyor system.
- Instrumentation and control related infrastructure for the above.
- Reticulation of supply to all infrastructure buildings, including lighting and small power requirements.
- Emergency power generation infrastructure.

- Backbone IT communication networking infrastructure to facilitate internet connectivity to the infrastructure areas.
- Internet connectivity, and data provisioning for the construction period.
- Site radio communications.
- Access control, and time and attendance systems.
- CCTV monitoring for process and security related purposes.
- The selected Independent Power Producer (IPP) for the solar PV plant is responsible for the full development of the solar plant facility, and there are therefore no capital costs for infrastructure included in the capital cost estimate. The following services shall be provided to the PV plant fence line, costs for which have been included in the capital estimate:
  - MV Power connection
  - Potable water supply.

All electrical supply and reticulation within the plant boundary is included in the scope of the DFS.

Engineering Design Basis

For both the process plant and the infrastructure sections of the Project, the MEL, PFDs, PCDs and site and plant layout drawings were used as a basis for the estimation. A common electrical load list using agreed voltages was compiled from the MEL utilising industry norms for utilisation and diversity of electrical consumers.

In conjunction with the site layout drawings, motors were assigned to MCCs and/or standalone motor starter panels. A key single line diagram was developed to describe the electrical reticulation network, and an equipment take-off was performed in each area.

The emergency power demand for the process plant was obtained from the plant electrical load list.

A detailed BOQ was compiled using the equipment take-off, along with a detailed cable schedule. MV cable lengths included in the BOQ were obtained through measurement of the preliminary cable routing identified on the site layout drawing. LV cable lengths were generally assumed to be 100 m, unless specific details were known regarding the positioning of the LV consumer in relation to the associated MCC or motor starter.

Sketches were compiled detailing preliminary earthing, and lighting and small power requirements within and around the infrastructure areas and administration buildings. Cabling for lighting and small power requirements was calculated on a per-luminaire and per-socket outlet basis.

Supply and Installation Cost Basis

Major electrical equipment costs in the process plant were based on budgetary quotes from global suppliers. Estimated costs of minor and miscellaneous electrical equipment in the plant were taken from Lycopodium's database.

Budget quotations were requested by DRA for the CCTV, access control, internet connectivity, and high mast lighting packages. Tenders were issued to the marked for the emergency power generator, mini substations, motor control centres, and the supply and installation contract. The rates received from the received budget quotations and tenders were used for the compilation of the capital cost estimate.

Control and Instrumentation

Engineering Design Basis

Process plant instrumentation has not been quantified for the purposes of the DFS, a factored estimate was applied for this element of the CCE.

In the Infrastructure area, instrumentation quantities were estimated via a take-off from the PCD drawings and compiled into the EC&I BoQ. Instrumentation cabling requirements were based on an average cable run of 20m per instrument. RIO and IJB panels were included based on the site layout drawings and associated instrument density.

The PCDs, electrical key single line diagram and the site layout drawings were utilised to generate a control network drawing depicting all process related control equipment (such as MCCs, RIO, and motor starter panels), CCTV networking infrastructure, and the administration IT network connectivity. Provision for network switches, fibre patch panels, firewalls and remote connectivity management devices were included within the control network drawing.

A detailed BoQ was compiled through an equipment take-off performed on the control network drawing; fibre optic cable lengths were estimated from the site layout drawings. A provision for software and software licenses was included in the BoQ as required for each associated system.

A provision for network management, file and print servers, backbone IT network infrastructure, printers, and wireless access points has been included in the BoQ based on the control network drawing and infrastructure building architectural layouts.

Supply and Installation Cost Basis

The cost allowances made in the capital estimate for the control network and associated hardware and software were obtained through a combination of budgetary proposals, and recent proposals received on other DRA implementation projects.

Supply of minor equipment items, and installation rates, were obtained via the tenders issued to prospective E C&I installation contractors.

An allowance has been included in the process plant portion of the CCE for a control system based on recent West African projects.

Transportation (Freight)

Transport / freight costs for Steelwork, Platework, Concrete and ancillary items for Civil works were quoted in the SMP rates and Civil contractor's rates respectfully. Transport costs for EC&I and mechanical equipment were obtained from vendor quotations. Other transport costs and if not quoted by Vendors, were based on a tonnage or 'per load' basis quoted by an approved Transporter / Freighter.

Spares, First Fill and Consumables

An allowance has been made for first fill of reagents and initial stock of consumables based on industry norms and Twin Hills Gold specific requirements based on calculations mainly by Lycopodium, as well as information provided by the vendors or by Osino.

Spare parts costs have been included in the estimate to cover commissioning and strategic spares for mechanical and electrical equipment. The spares holding costs have been derived from the recommendations of vendors in their quotations. The spare parts costs have been grouped per item of equipment in a separate section within the estimate. Where no spares were quoted by the vendor, and it has been deemed by Lycopodium or DRA that there should be a spares-holding, a percentage of the supply price has been applied.

Commissioning Spares

Commissioning Spares Quoted : 16%

Commissioning Spares Factored : 84%

- Mechanical Equipment : 1.5%
- EC&I Spares : 0.2%

21.2.5 Strategic / Capital Spares

Strategic Spares Quoted	:	16%
Strategic Spares Factored	:	84%
• Mechanical Equipment	:	5.0%
• EC&I Spares	:	1.0%

21.2.6 Construction Contract Estimating Methodology

Construction Contractor Workforce

The following criteria were established as the basis for the construction contractor work force estimation:

- Daily transportation of labour to and from the Project as needed.
- 13 consecutive workdays followed by a 14th day rostered day off.
- 10 working hours / day with one-hour unpaid lunch break.

Construction Contractor Installation Rates

Construction contractor installation rates were based on budgetary quotes received from known contractors with experience in the region of the Project and inclusive of the following provisions:

- Provision of temporary facilities, temporary construction power, water, and communications.
- Compliance with site health, safety, and environmental standards.
- Safety related costs i.e., Personal Protective Equipment (PPE), signage. barricading etc.
- Set-out and survey work associated with the works.
- All direct labour including foreman, leading hands (charge hand) tradesmen and labourers.
- Plant and equipment as necessary to complete the works.
- Consumables, small tools, and lubricants supply.
- Scaffolding, hoarding and gantries, handrails etc.

- Dewatering of excavations, dust suppression, weather, and noise suppression.
- Material handling of good on site, storage, handling to job face.
- Corporate overheads and profit.

Labour Productivity Adjustments

Base construction labour unit workhours were determined from ideal working conditions. Productivity factors were incorporated into the construction labour unit workhours as multipliers on the base construction labour units in recognition of the Project construction schedule, weather, and work conditions, as well as other factors including Lycopodium in-country experience.

In instances when the installation cost or the construction labour unit workhours were provided in budgetary quotes by construction contractors, no productivity factor has been applied to the CAPEX as such allowances are included in the quoted construction labour unit workhours.

Construction Contractor Indirect Costs

General

Construction Contractor Indirect Costs General are inclusive of:

- Deliverables: for securities, insurances, plans, as built drawing, schedule, and any other deliverable related to the scope of work.
- Mobilisation Costs: for mobilisation of personnel and equipment to the Project.
- Demobilisation Costs: for demobilisation of personnel and equipment to the Project.
- Recurring Costs: for management, supervision, operating costs, and the like.

Table 21.2.12 illustrates the source of cost of each Construction Contractor Indirect Cost.

Table 21.2.12 Construction Contractor Indirect Costs Source

Item	Source of Cost
Earthworks	Competitive budget quotes
Concrete	Competitive budget quotes
Structural, mechanical, platework and piping (SMP)	Competitive budget quote
Electrical and Instrumentation	Competitive budget quote
Site Materials Management	Estimate

Item	Source of Cost
Third Party Quantity Survey Verification	Competitive budget quotation
Heavy Lift Crane	Competitive budget quotation
Logistics and Transportation	Factored & benchmarked or in vendor prices

The construction estimate is based on the expectation that the following will be provided by Osino, with costs allowed for elsewhere in the CCE:

- Construction water source within 2km of the plant site.
- Borrow pit material source within 2km of the plant site.
- Cleared and levelled areas for laydown and other temporary facilities.
- Diesel fuel for the performance of the work from diesel fuel tanks located on Site at a rate per litre to be agreed.
- Permanent survey monuments and/or benchmarks.
- Site security services.
- Site medical clinic and services.
- Emergency evacuation.
- All Works Construction Insurance.
- Marine and Transit Insurance.
- Tax exoneration of temporary imports (and subsequent exports).

Heavy Lift Crane

The hiring of a 300-tonne heavy-lift crane has been included in the CCE for a period of four months to aid Construction Contractors complete their work. Costs were based on a quote but were also benchmarked against a recent Lycopodium African project.

Internet Communications

Osino will provide WIFI access to the EPCM and all Construction Contractors and visitors. Capital cost estimates for such activities are included in Owners costs.

Radio Communications

Osino will establish an ultra-high frequency (UHF) radio programming plan (incl., base station) and provide dedicated channels to the EPCM and all Construction Contractors and visitors. CAPEX for such activities is included in Owners costs.

The EPCM and Construction Contractors shall be responsible for supplying their own UHF radio requirements for integration with the site system.

Site Security Services

Osino will provide security services over the entirety of the Project site, including EPCM and Construction Contractor temporary facilities, the construction site, the laydown areas, etc. Cost estimates for these services are included in Owners costs.

Site Medical Clinic and Services

Osino will provide a medical clinic and medical services at the Project site for use by all site construction personnel and visitors, for work related health and medical incidents. Cost estimates for such activities are included in Owners costs.

Site Emergency Evacuation

Osino will make arrangements for emergency evacuation at the Project site for all site construction personnel and visitors.

Freight and Transport

Costs of Freight and Transportation have been factored based on regional historical data and benchmarked against similar sized projects with construction occurring in similar regions or have been taken from quotations for delivery of equipment from diverse sources worldwide.

Costs for offshore and onshore logistics services are deemed to include:

- Fixed Costs.
- Collection of consignments from supplier premises and delivery to the Project site via road, air freight and sea freight.
- Special Cargo allowance for Out of Gauge (OOG) consignments.
- Additional offshore charges.

Construction Water, Pumps and Piping

An allowance to establish, maintain and operate a temporary construction water supply (including required pumps and piping to a temporary water storage reservoir) has been included in the CCE. Construction Contractors shall be responsible to collect their water requirements from the temporary water storage reservoir and deliver it to their workforce.

Construction Power

An allowance for provision of construction power using generator sets has been included in the CCE.

Borrow Material Source

Osino has identified and will make available a source of suitable borrow material from within 2km of the plant site, including crushing and screening if needed. Construction Contractors shall be responsible to obtain their borrow requirements from the borrow source and deliver it to their workface.

Temporary Site Construction Facility

An allowance for temporary EPCM site construction facilities has been included in the CCE. Costs for permanent offices, meeting rooms, ablutions, office fit-out and furniture, IT equipment, laydown and security fencing were included in the CCE based on DRA and Lycopodium experience on African Projects, and some of these facilities as well as Owner's LDVs are likely to be made available to the EPCM contractor in the period before most Owner's team employees are mobilized to site.

Construction Contractors have allowed in their pricing to supply, maintain, and demobilise their own temporary facilities to support their work requirements.

Construction Operations

DRA, Lycopodium and Osino worked together to obtain budget prices for the following items related to construction:

- Third Party Inspection / Expediting Services for quality control of process plant critical equipment and materials.
- Construction Maintenance.
- HSE Equipment (Breathalyser, PPE, First Aid Kits, Fire Extinguisher, Environmental Spill Kits, Weather station kits).
- Laydown Areas.

- Construction Waste Management.
- Sewerage / Garbage Disposal.
- Vendor representatives for commissioning.
- Vendor commissioning labour allowance.

Construction Accommodation

This is included as part of the Construction contract prices. Osino will not provide a construction camp at site but will transport all workers from individual construction camps to be established in Karibib. Osino will be responsible for ensuring that serviced sites in Karibib are allocated to each contractor.

Construction Services

Allowances have been made for the following construction services:

- Mobile Equipment.
- Non-mining vehicles for EPCM contractor Engineers and Construction Supervisors has been excluded from this part of the capital estimate and included in Owner's G&A costs.

Provision has been made in the CCE for the following temporary facilities:

- Construction Stores: 4 off (6.06 m x 2.43 m Steel Containers).
- Construction Temporary Communications.
- PPE and Site Safety Equipment.
- Site Running Costs.
- Temporary and Permanent Signage.
- Diesel Fuel Costs.

Preliminary and General Costs

P&G costs include all main Contractors' overheads such as contractual requirements (e.g., safety, sureties, insurance, security during construction i.e., security contractor costs for construction period including their access control, turnstiles, etc. as required), the site establishment and the removal thereof including their own company and head office overheads.

The P&G costs also include for site management, site supervision, travel to and from the site, contractor supplied temporary facilities, offices and lay-down areas, cranes, tools, and contractors' equipment including Personal Protective Equipment (PPE) / Personal Protective Clothing (PPC) requirements.

P&G costs have been allowed for in the CCE as a percentage of the value of works to be executed and are depicted against each Work Breakdown Structure (WBS) area, in a separate column of the estimate summary sheet. Refer to Table 21.2.13. These percentages were determined from the bids received from various contractors and benchmarked against industry norms.

Table 21.2.13 Preliminary and General Percentages

P&Gs	Percentage %
Earthwork P&Gs	22%
Civil and Infrastructure P&Gs	27%
Buildings P&Gs	27%
SMP P&Gs	73%
SMP conveyor P&Gs	25%
In-Plant Piping P&Gs	73%
EC&I (On contractor supplied items and Installation)	43%

Vendor Commissioning

Vendor commissioning has been allowed for on all major equipment. The required days for commissioning and day rates have been derived from the recommendations of vendors in their quotations, if not quoted, an allowance was included in the estimate. The commissioning costs have been grouped per item of equipment in a separate section within the estimate. The following categories were catered for:

- Day Rate.
- Personnel Required.
- Induction and Medical.
- Installation Inspection and Acceptance.
- Commissioning Supervision.
- Training for Operation and Maintenance Personnel.
- Accommodation and Messing.

- Travelling (Car Rental etc.).
- Travel Time.
- Living out Expenses.

21.2.7 Contractor Mining CAPEX Requirements

The following mining infrastructure will be provided by the Contractor as part of its establishment fees.

- Mining Change House.
- Suitable Fleet of Mining Equipment in order to Perform the Scope of Work.
- Contractor Offices.
- Warehouse.
- Heavy Mobile Equipment Workshop.
- Light Vehicle Workshop.
- Maintenance Pad.
- Tyre Repair, Storage, and Change-Out Facility.
- Explosive Magazine and Bulk Emulsion Storage Facility.
- Pit Service and Refuelling Pad.
- Pollution Control System.
- Oil Interceptor.

21.2.8 Owner Team CAPEX Estimate

The general approach to cost estimating was to quantify each cost element using data generated from data sheets and support equipment lists. For equipment, budget prices were then obtained from vendors whilst bulk materials were priced by applying market related rates to quantities.

The cost estimate covers initial owner team mining, process plant and general & administrative equipment capital requirements over the life of mine. The following owner's cost items are catered for in the overall DFS capital cost estimate.

- Light Delivery Vehicles (Ldvs).
- Buses.
- Laptops and Communication Infrastructure.
- Mine Planning / Geology / Survey Software and Hardware.
- ERP System.
- Project Insurance.
- Fuel Management Systems and Fuel for The Ldvs and Buses.
- Owner's Team Office Furniture and General Expenses.
- Owner's Project Team Accommodation.

In addition, the Owner's Project Team, key operational management, and certain functions such as Security, Camp Management, HSE and Medical Services etc. will need to be recruited and mobilized during the project, well before the remaining staff arrive on site. The costs associated with these personnel are included in the capital cost estimate.

21.2.9 Niche Consultancy Capital Cost Estimates

The principles explained in this Section 21.2 for estimation of quantities and costs were also applied for the following sections of the Project during the DFS, with overall coordination by DRA or Osino:

- Phase 1 of the Tailings Storage Facility.
- Bulk grid power supply to site and connections with NamPower network.
- Okawayo River dam and diversion channel.

21.2.10 Indirect Project Costs

EPCM

Engineering and Procurement (EP) costs for the process plant and infrastructure elements of the Project were developed by Lycopodium with input from DRA, GSFA and Knight Piésold. The EP estimate covers the home-office based engineering services based in Canada, South Africa or Namibia and the Philippines, to design and procure the equipment and bulk materials for the process plant and associated infrastructure.

Construction Management (CM) costs were based on a staffing plan. The CM estimate covers the field or site-based services required to construct the facilities within the scope described.

21.2.11 Contingency Assessment

The purpose of contingency is to make specific provision for uncertain elements of cost within the project scope and thereby reduce the risk of cost over-run to a predetermined acceptable level. Contingencies do not include allowances for scope changes, escalation, or exchange rate fluctuations.

Contingency reflects the measure of the level of uncertainties related to the scope of work. It is an integral part of an estimate and has been applied (after careful analysis) to all parts of the estimate, i.e., direct costs, indirect costs, services costs, etc.

Any defined item no matter how preliminary the information, data or design will be covered by specific allowances to complete the scope, and not by contingency. In addition to the calculated amounts for direct and indirect costs, allowances are incorporated for contingencies, based on an assessment of the degree of definition available for each main cost centre. The analysis is made by assessing the level of confidence in each of the defining inputs to the item cost basis, being scope definition, supply cost basis and installation cost basis. The weighted average of each input is used to define the contingency for that item. The analysis is undertaken for each discipline within each area.

Contingency is typically assigned to each estimate line item on the basis that scope is categorized and attributed a potential contingent sum as percentage of the capital costs:

The categories are as follows:

Detailed take-off from detailed design drawings, equipment lists	3.0 to 5.0%
General take-off from sketches, plot plans, GAs, and SLDs	6.0 to 8.0%
Estimated from plot plans, GAs and previous experience	9.0 to 10.0%
Factored from previous projects / ratios	10% to 15.0%

Allowances	20.0%

Supply costs of equipment and materials (including freight) are categorized and attributed a potential contingent sum as a percentage.

The categories are as follows:

Awarded contract or purchase order	3.0%
Budget quotation	5.0% to 8.0%
In-house data base	9.0% to 12.0%
Estimated value	12% to 15.0%
Factored Value	15.0%
Allowance	20.0%

Installation costs are categorized and attributed a potential contingent sum as percentage.

The categories are as follows:

Awarded contract or purchase order	3.0%
Budget quotation	5.0% to 8.0%
In-house data base	9.0% to 12.0%
Estimated value	12% to 15.0%
Factored Value	15.0%
Allowance	20.0%

Contingency is then calculated for every estimate line item according to the above categorization in accordance with the following formula:

[A] = [0.4B + 0.4C + 0.2D]

Where [A] = Contingency %

[B] = Scope Category %

[C] = Supply Cost Category %

[D] = Installation Cost Category %

Each line item in the Capital Estimate has a contingency value allocated based on the apparent risk level. The assessment of the risk level is based on the present engineering progress, information provided by vendors and contractors and database information.

Contingency is individually applied to quantities, unit rates and costs and compiled as a weighted average to form the overall recommended Project contingency.

The recommended project contingency has been based on the present progress to date on the Project.

21.2.12 Qualifications

The consolidation of capital cost estimates by Lycopodium is subject to the following qualifications:

- Contractor and EPCM accommodation and messing are to be provided in Karibib by the individual companies based on an Osino specification, on serviced land to be made available free of charge by Osino. All contractor prices include these costs.
- Mining contractor mobilization and establishment costs were provided by Qubeka.
- Overhead power line and grid connection costs were supplied by GSFA.
- Tailings storage facility Phase 1 quantity and capital cost estimates were by Knight Piésold.
- Owner’s capital cost estimates were prepared by Osino.
- All labour rates, materials and equipment supply cost estimates have a base date of Q1 2023. Contingency has been allowed based on the quality of the various estimate inputs, however no allowance for escalation has been included.
- Construction contractor rates include mobile equipment, vehicles, cranage (up to 100 t), fuel, construction power and consumables for the duration of construction. Hire of a single heavy lift crane for a short duration for specific lifts has been allowed. Potable water and raw water supply will be provided by Osino and available at site for the use by contractors.
- Site construction offices will be containerized units only, with the intention that the permanent administration building construction schedule will be accelerated.
- Mobilisation / demobilisation / R&R costs for construction contractor personnel are incorporated in the contractor distributable labour rates on the basis of individual contractors.

- There is no allowance for blasting in the bulk earthworks. All indications indicate that blasting is not required.
- Tailings dam facility future lifts (Phase 2 and 3 of the TSF), site rehabilitation and back haul of filtered tailings by mining contractor are not included in the project capital cost estimate.
- An allowance for contractor accommodation costs per day has been included in the individual contractor rates. Contractors will erect and manage their own construction camps.
- An allowance for meals and accommodation for the EPCM team, Owner's Team and Senior Contractor staff has been included in the estimate.
- Project spares are included as a percentage allowance of the mechanical supply cost, based on similar size projects.
- Owner's vehicles and mobile equipment are to be purchased early for use by the EPCM team during construction.
- A commissioning assistance crew is included in the EPCM allowance.
- The estimate is based on the expectation that Osino will provide the following to the managing contractor:
  - Construction water and power supply
  - Cleared and levelled areas for laydown and other temporary facilities
  - Diesel fuel for the Works from its diesel fuel tanks located on Site at a rate per litre to be agreed. Actual diesel fuel usage will be monitored by Osino Resources and back charged to the Contractor as a deduction from the Contractor's monthly invoice
  - Permanent survey monuments and/or benchmarks
  - Emergency response / clinic.

21.2.13 Exclusions from DFS Capital Cost Estimates

The following items are excluded from the overall project capital cost estimate. Where there is a known cost implication for the Project, allowances or estimated have been compiled by Osino and included in the cash flow schedules in the financial model:

- Financing costs or interest costs during construction.

- Schedule delays exceeding a total of four weeks and associated costs.
- Scope changes.
- Unidentified ground conditions.
- Extraordinary climatic events.
- Insurance, bonding, permits and legal costs.
- National and local taxes, duties, fees, and royalties.
- Exchange rate variations.
- Project insurance cost.
- Force majeure.
- Labour disputes.
- Receipt of information beyond the control of EPCM contractors.
- Schedule recovery or acceleration.
- Research and exploration drilling.
- Salvage values.
- COVID related costs.
- Sustaining capital.
- Permits and licences.
- Resettlement and land purchase costs.
- Other project sunk costs.
- Project escalation from Q1 202
- Community relations.
- Withholding taxes.

- Waste rock and ore mining pre-stripping costs before commissioning of the process plant.
- Relocation or preservation costs, delays and redesign work associated with any antiquities and sacred sites.
- All costs associated with weather delays, including flooding, or resulting construction labour stand-down costs.

21.2.14 Capitalized Pre-Strip Cost Estimates

In addition to normal project capital, Table 21.2.14 illustrates the capitalized pre-strip costs.

Table 21.2.14 Details of Capitalized Pre-strip Mining Costs

Load, Haul & Secondary Mining Equipment - Total	**US$ Million**	**10.48**
Drill & Blast - Total	**US$ Million**	**3.67**
Clear & Grub	US$ Million	*0.27*
Surface Haul Road Construction	US$ Million	*0.43*
Surface Haul Road Maintenance	US$ Million	*0.14*
Presplit Drill & Blast	US$ Million	*0.42*
Total Pre-strip Contractor Cost	**USD Million**	**15.48**
Total Mining Contractor Fixed Cost	**USD Million**	**2.70**
Total Pre-strip Contractor Cost	**USD Million**	**18.18**

21.3 Project and Process Plant Operating Cost Estimate

21.3.1 Introduction

The operating costs have been compiled by Lycopodium based on costs developed by:

- Lycopodium / Osino – Process plant operating costs (Osino provided bulk power supply rates and labour costs).
- DRA - General Site Infrastructure OPEX.
- Knight Piésold – TSF Operating Costs.
- Qubeka – Contract Mining Operating Costs.
- Dornier Suntrace – Renewable Power Purchase Agreement Operating Costs.
- Osino – Site General and Administration Costs

The estimate is considered to have an accuracy of +15 / -10% and is presented in US$ based on an exchange rate US$1=ZAR/NAD 18.5. It is based on costs and exchange rates obtained or applicable during the first quarter of 2023 (Q1 2023).

Approximately 30% of process plant and G&A operating costs and 60% of mining costs were estimated to be Namibian dollar based, with the remainder being provided by suppliers denominated in United States Dollars.

21.3.2 Contract Mining Operating Scope of Work

The basis of the Twin Hills Gold Project DFS mining estimates is that mining will take place by conventional open pit methods and that the whole mining operation, except for the mine technical services function including grade control, will be outsourced to a reputable mining contractor company (Contractor). This includes drilling, blasting, loading, and hauling of ore and waste. The merits of contract mining include:

- Contractors can quickly deploy equipment and specialist work force addressing skills, staffing and equipment shortages.
- Junior mining companies can increase their scale of operations without making large investments in capital and labour.
- Under-capitalized mining companies are provided with the means to develop their mines more rapidly and cheaply than if they had relied on conventional sources of finance.
- Reputable contract mining companies provide mines with improved operational and best practice cost efficiency, and effective performance and safety management systems.

The Contractor will be responsible for the supply of all materials, equipment, facilities and services, supervision, and labour necessary to carry out the mining operations in accordance with the following mining contract specifications specified by Qubeka on Osino's behalf:

- The contract involves the drilling, blasting, loading and haulage of waste and ore material from the mining area to specific waste rock dumps and low grade strategic or run of mine ore stockpile locations in the mining area. The contract will include provision of support services to allow safe and efficient performance.
- The contract requires the mining of selected ore zones according to a well-defined schedule specified by Osino, then loading, hauling and stockpiling of ore together with the waste stripping (including topsoil and overburden removal and retention) required to expose the ore.
- Grade control stockpile and ROM stockpile re-handling operation.

- Mobilization and establishment of personnel, equipment, and infrastructure.
- Construction of new haul roads and maintenance of all roads including dust suppression necessary for the performance of the project.
- Construction and maintenance of all necessary bunds, drains and ore stockpile pads.
- Stripping and placing of overburden and waste material on waste rock dumps and the primary crusher ROM pad and the shaping thereof.
- Placement of waste rock on the TSF to assist with construction of the outer walls, internal berms and if necessary interstitial layers of rock between lifts of the TSF.
- Drilling and blasting of all material classified as non-free digging material.
- Loading and hauling of ore directly into the primary crusher tipping arrangement by preference and when so instructed by mine management.
- Creating and maintaining the ore stockpiles at the designated area.
- Supplying all equipment to perform the activities required.
- Secondary breakage of oversized rocks in pit and at the primary crusher or stockpiles as necessary.
- Minor dewatering works including the excavation of sumps, pumping and provision of drains in and around the pits to direct water to locations where it may be handled by the Contractor's or Owner's main dewatering and bulk water make-up supply facilities.
- Concurrent rehabilitation efforts of waste rock dumps.
- Provision of approved all weather in pit and ex pit haul road surface to be made from suitable materials found in pit or as nominated by the Contractor from another approved source.
- Regular periodic maintenance of the site haul roads within the BCM rates.
- If necessary, any in pit water handling.
- Establishment, re-instalment and maintenance of access ramps and haul roads on site.
- Creating and maintaining of clean and dirty water management systems, which include trenches berms and dams.

- Maintenance of own equipment.
- Logging of mining data as required by mine management for performance management.

21.3.3 Contract Mining Operating Cost Estimate

Development of the Mining Operating Cost Estimate

RFQ documents were prepared by Osino for mining equipment, drill and blast equipment, explosives management and mining operations. These were issued to the market in February 2023 to reputable mining contractor companies operating in southern Africa. All other mine technical services that include management, planning and grade control will be the responsibility of the Owner team. Operating costs for these have been estimated by Qubeka and Osino with reference toother similar operations.

Specific details of this mining contract as well as the bills of quantity for bench volumes / tonnes by material type per area and bench elevation were contained in the Twin Hills' schedule of rates as part of the request for quotation (RFQ) document. The RFQ was based on an initial six-year contract period with the option to extend and these rates were extrapolated over the LOM.

The RFQs were sent out to six reputable regional mining contractors for the mining and earthmoving contract. These companies are established and respectable mining contractors in Southern Africa and they all have sound contract mining experience of operations of a similar size to Twin Hills. All services will be supplied in accordance with all legislative requirements of the Republic of Namibia.

Qubeka carried out a tender evaluation process during the DFS. Mining rates provided by the most suitable company were used in the cost estimates discussed in this report.

It was the responsibility of the Contractors to correctly interpret and calculate equipment requirements. The recommended equipment requirements and associated mining rates in the RFQ submissions were benchmarked to other Namibian operations and endorsed by Talpac productivity simulation runs. The data obtained from the Contractor's RFQ Schedule of Rates submissions includes the following information for the contract mining OPEX estimate of the Project:

- Site establishing cost (NAD).
- Site decommissioning cost (NAD).
- Fixed monthly cost (NAD/month).
- Drill and blasting costs (NAD/bcm) for waste and ore.
- Loading and Hauling costs (NAD/bcm) for waste and ore per mining bench elevation.

- Daywork rates.
- ROM and stockpile re-handling cost (NAD/t).
- Diesel consumption (litres).

Exchange Rate and Diesel Charge

A diesel price of US$ 1.08/litre including rebates and an exchange rate of 18.50 (NAD: US$) was applied for costing the mining operation as presented in Table 21.3.1.

Table 21.3.1 Exchange Rate and Diesel Cost

Description	Unit	Cost
Exchange Rate	NAD / US$	18.50
Diesel (pump price)	NAD/L	21.52
Diesel (excl. road taxes and levies)	NAD/L	19.98
Diesel (excl. road taxes and levies)	USD/L	1.08

Mining Operating Cost Estimate Summary

A summary of the average estimated Project's mining unit cost estimate over the LOM is listed in Table 21.3.2 below and the percentage breakdown of the costs are depicted in Figure 21.3.1. This shows that the contractor load, haul, and secondary mining cost components are the major cost contributors. Year on year there are variances in the unit operating costs which can be attributed to changes in the depth and configuration of the mining operation.

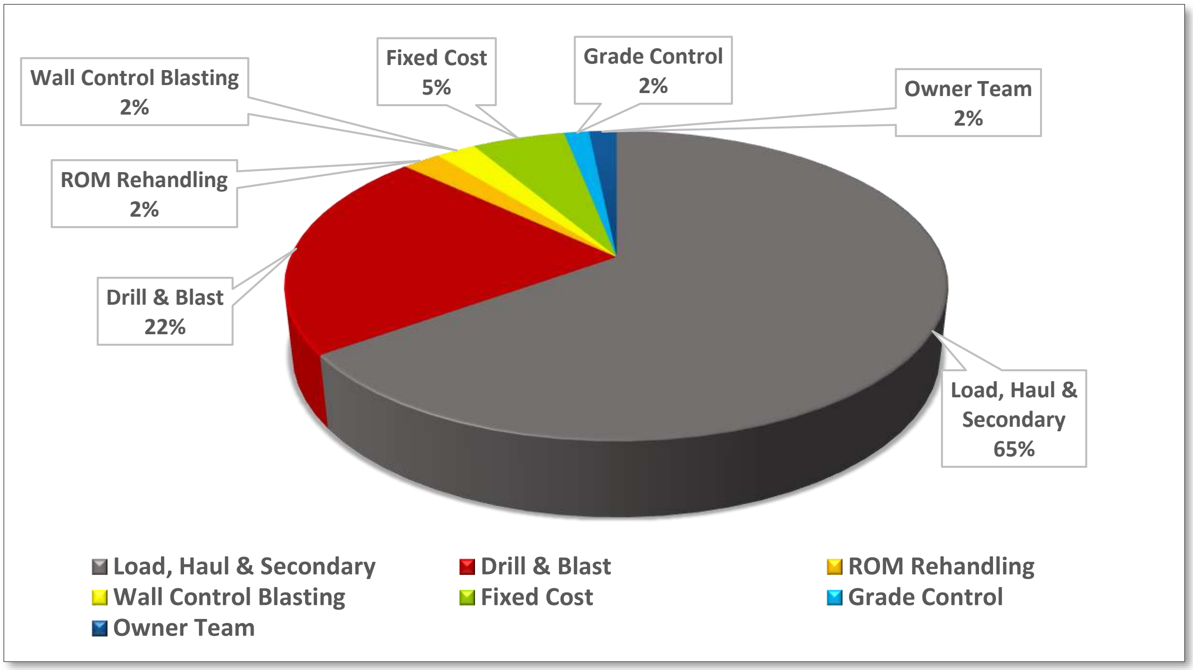
The variables here are the number of pits and operating pushbacks, mining elevation and the distances from the pit to the waste dumps, TSF, ore stockpiles and primary crusher. Another contributing factor towards the variance in operating unit costs is the split between bulk waste and selective waste and ore.

Total contract mining costs for the life of mine were estimated to amount to US$930 million, or approximately US$68.8m per year. This is based on forecasts of total amount of 64.5 million tonnes of ore and 299.1 million tonnes of waste rock mined. Table 21.3.2 summarizes the latest estimates of mining operating costs, obtained by competitive quotation from multiple possible contract mining companies.

Table 21.3.2 Average Estimated Mining Unit Cost Over the LOM

Mining OPEX Unit Costs	Unit	Value
Load, Haul & Secondary Mining Equipment - Ore	US$/t	0.38
Load, Haul & Secondary Mining Equipment - Waste	US$/t	1.38
Load, Haul & Secondary Mining Equipment - Total	US$/t	1.76
Drill & Blast - Ore	US$/t	0.14
Drill & Blast - Waste	US$/t	0.38
Drill & Blast - Total	US$/t	0.52
Stockpile Rehandling	US$/t	0.04
ROM Rehandling	US$/t	0.02
Wall Control Drill & Blast and Haul Road Maintenance	US$/t	0.07
Total Mining Contractor Variable Cost	**US$/t**	**2.41**
Demobilization of all Mobile Plant	US$/t	0.01
Demobilization of all Fixed Facilities	US$/t	0.00
Demobilization of Personnel	US$/t	0.01
Demobilization	US$/t	0.02
Fixed Costs - Mobile & Fixed Equipment	US$/t	0.07
Fixed Costs - Staff	US$/t	0.10
Fixed Costs - Other	US$/t	0.01
Fixed Cost	US$/t	0.18
Total Mining Contractor Cost	**US$/t**	**2.61**
Software	US$/t	0.00
Training	US$/t	0.00
Consultants and Special Projects	US$/t	0.00
Grade Control Resource In-fill Drilling	US$/t	0.03
Owner Mining Labour	US$/t	0.00
Total Owner Team Cost	**US$/t**	**0.03**
TOTAL Mining OPEX Excluding Pre-Strip	**US$/t**	**2.64**

Figure 21.3.1 Percentage Breakdown of Mining Operating Costs



21.3.4 Process Plant Operating Costs

Processing operating costs were developed by Lycopodium for the life of mine (LOM) processing schedule developed by Qubeka and Osino. It is expected that the plant will operate on a material blend predominantly consisting of fresh ore but with a maximum of 25% of transitional (oxidized or weathered) ore. Operating cost calculations took this into account.

Processing operating costs have been developed for a plant with an annual throughput equivalent to 5.0 million tonnes of fresh mineralized material plant feed at a P_{80} grind size of 63 µm, based on a 24 hour per day operation, 365 days per year. The plant will operate at the following availabilities:

- 70% (6,132 h/y) – primary, secondary, and tertiary crushing.
- 91% (8,000 h/y) – milling and all subsequent downstream processing plant sections, other than
- 80% (7,008 h/y) for the tailings pressure filtration circuit.

The operating costs have been compiled from a variety of sources, including the following:

- Labour pay-rates and complement developed by Osino, with benchmarking advice from other similar projects provided by Lycopodium and DRA. Pay rates were nominated in US Dollars per year, with housing allowances included.

- Grid power costs as advised by Osino, based on NamPower's published rates in Namibian Dollars.

- Renewable power costs from Dornier Suntrace obtained by competitive budget price quotations from potential independent power producers in US$. The cost estimates include provision for solar power to supply 37% of total demand of the project.

- Consumable and reagent prices were prepared using supplier budget quotations, mostly in US$.

- Modelling by OMC was used in support of crushing and grinding energy and consumables, based on physical mineralized material characteristics determined from comminution testwork for the various mineralized material types.

- Other energy consumption quantity estimates were developed by Lycopodium and DRA, by sizing and selecting all mechanical and major electrical equipment then incorporating data from the preferred vendors to compile overall electrical requirements for the operation.

- Plant reagent consumptions and gold extractions were based on the results from a metallurgical testwork programme, benchmarked against other similar gold recovery operations.

- Vehicle diesel consumption was based on calculations prepared by Qubeka, DRA and Osino.

- Water costs were based on the project expectation that all make-up water will be sourced from limestone aquifer boreholes on site or from open pit dewatering.

- Osino and Knight Piésold applied first principal estimates based on typical operating data and standard industry practice. to calculate Owner's team expenses and TSF operating costs.

The processing plant operating cost estimate is summarized in Table 21.3.3. The relative proportions of each operating cost centre for the process plant (processing plus G&A) operating costs are shown in Figure 21.3.2.

The process operating costs have been split into fixed and variable components to enable them to be used to derive annual costs for changing plant feed blends and/or throughput over the life of the project. The fixed and variable costs are considered valid for throughput variations within 25% of the design plant feed throughput.

The operating costs include all direct costs to allow production of gold bullion. The battery limits for the processing operating costs are as follows:

- Mineralized material delivered to the ROM bin.

- Tailings discharged to the tailings storage facility (TSF).
- Gold bullion in plant gold-room safe.

Figure 21.3.2 Process Plant Operating Cost Breakdown

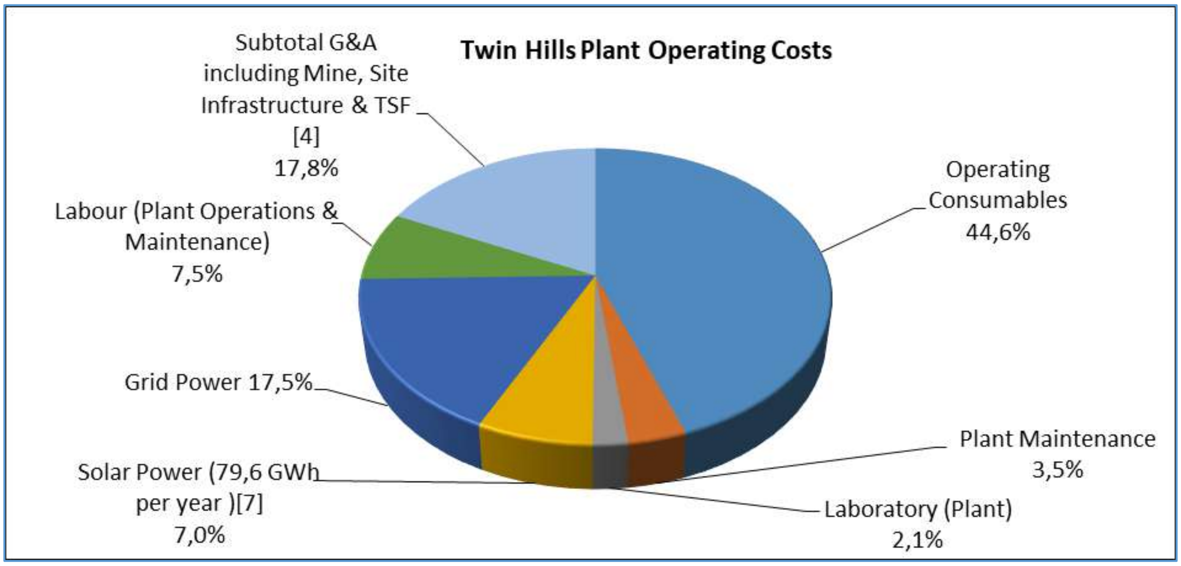


Table 21.3.3 LOM Processing Cost Summary (US$, Q1 2023, +15 / -10%)

	LOM Blend	
Proportion of LOM	100%	
Plant Feed t/y	5,000,000	
Cost Centre	**US$ million/y**	**US$/t**
Operating Consumables	30.37	6.07
Maintenance	2.39	0.48
Laboratory	1.43	0.29
Solar Power	4.78	0.96
Grid Power (Plant)	11.90	2.38
Process Plant Labour	5.14	1.03
Total Processing	**56.01**	**11.20**
General & Administrative (G&A) Labour	6.53	1.31
G&A Power	0.40	0.08
G&A Expenses	1.89	0.38
Infrastructure	1.72	0.34

	LOM Blend	
Tailings Storage Facility	1.62	0.32
Total General & Administrative Costs	**12.16**	**2.43**
Total OPEX (Excluding Mining)	**68.17**	**13.63**

Power

The power cost estimate has been based on solar power up to a yearly maximum of 79.6 GWh at a unit cost of US$0.06/kWh with the remainder coming from grid power at a unit cost of US$0.099/kWh based on 67% off peak (minimum, nighttime) tariff and 33% peak tariff. The average continuous power draw and power cost for the LOM blend by plant area is summarized in Table 21.3.4.

Table 21.3.4 LOM Blend – Power Cost Summary (US$, Q1 2023, +15 / -10%)

Plant Area	**Installed Power MW**	**LOM Average Power Draw MW**	**LOM Power Cost US$ millions/y**
Feed Preparation	5.25	2.58	1.89
Milling, Classification and Gravity Concentration	16.83	11.77	8.63
Trash Removal & Thickening	0.68	0.28	0.21
Leaching	2.08	1.42	1.04
Acid Wash, Elution, Carbon Regen, Gold Room, ILR	2.80	1.02	0.74
Cyanide Destruction, Tailings Handling & Fuel	6.96	2.97	2.17
Reagents and Water Services	2.57	1.41	1.03
Plant and Air Services	1.42	1.04	0.76
Borehole Water Pump Stations	0.29	0.11	0.08
Area Building Facilities	0.62	0.26	0.19
Non-Process Infrastructure (Osino)	1.22	0.46	0.34
Total	**40.71**	**23.29**	**17.08**

Operating Consumables

Costs for processing operating consumables, including reagents, liners, fuel and process supplies have been estimated and are summarized for the various generic mineralized material types and LOM blend by plant area in Table 21.3.5.

Table 21.3.5 Process Consumables Cost Summary (US$, Q1 2023, +15 / -10%)

Plant Area	LOM Blend	
Throughput	**5,000,000 t/y**	
% of LOM	**100%**	
	US$ millions/y	**US$/t**
Crushing	0.68	0.14
Milling	11.56	2.31
Pre-Leach and CIL	10.18	2.04
Cyanide Destruction	3.22	0.64
Thickening and Filtration	2.43	0.49
ADR and Gold Room	2.06	0.41
Miscellaneous	0.23	0.05
Total	**30.37**	**6.07**

The consumption of reagents and other consumables has been calculated from laboratory testwork and comminution circuit modelling at average mineralized material properties, calculated from first principles, or has been assumed based on experience with other operations. No additional allowance for process upset conditions and wastage of reagents has been made.

Reagent costs have been sourced from a combination of budget quotations, Client supplied costs, and in-house data relating to similar projects in the region. Transport and freight to site and import duties and taxes have been added based on vendor information.

Cyanide destruction cost has been based on the Air / SO2 method, with the treatment of CIL tailings containing 150 g CNWAD/m3 down to <50 g CNWAD/m3 after cyanide destruction. The cost of reagents for cyanide destruction has been derived from metallurgical testwork data. Reagent requirements for a possible arsenic precipitation process have been excluded as it is a future option for the process facility that is not currently thought to be needed.

A diesel price, delivered to site, of US1.08 per litre has been used, as confirmed by Osino. Diesel will be used in plant mobile equipment, for the carbon elution heater circuit, the carbon regeneration kiln, and furnace. The diesel consumption for plant mobile equipment is based on industry standard vehicle consumption rates and estimated equipment utilization, while the diesel usage for carbon treatment has been calculated from equipment anticipated running times and vendor data.

Allowances have been made for water treatment reagents and operator supplies. Lubricants are excluded from the consumables costs and have been included under the maintenance cost centre.

Maintenance

The plant maintenance cost allowance has been factored from the capital supply or operating costs using factors from the Lycopodium database. It has been summarized for the expected LOM ore feed blend. The allowance covers mechanical spares and wear parts, but excludes crushing and grinding wear components, grinding media and general consumables which are allowed for in the consumables cost.

The maintenance cost excludes payroll maintenance labour which is included in the labour cost. Contract labour has been allowed for primary crusher and mill liner changes and plant shutdowns.

Allowances for plant mobile equipment, plant building maintenance and general maintenance expenses have been made. The mobile equipment allowance is based on unit costs for maintenance of the light vehicles, portable generators, and other mobile equipment for the process plant.

The plant infrastructure allowance includes maintenance of Process Plant and Mining Services Area buildings.

General maintenance expenses include specialist maintenance software, maintenance manuals, training costs, vendor visits, and control system maintenance and licence fees.

Labour

The labour rates, manning levels and rosters used to determine the labour operating cost estimate have been agreed with Osino and are based on benchmarking with other Namibian gold operations. In total, the Twin Hills operation is expected to utilise about 1,000 personnel, of whom more than 50% will be contractor's responsible for mining and several other functions.

The plant labour cost includes all labour costs associated with plant operations and maintenance personnel. The plant labour cost excludes all contract mining operations personnel (included in the Mining cost category) and all General & Administrative Overhead labour costs.

The site laboratory will be operated on a contract basis with the personnel included in the process labour count, but the labour costs included in the contract laboratory cost. Camp management / catering / cleaning, site security and the medical clinic will be operated on a contract basis with the personnel included in the administration labour count, but the respective labour costs included in the camp contract cost, the security contract cost, and the medical services contract cost.

The estimate of labour complement has been based on a four-shift operation (three shifts working 8 hours per day, one relief shift), to provide continuous coverage for the plant operation with allowance for leave and absenteeism coverage. Provision has been made in the manning numbers to accommodate annual and sick leave requirements.

The roster is based on a small number of expatriate personnel working six weeks on site and three weeks off site with all other personnel working 10 days on site and four days off site with four weeks annual leave and two weeks sick leave per year.

Unit rates for labour have been based on Osino's assessment of current norms in the mining industry in Namibia and includes base salary and an overhead component. The overhead cost includes allowances for housing, travel, overtime and shift work, medical health insurance, life, and disability cover, leave provisions and production bonuses.

Laboratory Costs

A contract laboratory will provide sample preparation and assay services for plant and environmental samples as well as an estimated 100 mine grade control samples per day.

Laboratory costs have been based on competitive quotations received from contract laboratories and has been benchmarked against analytical laboratories at other similar African gold operations. The laboratory cost allows for the supply of the laboratory equipment, mobilization, and all ongoing costs (laboratory labour, equipment, and consumables) comprising a fixed monthly cost and a variable cost related to the number of samples being processed. The laboratory building has been included as a separate item in the capital cost estimate.

Mobile Equipment

Plant mobile equipment requirements have been agreed with Osino. Mobile equipment costs provide for the fuel and maintenance of the mobile equipment fleet (excluding the mining fleet and mining light vehicles). The purchase cost of this equipment has been included in the capital cost estimate.

The fuel and maintenance costs for the mobile equipment are included in the consumables and maintenance cost centres, respectively.

Water Supply

Water supply costs are based on a site wide water balance undertaken by Osino and Knight Piésold with cost effectively zero other than pump power costs, based on 100% of the water being sourced from boreholes or pit dewatering.

21.3.5 Owner's Team Mining Technical Services Operating Costs

All mining technical services costs that are incurred by the Owner at a Contractor Mining operation were classified as 'Mining Owner Team Costs'. These include:

- Light delivery vehicle (LDV) fuel and maintenance cost.

- Computer and hardware cost.
- Software cost.
- Training cost.
- External consultants' cost.
- PPE, general and office consumables cost.
- Grade control and resource expansion drilling cost.
- Owner mining labour costs consisting of:
  - Mine planning teams.
  - Mine surveying teams.
  - Geological team.
  - Geotechnical personnel.
  - Grade control supervisors.

21.3.6 Site General and Administration Cost Estimates

The general and administration costs were estimated by Osino. They include the following ongoing operating expenses:

- Site office expenses including communications and communication maintenance, office equipment and supplies, computer supplies and software licenses.
- Insurance expenses covering industrial special risks, third party liability, motor vehicle and bullion transport. Labour associated insurances (medical, death and disability and workers liability insurances) are included in the labour costs.
- Financial expenses including banking charges, legal fees, auditing costs and accounting consultants and bullion selling. Bullion refining and royalties are excluded as they are deducted directly from revenue in a separate cost category.

- Government charges including permits and environmental inspection fees. Permits, licences or legal and administrative costs associated with government mining and environmental regulations. This includes reporting requirements during operation and related administrative costs.

- Personnel expenses such as first aid and medical costs, safety supplies, travel and accommodation, expatriate travel, international expat recruiting / relocation costs, training, recreational and local facilities costs, professional memberships and subscriptions, and entertainment allowances. The allowances for expatriate travel (international and regional) and international expat recruiting / relocation include all personnel (mining as well as administration and process plant).

- Contract costs for personnel transport (in country charter flights and on site bussing), camp, catering and cleaning, environmental compliance testing, OH&S and other consultants. The camp catering and cleaning contract cost includes all personnel (mining as well as administration and process plant).

- Community relations expenses including general expenses, community projects and scholarships.

- Infrastructure operating costs.

- Co-disposal facility operating costs.

21.3.7 Operating Cost Estimate Exclusions and Qualifications

Exclusions

- Taxes, royalties, and duties, including VAT.

- Interest on capital loans.

- Sunk costs.

- Any impact of foreign exchange rate fluctuations.

- Any escalation from the date of the estimate.

- Future required equipment power and operating costs.

- Any contingency allowance.

- All withholding taxes.
- Gold refining and bullion transport and in-transit security of gold from site (but insurance of the bullion on site is included in the G&A Insurance costs).
- Containment, monitoring, or treatment of waste rock in the event that acid rock drainage or metal leaching is applicable.
- Hydrogeological monitoring, dewatering or storm water control measures during construction and prior to or during operations.

Qualifications

- Refining costs as well as royalties are incorporated in the Financial Model cash flow schedules.
- Tailings storage facility future lifts or expansion Phases, including site rehabilitation and closure are included in sustaining capital in the Financial Model.
- The power consumption for the crushers and ball mills has been calculated by OMC based on the physical mineralized material properties determined from comminution testing. The power consumption for the remainder of the individual plant mechanical equipment items has been calculated from the installed power and typical drive efficiency and utilisation factors.

21.3.8 Process Plant Pre-Production and Working Capital Costs

The costs incurred by operations during the latter stages of construction and commissioning are included in the capital cost estimate but are derived from this OPEX estimate. Pre-production costs associated with mining are excluded.

Pre-Production Labour

The Owner's Project Team will be mobilized starting 23-28 months before planned date of first production.

Pre-production site administration and processing labour costs reflect the need to recruit key operating personnel in time for them to set up and establish operating procedures and undergo training as required. Staff recruitment will commence about eighteen months preceding plant start-up, starting with Security, Procurement, HSE, Camp and Medical personnel.

Operational Managers will be recruited and brought on board about 12 months before commissioning, to plan and implement the Operational Readiness program.

Pre-Production Site Administration Expenses

The pre-production site administration expenses cost covers the establishment of operations during the eight months preceding start-up and includes provision for power consumption, mobile equipment, and other expenses during this period.

First Fill Reagents and Opening Stocks

Costs have been allowed in the capital cost estimate and project financial model cash flow estimates to purchase the mill balls and cyanide needed to commission the plant, and to fill the reagent tanks. Other consumables and reagents required for the process plant first fill and opening stocks are expected to be paid for in the commissioning and ramp up period, from the operating cost budget.

Opening stocks refer to the purchase of the reagents and consumables required to sustain the operations for 6 weeks, which is the minimum on-site start-up storage quantity nominated by the Client. Quantities specified have been based on either consumption over the minimum period or minimum shipping quantities, considering package size.

Training

The training allowance covers the cost of providing pre-production training for process plant operations and maintenance staff, but not staff salaries as these are covered in the pre-production labour costs.

Working Capital

Working capital covers the cost of operating the process plant before the first receipt of revenue from bullion sales. The working capital calculation is based on treating 100% ROM feed for the initial six weeks of operation at 80% of the design throughput rate. Working capital calculations are included in Osino's project cashflow analysis but are not included in either the capital or operating costs estimates.

The cash flow schedules also take account of initial gold lockup of approximately one week of production (in the CIL tanks as well as the carbon inventory) before first gold can be poured. Later in the life of mine, the gold inventory in the circuit is expected to increase to as much as three weeks of production.

21.3.9 Comparison of PFS and DFS Process Plant Operating Cost Estimates

Table 21.3.6 presents the main sources of processing OPEX differences from the PFS to the DFS.

Table 21.3.6 Comparison of PFS and DFS Plant OPEX Estimates

Variable	Change	US$/tonne Ore Processed Delta	New US$/t Ore Processed	US$/Oz Au Delta	New US$/oz Au
Milling Consumables	Milling plant - Mill ball price decrease	-0,09	$2,31	-$1,27	$75,91
CIL Consumables	Preleach and CIL - Cyanide price increase	0,28	$2,04	$0,29	$56,79
Other Process Consumables	Cyanide Detoxification - High copper sulphate price	0,24	$0,64	$9,13	$56,04
Power	Higher power tariff due to solar IPP all OPEX instead of own plant cost mainly capex	0,89	$0,94	$4,34	$110,55
Plant Maintenance	DFS estimate prepared with vendor contributions	-0,06	$0,47	-$1,25	$15,85
Laboratory	DFS is a quoted cost for laboratory operation	-0,02	$0,28	-$0,28	$9,41
Process Plant Labour	Increased complement, housing allowances added to salaries	0,28	$1,01	$8,94	$32,41
General & Administrative	Increased labour, housing allowances added to salaries	0,26	$2,39	$11,19	$79,64
Other items	No significant change	-0,10	$3,42	$0,00	
Total Mining Costs	**14 M extra tonnes of waste (THW), + GC and ROM haul costs**	**0,83**	**$14,58**	**$40,56**	**$481,56**
TOTAL OPERATIONAL COSTS		**$2,51**	**$28,08**	**$71,64**	**$918,16**
Plant and G&A OPEX	*Note - included in totals immediately above*	*$1,68*	*$13,50*	*$31,08*	*$436,60*
Mining OPEX	*Included in totals above - shown here as US$/tonne rock (ore plus waste)*	*$0,07*	*$2,59*		

21.3.10 Sustaining Capital Cost Estimates

The annual sustaining capital requirements for the Twin Hills operation were determined in the DFS by considering the following elements:

- Mining Truck Despatch System – US$1.95 million in Year 1.
- Mobilization of all Mobile Mining Equipment – US$0.24 million per quarter.

- Tailings Storage Facility Phase 2 – US$15.72 million in Year 2.
- Tailings Storage Facility Phase 3 – US$10.62 million in Year 4.
- Process Plant LDVs depreciated over 4 years – US$0.72 million per year.
- Materials handling plant equipment – US$0.08 million per year.
- Housing Mortgage Support – US$0.28 million per year.
- Closure Costs – US$23 million in Years 12/13.
- Credit of US$35 million for plant salvage in Year 14.

The total sustaining capital estimate is therefore US$29 million over the life of mine.

22.0 ECONOMIC ANALYSIS

The assessment presented in this report considers economic considerations applied to Indicated Resources which have been categorized as Mineral Reserves. The Mine Schedule utilises mineral reserves and the Qualified Person, Mr. Georgi Doundarov, from Lycopodium considers that the material has demonstrated economic viability.

22.1 Fiscal and Economic Parameters

22.1.1 Royalties and Duties

A royalty on gold sales of 3% and an export levy of 1% has been applied to the revenue stream according to Namibian tax legislation. The royalty is tax deductible and has been deducted before tax in the financial evaluation.

22.1.2 Taxes

A corporate tax rate of 37.5% on net profit is applicable in Namibia. Although this is relatively high relative to other jurisdictions, Namibia offers attractive deductibility and depreciation allowances which ameliorate the higher corporate tax rate. Net profit has been calculated as revenue less operating costs, and less royalties. A tax shield has been applied whereby development capital expended prior to production is depreciated over a three-year period from the time that first revenue is produced as per the Namibian regulations. In addition, sustaining capital expended in any given year is fully depreciated against income before the calculation of tax. Also, direct pre-production exploration and development expenses incurred prior to project construction are carried forward and are tax-deductible, thereby acting as a further tax shield.

22.1.3 Economic Parameters

All costs have been estimated in US Dollars. The US Dollar to Namibia Dollar exchange rate used is US$1.00 = NAD18.5. All capital and operating costs are provided in First Quarter 2023 money terms. Inflation rates have not been applied in the financial model as the evaluation has been carried out on a real terms constant money basis.

No price escalation or exchange rate variation have been applied to the model, and cost input parameters were considered fixed for the life-of-mine for the purposes of this financial valuation.

The financial valuation has been completed using a base-case gold price of US$1,750/oz with a sensitivity analysis provided ranging from US$1,500/oz to US$2,000/oz. The detailed sensitivity tables are presented below in the section entitled Project Parameter Sensitivities. US$1,750/oz is slightly higher than the US$1,700/oz used for the Whittle pit optimizations but is more aligned with the medium-term Canadian consensus broker estimates.

22.2 Project Timing

Key assumptions with respect to project timing used in developing the financial model are:

- For the purposes of the financial valuation, project capital expenditure is over two years prior to production (Years -1 and 0). In the cash flow model US$100m is spent in Year -1 and US$265m is spent in Year 0.
- Osino will implement a six-month FEED program preceding construction and costs associated with this study phase have been forecast in the US$75m losses carried forward in the economic model.
- The first ore is mined and stockpiled during the pre-strip period in Year 0 of the Life of Mine schedule. Ore is first processed at the start of Year 1.
- Commissioning and ramp-up of the plant occurs during Year 1 of the schedule.
- It is expected that the project will reach 100% of name plate capacity within three months of commissioning, in line with experience at other similar projects that have been constructed by Lycopodium elsewhere in Africa during the last few years. This is believed to be realistic taking into account the capitalized pre-stripping which will accumulate an ore stockpile.

22.3 Financial Model

The financial assessment of the Project was carried out on a 100% equity basis, not accounting for potential sources of funding which may include debt. Osino's understanding of current Namibian tax regulations were applied to assess the tax liabilities.

The key operating assumptions and economic parameters used in the DFS are as follows:

Table 22.3.1 Key DFS Operating Assumptions and Economic Parameters

Item	Units	Amount
Life of Mine	Years	13
Gold price (base case)	US$/oz	1,750
Exchange Rate	US$ to ZAR/NAD	18.50

Item	Units	Amount
Gold Recovery	%	92.0%
Royalty (tax-deductible)	%	3.0%
Export Levy	%	1.0%
Life-of-Mine Production Parameters		
Ore Tonnes Mined	kt	64,513
Ore Grade Mined	g/t	1.04
Contained Gold	koz	2,151
Waste Tonnes Mined	kt	299,072
Stripping Ratio		4.64
LOM Gold Production	koz	1,979
LOM Average Annual Gold Production (years 1-10)	koz annum	162
Average Annual Gold Production (years 1 – 5)	koz annum	176
Life-of-Mine Unit Costs per Tonne Mined / Processed		
Refining cost	US$/oz	0.55
Gold transport cost	US$/oz	2.20
Mining Cost (per tonne mined)	US$/t	2.64
Variable Processing Cost (per tonne processed)	US$/t	11.20
Fixed Processing Cost (per tonne processed)	US$/t	2.43
Overall Processing unit Cost (per tonne processed)	US$/t	13.63
Unit Costs per Ounce Produced		
LOM Average Operating Costs [1]	US$/oz	918
LOM Average Cash Costs [2]	US$/oz	991
LOM Average All-in Sustaining Costs [3]	US$/oz	1,011
Capital Costs		
Construction Capital (Lycopodium Estimate)	US$m	313
Contingency (9.8% of construction total)	US$m	34
Capitalised Pre-strip	US$m	18
Total Project Capital (including contingency)	**US$m**	**365**
Sustaining Capital (including closure costs)	US$m	64
Plant Salvage Cost	US$m	35

Notes:

1. **Mining, processing plus on-site G&A**

2. **Operating costs plus selling costs, royalties & levies**
3. **Cash costs plus sustaining capital (incl. closure costs & salvage value)**
4. **Lycopodium's assessment of fixed and variable costs proposed US$8.05/t fully variable costs and a cost per tonne equivalent of fixed annual G&A costs of US$5.52/t ore processed. Since the plant operates a full capacity for the full LOM period, the difference in variable to fixed cost ratio from the table above does not affect the economic return of the project.**

Table 22.3.2 Economic Analysis Summary Table From Mine Schedule Reserves

	Units	Total/Avg.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mining			Pre-strip														
Ore - Oxide & Transitional	kt	**8,580**	729	3,603	1,350	1,157	173	262	56	60	540	437	214				
Ore - Fresh	kt	**55,933**	3	3,961	4,840	4,235	3,940	5,606	5,340	4,821	2,933	5,805	2,722	5,769	5,957		
Ore Tonnes Mined	kt	**64,513**	732	7,564	6,190	5,392	4,113	5,868	5,396	4,881	3,473	6,242	2,936	5,769	5,957		
Ore Grade Mined [1]	g/t	**1.04**	1.00	1.15	1.01	1.09	1.06	1.10	1.00	0.99	0.98	1.07	1.03	0.90	1.00		
Waste Tonnes Mined	kt	**299,072**	6,063	18,589	24,262	28,280	29,467	27,712	27,879	30,247	33,027	27,195	26,183	16,039	4,130		
Total Tonnes Mined	kt	**363,585**	6,795	26,153	30,452	33,672	33,580	33,580	33,275	35,128	36,500	33,437	29,119	21,808	10,087		
Strip Ratio		**4.64**	8.28	2.46	3.92	5.24	7.16	4.72	5.17	6.20	9.51	4.36	8.92	2.78	0.69		
Stockpile Balance (closing)	kt		732	3,241	4,243	4,447	3,373	4,052	4,406	4,278	2,670	3,847	1,751	2,519	3,476		
Stockpile Grade	g/t		1.00	0.83	0.72	0.71	0.68	0.69	0.69	0.68	0.62	0.66	0.56	0.65	0.67		
Processing																	
Plant Feed	kt	**64,513**		5,055	5,188	5,188	5,187	5,189	5,042	5,009	5,081	5,066	5,032	5,000	5,000	3,476	
Feed Grade	g/t	**1.04**		1.34	1.13	1.12	1.01	1.15	1.03	1.00	0.92	1.14	0.92	0.90	1.04	0.67	
Au Produced	koz	**1,979**		198	177	174	156	177	152	149	135	170	135	133	157	66	
Revenue																	
Gold Price	US$/oz	**1,750**		1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	
Gold Sales	US$m	**3,463**		347	309	305	273	309	266	261	237	298	236	233	274	116	
Royalty & Export Levy [2]	US$m	**(139)**		(13.9)	(12.4)	(12.2)	(10.9)	(12.4)	(10.7)	(10.4)	(9.5)	(11.9)	(9.4)	(9.3)	(11.0)	(4.6)	
Selling & Marketing Costs	US$m	**(5)**		(0.5)	(0.5)	(0.5)	(0.4)	(0.5)	(0.4)	(0.4)	(0.4)	(0.5)	(0.4)	(0.4)	(0.4)	(0.2)	
Operating Costs																	
Mining	US$m	**(941)**		(63.8)	(73.9)	(78.9)	(82.0)	(84.6)	(86.4)	(89.4)	(94.7)	(91.7)	(75.9)	(67.3)	(41.0)	(11.8)	
Processing	US$m	**(720)**		(56.4)	(57.4)	(57.4)	(57.4)	(57.4)	(56.3)	(56.1)	(56.6)	(56.5)	(56.3)	(56.0)	(56.0)	(39.9)	
Administration / Fixed / G&A	US$m	**(155)**		(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(12.2)	(9.0)	
Total Cash Operating Cost	US$m	**(1,817)**		(132.4)	(143.6)	(148.6)	(151.7)	(154.3)	(154.8)	(157.6)	(163.5)	(160.4)	(144.3)	(135.4)	(109.2)	(60.7)	
Unit Costs																	
Cash Operating Cost (C1)	US$/oz	**(918)**		(667.5)	(813.3)	(854.0)	(973.9)	(874.0)	(1,017.8)	(1,057.1)	(1,209.2)	(941.3)	(1,070.9)	(1,018.6)	(697.0)	(918.0)	
All-in Sustaining Cost (AISC) [3]	US$/oz	**(1,011)**		(760.0)	(986.5)	(934.1)	(1,123.1)	(952.9)	(1,095.7)	(1,135.2)	(1,287.8)	(1,018.7)	(1,149.5)	(1,097.3)	(769.8)	(990.8)	
Capital Expenditure																	
Project Capex (excl. contingency) [4]	US$m	**(331)**	(331)														
Contingency @ 15%	US$m	**(34)**	(34)														
Sustaining Capex (incl. closure) [5]	US$m	**(29)**		(3.9)	(17.7)	(1.3)	(11.9)	(1.1)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(11.5)	(11.5)	35
Tax Paid	US$m	**(387)**			(4.8)	(7.6)	(36.6)	(52.8)	(37.3)	(34.4)	(23.4)	(46.7)	(30.3)	(32.5)	(53.3)	(14.5)	(13.1)
Cash Flow																	
Net Free Cash Flow before Tax	US$m	**1,108**	(365)	207	137	142	98	141	100	93	63	122	82	86	136	32	35
Net Free Cash Flow after Tax	US$m	**721**	(365)	207	132	134	61	88	63	58	39	75	52	54	83	18	22
Discount Factor		**5%**	1.00	0.95	0.91	0.86	0.82	0.78	0.75	0.71	0.68	0.64	0.61	0.58	0.56	0.53	0.51
Discounted Cashflow$_{5\%}$ before Tax	US$m	**742**	(365)	197	124	122	81	111	75	66	42	78	50	50	76	17	18
Discounted Cash Flow$_{5\%}$ after Tax	US$m	**480**	(365)	197	120	116	50	69	47	41	27	48	32	31	46	9	11
Payback Period (post-tax)		**2.2**															

IRR (post-tax)	**33%**

[1] **Mining dilution and ore loss has been applied to the ore tonnes**

[2] **Namibian Government royalty (3%) and export levy (1%)**

[3] **AISC comprises C1 costs + sustaining capex + royalties + export levies + gold refining, transport & marketing costs**

[4] **The project capex of US$365m includes US18m of mining pre-strip costs plus US$34M contingency (9.8% of total construction capital). US$35m salvage value is accounted for as a credit in the sustaining capital costs.**

[5] **Sustaining capital is estimated based on replacement of vehicles and IT assets + US$25M dry-stack expansion capital from year 4+ US$23M in estimated closure costs – estimated salvage value**

22.4 Results

22.4.1 Key Economic Results

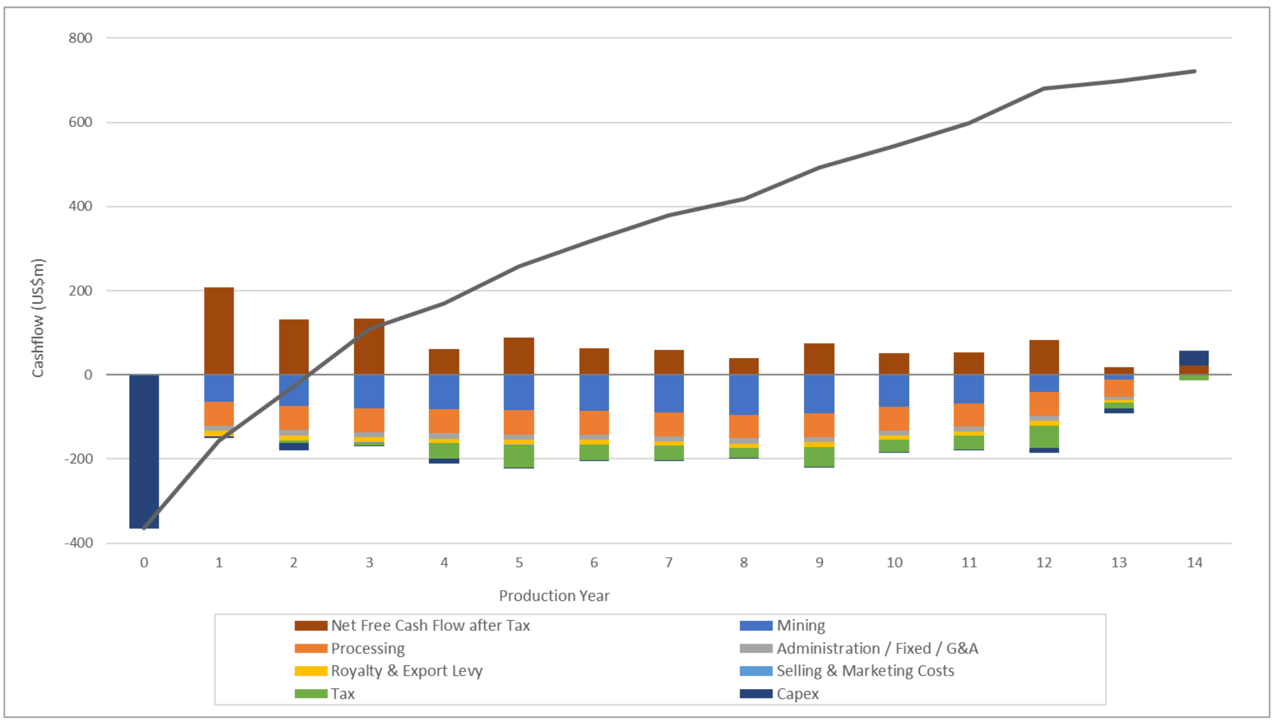
The key economic results of the DFS economic assessment of the Twin Hills Gold Project are presented in the table below.

Table 22.4.1 Feasibility Study Economic Assessment Summary

	Units	US$1750/oz		US$1950/oz	
		Pre-Tax	Post-Tax	Pre-Tax	Post-Tax
$NPV_{5\%}$	US$m	742	480	1024	656
$IRR_{5\%}$	%	34%	28%	46%	36%
Payback	years	2.2	2.2	1.9	1.9
LOM Cashflow	US$m	1108	721	1488	958

22.4.2 Life of Mine Cash Flow Analysis

Figure 22.4.1 Life of Mine Cash Flow Analysis at US$1,750 Gold Price (US$M, undiscounted)



22.4.3 Project Parameter Sensitivities

An after-tax sensitivity analysis to the key project variables was carried out which indicates that the project is most sensitive to a change in grade or gold recovery, as indicated by the slope of the blue line in the diagram below.

The breakeven (NPV=0) is at a gold price of US$1,230/oz and implies that the capital investment is repaid plus a 5% return using a 5% discount rate. The nominal breakeven (sum of undiscounted cashflows = 0) gold price is US$1,167/oz.

The project is most sensitive to changes in gold grade, with every 5% change in gold grade resulting in a change in NPV of around 15%. This is indicated by the slope of the blue line graph in the diagram below, which confirms that the project NPV is most sensitive to changes in the average gold grade.

Figure 22.4.2 Post-Tax Project NPV Sensitivity to Variations in Key Project Parameters at US$1750/oz

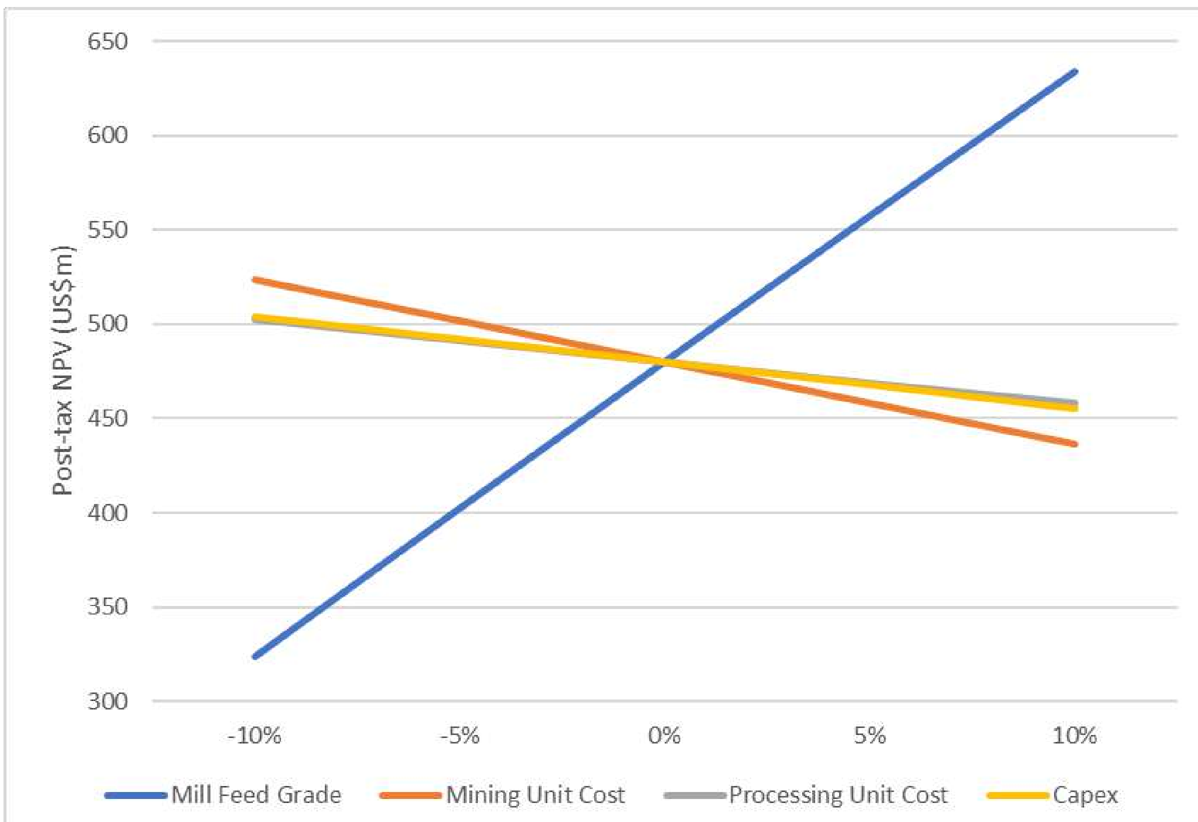


Table 22.4.2 Two-factor Post-Tax Project NPV Sensitivity Analysis

Discount Rate & Gold Price - Post-Tax NPV$_{5\%}$ Sensitivity							
	1500	**1600**	**1700**	**1750**	**1800**	**1900**	**2000**
5%	256	346	436	480	524	612	700
6%	230	316	401	443	485	568	652
7%	206	288	369	409	449	528	607
8%	183	262	339	377	415	490	565
9%	163	238	312	348	384	456	527
10%	144	216	287	321	355	423	492

Mill Feed Grade & Gold Price - Post-Tax NPV$_{5\%}$ Sensitivity							
	1500	**1600**	**1700**	**1750**	**1800**	**1900**	**2000**
0,93	118	201	283	324	364	445	524
0,99	188	274	360	402	445	529	612
1,04	256	346	436	480	524	612	700
1,09	323	418	511	557	603	696	788
1,14	391	489	586	634	682	779	876

Mining Unit Cost & Gold Price - Post-Tax NPV$_{5\%}$ Sensitivity							
	1500	**1600**	**1700**	**1750**	**1800**	**1900**	**2000**
2,38	300	390	479	523	567	655	743
2,51	278	368	457	502	546	634	722
2,64	256	346	436	480	524	612	700
2,78	234	324	414	458	503	591	679
2,91	211	302	392	437	481	569	657

Processing Cost (Variable) & Gold Price - Post-Tax NPV$_{5\%}$ Sensitivity							
	1500	**1600**	**1700**	**1750**	**1800**	**1900**	**2000**
7,24	278	369	458	502	546	634	722
7,64	267	357	447	491	535	623	711
8,05	256	346	436	480	524	612	700
8,45	244	335	425	469	513	601	689
8,85	233	324	413	458	502	590	678

Construction Capex & Gold Price - Post-Tax NPV$_{5\%}$ Sensitivity							
	1500	**1600**	**1700**	**1750**	**1800**	**1900**	**2000**
329	281	371	460	504	548	636	724
347	269	359	448	492	536	624	712
365	256	346	436	480	524	612	700
384	243	333	423	468	512	600	688
402	230	321	411	456	500	588	676

Table 22.4.3 $IRR_{5\%}$ Sensitivity to Gold Price

$IRR_{5\%}$ sensitivity to Gold Price							
	1500	**1600**	**1700**	**1750**	**1800**	**1900**	**2000**
	16%	21%	26%	28%	30%	34%	38%

22.5 Conclusion

An economic analysis of the mine schedule generated from the DFS Reserve Mine Schedule has shown financial viability of the project at a gold price of $1,750/oz, and the sensitivity analysis has demonstrated continued profitability against changes in key project parameters at different gold prices.

23.0 ADJACENT PROPERTIES

23.1 Navachab Gold Mine

The mining license area of the Navachab gold mine can be considered as an adjacent property. The Navachab gold mine and deposit is located within 10 km from parts of the Project licences. The mine is about 25 km southwest of the Twin Hills deposit.

The Navachab gold mine (currently owned and operated by the private mining group, QKR) was commissioned in 1989 by Anglo American. The mine was sold by AngloGold Ashanti to QKR in 2014. QKR does not publicly report Mineral Resources for Navachab.

The last publicly available Mineral Resource was reported by AngloGold Ashanti in 2013.

23.2 Marble Quarries

Dimension stone mining claims are located 2-3 km south of the Twin Hills project area. There are 17 mining claims, and all are located on the Karibib Marble Ridge. Currently there are three quarries mining marble blocks which are used for sculptures, buildings, and furniture. The quarries are owned by Africa Big Lion Mining (Pty) Ltd.

23.3 Verification

The authors have been unable to verify the information above concerning the nearby mineral properties which was provided by Osino staff, and the information is not necessarily indicative of mineralization on the Project that is the subject of this Technical Report.

24.0 OTHER RELEVANT DATA AND INFORMATION

24.1 Sustainability

From its inception, Osino has set high standards for responsible exploration and mining. As the Company transitions from junior explorer to gold mine developer and operator, it continues to raise the bar on its sustainability performance.

The Company recognises that prioritising sustainability improves community and broader stakeholder relationships, employee motivation and relationships, operational productivity, risk management, company reputation and investment attractiveness. Further, it is essential to Osino's social license to operate.

The Company's commitment to environmental and social value-creation is captured in its organizational purpose – 'to discover and develop gold projects in Namibia that build value for all stakeholders'.

Osino's approach to sustainability and its related reporting are guided by the Sustainable Development Framework of the International Council on Mining and Metals (ICMM), the Best Practice Guide for Mining in Namibia, GRI's Sustainability Reporting Standards (the GRI Standards) and the Sustainability Accounting Standards Board's (SASB) Metal and Mining Sustainability Accounting Standard.

Sustainability is embedded in policies, SOPs and oversight mechanisms (at board and operational level) to ensure that it is instilled in the Osino culture and at the Twin Hills Gold Project from the start. The Company's ambition is to demonstrate its commitment to responsible mining at each step of the project process, from feasibility through to closure.

For additional information about Osino's sustainability efforts, please read the 2021 and the soon-to-be-published 2022 Sustainability Reports.

24.1.1 Twin Hills Gold Project

As the Twin Hills Gold Project progresses from the exploration and feasibility phases to construction and operation over the next few years, potential impacts from the activities of the Company will increase significantly.

Osino has set itself the goal of embedding sustainability in all aspects of the mine's design as far as is financially reasonable. This starts with a thorough understanding of the mine's potential environmental and socio-economic impacts developed through stakeholder consultations, input from specialists, and the expert studies and public participation meetings carried out as part of the Environmental and Social Impact Assessment (ESIA).

Osino staff are now working with various technical, environmental, and social experts to integrate sustainability into the mine's design. Significant progress has been made, particularly on long-lead-time items, such as plans to share value with our host communities, reducing environmental impacts and implementing environmental programmes (to achieve a net-positive contribution). A detailed sustainability-related operational readiness gap assessment will be undertaken during the front-end engineering and design stage.

Initiatives, in summary, that are being undertaken:

- Developing a comprehensive employee housing plan to encourage investment in safe, decent and affordable housing. The plan particularly aims to benefit lower-income earners.

- Collaborations with local town councils and NGOs to reduce pressure on the local housing market and community infrastructure. The housing plan will also help alleviate this pressure.

- Expanding the socio-economic development work of the Twin Hills Trust to assist host communities to address critical needs.

- Local job creation and economic development through community-focussed skills development, hiring and procurement programmes.

- Developing plans to use materials available on-site (waste marble, calcrete, and sand) to produce building materials for mine infrastructure that will boost employment opportunities for host communities during construction. This initiative will also help reduce the environmental impact of building during construction and operations and facilitate reuse of building materials by local communities after mine closure.

- A filtered dry-stack tailings storage facility will significantly reduce water losses when compared to conventional pumped slurry tailings. Water recycling in the processing plant, rainwater harvesting, water-wise building design and good equipment choice will further reduce water consumption.

- Studies by leading Namibian hydrologists indicate that sufficient water for the mine can be sourced from groundwater on the property and, later, from pit dewatering without affecting groundwater levels or borehole yields beyond the mine property. Nonetheless, a backup water supply strategy has been developed with the assistance of NamWater to mitigate possible supply risks.

- The mine's physical layout will attempt to reduce and screen the visual impact of the built landforms. Ambient impacts, such as noise and dust on the immediate and surrounding environment, will be minimised.

- Installing a solar photovoltaic plant to supply about 37% of the mine's power requirements, significantly reducing Scope 2 emissions.
- Mine buildings are being designed to minimise heating, cooling, and lighting requirements (reducing Scope 1 and 2 emissions) and to minimise the embodied energy of the building materials used (Scope 3 emissions).

The sections below provide additional detail.

24.1.2 Management of Material Matters

The material matters for the Twin Hills Gold Project were identified through a structured process and are reviewed and updated periodically. Material matters are those topics that most significantly affect our ability to create value for all stakeholders over the short, medium, and long term. They include the project's most significant positive and negative impacts on the economy, environment, and people, as well as the interests and expectations of stakeholders.

Material matters are described in more detail below.

24.1.3 Occupational Health and Safety

Goal: Provide a safe work environment for all employees and contractors.

Health and safety risk management is important for any exploration and mining operation, and risk management is an ongoing priority for Osino. Potential health and safety risks associated with these activities include accidents on duty, vehicle accidents, fitness for work and work-related illness. Osino has established procedures and controls to safeguard employees from injury or damage to their health and provides suitable facilities and arrangements for their welfare.

Health and safety management systems align with the requirements of Namibian labour, mining and health and safety regulations, as well as with the Environmental Clearance Certificates (ECCs). Work towards alignment with ISO 45001, the international standard for occupational health and safety management systems, is ongoing, and is driven by a full-time HSE Supervisor with support from external experts.

For the future mine, Osino will continue building on its strong foundation of health and safety management.

24.1.4 Employee Welfare and Relationships

Goal: An engaged and thriving workforce.

Employees are Osino's most valuable asset. Supporting their wellbeing and satisfaction demonstrates that we are a team, increases productivity and improves retention.

Human resources issues are overseen by the Country Manager, with the support of external human resources and labour law specialists. Osino strives to continually improve the welfare of employees by implementing sound human resources practices and by strengthening relationships between management and employees. Metrics that indicate employee perceptions including turnover rates, length of tenure and internal grievances, are tracked, and indicate a well-satisfied workforce.

Osino signed a recognition agreement with the Mineworkers Union of Namibia early in 2022 and has since then met regularly with shop stewards to build relationships and ensure good communication with employee representatives.

A comprehensive employee housing plan is being developed. It is particularly aimed at benefiting lower-income earners by encouraging investment in safe, decent, and affordable housing. The plan is described in more detail further below.

24.1.5 Diversity, Equal Opportunity, Non-Discrimination

Goal: To be a fair and inclusive employer

Osino prides itself on, and values the diversity of, its team members. The Company is committed to providing equal opportunity and eliminating unfair discrimination among employees. Fair treatment of all who work with Osino is not only morally right, but also benefits us as a business. A diverse workforce can boost innovation and ensures that the interests and opinions of a broader range of stakeholders are embraced.

Osino's hiring process and human resources practices aim to be fair and inclusive and aim to promote the representation of previously disadvantaged persons in the workforce. Osino's approach to local employment aligns with Namibia's Affirmative Action (Employment) Act. Preference is given to racially disadvantaged persons, women, people with disabilities and people from local communities.

At the end of 2022, the workforce comprised 93% Namibian nationals, 21% were women and 90% were racially disadvantaged. 50% of senior geologist staff are female. Osino has a 100% equal pay for equal positions policy.

24.1.6 Communities

Goal: Build strong relationships with communities and support their development.

Good community relationships are critical to Osino for multiple reasons. It reduces the chances of conflict and disagreement and helps maintain its social license to operate. It also helps identify ways to better share value created by the Company with its host communities and contribute to their development. Osino maintains close and regular contact with a variety of community stakeholders across different sectors, which allows us to stay abreast of evolving stakeholder needs, expectations, and perceptions.

Relationships with communities are positive and considerable effort has been invested to engage with different groups of stakeholders. Several, well-attended public participation meetings have given the Company the opportunity to update communities on project progress and allow for the needs, concerns, and expectations of the community to be discussed. A Community Liaison Officer is being appointed to expand Osino's community engagement activities.

In 2021, Osino set up the Twin Hills Trust to fund community development projects that benefit the most vulnerable community members. The Trust is funded by Osino and a growing number of suppliers and service providers, shareholders and Osino managers. Projects include supporting over 20 early-childhood development (ECD) centres in the informal settlements of Karibib and Omaruru (benefiting more than 600 children under six years old), installing sanitation infrastructure in one of Karibib's informal settlements (that will eventually allow some 700 households to connect) and subsidising the development of serviced plots for low-income earners in Karibib.

Detailed community baseline studies and detailed needs and impact assessments will be undertaken in the second half of 2023. These will form the basis of a comprehensive value creation and impact management plan (exceeding those of basic ESIA-related requirements).

We are scoping a local hiring and skills development plan to identify how to increase the proportion of future employees from our host communities. Related to this, a local procurement and supplier identification and development plan will be drafted to promote the use of local suppliers and service providers.

Studies and plans are well-advanced for using materials available on-site (waste marble, calcrete, and sand) to produce building materials on-site to boost employment opportunities for host communities during construction. This will also help reduce the environmental impact of buildings and the mine site layout – see climate change section for more details.

An employee housing plan (discussed in more detail further down), will contribute to community infrastructure, municipal income, and economic well-being, particularly in Karibib and Omaruru.

24.1.7 Land Management

Goal: Create net-positive benefit by unlocking environmental and social opportunities

Osino is fully committed to the responsible stewardship of the ecological environment and natural resources. Namibia has many areas of unique and interesting biodiversity, and it is Osino's aim to achieve a net-positive environmental and social impact. This will be achieved in partnership with researchers and NGOs who are active in protecting and better understanding these impacts. Willing neighbouring landowners will be encouraged to support these efforts.

Osino is a corporate sponsor of the Namibian Chamber of Environment (NCE), and the Twin Hills Trust is becoming a member. In partnership with government and the Chamber of Mines, the NCE produced a *Best Practice Mining Guide* that outlines best practice across the mining life cycle in the context of Namibia for the environment and communities. This Guide, which is a valuable resource cutting across the country's entire mining sector, informs Osino's environmental and social plans.

Utilizing the rangeland that surrounds the mining area for future value-adding activities, will be based on several important considerations. These include: The findings of the stakeholder needs assessment, a detailed understanding of immediate neighbours' aspirations and identification of possible partnerships with them, government development objectives, possible opportunities for environmental research and education through creating appropriate facilities and partnerships. A detailed land management plan will be developing during mine construction.

Osino's exploration activities take place over approximately 4,600 square kilometres under 20 EPLs. This land is not owned, and these activities are conducted under land access agreements negotiated with landowners in line with applicable national regulations. Most of the activity in the past year has focussed on the Twin Hills site, which is owned by Osino, and covers an area of roughly 1,530 square kilometres located approximately 15 kilometres northeast of Karibib.

The Twin Hills site is considered a moderately sensitive area from a biodiversity perspective. The project area is privately owned ranch land, recently acquired by Osino. It is not part of a communal conservancy, nor is it situated within a freehold conservancy. There are no villages or homesteads near the project apart from a few farmhouses.

EPLs are issued by the Ministry of Mines and Energy and require environmental clearance certificates (ECCs) granted by the Ministry of Environment, Forestry and Tourism that are based on scoping studies, environmental impact assessments for the planned exploration activities and environmental management plans (EMPs). In terms of the ECCs, Osino submits environmental progress reports every six months documenting work completed, any environmental impact, as well as remedial actions and rehabilitation carried out.

24.1.8 Water Management

Goal: Manage water sources and usage responsibly

Water is a vital but scarce shared resource, particularly in Namibia. Water stewardship and the continued health and functioning of water ecosystems are a key priority for the development of the Twin Hills Gold Project.

As part of the ESIA process, specialists established a water baseline and assessed water quality to ensure potential impacts on groundwater and surface water are understood, measured, and managed to prevent long-term alteration or harm. An ESMP specifies water management activities and regular monitoring relating to pollution, efficiency, catchment and groundwater recharge, groundwater levels and water quality.

Additional studies include assessing surface water supply options, hydrogeological modelling, groundwater supply and sustainable yield investigations for the mine.

The mine is being designed to minimise the amount of water used through use of water-efficient equipment, recycling and the use of filtered tailings storage facility that reduces tailings-related water losses to just 16%.

Annual water demand is estimated to be 1.2 million m^3 (which includes a 10% safety margin), with studies indicating that demand can be met from site boreholes, and later pit dewatering. Modelling indicates that the cone of drawdown will not affect groundwater levels beyond the project's property limits. To further de-risk water requirements for the project, a backup water supply strategy has been developed with the assistance of NamWater that draws on several supply options.

Designs for the mine's facilities and infrastructure include measures to prevent potential groundwater contamination, including lining of water retention and storage ponds and a multi-layered barrier system to prevent contamination of stormwater runoff from affected areas. The tailings storage facility (TSF) design will include a composite geosynthetic liner system to prevent possible seepage of acid rock drainage into the groundwater with an impermeable geomembrane and fine granular calcrete barrier.

24.1.9 Climate Change and Energy Use

Goal: Design and build a climate-responsible and resilient mine

Human-caused / anthropogenic greenhouse gas emissions, and the resulting climate change this causes, present society with significant social, environmental, and financial challenges. Osino is attuning itself to the resulting risks and the need for mitigation and adaptation efforts and is integrating this thinking into its mine design process.

Osino is also currently in the process of completing an initial assessment based on the Task Force on Climate-related Financial Disclosure (TCFD) as a first step towards developing a comprehensive climate change strategy. Osino is likely to adopt the TCFD recommendations relating to governance, strategy, risk management and metrics and targets.

Potential climate change risks for the project include:

- Drought reducing water supplies and the increasing risk of fires.
- Reduced water supplies, impacting mining schedules and local community goodwill.
- Damage to infrastructure due to high winds or flooding.
- Disruption of the power supply due to infrastructure damage elsewhere.
- Disruption or damage to transportation equipment or routes by heavy rains.
- Effects on employee safety due to a variety of possible climate events.
- Heavy rain impact on tailings storage facilities.
- Policy, legal, technology and market changes to address mitigation and adaptation requirements related to climate change (transition risks).

An estimation of emissions, based on forecast fossil fuel (Scope 1) and electric grid power (Scope 2) requirements has been undertaken. Scope 3 emissions have not been estimated at this early stage. Key emission forecasts are estimated as follows:

- Total Scope 1 emissions over life of mine are expected to be about 590,000 tCO2e. Average annual emissions, over 14 years, which includes pre-stripping, are expected to be around 42,000 tCO2e. Emissions are predominantly due to drilling, hauling, and loading in the mine pit, general mine vehicles and busses to transport employees.

- Total Scope 2 emissions over life of mine are expected to be about 1,514,000 tCO_2e, with an annual average expected to be about 116,000 tCO_2e (over 13 years of processing and excluding pre-strip). Scope 2 emissions are due to the use of grid electricity from NamPower[1], which will supply about 63% of the mine's power requirements. The remaining 37% is expected to be supplied by an on-site photovoltaic plant. Most of the power will be used by the processing plant.

- Total Scope 1 and 2 emissions over life of mine (including pre-strip) are expected to be about 2,107,000 tCO_2e, with annual emissions averaging about 151,000 tCO_2e.

- Average emission intensity over life of mine is expected to be about 1.0 tCO_2e/oz Au produced.

24.1.10 The Kranzberg-Karibib Pipeline

The envisaged Kranzberg Water Supply Scheme comprises the following:

- Productive boreholes.

- Borehole pumps and pipelines which connect each borehole to a collector reservoir.

- A base pump station and one intermediate booster pump station and 27 km long bulk water pipeline which delivers the water from the collector reservoir to the 500 m^3 balancing tank at the NamWater premises in Karibib. Pipeline constructed underground along the B2 Main Road of ND200 oPVC pipes with a pressure rating of up to 25 bars. Pipeline capacity 500 000 m^3/yr.

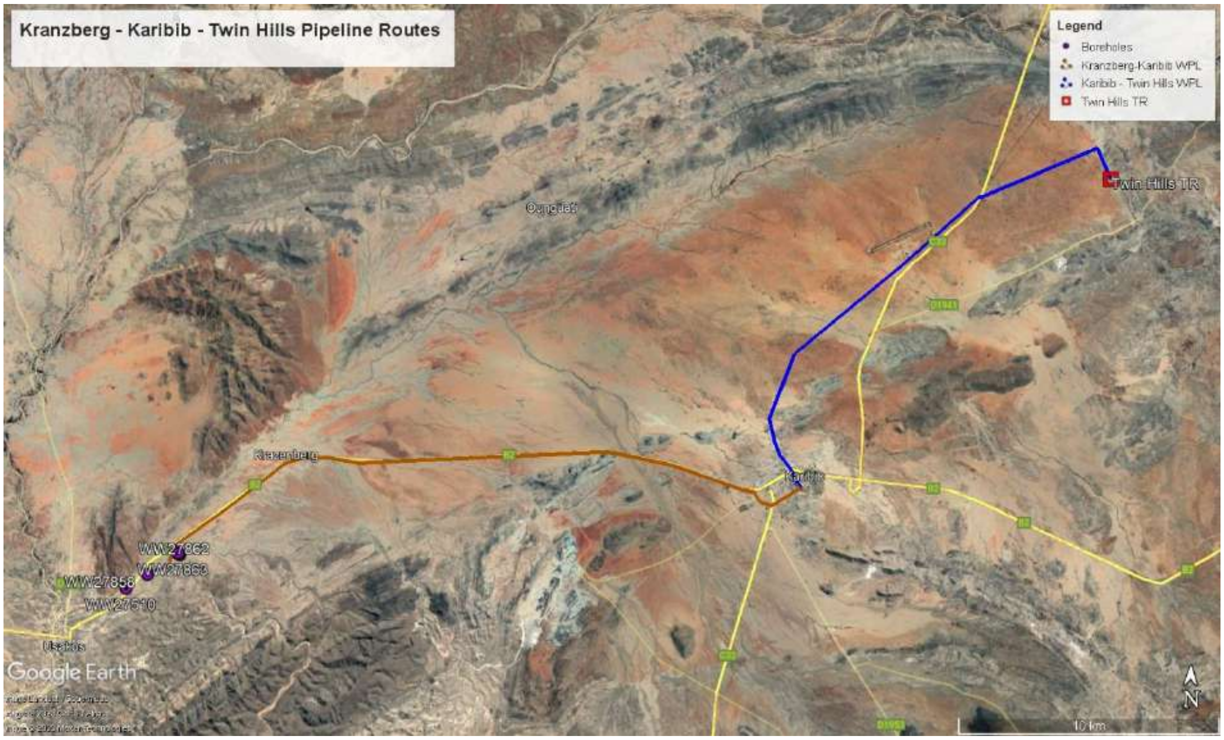
24.1.11 The Karibib-Twin Hills Pipeline

The borehole water from the Kranzberg aquifer and any other treated and disinfected waste water from Karibib for reuse on the mine and any raw water offered by NamWater is pumped from the 500 m^3 balancing tank at NamWater's premises in Karibib to the mine site.

The envisaged Karibib-Twin Hills Pipeline entails a base pump station and 21.5 km long bulk water pipeline which delivers the water from the balancing tank to the terminal reservoir / pond at the mine site. Pipeline constructed underground of ND200 oPVC Class 12 and 16 pipes. Pipeline capacity 500 000 m^3/yr.

1 A Namibian grid emissions factor (GEF) of 1.0 tCO2e/MWh was used for Scope 2 calculations. It is noted that different sources suggest different GEFs. This is as a result of Namibia purchasing power from a variety of neighbouring countries, which means their blend fluctuates within and across years. NamPower has not begun publishing accurate historic GEF figures or publishing estimated forecast GEFs. Given this uncertainty, a factor was selected that we believe to be on the higher / conservative side.

Figure 24.1.1 Kranzberg – Karibib – Twin Hills Pipeline Routes



24.2 Operational Readiness

24.2.1 Introduction

Minopex Technical Advisory (MTA), a subsidiary of DRA, was contracted to prepare an Operational Readiness (OR) gap assessment to ensure a smooth transition from project construction to commissioning, through to operations. The purpose of the exercise was to ensure that value will not be destroyed during the ramp-up phase to steady state operation and that all risks identified through the OR effort are addressed through the implementation of the necessary tasks. OR detailed planning and implementation will run in parallel to the project and reciprocal integration with the project schedule is of key importance.

The following process was followed during the OR gap analysis to first determine the current state and second to define a high-level roadmap to the future state of the planned operation.

- A gap analysis for the process plant operation and related support workstreams was conducted utilizing MTA's pre-defined questionnaires. These were web-based questionnaires completed with project and/or site representatives.

- The gap analysis submissions were prepared by MTA subject matter experts and were clarified with the respective Osino functional owners.
- The respective workstreams were defined based on the status and/or outcome of the gap analysis compared to the required or needed 'future state'
- A high-level implementation plan for each workstream was drafted.

The fourteen work streams listed below were investigated following this approach:

- Management of Change (MoC).
- Processing.
- Metal Accounting.
- Analytical & Metallurgical Laboratory.
- Safety, Health, Environmental & Quality (SHEQ).
- Human Resources Management (HRM).
- Training & Development.
- Procurement & Inventory.
- Engineering & Design.
- Commissioning & Ramp-up.
- Asset Management and Maintenance (AMM).
- Business (Information Technology) Systems.
- Information and Communications Technology (ICT) Infrastructure.
- Operational ICT Systems.

Each of the workstreams were defined with the readiness focus on process, people and systems associated with the respective key functional elements. These definitions will provide the Operations management and the designated OR team with the requisite guidance and frameworks to understand what needs to be developed and implemented prior to the commencement of commissioning.

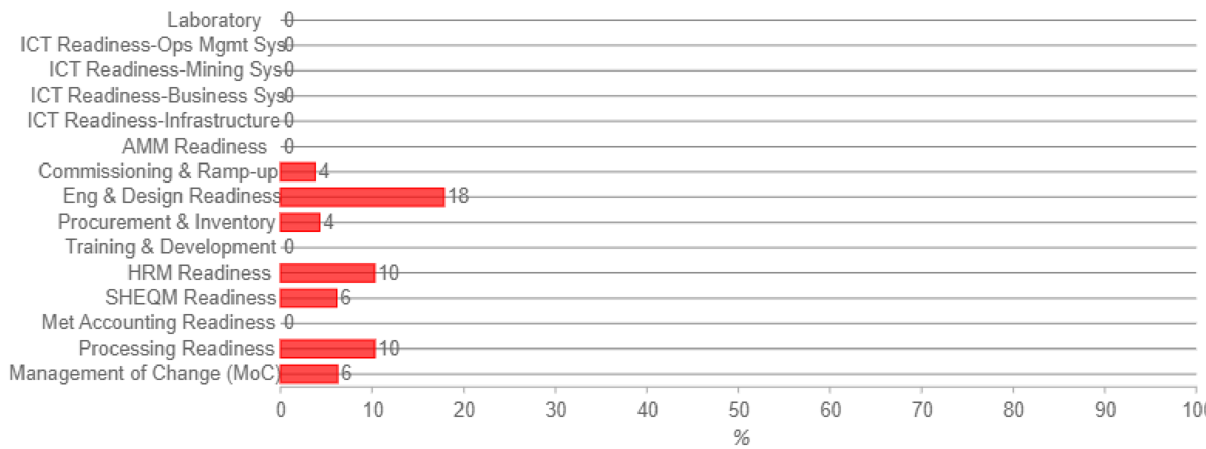
Minopex's OR capabilities and methodology are limited to its core area of expertise, which is process plant contract operations. Osino therefore needed to add some other departments to the Gap Analysis exercise. Operational Readiness of the following workstreams was assessed directly by the Osino study team and the management team currently based in Namibia:

- Site Administration.
- Mineral Resource Management and Mine Technical Services.
- Mining Operations Coordination.
- Finance.
- Legal & Secretariat.
- Strategic Stockpiling.
- Tailings Storage Facility.
- Corporate Strategy.
- Security.
- Sustainable Development and Governance (SDG).
- Other Peripheral Support.

For these workstreams, a slightly different methodology was used. In descending order of priority, the OR investigation team considered Strategy, Policies & Procedures, Organization & Structure, Competence, Facilities & Layout, Equipment & Process Technology and IT Infrastructure for each workstream. Action items needing OR planning and implementation were then identified and combined with the high-level plan developed for the workstreams studied by Minopex.

The overall level of operational readiness identified at this early stage of project development was only 4%, which was not considered to be unusual. (Figure 24.2.1) illustrates this, by MTA workstream.

Figure 24.2.1 Summary of Workstream Results



24.2.2 Management of Change

Four MoC elements were considered:

- Establish scope change and drivers of change.
- Define the Management-of-Change (MoC) process and identify support.
- Define Management-of-Change (MoC) process and identify support.
- Measure effectiveness of change and identify opportunities.

Effective Management of Change (MoC) forms an integral part of the long-term success of mining projects. A structured MoC process aims to identify and address risk brought about by change(s) that may impact the business. Change may be an addition, deletion, modification, or replacement to any aspect of the company's business that has the potential to impact health, safety, the environment, community, regulatory compliance, or operational performance.

As such, it is essential for any mining project to ensure that the required processes, procedures, and systems for the MoC are implemented as part of the Operational Readiness (OR) of the project. At Twin Hills, MoC has commenced during the project study phases but will now need to be rolled out to the operation.

24.2.3 Process Plant Operations

Process Plant Operations Readiness consists of 6 elements:

- Workgroup mobilization.
- Infrastructure and support services.
- Plant production processes.
- Operations and metallurgical systems.
- Document management systems.
- Performance management toolkit.

It is imperative that all process elements are developed for the Twin Hills Gold project before commissioning. None of the Process readiness elements identified as Gaps were perceived as major risks at this stage of the project as there is still sufficient time during the next phase of the project for these elements to be developed.

24.2.4 Metallurgical Accounting

Six elements were considered for Metallurgical Accounting Readiness:

- Workgroup mobilization.
- Infrastructure and support services.
- Metallurgical accounting processes.
- Metallurgical accounting systems.
- Document management systems.
- Performance management toolkit.

Metallurgical or Metal Accounting involves mass measurement, sampling, analysing, and accounting for all metals of economic value in a mine and subsequent process streams by collecting designated process data from several sources and compiling it into a report format to meet the Company's reporting timeframes and requirements.

The Metal Accounting Operational Readiness Workstream is aimed at benchmarking the Metal Accounting Practices of Osino by aligning the infrastructure, processes, standards, procedures, and systems with a system such as the AMIRA P754 Metal Accounting Code of Practice and Guidelines. No work has been done yet on Metal Accounting OR but this is not currently considered to be a major risk for Twin Hills.

24.2.5 Analytical and Metallurgical Laboratory

'Laboratory' consists of six elements:

- Laboratory operating needs.
- Infrastructure and support services.
- Laboratory and Analytical Services processes.
- Laboratory and Analytical Services systems.
- Document Management systems.
- Performance management toolkit.

The Laboratory is an important part of a gold producer's operation and its major requirement is to ensure unbiased sampling and preparation with an acceptable level of precision in a timeframe suited for the Metal Accounting system.

The Laboratory Operational Readiness Workstream was aimed at assisting Osino by aligning the infrastructure, processes, standards, procedures, and systems with ISO9001 Principles as well as the AMIRA P754 Metal Accounting Code of Practice and Guidelines.

No major risks were identified. Taking into account that the laboratory function will be outsourced, care should be taken that the scope of work of the contract operator is clearly defined and that associated activities and interfaces are catered for in any contracts and possible service level agreement(s).

24.2.6 SHEQ

Safety, health, environmental and quality (SHEQ) Readiness consists of four elements:

- SHEQ workgroup mobilization.
- SHEQ governance & system structure.
- SHEQ support during design, engineering, construction, and commissioning.
- SHEQ management framework.

It is crucial that SHEQ requirements and systems are proactively put established as early as the front end engineering design (FEED) phase of the project. The objectives will be to ensure smooth transition from the studies to the design, construction, and commissioning phases of the project and then into the final operational stage of the mine and process plant.

Some of the key elements such as permits, licenses, environmental and social impact assessments, etc. have already been secured. However, there are several operational requirements that require development and structure in line with a formalised SHEQ system guided by and aligned to a group policy.

Given the current status of limited SHEQ infrastructure, a huge effort will be required to set this in motion at a very early stage, even before construction commences. Having a framework in place is critical as it provides the overall framework within which all parties need to operate to eliminate or minimise unwanted events. This covers items such as SHEQ Policy Statement, Risk Management Principles and Practices, Incident / Accident Investigations, Emergency Preparedness and Response management, etc.

24.2.7 Human Resources Management (HRM)

The HRM OR analysis was based on the MTAC OR framework and assessed 8 elements:

- HR workgroup mobilization.
- HR processes.
- HR procedures and standards.
- Governance and compliance processes.
- Skills development and training processes.
- HR systems.
- HR performance management.
- HR document management.

In general, the basics of HRM are already in place since Osino has been running an exploration operation for several years. Only minor policies and procedures remain to be concluded. The current labour force is 92 employees in total (77 x Males and 15 x Females). SEENA, a legal consultancy company, has been appointed to draft new Contracts of Employment and was assigned to formalize the Disciplinary Code (Policy and Procedure).

A good HRM basis for operations has been established although the size of the workforce will increase by about one order of magnitude when mining and processing operations commence, and documentation of some policies and procedures must still be completed.

No major risks have been identified as the Employment Equity (EE) and Affirmative Action (AA) Reports are valid and comply with legislation. A well-constructed and comprehensive Induction Programme covering all applicable disciplines must be compiled to equip the employees who will be entering the company, covering SOP's, SHEQ Policies and Procedures applicable on the mine, Environmental, etc.

The Osino HRM team must ensure that the Mining Contractor provides them with a comprehensive employment pack of each employee with certified copies of all relevant qualifications as required per their job description.

24.2.8 Training and Development

The Training and Development OR assessment considered seven elements:

- Training workgroup mobilization.
- Establish training and skills development needs.
- Define and develop processes, procedures, and standards.
- Define and develop training execution and delivery requirements.
- Specify infrastructure requirements.
- Training and skills development systems.
- Training document management.

A huge effort will have to be exerted to summarize all the training needs as listed in job descriptions and subsequently compiled training matrices. A decision will then have to be taken which of these courses could be presented in-house, which must be presented by external service providers, and which are specialised training requiring attendees to travel. Training staff will need to be appointed soon after the Head of Department.

Original Equipment Manufacturer (OEM) operational and maintenance training must be secured and incorporated. OEM manuals are non-negotiable and will be included in all OEM Supply Agreements.

Based on the scope of in-house training the number of training Facilitators, Assessors and Moderators will have to be determined. The availability of training infrastructure, e.g. classrooms, e-learning and assessments, mock-ups, etc will have to be determined and finalized to cater for all the training needs.

24.2.9 Procurement and Stores

Procurement & Inventory considered six elements:

- Procurement workgroup mobilization.
- Infrastructure and equipment.
- Processes, procedures, and standards.
- Procurement and inventory management.
- Procurement and inventory management systems.
- Document management systems.

Procurement Mobilization and Sourcing have been identified as elements that will have significant influence on the Project implementation as well as subsequent operations. The following actions should be implemented to mitigate risk:

- Identify and develop departmental structure for implementation.
- Engage and mobilize critical procurement personnel to ensure readiness for project execution.
- Preferred and Sole Source registers needs to develop.
- All contract related documents (Enquiry, TEAR Document, Contract) needs to be developed in collaboration with the legal department. Develop and implement contract management.

24.2.10 Engineering and Design Readiness

The engineering function is a continuous function that commences early during the study phases, plays a vital role during the Engineering & Design (E&D) development, and contributes through life-of-mine operations to ensure that assets and infrastructure are maintained to an efficient level that supports the business case.

E&D OR, through commissioning and ramp-up, must ensure a smooth transition from the project phase to the operational phase. 18% of the requirements for E&D were found to already be in place currently, which is expected at this study phase of the project and is not seen as a major risk currently, although attention to this workstream should be considered from early stages of project implementation.

An engineering manager and workgroup should be appointed or assigned quite early in the process. This would ensure that there are sufficient resources and available time to draft and review engineering policies, procedures, and contractual agreements. A maintenance / asset care model also needs to be developed early and long lead items must be identified and ordered timeously.

24.2.11 Commissioning and Ramp Up

Commissioning and Ramp Up includes four OR elements:

- Commissioning workgroup mobilization.
- Commissioning pre-requisites.
- Commissioning and handover
- Project handover documentation.

The Commissioning and Ramp-Up readiness workstream aims to define the processes required during commissioning and establish simple, concise procedures and clearly identify the responsibilities of those involved. This is done to facilitate an efficient and safe plant and mine commissioning process. Furthermore, this workstream aims to facilitate the handover process between EPCM Contractor and Owner, ensuring that all commissioning requirements have been fulfilled.

Given the current study phase, the risk involved in the commissioning and ramp up readiness plan is seen as minimal although little planning has been done so far.

A commissioning manager and workgroup should be appointed or assigned quite early in the project implementation phase. This will ensure that there are sufficient resources and available time to draft and review commissioning policies, procedures, and contractual agreements.

This team should consider all requirements for commissioning and handover which include:

- Transfer of commissioning spares to the operational store.
- Contractual training requirements and the rollout thereof.
- Data pack requirements.

- Commissioning roles and responsibilities.
- Stakeholder identification and communications.
- Development of commissioning plan and processes.
- Commissioning close-out.

24.2.12 Asset and Maintenance Management

AMM Operational Readiness includes 20 elements:

- AMM requirements.
- Work planning and control.
- Strategy management.
- Information management.
- Technical information.
- Organization and development.
- Contractor management.
- Financial management.
- Risk management.
- Health, Safety, Security and Environment.
- Asset care plans.
- Operator asset care.
- Material management.
- Support Facilities and Tools.
- Life cycle management.
- Shutdown and outage management.

- Performance measurement.
- Condition based maintenance & monitoring.
- Total fluid management.
- Defect elimination.

MTA has an Asset Management framework within a proprietary software package called MTAC (Minopex Technical Advisory Collaborator). The framework aligns to PAS 55 and ISO 55000 principles as well as The Global Forum on Maintenance and Asset Management (GFMAM). The framework used for the Twin Hills gap analysis was built around the 20 elements mentioned above.

Asset and Maintenance Management (AMM) is all about:

- Opportunity.
- Value.
- Safety.
- Visibility.

Asset Management governs all aspects of Operations and Maintenance. AMM operational readiness needs to take account of personnel, contractors, materials, resources, and procedures, safety risks, lost production, reputational damage, reduced asset life, poor quality, delivery issues etc.

AMM is an engineering function and the realisation of efforts going into AMM should commence during the commissioning phase of the project (although preparation for certain elements will start as early as the design phase). AMM OR, through commissioning and ramp-up, must ensure a smooth transition from project implementation to the production phase of the operation.

None of the requirements for AMM are in place yet, which is expected at this study phase of the project and is not seen as a major risk currently. Attention to AMM should be considered from the early stages of project implementation.

24.2.13 Information Technology (ICT Infrastructure, Business Systems, Operational Management Systems)

ICT Readiness - Infrastructure consists of two elements:

- ICT Work Group Mobilization.

- ICT Infrastructure.

There are six elements in ICT Readiness – Business Systems:

- Process and Systems Definition.
- Establish Required Business Systems.
- Management of Project Implementation.
- Systems Implementation.
- Systems Training.
- Business Systems.

ICT Readiness – Ops Management Systems Readiness consists of 4 elements:

- OT Systems.
- Advanced Solutions.
- Engineering Systems.
- MES System.

Information Technology is an important aspect to the success for any project or business and covers a wide range of deliverables, but more importantly forms the foundation that all Business Systems work on. OR and the ICT Readiness stream ensure that the people, processes, and technologies are in place and aligned to support the various stages of operations. It expands into sufficient capabilities to efficiently deploy, operate, and maintain the various supporting ICT systems in line with industry best practises, standards, and procedures (ISO/IEC 27000, NIST).

A business system is a defined set of principles, practices, and procedures, supported by business management software, that are applied to specific activities to achieve a specific result. A business system will also connect different departments of a business to work together to achieve business objectives.

Implementing business systems is an operations and maintenance differentiator and achieves business stability and security through:

- Achieving consistency and compatibility of reported information across business units.

- Improved efficiency, agility, and accuracy.
- Striving towards full transparency of all revenue and cost of sales.
- Enhanced statistical forecasting for inventory, enabling informed materials replenishment decisions.
- Standardized and consistent application of on-site procurement policies.
- Greater integration and collaboration between departments as well as enhanced employee accountability and engagement.

Operational Management Systems (OMS) involve the use of technology to streamline and automate business processes, optimize resource utilization, and increase efficiency. The system typically includes modules for managing production, inventory, quality control, distribution, supply chain, customer relationship management, and other operational processes.

OMS provides managers with real-time information and data analytics to make informed decisions quickly, track performance metrics, and improve overall productivity. The system often integrates with other enterprise systems, such as accounting, human resources, and marketing, to provide a comprehensive view of the organization's operations.

Overall, OMS plays a crucial role in enhancing organizational efficiency, reducing costs, and increasing profitability.

None of the OR requirements for ICT are in place currently, which is expected at this study phase of the project and is not seen as a major risk currently. Attention to ICT should be considered from early stages of project implementation.

24.2.14 Support Functions Reviewed by Osino

From an OR perspective, all functions mentioned in this sub-section were assessed by considering seven elements in each case, in descending order of priority:

- Strategy.
- Policies, Processes and Procedures.
- Organization and Structure.
- Competence.

- Facilities and Layout.
- Equipment and Process technology.
- IT Infrastructure, Systems, Software and Storage.

Site Administration

The Site Administration function is of importance for several reasons such as communication (ensuring objectives, goals and responsibilities are known across the company), compliance (regulatory requirements), consistency in the application of policies and procedures, local budgeting, record keeping and community engagement. The responsible person highlighted by Osino for this workstream is the Head of Finance and Administration, although in the current preparatory phase of project development the Country Manager fulfils this function and is also responsible for Namibian regional exploration away from the Twin Hills site.

Mineral Resource Management and Mining Technical Services

In practice, these departments are often completely separate at an operating mine, but their objectives and functions overlap. MRM and MTS will be Owner's team functions and will not be delegated to the Contract Mining team. Confirmation of the remaining ore resource, grade control, geotechnical and hydrogeological assessment of the open pits are important MRM functions. The MTS group will be responsible for preparing the long and short term mine plans as well as for monitoring the Contract Miner's performance against production, grade control, explosives, safety, operating and maintenance, training, waste rock dumping, tailings storage facility interface and strategic ore stockpiling targets.

Mining Operations Coordination

In addition to the MTS functions shown above, Osino management will need to ensure that the Mining Contractor undertakes key OR planning and implementation activities itself during the implementation phase of the Twin Hills project.

Some of the main OR activities will relate to pre-strip of waste rock and ore before production commences, agreement of mining targets and key performance indicators, recruitment, and on-boarding of key management as well as Drill & Blast and Load & Haul personnel, training where needed and legal appointments. The responsible Osino manager will be the Chief Operating Officer (COO) and the Mining Contractor's appointed Open Pit Mining Manager will report directly to the COO.

Finance

The Finance function is essential in ensuring that issues / tasks such as initial project funding arrangements, establishment of bank accounts as well as creditor and debtor management, control of outgoing and incoming cash, revalidation of the business case, re-evaluation of financial model, planning of and control against budgets and reporting on financials are taken care of.

Legal and Secretariat

The Legal and Secretariat function is important in maintaining good governance, monitor and govern company operations, and ensuring compliance in terms of laws (labour) and regulations (environmental), to name a few. The responsible person highlighted by Osino for this workstream is the Company Secretary.

Strategic Stockpiling

The mining and processing schedules developed for the Twin Hills project include an important provision to mine and stockpile oxidized or low-grade ore on several strategic stockpiles, enabling higher grade ore to be processed in the early years of the life of mine. This advances revenue and improves the discounted cash flow of the operation over the life of mine as well as shortening the initial payback period. The strategic stockpiling function also plays an important role in ensuring continuous primary crusher operation and steady flow of feed to plant, management of risk and improvement in flexibility to blend ore from multiple stockpiles with freshly mined ore to be processed if there is a strategic imperative to do this. Because this is such an important element of the production plan, the responsible person highlighted by Osino for this workstream is the Chief Operating Officer (COO). This is not a function that can readily be delegated to either the Mining Manager or the Process Plant Manager since it requires the responsible executive to consider both elements of the value chain objectively.

Tailings Storage Facility (TSF)

Design and cost estimation work for the TSF was done by Knight Piésold during the Definitive Feasibility Study. Continued input to design, placement of the impermeable liners, construction planning and management as well as stability, geochemical, seepage and groundwater monitoring will be required from a specialized consultancy, to be coordinated by an Osino Executive, expected to be the Process Plant Manager.

The operational tasks to be considered by the responsible manager for the TSF will include procedures and risks associated with transport, deposition and storage of mine waste rock (needed for the TSF berms, outer cladding and interstitial layers between tailings lifts) and filtered tailings. Failures of either the lining or the TSF structure must not occur, and risks must be mitigated as these could lead to pollution and accidents as well as production losses. OR for the TSF also needs to consider environmental compliance, risk management, social responsibility, and mine closure requirements potentially including soil replacement at the end of the life of mine.

Corporate Strategy

Corporate Strategy determines and defines numerous items such as the organization's overall value, enhancing sustainable returns, risk mitigation and company goals to name a few. The responsible person highlighted by Osino for this workstream is the Chief Executive Officer (CEO).

Security

The Security function must be in place from the beginning of the FEED phase of the project, continuing through project implementation and into the production phase. The Security Department will be responsible for ensuring the security of personnel, maintaining a safe working environment, protection of physical assets including equipment and gold, ensuring compliance relating to no firearms, alcohol and similar items on site, compliance with other security related regulations and regulatory body guidelines and mitigation of safety and production risks by preventing security incidents. The responsible person highlighted by Osino for this workstream is the Owner's Security Manager.

Sustainable Development and Governance (SDG)

The SDG function plays an important role in minimizing the impact of the mine on the environment, ensuring that the mine is operating in compliance with local laws and regulations, and that it is contributing to the social and economic development of the local communities. The mine's financial performance and investor confidence can be enhanced through a well-designed and implemented governance and sustainability program. The responsible person highlighted by Osino for this workstream is the Sustainability Manager.

Other Peripheral Support Activities

Logistics, operational readiness planning and implementation, power supply and water supply were considered under this heading.

Very few of the elements considered in the portion of the OR Gap Analysis conducted by Osino have so far progressed much. This is not considered to be a risk at this early stage of the Project.

24.2.15 High Level Action Plan for Operational Readiness

Actions required to bridge the gaps identified for all workstreams described above were compiled into a high-level Operational Readiness Plan (ORP) with approximately 800 activities and a very rough high-level schedule showing that the OR work could be completed in a time period consistent with implementation of the Project. The ORP plan shows the proposed durations and timelines for the required actions to ensure all workstreams are operationally ready before commissioning.

Most of the OR activities only need to be completed during project implementation, before the process plant is commissioned. However, some more urgent items were identified in two categories. These are listed below. The activities listed for the DFS have commenced as planned or have already been completed.

24.2.16 OR Activities to Commence During the DFS

- Ensure that appropriate design reviews and hazard and operability studies take place during the DFS.
- Develop the operational budgets for all departments, post DFS, including Owner's project and operational readiness teams.
- Draft the project delivery strategy.
- Confirm the staff accommodation and transport strategies during the project and for the operation.
- Confirm the project, Twin Hills operational and Osino overall structures.
- Re-define Country Manager's role, post DFS.
- Recruit Owner's Project Director for FEED and EPCM oversight.
- Ensure IT server rooms and back up storage are fit for purpose for FEED, EPCM and Operations.
- Define ERP system requirements for budgeting purposes.
- Define Owner's team planning and scheduling package requirements, post DFS.
- Confirm the selection of Owner versus Contractor mining.
- Confirm the open pit design and scheduling strategy.
- Define dust control and suppression strategy and requirements.
- Determine geotechnical requirements for the open pits, plant, TSF and infrastructure areas.
- Confirm that DFS designs and layouts are consistent with legal requirements relating to the blasting radius.
- Ensure qualified person (QP) sign off of resource and reserve statements as well as NI 43-101 Reports.

- Add extra core storage space.
- Confirm MRM and MTS structure, design and procure the building for these personnel.
- Acquire more MRM and MTS equipment.
- Continue to apply for and put in place all necessary permits for the operation.
- Prepare cash flow model and financial valuation for DFS Report.
- Revalidate the business case for Twin Hills.
- Commission local remuneration studies.
- Confirm local taxation, levies, royalties, and similar local statutory provisions.
- Confirm gold inventory calculation procedures.
- Define insurance requirements and investigate policy costs.
- Recruit additional financial personnel.
- Confirm the filtered tailings deposition strategy and operating methodology.
- Develop and implement a public relations strategy.
- Confirm organizational structure and senior staff reporting lines.
- Develop an SDG strategy and high-level implementation plan.
- Develop and implement a responsible sourcing plan.
- Establish community grievance, indigenous people, and displacement / resettlement policies.
- Develop renewable and bulk power as well as water supply strategies.
- Develop staff housing allowance and transport plans and cost estimates.

24.2.17 OR Activities to Commence During FEED

- Develop process plant operating model.
- Ensure all processing and related infrastructure options have been evaluated.

- Ensure all materials handling requirements for the plant have been addressed.
- Identify and commence drafting of operational policies and procedures for the plant.
- Develop the metallurgical accounting operational philosophy and strategy.
- Begin to mobilize the HSE work group.
- Begin to mobilize the Procurement work group.
- Develop the organizational structure and operating model for the Engineering work group.
- Ensure the next stage of design reviews and HAZOPs take place.
- Set up the Company's document management systems.
- Set up the Company's change management systems.
- Mobilize the analytical laboratory key team members.
- Prepare the overall Namibian administration strategy.
- Prepare the overall Company training strategy.
- Possibly establish separate legal entities and structures for Twin Hills and Namibian resource exploration.
- Confirm the site organizational structure for administration and all other departments.
- Confirm the project implementation plan and schedule post FEED.
- Confirm the operational readiness plan and schedule, post FEED.
- Put in place the legal HSE appointments for all Osino departments.
- Set up office space for the Owner's project team as well as for Administration at site.
- Develop a detailed specification for Owner's ERP system.
- Define corporate and site IT connection requirements.
- Confirm all departmental budgets, post FEED.

- Confirm geotechnical requirements for the open pits, plant, TSF and infrastructure.
- Continue brownfield exploration as well as in-fill drilling at site.
- Optimize ore mining recovery and dilution strategy.
- Develop explosives management and magazine strategy.
- Continue sample preparation and critical testing – for example, more work on tailings filtration.
- Develop a groundwater management procedure.
- Define financial objective for the Company.
- Refine and adopt financial accounting policies and guidelines.
- Refine and adopt project & operational cost control and report standards.
- Confirm policies and procedures for employee payment and allowances.
- Develop and implement a purchase order system.
- Confirm financial levels of authority and approval procedures.
- Establish additional financial facilities.
- Confirm cost centres and structural responsibilities for financial matters.
- Determine legal strategic objectives for the Company.
- Refine and adopt legal policies and guidelines.
- Continue to put in place all necessary permits for the operation.
- Continue making annual financial and tax submissions as required.
- Confirm that land use and any lease or purchase agreements are in place.
- Retain a company to provide legal advisory services.
- Confirm the strategic stockpiling and blending strategies.
- Optimize the detailed stockpiling and reclamation schedules.

- Update the corporate vision and strategic business plan.
- Define requirements for a management information system.
- Develop a contractual risk management strategy.
- Refine the local employment strategy.
- Refine the corporate social investment strategy.
- Identify additional special community and stakeholder projects.
- Develop a consolidated set of corporate policies and procedures.
- Roll out change management and risk management strategies.
- Appoint Chief Operating Officer and Project Director for implementation phase.
- Prepare a set of KPIs for executives and reach agreement on these.
- Define performance management system to be used.
- Begin formal monitoring of overall regulatory and training compliance.
- Review, update and if necessary, mitigate identified project risks.
- Develop general and access control security strategy, standards and protocols.
- Establish security cooperation with local authorities.
- Prepare emergency procedures.
- Optimize physical security infrastructure requirements.
- Define time & attendance system requirements.
- Confirm other security and communication equipment requirements.
- Optimize SDG strategy.
- Prepare a sustainability policy document.
- Prepare all other SDG policies.

- Confirm renewable and bulk power supply as well as water supply strategies.
- Develop a logistics strategy for imports and exports.
- Determine the structure and size of the operational readiness planning team and recruit key personnel.

24.3 Staff Housing

Mine personnel will predominantly live in Karibib and Omaruru. Osino is developing an employee housing plan to ensure that employees and contractors have access to quality accommodation and are encouraged to invest in property. The plan, which is particularly aimed to benefit lower-income earners, draws on the best practices from the mining sector in Namibia and South Africa.

The housing plan aims to:

- Facilitate access to safe, decent, and affordable housing.
- Encourage ownership as a way to improve quality of life and security for employees.
- Reduce 'heating' of the local housing market.

Osino recognizes that accommodation is a personal decision and employees have the right to make their own decisions in terms of their lifestyle, values and priorities. For this reason, employees will be required to make the primary contribution towards their housing arrangements.

The housing policy aims to achieve a balance between the priority of ensuring good quality housing close to work and employees' personal long-term housing investment priorities. It takes into account the different priorities of lower- and higher-level employees, and includes the following components:

- A standard housing allowance for all employees.
- A discounted rental scheme to access tax benefits or a stay-at-home incentive to create financial equity.
- A home ownership loan to encourage ownership and address potential affordability constraints.
- Housing transaction support at onboarding.
- Transport to and from the mine.

- Contribution to housing conditions in surrounding communities.
- Specifications for contractor housing specifications.

25.0 INTERPRETATION AND CONCLUSION

25.1 Introduction

The Twin Hills Gold Project is located within Namibia's prospective Damara sedimentary mineral belt, in proximity to and along strike of the producing, open-pit Navachab and Otjikoto gold mines. Twin Hills is a sedimentary-hosted, structurally controlled gold deposit that fits the broad orogenic model and is amenable to conventional mining and metallurgical processing.

The Project is in central Namibia approximately 20 km from the local town of Karibib, and 150 km from the capital city, Windhoek. The Project area has access to excellent infrastructure by being in close proximity to Namibia's well-maintained national rail, road, and bulk utilities network. It is within 5 km of the sealed national highway network, within 20 km of a major high tension overhead power line and within 220 km of the modern seaport of Walvis Bay, to the west of the Project, which is the main logistical port suppling the mining industry in the region.

The Project is rapidly being advanced through accelerated exploration drilling and fast-tracked development studies. The DFS contemplates a low-risk, technically simple open-pit mine utilizing contract mining and feeding a conventional carbon-in-leach (CIL) metallurgical plant processing 5 million tonnes of mineralized material per annum (Mtpa).

25.2 Mineral Resource

The Project comprises a number of gold occurrences (including Twin Hills) that are associated with orogenic gold mineralization along the KFZ. The Navachab gold mine is located approximately 25 km away from Twin Hills in a broadly similar geological setting. Systematic exploration along the KFZ by Osino has led to the MRE reported herein. It has also identified numerous other gold occurrences that warrant further exploration and in excess of 20 km of mineralized strike has been discovered. A total of 1,069 drillholes for 225,574 m of drilling have been completed by Osino at Twin Hills which inform the Mineral Resource estimate.

No reliance has been placed on historical drilling data, although a moderate amount of historical exploration was undertaken in the Project area and immediate surrounds by Anglo American and Bafex. A review of the QAQC results associated with the data acquired by Osino, coupled with a review of Osino's drilling, logging, sampling, and assay practices and procedures, indicates that the data are acceptable for use in the MRE.

25.3 Mining

Based on the updated Mineral Resource Estimate of 25 July 2022, a Whittle pit optimization was run at a base gold price of $1,700 per ounce gold and a 5% discount rate. It included a 3% gross royalty and a 1% export levy to the Namibian government. Stated below in Table 25.3.1 are the significant assumptions used to generate the Twin Hills Gold Project DFS Mining Study. This was used to support a Project Mineral Reserve Estimate at a gold cut-off grade of 0.40 g/t Au of 64.51 million tonnes of Proven & Probable Minerals Reserves @ 1.04 g/t Au, containing 2.15 Moz Au.

Table 25.3.1 Mine Planning and Whittle Pit Optimisation Assumptions

Parameter	Units	Values
Base Currency		USD
Base Date		Q2 2023
Exchange Rate – real	(NAD : USD)	17.50
Discount Rate (for NPV calculation)	(%)	5.00%
Base Gold (Au) Price – real	(USD/oz)	1 700
Government Royalty (3%) + Export Levy (1%)	(%)	4.00%
Selling Costs - Gold Refining Costs	(USD/oz)	0.55
Selling Costs - Gold Transport Costs	(USD/oz)	2.20
SMU Block Size	X(m) x Y(m) x Z(m)	10 x 5 x 2.5
Mining Dilution	(%)	11%
Mining Losses	(%)	-3%

The deposit is a large, shallow gold deposit amenable to open-pit mining. The orebody will be mined as a conventional shovel and truck operation, with bulk mining augmented by more selective mining in areas with narrow ore zones. Mining will apply conventional open pit methods, and the whole mining operation, except for the mine technical services function, will be outsourced to a reputable mining contractor. This includes drilling, blasting, loading, and hauling of ore and waste.

It was assumed that the whole mining operation, except for the mine technical services function, would be outsourced to a reputable mining contractor company. This includes drilling, blasting, loading, and hauling of ore and waste. The mining contractor will supply all materials, equipment, facilities and services, supervision, and labour necessary to conduct the mining operations per the contract specifications. Drilling and blasting will be performed on 5.0 m benches for ore and selective waste material; and 10.0 m benches for bulk waste material. The entire waste benches will be excavated in a bulk mining fashion with excavators on two 5.0 m bench flitches. In contrast, the mineralized benches will be selectively loaded in two 2.5 m flitches to minimize dilution. The truck and shovel match on the ore and waste benches have been considered and are planned as follows:

- A fleet of 200-t hydraulic backhoe excavators will be employed for selective ore and waste loading, including bulk loading for entire waste benches.

- 100-t capacity, off-highway rigid haul trucks will be used, and standard open-pit drilling equipment will be required.

The remainder of the mining production fleet consists of support equipment that includes graders, track and wheel dozers, front-end loaders, rock breakers and utility excavators. Ore and waste will be loaded with hydraulic excavators and hauled by diesel-powered trucks to the primary crusher, Run of Mine (ROM) pad stockpiles, low-grade stockpiles, or waste rock dumps.

The objective of the pit design process was to transform the pit shells obtained from the optimization into a practical pit, including ramps, bench, and berm configurations by taking all the required inputs into account. The practical pit design forms part of a critical input for the scheduling and Mineral Reserve estimation processes. The project is planned as a multi-pit mining operation with seven pushbacks in the Central Twin Hills / Bulge pit design and three separate satellite pits (Clouds, Clouds West, and Twin Hills West) to be mined in different phases throughout the LOM.

The pits with interim pushbacks will be mined to facilitate the maximization of gold grade to the plant in the early years. Also, waste stripping will be deferred as far as possible into the future to reduce operating costs in the early years of production. The Whittle pit optimization exercise resulted in a selection of lower revenue factor shells. At the same time, the pushback stages were designed to provide access to the shallower portions of the orebody during the initial project life.

The final Twin Hills Gold mine production schedule for the DFS required maximum annual material (ore plus waste rock) movement of 33.5 Mtpa, providing approximately 13 years' ore supply at 5 Mtpa.

25.4 Production Schedule

The mining philosophy will expose higher-grade ore as early as possible and transfer this directly to the processing plant. Lower-grade ore will be stockpiled in strategic grade banded stockpiles (high, medium, and low grade) until the plant can process the highest-grade material available.

The pre-strip period is six months, with a total of 6.79 Mt mined from the first two pushbacks. After the pre-strip period, the ore inventory on the grade control and ROM stockpiles is 0.73 Mt. This will be placed on run-of-mine (ROM) finger stockpiles to mitigate possible ore supply disruptions from the pits at the start of operations. The expected ramp-up period to nameplate plant production capacity is three months, and sufficient ore must be available from mining in this period to enable performance tests to be carried out. Based on the DFS production schedule, the annual gold production for the first five years of production is estimated at about 177 koz/a. The average annual gold production over the entire LOM is approximately 154,000 oz annually, and the cumulative product produced is 1.998 million troy ounces. The key mining parameters of the DFS are listed in Table 25.4.1.

Table 25.4.1 Key Mining Parameter Results

Key Mining Parameters	Unit	Total / LOM
Operations		
Mining pre-strip period	Months	6
Mine production life	Years	12
Processing production life	Years	13
Mining		
Ore mined	Mt	64.51
Strip ratio	X	4.64
Waste mined	Mt	299.07
Processing		
Ore processed	Mt	64.51
Average gold head grade	g/t	1.04
Average CIL gold recovery	%	92.92%
Output		
Gold production	M oz	2.00

25.5 Mineral Processing and Process Plant

The DFS process design utilizes results from the Pre-feasibility test work undertaken in 2021 and 2022 on composite samples of Fresh material and Transition material from drill cores supplied from the Twin Hills mineral resource, as well as variability test results carried out in 2022 on core samples and tailings filtration and conveyability tests of composite samples that were completed in March 2023.

The PFS test work was conducted in South Africa at Maelgwyn for gold extraction, Geolabs for comminution, Roytec for filtration, and Mac One for thickening. During the DFS, the further test work was conducted in South Africa at Maelgwyn for ore variability, Paterson & Cooke for dynamic thickening, filtration and conveyability, FLSmidth and Bokela (in Germany) for filtration and Paterson & Cooke for tailings pipe loop tests.

From this testwork and the processing schedules developed for the project, the expected average gold recovery over the whole life of mine was 92.0%. This is less than the results achieved in the metallurgical tests, because about 0.7% of gold will be lost in barren CIL circuit solution contained in filtered tailings. However, due to the mining and processing strategy explained earlier, with higher grade ore being processed in early years of the life of mine, average gold recovery for the first five years of operation was forecast to be 93.2%.

Several techno-economic trade-off studies of alternative possible process configurations were carried out during Pre-feasibility, with reference to test results where possible. These included: investigation of a primary jaw crusher, a standard Primary Crusher / Stockpile / SAG Mill / Ball Mill / Pebble Crusher circuit, a flotation circuit ahead of leaching, pre-oxidation with lead nitrate, conventional tailings thickener underflow disposal and pressure filtration of tailings. In addition, pressure filtration / vacuum belt filtration / disk filtration of tailings trade-off studies of alternative possible process configurations were carried out during definitive pre-feasibility. The current flowsheet was selected in preference to the alternatives.

Orway Milling Consultants (OMC) took the high competence of the Fresh material (SMC Axb value <40) into consideration in their comminution model and did not specify a SABC milling circuit. The comminution circuit design uses three-stage crushing with a single-stage ball mill to achieve an 80% passing 63-micron product size classification. A gravity recovery circuit follows the comminution steps, with gravity concentrate being processed by intensive leaching to recover gold.

Gravity circuit tails will report to the milling circuit. Cyclone overflow from the milling circuit will report to the pre-leach thickener. Underflow from this thickener containing 50% solids will be processed by pre-oxidation with oxygen addition through shear reactor technology ahead of the CIL circuit, to increase gold leaching kinetics to achieve ultimate gold dissolution in a nominal 24 hours of residence time. Additional oxygen will be added to all CIL tanks to maintain a high dissolved oxygen level.

Elution, electrowinning and smelting of gold will be applied to generate the final product. Carbon will be regenerated and recycled to the CIL circuit. In addition to the metallurgical processing circuits, reagents and utilities will all be included within the plant boundary, as well as typical plant infrastructure.

25.6 Tailings Disposal and Storage

The design and cost estimates were prepared to provide safe and secure storage of 64.5 Million tonnes (Mt) of tailings over 13 years for an average throughput of 5 Million tonnes per annum (Mtpa). Filtered tailings from filter presses will be conveyed to the TSF located approximately 500 metres (m) from the processing plant using an overland belt conveyor with a design capacity of 1030t/h. At the TSF, it will be deposited onto the waste disposal system in predetermined layers using a series of deposition conveyors.

A purpose build forward stacking conveying system, comprising comprise of a plant feed, emergency, and forward stacking streams #1 and #2 was selected that will adhere to the process requirements of the TSF dry stacking methodology explained elsewhere in this report. The system design allows advance planning for i.e., stacking, movement of equipment and uninterrupted safe access during the pad lining process whilst offering the best overall availability and production reliability offering a simplified, cost-effective design which incorporates commonality of spares and standardisation / interchangeability with associated equipment.

Deposited tailings material will be left to dry and later will be covered with capping material for environmental protection (to prevent washing out and erosion). No water is expected to be recovered and recycled to the processing plant in the base case.

Geotechnical testing to date suggests that the Standard Proctor optimum moisture content (OMC) is 12% and the maximum dry density (MDD) is 1.6 t/m^3 while filtration testing by FLSmidth and Paterson and Cooke confirmed that the material can / will be supplied at a moisture content (mc) between 14 and 16% by mass. This material should be suitable for conveyor transport based on the conveyability tests undertaken. The filtered tailings will be laced to form a stiff stack.

Completed geochemical characterization tests to date indicate that the tailings material is potentially acid forming and presents a significant risk in terms of acid generation. Short term leaching experiments identified arsenic, aluminium and iron as potential pollutants of concern in high water to rock leaching ratios, although in a filtered tailings TSF capped with waste rock it is not expected that a high water to solids ratio will occur. Nevertheless, based on these results, a composite lining system was included in the TSF design using a combination of geomembranes and neutralization potential of compacted local calcrete material. This barrier system is to be tested in the next phase of the project, ahead of detailed design.

In the planned operational scenario, tailings filter cake will be conveyed to the composite lined storage facility (TSF) which will be constructed in phases to defer capital. The main conveyor belt will discharge onto a forward stacking stacker advanced over tailings.

25.7 Process Plant

After site clearance, preparation of earthworks terraces or platforms, and erection of fences, the buildings shown under cost code 370 of the DFS capital cost estimate will be erected during the project implementation period. These will be used by the Engineering, Procurement and Construction Management (EPCM) Contractor during construction, for handover to the Owner's operational team on commissioning of the project:

- Small canteen.
- Air services building.
- Maintenance workshops.
- Plant stores.
- Training facility.
- Control room.

- Motor control centre buildings.
- Analytical laboratory.
- Reagent storage shed.
- Waste management shed.

25.8 Non-Process Infrastructure

The anticipated infrastructure for the Project outside the process plant includes the following items:

- Diverting and rerouting the D1941 district road to ensure mining of the ore bodies underneath the existing road can be done. Access roads to the process plant and the mining contractor's laydown area will T-off from the new D1941 road.
- The borehole water supply network and storage facilities providing water from the north and the south to the process plant and mining contractor laydown area.
- The mining contractor's facilities such as equipment maintenance workshop, refuelling facilities, explosive magazine, office administration facilities, assay laboratory, and warehouse facilities.
- General Process plant infrastructure which will includes internal access roads, storm water handling facilities, water supply, power supply network, emergency diesel generators, sewerage reticulation and treatment plant and waste management facilities.
- General Process plant facilities will include for site security and access control, change house facilities, Training and induction facilities, canteen facility, administrative offices, medical and emergency response facilities, warehousing facilities including open air laydown areas, workshop facilities, ablution facilities, emergency backup generation facilities, waste management and recycling facility.
- Given the Project’s proximity to the town of Karibib, no on-site accommodation will be required. Accommodation for construction contractors and for mine employees will be provided through rental houses in the town of Karibib or in the case of the contractors serviced land on which they can erect temporary accommodation.
- Mining fleet and LDV fuel and lubrication bulk storage / dispensing system and fuel management facilities, as well as a separate much smaller fuel storage / dispensing facility for the process plant. The Supply, storage and dispensing of fuel and lubes will be outsourced to a reputable service provider in the Namibian fuel industry.

The infrastructure provided is adequate for the location of the project and appropriate for the size of the mine.

25.9 Civils Geotechnical

Construction material

The construction materials on site include colluvium and sand of mixed origin, which are classified as G9 construction material and are preferred for non-structural bulk fill. Alluvium, on the other hand, is highly variable and may contain organic material, so careful selection is necessary to ensure low fines content and no organic material for non-structural fill purposes. Calcrete, consisting of nodular and hardpan calcrete, is classified as G4 to G8 construction material and is recommended for structural fill in engineered layer-works such as haul and access roads and platforms. Quartzitic sandstone and meta-greywacke are also suitable for engineered layerworks, but schist should be avoided as the rock may slake upon excavation and exposure.

Foundation considerations

Based on the boreholes and test pit information, the bulk of the Processing Plant footprint contains shallow hardpan calcrete, which is typically found at a depth of 0.4 meters below ground level. The lateral and vertical continuity of the hardpan calcrete can vary, and there may also be powder calcrete below it, which is unsuitable for foundations and requires in-situ improvement. Lightly loaded structures can be placed on strip or pad footings on the shallow hardpan calcrete zone, while reinforced strip footings should be used to mitigate weak or discontinuous hardpan calcrete zones. Heavy loaded structures and settlement sensitive structures should receive special attention, and foundation excavations should extend through the upper hardpan and powder calcrete zones. Blended and/or stabilized arisings to be used to construct engineered backfill layerworks inside the excavations to bring the foundation back to surface level or founding depth. Alternatively, piling is an option and can be odex drilled, cast in-situ end bearing piles into massive calcrete at depth. For general underground services, the presence of hardpan calcrete near the surface makes conventional trenching difficult. Bucket wheel trenching equipment may be required for services. In the construction of haul and access roads, the subgrade conditions are generally expected to be favorable, especially in areas with calcrete. Unconsolidated materials should be improved by in situ compaction. Calcrete is a potential material for road construction, although its use as a wearing course may generate dust.

25.10 Bulk Grid Power Supply

NamPower Erongo Transmission Substation

NamPower is currently in the process of planning and constructing the Erongo Substation. Osino has entered into a power supply agreement with NamPower and is making regular progress payments associated with this contract. In addition to this Agreement, NamPower has shared a high-level project implementation schedule with Osino indicating that the new substation will be commissioned in November 2025

NamPower's progress will be monitored during the overall development of the Twin Hills project, to ensure that the key deliverable dates are consistent with the Erongo substation development schedule.

Twin Hills Switchyard and Consumer Substation

The Twin Hills power transmission line and connection to the Erongo Substation will be implemented within the Osino mine and project development plan. Osino will be responsible for directing the detailed engineering, procurement, construction, testing and commissioning of the following grid connection facilities:

- 66 kV transmission line from Erongo Substation to Twin Hills 66/11kV Switchyard, to be designed and constructed according to NamPower specifications and requirements. The asset will be handed over to NamPower after construction.
- 66 kV Metering station at the Twin Hills Gold Mine switchyard, to be constructed according to NamPower Specifications and designs. The asset will be handed over to NamPower after construction.
- 66/11 kV Twin Hills switchyard and associated consumer substation, to be designed and constructed by Osino for operation and maintenance during the life of mine

25.11 Alternative Power Supply

Alternative sources of energy supply have been investigated during the course of the feasibility study, and a competitive tender was issued into the market to obtain proposals from prospective independent power producers (IPP). As a result of this tender, bidders were shortlisted for further engagement during the following project phase. It is planned to enter into a private power purchase agreement with the selected IPP.

The alternative energy source identified is predominantly solar PV, with the potential for the addition of wind power generation as a prospective enhancement. The solar PV plant capacity is 25.5 – 27.1 MWac and is expected to offset approximately 35% of the Mine's total energy consumption. A battery energy storage system has not been included as part of the PV plant in the DFS.

With the inclusion of the renewable energy plant, the anticipated carbon footprint of the Mine will be reduced by 19.9 kt annually of CO2 emissions compared to a 100% Coal Generation system.

The range for the proposed tariff by the IPP bidders is 5.5 – 6.63 US cents/kWh, compared to the anticipated cost of energy from NamPower for the 2022 / 2023 financial year of 9.77 US cents/kWh.

25.12 Ground Water

The Twin Hills project is characterized by arid conditions with a rainfall season spanning from December to March / April. Precipitation is typically as intense thunderstorms resulting in flash flood rainfall events. The mean annual rainfall is 184 mm, although drought periods in Namibia can last several years. The gross potential evaporation exceeds the mean annual rainfall (3200 to 3400 mm per annum) throughout most of the year, meaning that recharge to groundwater is episodic following high-intensity rainfall events.

The site water balance shows an overall site water requirement of 1.1 million m^3/year of fresh water which must be supplied from external sources either through groundwater boreholes, surface and groundwater storage projects, or freshwater purchase agreements with local or regional authorities.

A hydrogeological study was completed from 2020 to 2023 to determine the open pit dewatering requirements as well as the groundwater resources that may be available for mine water supply. Initial work comprised of geophysical surveying and borehole drilling and test pumping to confirm actual sustainable yields of selected boreholes.

The main aquifers in the region are the alluvial deposits in the Kahn River and the karstic aquifers in the Karibib Marble. The Kuiseb mica-schists are considered to have low permeability, low recharge, and low groundwater abstraction potential.

In total 26 boreholes drilled into the Kuiseb mica schists around / within the planned open pits confirms the low permeability with minor secondary permeability developed in faults and fractures and associated with the northeast-southwest foliation. The bulk hydraulic conductivity is 0.01 to 0.03 m/day with low maximum pumping yields of < 200 m^3/day.

Based on the drilling of 58 groundwater exploration boreholes in the Karibib Marbles, this formation has the highest water supply potential. The test pumping yields of boreholes in the marbles varied from >2000 m^3/day to <100 m^3/day consistent with the heterogeneity of the marble.

A shallow alluvial aquifer is well developed along the Khan River which is used as a water supply to the region and has been characterised through testing of 12 boreholes.

The groundwater hydrochemistry for the Kuiseb mica-schists has a high background sulphate (350 to 900mg/l) compared to the marble aquifer which ranges from 10 to 60 mg/l.

Estimates of groundwater over LOM to the pits range from 0.21 Mm^3/year in year one increasing to a cumulative maximum of 1.71 m^3/year in year 10 when all pits (Main, Cloud, Cloud West, and West) are in operation. This indicates that during the early years of mining, there will be a water supply deficit until year seven in terms of meeting the mine's water demand of 1.1 Mm^3/year, whereas after year seven the full water demand for the operation should be met from pit dewatering.

Pit inflows can be managed from in-pit sumping by sizing the dewatering infrastructure to include direct precipitation as well as predicted groundwater inflows. Active dewatering boreholes have not been included, as the passive inflows can be managed from in-pit sumps and the pore pressures remain at least 50 m behind the pit walls due to passive dewatering but may require localized depressurisation by sub-horizontal drain-holes behind disconnected structures or due to transient higher inflows following rainfall events.

As makeup water to mine water supply, the groundwater exploration boreholes with the highest yields were included in the model, taking into consideration the overlapping impacts between adjacent boreholes being pumped simultaneously and the developing cone of drawdown of the water table induced by passive dewatering from the mine pits. The cumulative total yield of six boreholes is 1.2 Mm^3/year with an additional three in reserve. From the start of the LOM, this is sufficient to match the water requirements of the operation. Later in the LOM, mine water supply is supplemented by inflows into the pit.

To mitigate any risk of supply shortfall, the mine water requirement of 1.1 Mm^3/year is met from year one to the end of LOM in year 13 through a combination of the groundwater supply boreholes in the Karibib Marbles and the pit inflows which increase with the deepening pits.

For sizing of sump pump-out volumes and reticulation and storage, the cumulative yield accounting for the appropriate stormwater return period must be taken into consideration.

The cumulative cone of drawdown due to passive dewatering of the open pits and the water supply boreholes will be elongated towards the northeast-southwest along the strike of the orebody and parallel to the southern limb of the Karibib Marble and two are on the northern limb of the Karibib Marble. There are no boreholes used by farmers that will be impacted. Two of the water supply boreholes are located on the northern limb of the Karibib Marble anticline and close to the Khan River. Managed aquifer recharge (MAR) of the water supply boreholes is under consideration to increase the sustainability of the aquifers due to the cone of drawdown but there are no boreholes used by farmers that will be impacted.

Contaminant transport modelling of sulphate representing possible plume migration from the lined tailings storage facility (TSF) and waste rock dumps (WRDs) indicates the drawdown cone development around the pits effectively captures the plume during operations and post closure due to the pits being terminal sumps. The plume extent from all the WRDs over LOM extends less than 180 m from the WRD footprints. Following 50 years post-operation, the plume will have migrated less than 250 m from the WRD footprints and the simulated seepage from the lined TSF is within 35 m from the footprint.

Surface Water and Mine Water Balance

The site water balance is based on a peak process throughput of 5.2 Mtpa and has a water demand of approximately 1.1 million cubic meters per annum (Mm^3/a). The process design aims to maximize the reuse of water by recycling process solutions wherever possible through filtration systems in the plant. The site demand specified in the DFS includes inflows and outflows to the process operation including the open pits as well as domestic consumption of water and the water required for dust suppression on the site roads and at the crushers.

The plant demand assumes that approximately 85 % of the water contained in tailings is recycled at the plant and the remaining water is lost in the filtered tailings cake sent to the tailings storage facility. Evaporation from the open pits, groundwater inflows, and direct rainfall are considered in the water balance model.

The DFS water balance shows that the plant demand can be supplied by groundwater from boreholes and pit dewatering operations through the life of the project. Occasional surface storm water runoff will be diverted from the Okawayo stream to the Clouds West pit after it is mined out in year one of operations.

The Clouds West pit as a storage reservoir will be intermittent and it impact on the overall groundwater recharge may be negligible. This will continue to be evaluated in greater detail as the project moves forward. The water balance model and sustainability of groundwater inflows should be updated during the operation through constant monitoring of water supply, levels and annual groundwater water balance accounting.

The use of alternative water supply sources is not required according to the current model, but the potential quantities of alternative water supply and potential supply are listed below.

- Groundwater borehole pumping along the Karibib marble is estimated to be able to supply approximately 3,000 m^3/day, which is in excess of current estimates of demand.

- The Karibib wastewater scheme could potentially supply up to 150,000 m^3/yr based on the current population estimate.

- The potential for Khan River sand and river dams with managed groundwater recharge sites to increase the sustainability of abstraction could benefit the project. This water would be pumped to the site through a pipeline.

- The potential long-term yield of the Okawayo flood attenuation dam and groundwater recharge scheme is currently being investigated. This is also likely to increase the sustainability of the groundwater options while supporting pit dewatering and mitigating risks to the open pit under flash flood conditions.

- NamWater sources water from the Swakoppoort Dam and conveys it to the Okangava reservoir and Karibib site through a pipeline. Applications to purchase water from the scheme were submitted during the PFS and NamWater proposed instead that Osino and NamWater should jointly investigate extraction of water from the known Kranzberg aquifer, with pumps and a pipeline to the Twin Hills site via Karibib then to be constructed.

None of these surface water supply options are expected to be required for Twin Hills to have sufficient water available for the planned operation, based on the combination of groundwater options discussed earlier. However, if required, the surface water options offer several mitigations of any possible shortfall of water due to drought or other circumstances.

25.13 Pit Geotech

The findings of the Geotechnical FS has led to the conclusion that the slope design developed in the PFS is still valid and slope design parameters are detailed in the body of the report. Beside the review of foliation data and potential weak zones associated with previously modelled Biotite Schist, an update of the pore pressure model (hydrogeological model) was included in the investigation. Additionally, the analysis results indicate that the slope stability is governed by small scale structures, and adjustments have been made to the batter angles to account for it. Double bench design recommendations have been included for the south slope, but due to flatter batter angles double benches on the north are not recommended. Further, 70° double benches are difficult to drill accurately, and the remaining berm widths on the north slope are small and prone to breakback, which can lead to instability.

The analysis indicated that the presence of groundwater has a minor effect on the overall angle stability. However, it has the potential to have a significant impact of structurally controlled failures. It is therefore still best practice to ensure the phreatic surface is pushed back from the mining slopes by systematic drainage that will be installed once mining develops below the phreatic surface. The provided slope design assumes good mining practice which includes, good effective limit blasting and redundancy in mine access. The impact of the foliation and other geological structures on the bench scale stability should be noted, since the design is based on a POF approach, break back will occur to these planes, in some cases the breakback can be significant. This highlights the requirements for good pre-split and scaling mining practice, dewatering and mine access redundancy.

25.14 Environmental

An environmental and social impact assessment was undertaken with due consideration to the biophysical, social, and economic factors, as well as the relevant Namibian legislative requirements, EPS and IFC performance standards. The economic benefits of such a development are numerous; however, as in any mining project of this nature, there are also negative impacts which will require planning, monitoring and mitigation during construction, operation, and decommissioning phases.

None of the impacts identified are considered as fatal flaws and any high significance impacts will be reduced to low to medium significance after implementation of mitigation measures.

25.15 Sustainability

Osino recognizes the importance of responsible mining across the social, environmental and governance spectrum, and sustainability priorities are embedded throughout the organization in policies, SOPs, oversight mechanisms and the company culture.

The Company has invested considerable effort to understand the mine's potential environmental and socio-economic impacts and material matters. It has taken steps to minimize the negative and expand on the positive impacts. The integration of sustainability into the mine's design continues, and Osino considers itself well positioned to manage its sustainability-related risks and create sustainability-related opportunities throughout the life of mine.

Osino's sustainability efforts are informed by its material matters, namely occupational health, and safety; employee welfare and relationships; diversity, equal opportunity and non-discrimination; communities; land management; water management; and climate change and energy use. These key items as well as an in depth understanding of the Namibian social and environmental contexts, in practical terms, have provided for a robust foundation for the company in these spheres.

Key sustainability initiatives, which are in development or ongoing, include:

- A comprehensive employee housing plan, which aims to benefit lower-income earners.
- Collaborations with local town councils and NGOs to reduce pressure on the local housing market and infrastructure.
- The socio-economic development work of the Twin Hills Trust to assist host communities to address critical needs.
- Local job creation and economic development through community-focused skills development, hiring and procurement programs.

- The use of materials available on-site (waste marble, calcrete, and sand) to produce building materials for mine infrastructure, will boost opportunities for employment and skills development, reduce environmental impacts (of construction and operations) and facilitate reuse of building materials by local communities after mine closure.
- A filtered dry-stack tailings storage facility to reduce water requirements. Water recycling, rainwater harvesting, water-wise building design and good equipment choice will further reduce water consumption.
- Sustainably supplying all water requirements from groundwater on the property and, later, from pit dewatering. A backup water supply strategy has also been developed.
- Minimize the mine's visual layout and its ambient impacts.
- A solar photovoltaic plant is expected to supply about 37% of the mine's power requirements, thus significantly reducing Scope 2 emissions.
- Mine buildings are being designed to minimize heating, cooling, and lighting requirements (reducing Scope 1 and 2 emissions) and to reduce the embodied energy of building materials used (Scope 3 emissions).

25.16 Proposed Project Development Plan

FEED

Osino's intention is to continue to fast-track the development of the Twin Hills project. The next steps expected to be completed include the following main activities:

- The project execution plan and schedule produced during the DFS will be enhanced.
- Front end engineering design (FEED) proposals from two companies have been evaluated and one of these companies will be appointed early in the third quarter of 2023.
- In parallel with FEED, Osino will prepare a detailed operational readiness plan for the project.
- The core project implementation Owner's and EPCM teams will be established.
- The procedures, detailed schedule, control budget estimate and plans for project implementation will be established.
- Preparatory earthworks on site as well as access road design and approvals will be initiated.

The objectives of FEED are:

- To optimize the project design criteria to match the latest technical input data.
- Extend the DFS designs to include standard basic engineering package deliverables.
- Confirm major equipment vendors, service suppliers and contractors and prepare procurement documentation to enable orders to be placed soon after FEED is concluded.
- Update DFS site and plant layouts as well as material take offs and bills of quantity.
- Update, enhance and optimise the project implementation schedule. It is expected that, following a successful FEED phase lasting four to five months, the project implementation schedule to production of first gold should not exceed 24 months.

EPCM Phase

After the completion of FEED, then Osino will proceed with the full implementation of the Project only when finance is full yin place. The DFS shows that funding is expected to be in place by January 2024. A Project Execution Plan has been prepared during the DFS. An overview of the main features of this PEP follows.

Project Definition (Plant, Mine and Infrastructure)

The Twin Hills Project (The Project) consists of several major areas including:

- Primary crushing.
- Coarse ore stockpile.
- Secondary and tertiary crushing and screening.
- Fine ore stockpile (including cover).
- Milling and classification.
- Gravity recovery.
- Trash screening and thickening.
- Pre-oxidation and Carbon-In-Leach (CIL) with oxygen air sparging.
- Acid wash and elution.
- Electrowinning and smelting.

- Carbon regeneration.
- Cyanide destruction.
- Provision for future possible arsenic precipitation.
- Thickening of detoxified tailings slurry.
- Filtration of tailings thickener underflow.
- Conveying and deposition of filter cake product to the lined tailings disposal facility.
- Services, utilities, water recycle and reagents networks within the process plant fence line or boundary.
- Control room(s).
- Analytical laboratory.
- Ablutions.
- Change rooms.
- Mess rooms.
- Workshops / warehouses.
- Security facilities.
- Reagent make-up facilities.
- Gold room.
- Roads within the process plant and administrative infrastructure boundary fences.
- Site clearance and terrace platforms including those required for the plant and associated infrastructure, tailings storage facility, and mine infrastructure.
- Site roads on the property leading to remote support facilities and process plant.
- Bore holes, dam(s) and water diversion channels, pipelines, ponds, pontoons, pumps, dust suppression and other water supply infrastructure.

- Buildings outside the process plant boundary including the main access booms and turnstiles, bus stop, administrative offices, technical services offices, Owner's Team project offices, stores / warehouses and laydown areas, workshops, ablutions, construction offices, laundry, security offices and training & induction centre.
- Construction camp(s).
- Diesel storage and supply (including fuel management system).
- Oil separators.
- Borrow pits.
- Mechanical equipment and vehicles such as overhead cranes, mobile cranes, light delivery vehicles, buses, ambulance, trucks, backhoes, forklifts.
- Tools, furniture, computers, survey equipment, ERP system.
- Site and process plant perimeter fencing.
- Main and alternate power supply lines, substations, transformers, reticulation on site.
- Alternate power supply infrastructure such as diesel or heavy fuel oil generators, solar and wind power generation and energy storage facilities including batteries.
- Motor control centres.
- Stormwater drains, culverts, and storage dams.
- Raw, process, potable, and fire water reticulation.
- Sewage reticulation, treatment plant, water recycle network.
- Tailings disposal and storage facility.
- Medical clinic, first aid facilities.
- Communication equipment and infrastructure.
- Condition monitoring equipment.
- Waste management.

- Upgrades or rectification of existing core sheds, administrative buildings, farm buildings or exploration camp.
- Open Pit contract mining, explosives management, waste rock disposal, ore and waste rock haulage, in-pit and haulage roads, mine infrastructure.
- Establishment of bore holes, pumps, pipelines, electrical supply etc associated with bringing water from the Kranzberg aquifer to site this may not be required, to be confirmed during FEED.
- Detailed design, procurement, construction, and commissioning of the electrical 'shallow connection' including power lines and substations from the NamPower national grid.
- Rerouting of main access (national) road.
- Implementation by an Independent Power Producer of a renewable power supply installation on thew Twin Hills site.

Osino intends to appoint a single EPCM contractor to manage most of the activities above, but some of them will be managed directly by Osino's core project team working with local Namibian engineering contractors and consultancies.

Project Objectives

The key objectives during the execution phase of the Project are listed below:

- Health and Safety – Meet or exceed safety targets. Attain zero harm incidents during construction. Design for a safe operating environment.
- Environment – Be environmentally and socially responsible following the Equator Principles and International Standards. Have no serious environmental incidents. Comply with all permit requirements and the standards being followed by Osino for the Environmental and Social Impact Assessment (ESIA).
- Community – Maintain good community relations. Maximize utilization of local available resources and involvement of the local community. Leave a positive legacy.
- Capital Cost – Target to achieve the lowest cost outcome without compromising quality and schedule. Complete the Project within the Project control budget.
- Operating Costs – Target to achieve the lowest cost structure without compromising quality.
- Ramp-up Capacity – Target to reach plant design capacity and availability based on a contractually agreed ramp up period.

- Quality – Design the Project to be fit for purpose, easy to maintain, operator friendly and safe.

- Schedule – Schedule to meet start-up requirements. Attain mechanical completion within the planned dates. Meet ramp-up targets.

EPCM Contractor's Responsibilities

The scope of services for the EPCM Contractor will be inclusive of the following:

- Preparation and submission of a Project Health, Safety, Environmental and Community Relations (HSECR) Management Plan in accordance with Osino policies, procedures, rules, and regulations.

- Provision of a Project Quality Plan based on ISO 9000 and ensuring that the quality plan is effectively implemented during the Project.

- Process design including the process flow diagrams, process design criteria, final mass balance and water balance.

- Plant Engineering design including the preparation of technical specifications, material and equipment data sheets, equipment lists, line lists, valve lists, cable schedules, electrical load lists and instrument lists.

- Non-process Engineering design including tailings conveying and water and services areas by EPCM Contractor or its sub-consultants.

- Engineering design for all site infrastructure including buildings, terraces, roads, and fencing.

- Engineering design and management for stormwater drains, culverts, and storage dams, raw, process, potable and fire water reticulation, make up process water, sewerage reticulation, treatment plant, water recycle network.

- Engineering design and management for Tailings management facility (TMF).

- Engagement of, or interaction with, Specialist Consultants including fuel supply, mining, geotechnical, environmental, tailings storage facility (TSF), bulk grid power transmission, alternative power supply, access roads, waste rock management facilities (WRFs) and water management.

- Design, detailed engineering, and drafting including P&ID's, layout drawings, general arrangement drawings and detail drawings for the civil, structural steel, platework, mechanical, piping, and electrical disciplines.

- Provision of records of design audits and HAZOP studies.

- Procurement services including the tender, adjudication, and recommendation for award (RFA) of all purchase orders and contracts required for the expenditure of the capital works on the Project.

- Preparation and issue of tender packages for steelwork and platework fabrication supply contracts.

- Preparation and issue of tender packages for site construction packages, based on horizontal contract packages, for: earthworks, building works, concrete works, field erected tankage, structural, mechanical, and piping installation, electrical and instrumentation supply, and installation.

- Project management services to co-ordinate and manage all aspects of the Project and interface with the various vendors, suppliers and contractors involved in the Project. This would include the preparation and maintenance of the Project Quality Plan, the Safety Management Plan, the Environmental Plan, budget allocation and control, the Project implementation schedule, contract preparation and control and Project reporting.

- Project services including inspection and expediting, logistics planning and management, transport co-ordination and invoice approval and control.

- Construction management including site management, construction supervision, site safety, industrial relations, site interface and construction workforce accommodation. This will involve the co-ordination and management of all construction activities from site establishment to completion including the completion of all punch listing activities and the rectification of minor defects and omissions.

- Commissioning the Project including all testing and pre-commissioning, dry commissioning, and wet commissioning.

- Provision of a set of as-built drawings at the conclusion of construction.

- Provision of a set of vendors supplied manuals for mechanical and electrical equipment.

Owner's Team Responsibilities

The scope of services being managed by Osino will be inclusive of the following:

- Geology.

- Topographic surveys for the Project site.

- Environment, community relations, cultural or heritage work.
- Obtaining government approvals.
- Obtaining building permits.
- Obtaining import and duty exceptions (where applicable).
- Approval of purchase orders and contracts prepared by the EPCM Contractor on behalf of Osino.
- Payment of Project direct and indirect costs.
- Direction to the EPCM Contractor.
- Assist the EPCM Contractor with the planning and implementation of the Project.
- Ordering and provision of first fill, opening stocks and consumables, spare parts (if not included as part of the equipment orders), office equipment, office furniture, mobile equipment and vehicles, tools and equipment, warehouse shelving, pallet racks.
- Recruitment, operational readiness planning and implementation and training associated with the geology, mining technical services, plant operations and maintenance workforce and the administration team to manage and operate the mine, plant, and facilities pre and post commissioning.
- Mining (expected to be Contract Mining including explosives management).
- Open pit mine infrastructure.
- Provision of bulk and alternative (renewable) power supply to the Project site.
- Water boreholes, pumps, and pipelines from the Kranzberg aquifer to site.
- Rerouting of the main access (national) road to the site.
- Accommodation for the Owner’s team during the Project.

25.17 Overall Interpretation and Conclusions

Osino’s press release of 12 June 2023 highlighted the recovery, production, and financial expectations of the project over the whole life of mine as follows:

- NPV of US$742m (pre-tax) and IRR of 34% at 5% discount rate and US$1750/oz gold price.
- NPV of US$480m (post-tax) and IRR of 28% at 5% discount rate and US$1750/oz gold price.
- At spot gold prices (US$1,950/oz) the project generates just under US$1.5bn of net pre-tax cashflows, demonstrating the strong margins, cash generation potential & economics of the project.
- Overall capital cost of US$365 million (incl. US$34m contingency and US$18m capitalized pre-strip) with a payback period of 2.2 years.
- 13-year Life-of-Mine ("LOM") and 5.0 million tonnes per annum (Mtpa) design processing capacity.
- LOM gold recovery of 92.0% (LOM) utilizing a conventional 3-stage crushing, ball milling, gravity separation, pre-oxidation and CIL circuit plus filtration and a dry-stack tailings facility.
- Responsible social and environmental design criteria have been key study elements and have been integral to design and project planning from the outset, contributing considerably to the robustness of the project.

Both capital and operating cost estimates were prepared in mixed currencies and reported in USD. The capital cost estimate is classified as a Class 3 estimate with a +15%/-10% accuracy, similar to an Association for the Advancement of Cost Engineering (AACE) International Class 3 (+30%/-20%) and deemed suitable for a Feasibility Study (FS) level study.

The process plant and infrastructure capital estimates are robust and based on adequate designs, with good take-offs for quantities and market-based costing.

Lycopodium's overall conclusion is that the Twin Hills Gold Project DFS is a low technical risk conventional open pit mine and carbon-in-leach processing facility with a flowsheet which is based on unit operations that are proven in industry.

An economic analysis of the mine schedule generated from the DFS resource model has shown financial viability of the project at a gold price of US$1750/oz, and the sensitivity analysis has demonstrated continued profitability against changes in key project parameters at different gold prices.

A review of the outcomes of the DFS analysis indicates that the project is robust and has no fatal flaws, and it is therefore recommended that the project is progressed to the FEED phase of development.

25.18 Risks

25.18.1 General Risks

Although no major risks are currently evident, environmental, permitting, legal, title, taxation, socio-economic, and political risk issues could potentially affect access, title, or the right to perform the work recommended in this report.

25.18.2 Exploration and Mineral Resource Risks

Exploration Risk

A key risk, common to all exploration companies, is that the targeted mineralization type may not be discovered, or if discovered, may not be of sufficient grade and/or tonnage to warrant commercial exploitation. Exploration risk associated with strike, plunge and downdip extensions of known mineralization at the Project is considered reasonably low, given the success of drilling activities to date and an understanding of the geological setting of mineralization. Hitherto untested targets at the Project carry higher exploration risk, in common with other exploration projects. The geological setting of mineralization is well understood, and the success of the targeting rationale used by Osino has, to some extent however, reduced the risk associated with these other targets.

Mineral Resource Risk

A portion of the Mineral Resource estimate reported for the Project is classified as Inferred. An Inferred Mineral Resource is that part of a Mineral Resource for which quantity and grade are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply, but not verify, geological and grade continuity. Inferred Mineral Resources have the lowest level of confidence of all the categories.

The quantity and grade of the Inferred Mineral Resource would likely change with the addition of infill drilling, as mineralization (volume) could be added or removed from the current interpretation based on the additional data.

Mining and Mineral Reserve Risks

The mining model has been prepared based on a modified spreadsheet regularisation process (nominally 10.0 m x 5.0 m x 2.5 m) to seek a ~ 11% dilution with no metal loss and 3% ore losses. Bearing in mind that the total tonnes moved exceeds 33 Mtpa, a larger selective mining unit (SMU) might need to be considered during the FEED to match the size of the operation and proportionally increase dilution and mining losses.

Opting for a larger mining fleet to cater for the 33 Mtpa total tonnes optimally moved requirement; the 2.5 m selective loading flitch height needs to be revisited. A detailed bench height, smallest mining unit (SMU) and mining dilution study will be performed during the FEED stage.

The DFS pit design has only one dedicated ramp system going into the Bulge and Twin Hills Central pits, and this needs to be revisited during the DFS from a risk point of view should one ramp access fail versus increased mining costs due to increased stripping rations with a double ramp system.

During the pit design stage, the geotechnical catch berms were tapered in when intersected by a ramp to minimize waste stripping. Thus, access to cleaning benches could be hindered, and the overall slope angle could be compromised in these localized pit sectors. This will be addressed during the FEED in close consultation with the geotechnical consultant.

25.18.3 Minerals Processing and Metallurgy, Process Plant Risks

The following risks were identified by Lycopodium and Osino during the DFS:

- Maintaining pressure filtration performance is a continual operating challenge.
- The ramp up period of three months to nameplate capacity following commissioning and plant handover to Osino might be slightly extended in a plant with a high-pressure filtration unit in comparison to the traditional tailings pumping. Expatriate operating and maintenance skills are a prerequisite to achieving high pressure filtration operating efficiency in a shorter time duration.
- It is possible that dissolved arsenic concentrations in the CIL circuit could eventually increase to a steady state value that may not comply either with gold processing working practices or general health & safety standards. An arsenic removal circuit was investigated during the PFS and could be retrofitted in the plant if related operational challenges are identified following commissioning of the process.

25.18.4 Tailings Storage Facility Risks

The following risks were identified through the study:

- Risk that the filtered tailings moisture content is higher than the optimum compaction result and pose problem to the advancement of the conveying system and slope stability of the intermediate lifts or global lift should this be a continuous deviation. The substantial thickness of the lifts (5-8 m) will reduce the potential for air drying of the tailings that could result in some of the deposit becoming saturated particularly if the target range of moisture contents is not met. The thick lifts will also result in a relatively loose, contractive, and compressible deposit. These factors could lead to perimeter slope stability issues and lift surface trafficability issues that could make forward stacking challenging. Depending on the associated levels of risk, and performance of the filtration system, some consideration should be given to reducing the lift thicknesses or introducing additional air drying applying enhanced air drying, such as disking or dozer / excavator fluffing, in any perimeter areas where the tailings are placed at a higher mc than targeted. If done carefully, the dust generation potential should not be significantly increased because of the wetter nature of the material, however, this could be checked with a trial exercise.

- Risk that dust generation during deposition from uncovered and unsprayed tailings affects the workers, processing areas, and/or surrounding environment. Continuous cladding and binder spraying over the surface of placed tailings will be required during operations.

- Damage to exposed liner by mechanical equipment prior to or during deposition.

- Lifting of exposed liner due to wind, in areas where deposition has not yet occurred. This would require placement of sandbags.

- Adverse rainfall and flooding resulting in erosion of interim bench faces, erosion of the granular material of the drains.

- Acid generation potential of tailings material in the long-term requiring capping at rehabilitation and post closure water management.

- Arsenic release from the tailings taking place under neutral pH conditions, in the short to medium term. As the acid generation reactions occur, the profile of contaminants will also change, and different pollutants of concern may become mobile in the long term. The composite liner system is nevertheless expected to prevent any dissolved impurities in seepage from coming into contact with groundwater.

25.18.5 Infrastructure Risks

- Risk of insufficient raw water supply for the plant from the boreholes because of recurring drought (low rainfall) to replenish the borehole aquifers. However, multiple mitigation measures have already been studied to address this possibility and the hydrocensus work done indicates that the boreholes can provide sufficient water even if an extended drought occurs.

- Inflation rate fluctuations are possible specifically related to the macro-economic policies of Namibia and South Africa.

- The fuel price at present is unstable and is a major element in the operating costs, specifically for the Heavy Mining Equipment (HME) fleet.

- The location of the TSF on the southwestern side of the plant may contribute to dusty conditions due to the prevalent south westerly wind during more than half of the year.

- Borrow pit materials for engineered fill construction could be challenging and more drilling, blasting and crushing of material could be required than anticipated in the DFS.

Provision of temporary accommodation of construction contractors in Karibib and the influx of large numbers of contractors could have a social impact on the town and its permanent employees. Social impacts could be both positive and negative. This will need to be carefully monitored during project implementation.

25.18.6 Civils Geotechnical Risks

- The geotechnical investigation indicates a shallow hardpan calcrete zone that may be considered suitable foundation material for light infrastructure. However, due to the variability in the lateral extent and thickness of this horizon, it is recommended for additional drilling and continuous surface wave (CSW) testing to be conducted to confirm the founding conditions for heavy and/or settlement sensitive structures.

For general underground services, the presence of hardpan calcrete near the surface makes conventional trenching difficult and a bucket wheel trencher may be required.

25.18.7 Surface Water Risks

- The current climate change models, indicate that the climate will become more variable.

- Part of the main pit is situated directly in the flow path of the Okawayo River. The pit would be subject to extensive flooding if no flood mitigation measures are implemented. The pit development schedule show that implementation of flood mitigation measures is required after about year four of operations. A diversion option of an upstream dam and diversion above the marble contact into the small Clouds West pit (which will be mined in year one) with an overflow downstream of the operation was selected and costed during the DFS and will be implemented in year one of the Project.

- The annual exceedance probability to design for is not clearly defined by regulations. Using a dam wall for attenuating a flood will have additional guidelines that govern the magnitude flood the infrastructure must safely handle and discharge associated to the risk profile of the structure.

25.18.8 Groundwater Risks

- The water table in the pit high walls over LOM decreases as the mine extends in depth due to passive dewatering from the pit sumps. Discussions with the geotechnical teams have indicated that no depressurization will be required due to the high rock mass strength. However, the role of late dykes, faults, and/or enhanced recharge from mine infrastructure close to the pits could result in higher or transiently high pore pressures following storm events that could impact pit stability. If there is a compartmentalization of the water-bearing zones, some lithologies / structures dewater quicker than other areas and sub-horizontal drain holes may be required.

- The Okawayo Stream passes directly through the Central Pit eastern wall, and it is possible that there could be a zone of weakness in this sector of the pit, with a seepage face that may require depressurization / dewatering. Tracer testing and installation of VWTs along this structure will be undertaken to collect the data to quantify and mitigate this risk.

- The modelled cone of drawdown due to mining over LOM has been shown to not reach the adjacent farm boreholes currently in use. However, the confidence level is based on the data available and is a function of hydraulic properties and recharge which has been estimated based on chloride in rainfall and groundwater mass balance.

- Static testing has shown that the tailings and waste rock are potentially acid generating. The TSF will be lined with a composite liner to prevent seepage into groundwater.

25.18.9 Water Balance Risks

- The high-level water balance is based on a monthly time step. The capacity of infrastructure to accommodate short duration flood / storm events is not clearly defined in a monthly timestep model. Changing the timestep to a daily model in the next phase of the project will allow for the various components to be stressed against different duration storms, which also allows for operating procedures to be refined in terms of pumping into and out of different containment facilities.

25.18.10 Pit Geotech Risks

Some weak zones have been identified in the core and are the result of deeper weathering along structures, which requires further investigation to understand their orientation and interaction with the geology and planned pits. Since identifying structures across drillholes is unreliable, deep geophysics should be undertaken to aid in assessing the risks associated with these structures. Once these uncertainties are better understood, the stability of the slopes should be reassessed.

Single ramp access has been designed, a double ramp access is recommended for the deep THC and Bulge pit area, due to the potential for structurally controlled failures, and the weak zones identified in the core.

25.18.11 Environmental Risks

- Risk of TSF seepage causing downstream contamination.

25.18.12 Sustainability Risks

Significant potential risks could arise if issues related to the mine's material matters are not well-managed or arise due to unforeseen circumstances. Such risks include:

- A lack of operational readiness, as relating to a host of sustainability matters, such as insufficient planning, inexperienced staff, workforce shortages, challenges in change management and training, environmental and social compliance issues, could hinder a smooth transition from project development and construction through to commissioning and operations.

- A major health and safety event, such as an explosion or a geotechnical failure could lead to a significant interruption or cessation in operations and potential legal issues.

- Inadequate health and safety management could lead to a poor health and safety record, including fatalities, which in turn could lead to permitting, reputational and other issues.

- Strike action could disrupt operations if employees or their union feel that Osino has not been treating or remunerating workers fairly, if working conditions are not considered safe, or for a range of other reasons.

- Climate change transition risks, as the global commitment to reduce greenhouse gas emissions increases, pressure on the mine to reduce its carbon footprint is likely to increase, thus potentially increasing operational costs.

- Physical climate change risks could additionally affect operations. For example, a reduction in rainfall could reduce water availability and escalating temperatures could make working conditions more difficult.

25.19 Opportunities

Several major project opportunities have been identified as part of this DFS, including the following:

25.19.1 Exploration and Mineral Resource Opportunities

Exploration Opportunities and Conclusions

Additional discovery potential exists within the Project area at exploration targets delineated along the KFZ and on the Dobbelsberg Dome. There are a series of soil anomalies along the KFZ to the east of the Twin Hills Mineral Resource at Twin Hills East, OJW South, Oasis and Rheinsheim that remain to be drill tested. In addition, the recently delineated Dobbelsberg and Puff Adder geochemical anomalies and initial drilling on the Dobbelsberg Dome, approximately 2 km south of Bulge, need to be followed up. The bedrock anomaly delineated at Kranzberg to the southwest of Twin Hills should be followed up with further bedrock sampling and the magnetic anomaly along strike to the south west drill tested. Early work carried out at Goldkuppe and Wedge needs to be reviewed and further work considered in the area around the large north-south structure between Goldkuppe and Oasis.

Mineral Resource Opportunities and Conclusions

The conceptual pit shell used to report the Mineral Resource in order to satisfy RPEEE, resulted in the majority of the block model being reported as Mineral Resource. This suggests that undrilled mineralized material below the current RPEEE pit shell could potentially satisfy RPEEE requirements and that the deposit is effectively open at depth. Accordingly, it is reasonable to expect that majority of the Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued infill drilling.

25.19.2 Mining & Mineral Reserve Opportunities

- There is scope for further mining and processing schedule optimization to be completed in the next project development phase. Mining and processing techno-economic optimization exercises will be conducted during the FEED to optimize the pre-strip mining volumes further and potentially relax the oxide ratio to the plant feed.

- The effects of the war in Ukraine and continued growth in demand, and various constraints on the supply of diesel and ammonia (explosives) temporarily increased these mining input cost drivers. These will be revisited and aligned to a long-term outlook, resulting in slight cost reductions.

- A detailed owner vs contractor mining operating cost trade-off study will be performed during the FEED. The owner cost study will be modelled from first principles supported by requests for quotations from original equipment manufacturers for the supply and service of mining equipment, explosives, tyre, and fuel suppliers.

- Synergies be explored where the mining contractor could assist with specific tasks on the TSF construction at potentially more cost-effective rates when compared to a civil contractor.

- Similarly, during the above mining contractor RFQ scope, the supply of aggregate material for concrete and fill material for infrastructure terraces during the construction period will be included. This might save costs compared to the current civil contractor material supply rates.

- Perform a fleet size trade-off from first principles between a 90-t and 150-t truck operation to investigate a potential decrease in mining costs due to economics of scale.

- A drill and blast hole diameter trade-off exercise will be performed to reduce potential blasting costs further.

- In-pit dumping opportunities that don't dilute future reserves will be investigated to reduce waste cycle times.

25.19.3 Mineral Processing and Metallurgy, Process Plant Opportunities

- Reduction of soluble gold loss from CIL tails by placing filtration ahead of cyanide destruction will further reduce soluble gold loss and recover cyanide, both will improve the economics of the operation. If an arsenic removal step is found to be necessary, it could be applied to the filtrate from this step.

- The 80% design plant availability for the high-pressure filtration circuit could increase operationally to 85% availability based on similar milling operations. The opportunity of a higher plant availability will reduce downtime and possibility to increase the 5.0Mtpa nameplate capacity of the Twin Hills plant operation. Also, vacuum disk filtration could be considered further, as an alternative to filter presses. This would have lower capital cost and higher utilization, enabling the size of the thickener underflow stock tanks to be reduced.

- The selected process flowsheet may not be optimal for ore from the Clouds deposit. A finer grind or an additional process step could be investigated further, specifically for this material, with the possibility of achieving higher gold recovery.

- If the next set of Ondundu gravity separation tests are successful, the Twin Hills plant could possibly be used to process Ondundu gravity concentrate after year six of the operation when the gold recovery circuits after CIL will have plenty of spare capacity available.

Tailings Opportunities

- Development of the disposal facility is possible in discrete phases and with an opportunity of deferring capital expenditure. This principle has already been incorporated in the DFS capital cost estimates, with most of the tailings storage facility cost being deferred from project capital into sustaining capital.

- Additional evaluation of the composite liner system is proposed to confirm most economical and sustainable liner system to minimize potential for acid and metal leaching.

- The following additional areas of study are recommended for detailed TSF design which may lead to potential optimizations:

  - Additional evaluation of dust mitigation methods.

  - Further evaluation of geotechnical material behaviours to minimize risk to the material strength and upsets in the conveying system.

  - Evaluation of tailings lift thickness and required compaction effort to minimize risks to the perimeter slope stability and lift surface trafficability that could make forward stacking challenging.

  - Detailed design and alternatives assessment of closure cover options for the TSF.

25.19.4 Infrastructure Opportunities

Use of modular, fit for purpose building and other infrastructure designs, or designs making use of locally available building materials, may enable significant reductions in the infrastructure capital cost estimates.

- During the FEED, 'Construction Ready' drawings and documentation can be prepared to minimize the time required to finalize the designs, construction drawings and Request-For-Quotation (RFQ) documents during project implementation before construction can commence.

- Commence with the re-routing of the D1941 district road.

- Equip the boreholes, pipelines, and storage tanks to ensure that there is water on site for construction.

- Survey and peg the site as per the approved site layout and prepare and construct the Contractors laydown and site office areas.

25.19.5 Groundwater Opportunities

- Due to the shortage of water resources in the area, the flood mitigation structure that is under consideration to prevent floodwater ingress to the Central Pit could provide an opportunity to enhance aquifer recharge to the marble karstic aquifers. The design of the flood mitigation structure includes the development of a sub-surface sand dam as sediment buildup behind the structure to minimize surface evaporation and increase groundwater potential.

- On-going groundwater exploration for additional water supply potential associated with as-yet unexplored structures could augment the available groundwater yield.

- Dams in the Khan River with injection boreholes have been recommended, as the surface storage increases the volume that can be used while groundwater storage is important as subsidiary storage during dry seasons. The scheme should be coupled with a managed aquifer recharge scheme using injection boreholes in the marble aquifer adjacent to Spes Bona Compartment I.

25.19.6 Environmental Opportunities

- The contaminant transport modelling of sulphate representing possible plume migration from the lined tailings storage facility (TSF) and waste rock dumps (WRDs) indicates the drawdown cone development around the pits effectively captures the plume during operations and post-closure due to the pits being terminal sumps (meaning that due to the low rainfall, high evaporation rate and the low permeability of the pit rock types, the static groundwater table will not fully recover to pre-mining level and groundwater will continue to flow towards the pits). The plume extent from all the WRDs over LOM extends less than 180 m from the WRD footprints. Following 50 years post-operation, the plume will have migrated less than 250 m from the WRD footprints and the simulated seepage from the lined TSF is within 35 m from the footprint.

25.19.7 Sustainability Opportunities

High levels of responsible mining performance can result in a broad range of positive social, environmental, and economic benefits from improved reputation and a stronger social license to operate to long-term resource availability, positioning Osino for long-term success in a changing global landscape. Some of these could include:

- Excellence in health and safety management, which ensures that employees are well looked after and feel valued. This is likely to have motivational and productivity benefits for the mine staff and improve its reputation.

- High levels of employee welfare and good employee relationships are likely to result in higher levels of presenteeism, motivation, trust, and commitment. This could, in turn, result in higher productivity and retention levels and reduce the likelihood of industrial action. A diverse, non-discriminatory work environment offering fair and equal opportunities, could contribute similar benefits.

- Good community relationships would strengthen Osino's social license to operate. Collaboration with community members and other businesses, presents the opportunity for a more cohesive set of working relationships that could help improve the effectiveness of development activities and improve overall community resilience.

- Sustainable land management practices can improve the health of local ecosystems on the Twin Hills site, and possibly on neighboring properties, and offer the possibility for a range of environmental educational, food production and other benefits that could positively impact the local community.

- Well-studied and careful water abstraction and management, and related transparent communication, could lead to a strengthening of relationships with neighboring landowners, local communities and government departments, thus strengthening Osino's social license to operate.

- A comprehensive climate change strategy that focuses on reducing greenhouse gas emissions by, for example, implementing energy-efficient technologies, using renewable options, and optimizing fuel consumption is not only important in terms of contributing to the global push to reduce emissions, but could bring a range of benefits to Osino. These could include opportunities ranging from cost savings and operational efficiencies to accessing new markets as the carbon intensity of commodity production becomes more important globally. Additionally, sustainable mining operations are more likely to attract investments from environmentally conscious investors and funds. These scenarios have been recognised and are being designed into the mechanics of the Twin Hills Project.

- By proactively implementing sustainable practices, Osino can ensure compliance with evolving regulations and reduce the risk of fines, legal disputes, and project delays.

26.0 RECOMMENDATIONS

The recommendations that have been identified by the authors are presented in this section and it is recommended that they be progressively investigated and potentially implemented as the project progresses.

26.1 Exploration

26.1.1 Assays, QAQC and Data Management

Osino should consider the use of commercially prepared blank material (as opposed to the current river sand) to monitor potential contamination more precisely during sample preparation and assay.

26.1.2 Infill Drilling

Infill drilling, aimed at increasing the confidence of the Mineral Resource disclosed in this report, may be required in future, pending future requirements.

26.1.3 Exploration Drilling

Numerous targets located along the KFZ and associated splays as well as the Dobbelsberg anticline to the south of Twin Hills Central and Bulge, have been defined during systematic exploration at the Project and warrant drill testing. Drilling at some of these targets has already commenced. The program, which has been prepared by Osino and reviewed by CSA Global, is considered appropriate for the advancement of the Project, with the view to adding strike extent to the currently defined Mineral Resource. The proposed drilling metreage for these targets, together with the targeting rationale for these targets, are presented in Figure 26.1.1 and Table 26.1.1.

Figure 26.1.1 Exploration Drilling Targets at the Project

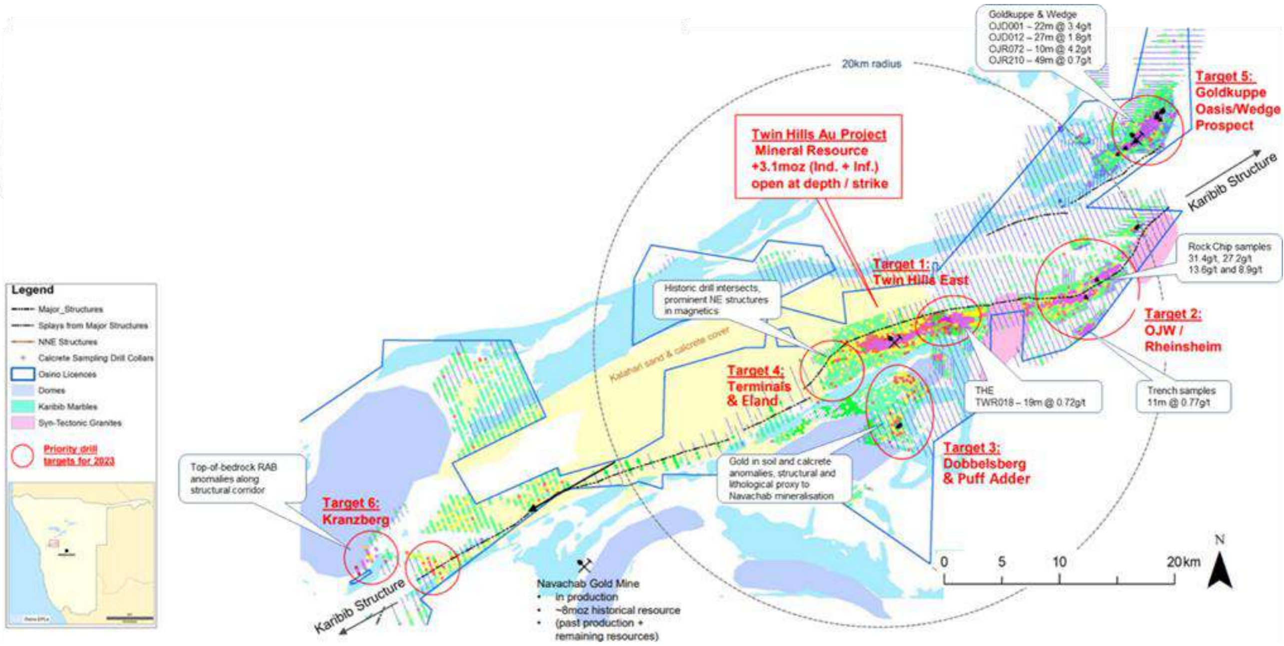


Table 26.1.1 Planned Exploration Drilling

Target name	Planned Meters (RC)	Planned Meters (DD)	Priority	Targeting Vectors
Twin Hills East	1000	1200	1a	Hosted along Karibib Fault extension from Clouds, follow-up on geochemical and magnetic anomalies.
Rheinsheim	800	600	1b	Karibib fault extension along preferential lithologies, follow-up geochemical and drill anomalies.
OJW South	600	400	1c	Secondary structure parallel to the Karibib fault within preferential lithologies, follow-up on surface geochemical anomaly.
Eland / Terminal	600	200	2a	Follow-up on potential western extension of Oryx mineralization along structural corridor.
Oasis	800	600	2b	Follow-up of surface geochemical and drill anomalies on north-south structures.
Puff Adder	0	600	2c	Eastern end of anticline hosting Navachab gold mine. Geochemical anomaly.
Kranzberg	800	0	2d	Bedrock geochemical and magnetic anomaly along highly strained structural corridor associated with the Karibib Fault.
West End	600	0	3a	Splays along the Karibib Fault south-west of THW.
OJW	0	400	3b	Karibib Fault extension along preferential lithologies, follow-up trench geochemical anomalies.

Target name	Planned Meters (RC)	Planned Meters (DD)	Priority	Targeting Vectors
Dobbelsberg	0	400	3c	Eastern end of anticline hosting Navachab gold mine. Surface geochemical anomaly associated with fold closure hosted within preferential lithologies.
Total	4,200	4,400		

26.1.4 Exploration Budget

Osino has compiled a working budget, based on actual costs incurred to date, for the completion of its exploration and infill drill program. The unit costs and total costs are provided in Table 26.1.2.

Table 26.1.2 Exploration, Project, and Mineral Resource Drilling Budget (C$)

Drill project	Total metres	Diamond (m)	RC (m)
Resource infill	9,000	4,000	5,000
Exploration	8,600	4,400	4,200
Project (Hydro, Geotech, Metallurgy, Condemnation)	7,000	2,000	5,000
Total	**24,600**	**10,400**	**14,200**
Drill project	**Total (C$)**	**Diamond (C$)**	**RC (C$)**
Resource infill	1,054,000	644,000	410,000
Exploration	1,052,800	708,400	344,400
Project	732,000	322,000	410,000
Total	**2,838,800**	**1,674,400**	**1,164,400**
Unit costs (C$)			
Diamond	$128/m		
RC	$53/m		
Assay	$24/m		
RC consumables	$5/m		
Diamond consumables	$9/m		

26.2 Mineral Resource Estimate

Infill drilling is recommended to upgrade the classification of the Inferred Mineral Resource. Inferred Mineral Resources are generally located at the bottom of the reporting pit shell and pose a low risk.

Additional closer spaced infill drilling will be required for classifying Measured Mineral Resources. Measured Mineral Resources are generally favourable in the payback area and will have to be assessed based on future requirements.

26.3 Pit Geotechnical

Based on the design check completed on the pit design "osino_th_dfs_apr_reserve_v04", the QP for the feasibility study recommendations that the following adjustments are investigated for implementation in the next pit design iteration listed as follows:

- Some batter angle design adjustments are required however this will not change the stack and overall angles, and adjustments are to be made in line with the updated design table.

Table 26.3.1 Summary of Slope Design Recommendations for the Twin Hills Pits

	Slope Height m	Bench Height m	Toe to Crest Stack Angle °	Stack Height m	Batter Angle °	Berm Width m	Toe to Toe IRA °	Geotechnical Berm Width m
Weathered	50	10	46	50	70	7.6	42	15
TH Bulge North Unweathered	350	10	60	50	70	2.8	57	15
		10	63	50	80	4.2	59	15
TH Bulge South Unweathered	350	20	63	60	80	9.9	56	15
TH BN North Unweathered*	50	10	55	50	70	6.6	50	15
TH Central North Unweathered	250	10	60	50	70	2.8	57	15
		10	63	50	80	4.2	59	15
TH Central South Unweathered	250	20	63	60	80	9.9	56	15
THC East End	250	10	63	50	80	4.1	60	15
Clouds N	170	10	60	50	80	5.0	56	15
Clouds W	170	10	60	50	70	5.0	56	15
Clouds S	170	10	60	50	80	5.0	56	15
THW Oryx Pit North	100	10	60	50	70	2.7	58	15
THW Oryx Pit South	160	10	60	50	80	5	56	15

- THC and TH Bulge South stacks have steeper toe-to-crest angles due to the 50m stack heights and 20 m bench heights (double benches). This can be corrected by increasing the stack heights. Increased stack heights are permissible due to the wide berm widths with the 20 benches.

- THC and TH Bulge North have narrow geotechnical berms when adjacent to ramps. This is generally acceptable except for the 1120 m berm. This is required to break the high stack on the N side where there are more than three benches above or below the berm.

- Single ramp access has been designed, a double ramp access is recommended for the deep THC and Bulge pit area, due to the potential for structurally controlled failures, and the weak zones identified in the core.

26.4 Mining

Qubeka recommends the following further detailed mine planning work to be undertaken:

- Owner mining vs contractor mining trade-off study.

- Run Whittle sensitivities on Twin Hills West to optimise waste to ore ratio.

- Owner vs MARC equipment maintenance trade-off study.

- Optimise pre-strip schedules and finger stockpile philosophy.

. • Waste dumping plans and schedules to optimise PAF material containment.

26.5 Mineral Processing and Metallurgy

26.5.1 Metallurgical Test Work

Limited additional metallurgical test work is recommended to investigate cost optimisation and target improved plant availability. These work streams are:

- Confirmatory leach and tailings filtration testwork on Twin Hills transitional ore samples. In particular:

  - Confirmatory intensive leach tests on gravity concentrate should be considered

  - Leach recoveries for transitional ore to be confirmed

  - Vacuum disk filter tests will be repeated to confirm if this is a viable alternative to pressure filtration

  - Pressure and vacuum filtration test rates for transitional material will be used to confirm the maximum percentage of transitional ore possible in plant feed, with the objective of reducing pre-strip requirements and shortening plant ramp up period.

- Commission ore sorting tests as well as pilot gravity separation and intensive leach tests on composite samples of Ondundu mineralized material.

26.6 Process Plant

26.6.1 Site Geotechnical Investigations

Geotechnical test pits have been excavated in the general area of the process plant, surface infrastructure and tailings storage facility. In addition, geotechnical drilling was carried out within the expected extent of both the main pit and the TSF. This work was sufficient to support the PFS design work, but it is recommended for additional geotechnical drilling to be conducted in critical areas across the site with a specific focus on final location of the major crushing, milling and CIL equipment and of major infrastructure items. During this drilling phase, standard penetration tests and shelby sampling will be conducted to gain additional information on the softer variable cemented alluvium underlying the surficial hardpan calcrete. Continuous surface wave (CSW) testing will also be conducted in critical areas. Both the additional drilling and CSW testing should be carried out by Osino early in the definitive feasibility study (DFS).

26.6.2 Engineering

The following elements of the process plant design need to be reviewed and optimised during the Detail design or FEED, in addition to all the normal discipline design activities that will occur during the Detail design or FEED but were not part of the DFS scope:

- The possibility of partially excavating about seven metres down to hardpan calcrete for the primary crusher foundation, with ROM pad height reduced to about 13 metres, needs to be investigated.

- Possibility of reducing size of coarse ore stockpile to be investigated.

- All other foundations under the main process plant equipment items to be reviewed to be consistent with the latest geotechnical data for this area (also see Infrastructure recommendations).

- Possibility of using an alternative cyanide detoxification process to be considered, to reduce operating costs.

- Possibility of moving cyanide detoxification after tailings thickening to be investigated, to reduce cyanide losses and reagent consumption.

- Possibility of using vacuum disk filters instead of filter presses for tailings dewatering to be revisited. Objectives will be to reduce capital cost of the filters and increase availability so that the size and cost of the thickener underflow stock tanks can also be reduced.

- Investigation of different types and sources of steel balls for the ball mill should be done.

26.7 Infrastructure

26.7.1 General Site Infrastructure

The engineering details of the required infrastructure have been developed to a scale consistent with the level of accuracy of this FS. In progressing this Project into implementation, some items will require further work to confirm the selection of the proposed solution and more accurately define the associated costs.

Key infrastructure areas for further investigation include:

- Geotechnical investigation to further develop construction requirements for the founding of heavy and dynamic structures in the Process plant.

- More detailed borrow pit investigations to try and reduce costs for opening up of borrow pits and for crushing and screening. This will include the determination of available sand volumes for concrete works and for filter drains.

- The Lidar surveys as received had some errors and for the detail designs, a proper survey of the construction areas needs to be provided to ensure engineering designs are done to the correct survey models. This may include the construction of survey beacons and calibration of the survey to the beacons for construction purposes.

- Osino to confirm with Karibib town council that serviced plots can be provided to the construction contractors and that they will be permitted to establish temporary accommodation camps on the plots for the duration of the project construction period.

- The application process to reroute DR1941 needs to proceed. A Namibian Contractor and a design engineer familiar with working with the Roads Authority of Namibia should be appointed as soon as possible, since it will be an integrated process to get the road constructed to the satisfaction of the Roads Authority.

- Permits for all boreholes must be obtained from the Namibia Department of Water Affairs.

- Layouts of all buildings for offices, warehouses, stores, workshops, etc. to be reviewed from a sustainability perspective. The aim will be to increase the use of local construction materials where it is not being used already and where this does not increase costs.

- The fire protection and detection design needs to be designed by a Fire Consultant together with Osino’ s prospective insurers.

26.7.2 NamPower Erongo Substation Development

- Osino should continue to pursue the application already submitted to NamPower to amend the Power from 16 MVA to 30 MVA.

- Continued interaction with NamPower will be required to ensure and validate the development of their transmission network infrastructure, including the development of the Erongo Substation, proceeds according to plan and to match the Twin Hills project development schedule.

26.7.3 NamPower Twin Hills Switchyard and Consumer Substation Development

- The development of the Grid Connection facilities falling under the scope of Osino, should be prioritised according to the development plans in order to successfully mitigate any supply chain constraints and construction delays.

26.7.4 Alternative (Renewable) Power Supply

ECB advised Osino in June 2023 that their application to exceed 30% of total site power consumption from renewable sources was approved. At this stage, this does not include authorization to deliver excess power to the national grid. Investigations in the next phase of the project should therefore focus on a higher percentage of total site power to be supplied by a photovoltaic installation, supplemented by wind generation and potentially battery storage (BESS) as well.

Duration of site investigations and permitting of a wind power installation are concerns, hence it is recommended that the project continues to ensure that the full requirement for power supply can be sourced from the National grid if required.

Osino will continue to work with a short list of three potential renewable power partners to investigate the options above. Final selection of the independent power producer must be made during the FEED phase of the project, in conjunction with commercial negotiations surrounding the private power purchase agreement.

As the selected IPP will be responsible for the development of its own infrastructure, there are no further recommendations made herein regarding development of the solar PV plant.

26.7.5 Tailings Storage Facility (TSF)

The DFS study of the TSF was prepared by Knight Piésold. Their recommendations included the following actions in the next phase of the project:

- The formal classification of the TSF should be confirmed to be either 'Significant' or 'High' according to Global Industry Standard on Tailings Management (GISTM, 2020) environmental classification.

- Potential for acid and arsenic seepage into groundwater was identified. The TSF must be lined with a composite liner system to prevent any such seepage and mitigate potential seepage through the liner. A composite liner with geomembrane and crushed calcrete was proposed during the DFS and included in the cost estimates. Osino will need to make available or generate new samples of tailings and provide samples of site calcrete so that this concept and the expectation that calcrete will react and expand when it comes into contact with potentially acid forming tailings material can be tested under the supervision or monitoring of a suitably qualified engineer.

- The Phased construction philosophy should be retained but optimised to reduce the Phase 1 footprint and expenditures.

- The Phased design approach should optimise and detail the design for closure strategy minimizing overall cost and addressing operating and closure objectives such as long term erosion control, dust mitigation and geochemical stabilization.

- More work should be done to evaluate the tailings lift thickness, compaction effort and cost required to ensure stable condition during operation and advancement of the conveying system. This should consider various tailings placement conditions and related operating requirement.

26.8 Hydrological Studies

26.8.1 Surface Water

Recommendations for the site surface water management are summarized as follows:

- Complete a detailed topographic survey (1 m contours accuracy) of the Okawayo catchment area and update hydrological and hydraulic models to assess the potential runoff and peak runoff for various flood events. This should also include the B2 highway crossing and location of roadway water crossings along the Okawayo catchment.

- Integrate and detail the overall site water management to include mining infrastructures / dewatering, downstream infrastructures such as roads, utilities, and final landscape of waste rock dumps. Detailed design should include:

  - Accurate sizing of canals, flood protection berms and storage containment facilities

  - Detailed stormwater design plan around the mine pit infrastructures development.

- Complete detailed design of the Okawayo flood mitigation measures with detailed peak flood assessment upstream and downstream of the structures, transient analysis and operational and environmental impact of various flood conditions on the downstream environment. This should consider a stepped development of the pit and details of flood protection berms, pit water management landscapes (pit lake), other site water management structures and dewatering capacity.

- Complete a sediment transport model and impact assessment for various conditions as part of the detailed design.

- Consider the mine development activities (phased development) and detailed infrastructures in a flood risk assessment, operational and emergency procedure requirement to mitigate risk.

- Complete as part of the detailed design additional geotechnical investigation to detail the founding conditions of the diversion structure and spillway discharge channel, as well as required suitable erosion protection measures.

26.8.2 Groundwater

It is recommended to advance the following scope of work to consolidate the water supply and model assessment.

- Investigative drilling and testing targeting old faults, late faults and dykes for pit wall characterization and ongoing groundwater exploration.

- Installation of additional piezometers and VWTs (optimisation on other drilling programs) to increase the confidence level in the model.

  - Located between the WRD and pits for the Twin Hills Central Pit and the Clouds Pit

  - Train dedicated personnel to download the VWT data quarterly

  - Analyse the long-term seasonal trends for pre-mining and once mining commences.

- Test pump the newly drilled boreholes (SLR 2023) to the west of the mine.

- One round of the samples to be collected during the dry season and wet season from groundwater and surface water (including rainfall) for stable isotopes and tritium to refine the recharge estimates to groundwater better.

- Geochemical testing of suitable materials as sub-drainages for the TSF and WRD, for neutralisation potential.

- Feasibility design of a combined surface water flood mitigation structure / sub-surface sand dam in the Okawayo tributary upgradient of the mine area as a dual purpose to enhance recharge to the upper contact of the marble unit.
  - Tracer testing in the Okawayo tributary Valley
- Update the numerical model predictions using the LOM, closure, and post-closure plans according to the latest data and mine designs, including pore pressure distributions according to geotechnical domains, and extreme climate conditions and the following scenarios:
  - Use kinetic testing results to update the contaminant flow model and predictions
  - Include additional production well WW2060179 (SLR 2023)
  - Update the MAR simulations with data obtained from additional fieldwork and include the simulation of the flood mitigation structure / sub-surface sand dam on inflows into the pit along the Okawayo tributary structure with water diversion and storage to Clouds West Pit once it is mined out in Year 1
  - The Khan River sand river dams with groundwater recharge sites to increase sustainability of groundwater abstraction on site with excess seasonal water to be used directly in the plant process.

26.8.3 Water Supply Options

Based on the DFS water study conclusions, the project design should continue to specify site boreholes and open pit dewatering as the main sources of make-up water for processing and dust control. The following recommendations are further made for detailed design and advancement of the water supply scheme in order to increase reliability, sustainability and flexibility in the water supply.

- Continue monitoring and calibrating groundwater models and site instrumentation to increase the confidence in groundwater and pit dewatering estimates.
- Continue investigating potential site managed aquifer recharge projects such as the Karibib Marble and Khan River areas to increase sustainability of the water supply.
- Investigate additional other bulk water schemes a to alleviate reliance on a single source supply including:
  - NamWater scheme bulk supply: an investigation into the sustainable yield of the Kranzberg aquifer indicates significant alluvial aquifer potential

- Karibib wastewater scheme supply: This option is being investigated in partnership with the town council and could supply up to approximately 150,000 m^3/year at current population estimate to 200,000 m^3/year depending on the population growth.

26.8.4 Water Balance

The site water balance shows that there is sufficient water from boreholes and pit dewatering on site to supply the operation throughout the life of mine. This is dependent on the tailings filtration circuit being retained, producing filter cake that contains not more than 16% moisture.

26.9 Sustainability

While the effort required to ensure that Osino prioritizes sustainability in all that it does is considerable, the opportunities that this focus could bring are likely to outweigh the costs and sacrifices that would have to be made to get there. Thus, while Osino is already well advanced on its sustainability journey, there is much that the Company can still do to accelerate this process. Key recommendations include:

- Operational readiness gap assessment: A detailed sustainability-related operational readiness gap assessment will be undertaken during the front-end engineering and design stage.

- Sustainability governance and management: In preparation for construction and operations, a suite of additional policies and procedures need to be finalized or implemented and rolled out. Topics these plans, policies and procedures should cover include: Sustainability, anti-bribery and corruption, whistleblowing, human rights, water use, responsible land use, climate change, employment equity and diversity, harassment, local employment and procurement, and recruitment and selection.

- Health and Safety: Osino should continue building on its strong foundation of health and safety management and ensure excellent systems are put in place at the outset of mine construction to embed this into the culture. Ongoing work aligning with best industry practices will be a priority.

- Community assessments and studies: Additional community assessments and studies, which are already planned, need to be rolled out. These present the opportunity to improve the Company's relationships in the community and will enhance its license to operate. A good understanding of host community needs and impacts, could also enable effective plans to be implemented.

- Responsible sourcing: This is a key component of our sustainability ambitions, enabling us to prioritise ethical and responsible decision making when purchasing goods and services. A responsible sourcing procedure is currently being tested on with a few key suppliers. This procedure will be rolled out over the next few months.

- Climate change strategy: Osino is currently in the process of completing an initial assessment based on the Task Force on Climate-related Financial Disclosure (TCFD) as a first step towards developing a comprehensive climate change strategy. This will be put in place, taking into consideration the governance, strategy, risk management and metrics and targets recommended by the TCFD.

26.10 Environmental and Social

- Ensure that the robust monitoring continues for surface and groundwater prior to and during construction, throughout operations and post-closure.

- Complete the update on the ESIA amendment to reflect the additional mitigation measures adopted as a result of the ongoing studies completed for the Project.

26.11 Rehabilitation and closure

It is recommended to regularly update the mine closure plan incorporating detailed geochemical characterisation, and update plans, with ongoing stakeholder input into post-closure beneficial land uses.

26.12 Next Steps in Project Implementation

26.12.1 Additional Drilling

It is recommended that additional exploration drilling to be performed according to Table 26.11.1. It is also recommended that additional resource drilling aimed at increasing the confidence of the Mineral Resource.

26.12.2 Front End Engineering Design (FEED)

Osino issued a competitive request for proposal to two engineering contractors in February 2023 for a FEED package to be completed in the period July to December 2023. Evaluation of the bids has been completed and an order will be placed on one company in July 2023.

The main objective of the FEED will be to ensure that all critical path activities for the second half of 2023 will be completed on time, enabling the project implementation phase to commence in January 2024 with planned project completion date of January 2026.

The main FEED activities recommended are:

- Complete those investigations proposed by the DFS consultants that are directly required for project design to progress.

- Complete additional metallurgical testwork, specifically but not exclusively related to tailings filtration and reactivity of filtered tailings and crushed calcrete.
- Process Plant and infrastructure designs will be optimised based on latest information available.
- Procurement documentation for long lead equipment items will be prepared and budget prices will be re-validated, to enable orders to be placed early in 2024.
- Technical and commercial discussions will be significantly advanced with major construction contractors identified to have the most competitive offers during the DFS as well as the short-listed Mining Contractors and Independent Power Producers.
- The core Owner's and EPCM project teams will be established, and local Namibian consultants will be appointed for certain tasks requiring specific local knowledge.
- Design standards, procedures and specifications, a detailed schedule, a control budget estimate and a construction plan for project implementation will all be developed.
- The Risk register for the project will be updated and mitigating actions will be initiated wherever possible,
- Detailed planning and possibly site preparation related to earthworks will commence.
- Osino will directly coordinate permitting, design and possibly construction work associated with the relocation of the National access road to the site and the 66kV power line from the Erongo substation.
- Osino will set up an active coordination mechanism with NamPower to ensure that progress on the Erongo Substation project is correctly understood by the Twin Hills team.
- Osino will finalise negotiations with the Karibib Town Council concerning serviced land for the Twin Hills construction camps.

The budget for the FEED package is estimated at US$2.1 million, constituted as follows:

Table 26.12.1 FEED Package

Item	US$
Resource Evaluation	70 000
Hydrogeology	110 000
Civil Geotechnical Study	100 000
Environmental	80 000

Item	US$
Metallurgical Testwork	110 000
Plant and Infrastructure Design	1 300 000
Mine Planning and Optimisation	70 000
Operational Readiness Consultants	100 000
Power and Water Investigations	90 000
Tailings Design	50 000
TOTAL	**2 080 000**

26.12.3 Operational Readiness (OR) Planning

Detailed planning of Operational Readiness activities required during project implementation will take place. In addition, the most urgent OR activities will be implemented in this phase of the Project, including the following:

- Confirmation of Namibian salaries and complements for the proposed Operational structure of the Twin Hills mine, process plant and infrastructure. Recruit the Osino Project Director for the EPCM implementation phase, COO and/or Country Manager, HSE Manager, Security Manager and Procurement Manger.
- Prepare the project and operational IT strategy and define ERP system requirements.
- Continue establishing all necessary secondary permits for the Project.
- Develop the process plant operating model.
- Identify and commence drafting of operational policies and procedures for the plant.
- Develop the metallurgical accounting operational philosophy and strategy.
- Develop the organisational structure and operating model for the Engineering work group.
- Ensure the next stage of design reviews and HAZOPs take place.
- Set up the Company’s document management systems.
- Set up the Company’s change management systems.
- Appoint the contract analytical laboratory company.
- Prepare the overall Namibian administration strategy.
- Prepare the overall Company training strategy.

- Put in place the legal HSE appointments for all Osino departments.
- Set up office space for the Owner's project team as well as for Administration at site.
- Confirm policies and procedures for employee payment and allowances.
- Develop and implement a purchase order system.
- Confirm financial levels of authority and approval procedures.
- Establish additional financial facilities.
- Refine and adopt legal policies and guidelines.
- Update the corporate vision and strategic business plan.
- Define requirements for a management information system.
- Develop a contractual risk management strategy.
- Refine the local employment strategy.
- Refine the corporate social investment strategy.
- Identify additional special community and stakeholder projects.
- Develop a consolidated set of corporate policies and procedures.
- Roll out change management and risk management strategies.
- Develop general and access control security strategy, standards, and protocols.
- Establish security cooperation with local authorities.
- Prepare emergency procedures.
- Optimise physical security infrastructure requirements.
- Define time & attendance system requirements.
- Confirm other security and communication equipment requirements.
- Optimise SDG strategy.

- Prepare a sustainability policy document.
- Prepare all other SDG policies.
- Develop a logistics strategy for imports and exports.
- Determine the structure and size of the operational readiness implementation team and recruit key personnel.
- Prepare Owner’s team budgets for 2024.

The Project FEED team will assist with a few of these activities, but in most cases, they will take place in parallel with FEED, under the direction of Osino operational management.

Additional costs for the OR planning not included in the FEED is mainly related to salaries of Osino personnel and will amount to approximately US$1 million.

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28.0 QP CERTIFICATES

Certificate of Qualified Person – Robert Armstrong

In connection with the Technical Report entitled, “Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report” dated effective June 12, 2023 (the "**Technical Report**") which was prepared for the issuer, Osino Resources Corp. ("**Osino**"), I, Robert Armstrong, do hereby certify that:

1) I am a Principal Consultant and Partner of SRK Consulting South Africa (Pty) Ltd., at 265 Oxford Rd, Illovo, Johannesburg, Gauteng, 2196, South Africa (telephone: +27 11 441 1111, email: johannesburg@srk.co.za).

2) The Technical Report to which this certificate applies is titled, “Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report” dated effective June 12, 2023.

3) I hold a BSc (Hons) degree in Mining and Expiration Geology from The University of the Witwatersrand (South Africa), and am a Fellow in good standing of the Geological Society of South Africa, a Member in good standing of the South African National Institute of Rock Engineering, a holder of a South African Chamber of Mines Rock Engineering Certificate and a registered Professional Natural Scientist (PrSciNat) with the South African Council for Natural Scientific Professions (SACNASP, membership number 400073/09). My experience includes 20 continuous years in the mining industry. I am familiar with National Instrument 43-101 ("**NI 43-101**") and, by reason of education and experience in project and operational mining geotechnical studies, and professional registration, I fulfill the requirements of a Qualified Person as defined in NI 43-101.

4) I have visited the Twin Hills Gold Project in Namibia on the 26th of February, 2022.

5) I am responsible for Section 12.4, 15.3, 15.4, 15.5, 25.13, 25.18.10, and 26.3 of this Technical Report.

6) I am independent of the issuer as described in section 1.5 of NI 43-101.

7) I have had no prior involvement with the properties that are the subject of this Technical Report.

8) I have read NI 43-101 and the parts of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.

9) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for, contain all scientific and technical information that is required to be disclosed and to make the Technical Report not misleading.

Dated this 5th day of July, 2023.

Robert Armstrong, FGSSA, COMREC, PrSciNat
Principal Consultant
SRK Consulting South Africa (Pty) Ltd.

Certificate of Qualified Person – Paul-Johan Aucamp

In connection with the Technical Report entitled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" with an effective date of June 12, 2023 (the "**Technical Report**") which was prepared for the issuer, Osino Resources Corp. ("**Osino**"), I Paul-Johan Aucamp, do hereby certify that:

1) Since 2012, I have been employed as a Principal Engineering Geologist with SRK Consulting (South Africa) (Pty) Ltd ('SRK Consulting'). 265 Oxford Road, Illovo, Johannesburg, (telephone: +27 11 441 1162, email: paucamp@srk.co.za).

2) The Technical Report to which this certificate applies is titled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" with an effective date of June 12, 2023.

3) I am a Member of the:

- The South African Council for Natural Scientific Professionals (SACNAP membership number 400422/04)
- The South African Institute of Engineering and Environmental Geologists (SAIEG membership number 96/182)

4) I am a graduate of the University of Pretoria and hold an MSc degree in Engineering and Environmental Geology.

5) I am a practising Engineering Geologist and have practised in my profession continuously since 1996, and my relevant experience for the purpose of this Technical Report is as follows:

- Numerous civil geotechnical assessments for existing and new mining ventures on the African continent. I have worked in Sierra Leone, Tanzania, Zambia, Mozambique, Zimbabwe, Namibia and South Africa performing similar work as for this assessment.

6) I have read the definition of "Qualified Person" set out in National Instrument 43-101 ("**NI 43-101**") and by reason of my education, affiliation with a professional association (as defined in NI 43-101), and past work experience, I fulfill the requirements of a Qualified Person as defined in NI 43-101.

7) I personally visited the Twin Hills Gold Project in Namibia between 12 and 15 January 2021 and 08 to 13 June 2023.

8) I am responsible for and have contributed to this Technical Report and the following sections of this Technical Report: Section 12.6 (Data Verification), 18.2.2 (Site Geotechnical Investigations and Assessment), Section 25.9, 25.18.6 (Interpretation and Conclusions) and Section 26.6.1 (Recommendations).

9) I am independent of the issuer as described in section 1.5 of NI 43-101.

10) I have had no prior involvement with the properties that are the subject of this Technical Report.

11) I have read NI 43-101 and the parts of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.

12) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for, contain all scientific and technical information that is required to be disclosed and to make the Technical Report not misleading.

Dated this 5th day of July, 2023.

"signed and sealed"
Paul-Johan Aucamp, MSc, Pr Sci Nat
Principal Engineering Geologist / Partner
SRK Consulting (South Africa) (Pty) Ltd

CERTIFICATE OF QUALIFIED PERSON

Veronique Daigle, Eng./Pr. Eng.

11 Nelson Mandela, Klein Windhoek, Windhoek, Namibia
PO Box 86062, Eros, Windhoek
Telephone: +264 811700824
Email: vdaigle@knightpiesold.com

To Accompany the Report entitled:

"Definitive Feasibility Study of Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report", prepared for Osino Resources Corp., dated 12 June, 2023.

I, Veronique Daigle, Eng., Pr.Eng. do hereby certify that:

1) I am a Lead Engineer and Director of Knight Piésold Consulting (Pty) Ltd (NamibianRegistration 2008:0657);

2) I am a graduate from Université de Sherbrooke, Sherbrooke, Canada, from 2006 with a Civil Engineering Degree (Cooperative Program), and I have practised my profession continuously since that time;

3) I am a registered member of the Engineering Council of Namibia, and Registered as Professional Engineer (license number PE2017-19) since 2017. I am also I am a member in good standing with the South African Committee on Large Dams, the Canadian Dam Association, and the Ordre des Ingénieurs du Quebec, Canada (member no 143 74);

4) I have worked as an engineer continuously since graduation from university in 2006. My relevant experience includes 17 years of continuous experience in tailings, geotechnical engineering and water management employed at Knight Piésold. In that time, I have been involved in preliminary and feasibility studies design, construction, operational review, risk analysis, and dam safety inspection of mining dams through North America, Western and Southern Africa, the Middle East and Europe.

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 by 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 have participated in the preparation of the report entitled "Twin Hills Definitive-feasibility Study, National Instrument 43-101 Technical Report", prepared for Osino Resources Corp., dated June 12, 2023, under Knight Piésold Consulting (Pty) Ltd (Namibia). I have participated, and I am responsible for sections 1.9, 12.7, 18.7, 18.8, 25.6, 25.18.4, and 25.19.4.

7) I have visited the Twin Hills project site and the proposed waste management facilities;

8) I have no prior involvement with the property;

9) I state that, as the date of the certificate, to the best of my qualified 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;

10) I have no personal knowledge, as of the date of this certificate, of any material fact or material change which is not reflected in this Technical Report;

11) I am independent of the issuer as defined in section 1.5 of NI 43-101;

12) I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form;

13) That, at the effective date of this technical report, to the best of my knowledge, information, and belief it contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

This 5th day of July, 2023.

Original signed and sealed

(Signed) "Veronique Daigle"

Veronique Daigle, Eng., Pr. Eng.

CERTIFICATE OF QUALIFIED PERSON

I, Georgi Doundarov, M.Sc., P.Eng., PMP, CCP, as an author of this technical report entitled "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023 (the "**Technical Report**"), which was prepared for the issuer, Osino Resources Corp. ("Osino"), do hereby certify that:

1) I am a Senior Study Manager with Lycopodium Minerals Canada Ltd. My office address is Suite 700, 5090 Explorer Drive Mississauga, ON L4W 4T9, Canada

2) I am a graduate of the University of Mining and Geology, 1996 with a M.Sc degree in Mineral Processing and Metallurgy as well as a graduate from the Yokohama National University, Yokohama, Japan, 2005 with a M.Sc. degree in Infrastructure Management - Mineral Processing and Metallurgy.

3) I am a Member of the Professional Engineers Ontario (PEO) and registered as a Professional Engineer in the province of Ontario with a number 100107167. I have worked as a metallurgical engineer and project manager for a total of over 25 years years since my graduation. My relevant experience for the purpose of the Technical Report is:

   - review and report as a consultant on numerous process facilities and mining projects around the world for due diligence and regulatory requirements;

   - Study Manager on a number of feasibility studies and detailed designs in the gold industry in Africa, Australia and Asia;

   - Lead metallurgist at a number of gold mines in Africa, Australia and Asia; and

   - development, execution and interpretation of a number of testwork programs in gold, copper, base metals and iron ore.

4) 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.

5) I have not visited the site of the Twin Hills Gold Project.

6) I am responsible for all of preparation of Sections 1.8.1; 1.11; 1.12; 1.13; 2; 3; 12.11, 18.1; 19; 21; 22; 24; 25.1; 25.15; 25.16; 25.17; 25.18.1; 25.18.5; 25.18.12; 25.19.8; 26.9; 26.12; and 27 of the Technical Report.

7) I am independent of the issuer as described in section 1.5 of NI 43-101.

8) I have no prior involvement with the properties that are the subject of this Technical Report.

9) I have read NI 43-101, and the parts of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.

10) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for, contain all scientific and technical information that is required to be disclosed and to make the Technical Report not misleading.

Dated this 5th day of July, 2023.

"*signed*"

Georgi Doundarov, P.Eng., PMP, CCP

CERTIFICATE OF QUALIFIED PERSON

Diana Duthe, M.Sc., Pr. Sci. Nat.

Knight Piesold (Pty) Ltd.
1 Discovery Place, The Ridge, Sandhurst, Sandton, South Africa
Telephone: +27(11) 8067111
Email: dduthe@knightpiesold.com

In connection with the Technical Report entitled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023 (the "**Technical Report**"), which was prepared for the issuer, Osino Resources Corp. ("Osino"), I, Diana Duthe MSc, Pr. Sci. Nat. do hereby certify that:

1) I am a Lead Hydrogeologist for Knight Piesold (Pty) Ltd., at 1 Discovery Place, The Ridge, Sandhurst, Sandton, South Africa;

2) The Technical Report to which this certificate applies is titled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023;

3) I am a graduate from the University of the Witwatersrand, South Africa, 1985 with a BSc. Hons in Geology, and I have practised my profession continuously since that time;

4) I am a graduate from the University of Neuchatel, Switzerland 1991 with a M.Sc. in Hydrogeology, and I have practised my profession continuously since that time;

5) I am a registered member of the Professional Registration of South African Council for Natural Scientific Professions (SACNASP) Number 400091/01, and I am a Member of the Groundwater Section of the South African Geological Society (GSSA);

6) I have worked as a scientist continuously since graduation from university in 1985. My relevant experience for the purpose of the Technical Report is over 30 years of consulting in the field of Geology, Geochemistry and Hydrogeology;

7) 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 by NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;

8) I am responsible for the following sections of this Technical Report: 12.9, 18.4, 18.5, 25.12, 25.18.7, 25.18.8, 25.18.9, and 25.19.6.

9) I have personally visited Twin Hills Gold Project in Namibia on the 2^{nd} and 3^{rd} of February 2022;

10) I am independent of the issuer as defined in section 1.5 of NI 43-101;

11) I have no prior involvement with the properties that are the subject of this Technical Report;

12) I have read NI 43-101, and the parts of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101; and

13) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for, contain all scientific and technical information that is required to be disclosed and to make the Technical Report not misleading.

Dated this 5^{th} day of July, 2023.

Signed and sealed

(Signed)

Diana Duthe, M.Sc., Pr. Sci. Nat.

Certificate of Qualified Person – Anton Geldenhuys

In connection with the Technical Report entitled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023 (the "**Technical Report**") which was prepared for the issuer, Osino Resources Corp. ("**Osino**"), I, Anton Geldenhuys, do hereby certify that:

1) I am a Principal Consultant of CSA Global South Africa (Pty) Ltd., at Woodlands Office Park, Woodlands, Sandton, Gauteng, 2148, South Africa (telephone: +27 11 798 4300, email: info@csaglobal.com).

2) The Technical Report to which this certificate applies is titled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023.

3) I hold a BSc (Hons) degree in Geology from Rand Afrikaans University (South Africa) and an MEng from the University of the Witwatersrand (South Africa).

4) I am a Member in good standing of the Geological Society of South Africa and a registered Professional Natural Scientist (PrSciNat) with the South African Council for Natural Scientific Professions (SACNASP, membership number 400313/04). My experience includes 21 continuous years in the exploration and mining industry. I am familiar with National Instrument 43-101 ("**NI 43-101**") and, by reason of education, experience in exploration, mineral resource development and the evaluation of mining projects, and professional registration, I fulfill the requirements of a Qualified Person as defined in NI 43-101.

5) I have visited the Twin Hills Gold Project in Namibia during the period from March 28-31, 2021 and February 2, 2022.

6) I am responsible for the following sections of this Technical Report: Sections 1.1, 1.2, 1.3, 1.5, 4, 5, 6, 7.1, 7.2, 8-11, 12.1, 12.2, 12.3, 14, 23, 25.2, 25.18.2, 25.19.1, 26.1, and 26.2.

7) I am independent of the issuer as described in section 1.5 of NI 43-101.

8) I have had no prior involvement with the properties that are the subject of this Technical Report.

9) I have read NI 43-101 and the parts of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.

10) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for, contain all scientific and technical information that is required to be disclosed and to make the Technical Report not misleading.

Dated this 5th day of July, 2023.

"signed and sealed"

Anton Geldenhuys, MGSSA PrSciNat
Principal Consultant
CSA Global South Africa (Pty) Ltd.

CERTIFICATE OF QUALIFIED PERSON

I, Olav Mejia, P.Eng., as an author of this technical report entitled "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023 (the "**Technical Report**"), which was prepared for the issuer, Osino Resources Corp. ("Osino"), do hereby certify that:

1) I am a Manger of Process with Lycopodium Minerals Canada Ltd. My office address is 5090 Explorer Drive, Suite 700, Mississauga, Canada L4W 4T9.

2) I am a graduate of the University of San Marcos with a B.Eng. degree in Chemical Engineering and graduate of the University of British Columbia with a MASc degree in Mineral Processing.

3) I am a member of the Professional Engineers of Ontario and registered as a Professional Engineer in Canada with registration number 100602612. I have worked as a Chemical engineer and mineral processing engineer for over 25 years since my graduation. My relevant experience for the purpose of the Technical Report is:

   - Metallurgical and operational experience in copper and molybdenum concentrators and gold plant operation and gold plant designs within South America and North America

   - Lead process engineer on copper and gold projects ranging from testwork management, all phases of studies and detail design up to commissioning of numerous projects in Canada and Americas.

   - Lead process engineer on copper and molybdenum plants in Canada.

4) 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.

5) I have not visited the site of the Twin Hills Gold Project.

6) I am responsible for all of preparation of Sections 1.4; 1.7; 12.10; 13; 17; 25.5; 25.7; 25.18.3; 25.19.3; 25.19.5; 26.5; and 26.6.2 of the Technical Report.

7) I have no prior involvement with the properties that are the subject of this Technical Report.

8) I have read NI 43-101, and the parts of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.

9) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for, contain all scientific and technical information that is required to be disclosed and to make the Technical Report not misleading.

Dated this 5th day of July, 2023.

"*signed*"

Olav Mejia, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

Werner K Moeller [BEng (Mining), BEng (Hons) (Industrial), FAusIMM, MSAIMM, MCIM]

Unit 4, Trifft Corner, 19 Schinz Street, Klein Windhoek, Namibia
Telephone: +264 81 142 0000

In connection with the Technical Report entitled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023 (the "**Technical Report**"), which was prepared for the issuer, Osino Resources Corp. ("Osino"), I, Werner K Moeller, BEng (Mining), BEng (Hons) (Industrial), FAusIMM, MSAIMM, MCIM, do hereby certify that:

1) Since 2016, I have been a Director of Qubeka Mining Consultants CC at Unit 4, Trifft Corner, 19 Schinz Street, Klein Windhoek, Namibia, 9000 (telephone: +264 81 142 0000, email: werner@qubeka);

2) The Technical Report to which this certificate applies is titled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023;

3) I am a graduate of the University of Pretoria, South Africa and hold a Bachelor's Degree majoring in Mine Engineering (2001) and an Honours Degree majoring in Industrial Engineering (2002), and I have practised my profession continuously since that time;

4) I have the following foreign associations and membership designations:
   - Fellow of the Australian Institute of Mining and Metallurgy – FAusIMM nr. 329888
   - Member of the South African Institute of Mining and Metallurgy – MSAIMM nr. 704793; and
   - Member of the Canadian Institute of Mining, Metallurgy and Petroleum – MCIM nr. 708163;

5) I am a practising mining engineer and have practised in my profession continuously since 2002, and my relevant experience for the purpose of this Technical Report is as follows:
   - Operational experience on several mines in Africa, including in Namibia and three years at Rio Tinto's Rössing Uranium Mine;
   - Mine planning and study experience on a number of open pit projects, including QKR Namibia's Navachab Gold Mine and B2 Gold's Otjikoto Gold Mine; and
   - Project manager for feasibility studies throughout Africa;

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 by 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 responsible for the following sections of this Technical Report: Section 1.6, 12.5, 15.1, 15.2, 15.6 to 15.10, 16, 25.3, 25.4, 25.19.2, and 26.4;

8) I have personally visited Twin Hills Gold Project in Namibia on the 2nd and 3rd of February 2022;

9) I am independent of the issuer as defined in section 1.5 of NI 43-101;

10) I have no prior involvement with the properties that are the subject of this Technical Report;

11) I have read NI 43-101, and the parts of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101; and

12) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for, contain all scientific and technical information that is required to be disclosed and to make the Technical Report not misleading.

Dated this 5th day of July, 2023.

(Signed)

Werner K Moeller [BEng (Mining), BEng (Hons) (Industrial), FAusIMM, MSAIMM, MCIM]

Certificate of Qualified Person – Luke Towers

In connection with the Technical Report entitled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023 (the "**Technical Report**") which was prepared for the issuer, Osino Resources Corp. ("**Osino**"), I, Luke Towers, do hereby certify that:

1) I am an Associate of Environmental Compliance Consultancy, at Klein Windhoek, Wasserberg Park, 1 Jan Jonker Street, P.O. Box 91193, Namibia (telephone: +264 81 669 7608, email: info@eccenvironmental.com).

2) The Technical Report to which this certificate applies is titled, "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023.

3) I graduated from the University of the Free States, South Africa with a BSc Geology (Hons) in 2013 and a MSc Geohydrology in 2018, and have practiced my profession continuously internationally as a professional natural scientist for 8 years since 2013. I am a South African Council for Natural Scientific Professions registered professional member (Pr.Sci.Nat. nr 114418) and a member of the Groundwater Division of the Geological Society of South Africa (member nr. 8254).

4) I am responsible for the following sections of this Technical Report: Section 20 (Environmental Studies, Permitting and Social or Community Impact), and the related disclosure in Sections 1.10, 12.8, 20, 25.14, 25.18.11, 25.19.7, 26.10 and 26.11.

5) I have read National Instrument 43-101 ("**NI 43-101**") and the definition contained therein of "Qualified Person", and by reason of my education, professional registration and experience as a professional natural scientist, I fulfil the requirements of a Qualified Person as defined in NI 43-101.

6) I have not yet to date personally visited the Twin Hills Gold Project in Namibia.

7) I am independent of the issuer as described in section 1.5 of NI 43-101.

8) I have had no prior involvement with the properties that are the subject of this Technical Report.

9) I have read NI 43-101 and the parts of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.

10) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report that I am responsible for, contain all scientific and technical information that is required to be disclosed and to make the Technical Report not misleading.

Dated this 5th day of July, 2023.

"signed and sealed"

Luke Towers, MSc Geohydrology, Pr.Sci.Nat.
Environmental Compliance Consultancy, Associate

CERTIFICATE OF QUALIFIED PERSON

Robin Mark Welsh BSc Eng, Pr. Eng., SMSAIEE

21st Floor, 2 Long Street, Cape Town, 8000
Landline : +2721 285 0119 Mobile: +27 82 336 3751
Email: Rob.Welsh@draglobal.com

I, Robin Mark Welsh, BSc Eng, Pr. Eng, SMSAIEE an author of this technical report entitled "Definitive Feasibility Study of the Twin Hills Gold Project, Namibia, National Instrument 43-101 Technical Report" dated effective June 12, 2023 (the "**Technical Report**"), which was prepared for the issuer, Osino Resources Corp. ("Osino"), do hereby certify that:

1) I am a Senior Project Manager for DRA Projects Pty Ltd;
2) I am a graduate from University of Natal, Durban, South Africa, with a Bachelor of Science in Electrical Engineering (1991). and have practiced my profession continuously since 1991 and have gathered extensive operational and project experience relating to electrical engineering design, management of multi-discipline teams, including but not limited to, procurement, management of fabrication subcontractors, project budget and costs, installation, supervision and commissioning; My relevant experience for the purpose of the Technical Report is over 30 years of consulting in the field of Mining, Mineral Processing and Metallurgy, Project Management, Marketing, Costs and Financials;
3) I am a member and a registered Professional Engineer with the Engineering Council of South Africa (ECSA) (No. 990118), and I am a Senior Member of Southern African Institute of Electrical Engineering (SAIEE);
4) 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 by NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;
5) I visited the site on 15 November 2022
6) I have participated in the preparation of Sections 1.8.2, 18.2.1, 18.2.3 to 18.2.10,18.3, 18.4, 25.8, 25.10, 25.11, 26.7 and 26.8;
7) I have no prior involvement with the property;
8) I have no personal knowledge, as of the date of this certificate, of any material fact or material change which is not reflected in this Technical Report;
9) I am independent of the issuer as defined in section 1.5 of NI 43-101;
10) I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form;

11) That, at the effective date of this technical report, to the best of my knowledge, information, and belief it contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Dated this 5th day of July, 2023.

Original signed and sealed

"Signed"

____

Robin Mark Welsh BSc Eng, Pr. Eng., SMSAIEE