Project Summary – Winniperu Quarries

Potaro Mining Company

Submitted by: Pradeep Abdool CEO

The summary contains the following information as required by the EPA Act:

- **a non-technical explanation of the Project;**
- **the location, design and size of the project;**
- **the duration of the project;**
- **the possible effects on the environment.**

Summary

Potaro Gold Mining Company **(PGMC) –** Winiperu Quarry (the company) recognises the demand for aggregate, the current limitations of supply and the anticipated increase in demand from the emerging oil and gas sector and the expanding civil works and construction sector. As such the company seeks to obtain from the Guyana Geology and Mines Commission (GGMC) a Quarry License (QL) to develop a modern, large-scale quarry to meet the existing and projected demand for aggregate and boulders.

The area is approximately 80 Km south west of the capital city of Georgetown and the closest town is Bartica, some 16.39 Km south, all distances along terrestrial routes. The Phase 1 project will see stone extraction and construction of infrastructural works being conducted on Mining Permits GS23: R-423/000 and GS23: R-423/003 for the first five years of the project life. Subsequent extensions of the Quarry license will see stone extraction and construction of infrastructural works on GS23: R-423/001 and GS23: R-423/004.

The area is located opposite Baracara Quarries, on the left bank of the Essequibo River. The site is located 1.85 Km from the bank of the Essequibo River on Permits **R-423/000,001,003** and **004**. The 1.85 Km is STATE Property and is of benefit to the investor as it is also underlain by competent gabbro, exposed at the bank of the river. The properties bound an area of **4,726 acres**.

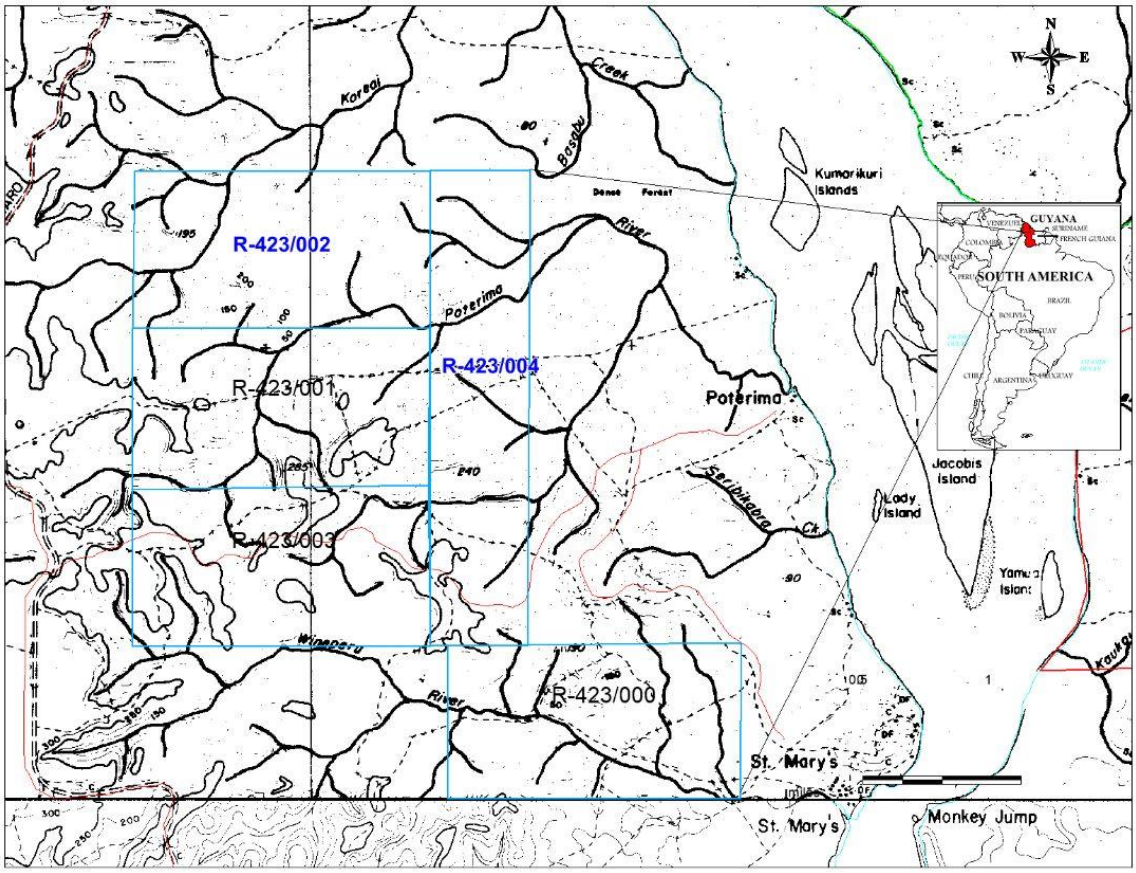

Figure 1: Location of PGMC-Winiperu Quarry

Mineral Tenure

The site is surrounded by mineral properties to the North, South and West, but the eastern section is vacant towards the Essequibo River. The mineral properties are prospecting permits but DO NOT encompass gabbro intrusions. ALL mineral properties are held for gold and quarriable materials added to the Mining Permits and Quarry License.

Geology

The area is characterized by the Bartica Assemblage, particularly the Bartica Gneiss. The GABBRO intrudes the gneiss, from Baracara Quarries in the East to the mineral properties R-423/000-004. The gabbro is mined by Baracara quarries. Gabbro is mafic, intrusive, coarse-grained rock with allotriomorphic texture. Gabbros contain mainly ferromagnesian minerals and plagioclase, the amount of ferromagnesian minerals equaling or exceeding that of the plagioclase. Gabbros are plutonic rocks formed by cooling and crystallization of molten magma trapped under the Earth's surface and chemically equivalent to extrusive basalt. The ferromagnesian minerals are pyroxene (diopside or diallage, augite and hypersthene), hornblende, and olivine, occurring either together or singly. The pyroxene in gabbros is mostly clinopyroxene (diopside and augite) with or without small amounts of orthopyroxene (hypersthenes). The feldspar in gabbros is chiefly calcic plagioclase, generally 50–60% labradorite [(Ca, Na)(Al, Si)4O8], and also plagioclase composition of bytownite to anortite. Gabbros are mostly dark colored, ranging between dark gray and greenish black because of the high proportion of ferromagnesian minerals. The rocks are at the turn of diorite in peridotite and pyroxenes according to the mineral and chemical composition. Gabbro with olivine is called olivine gabbro. If olivine gabbro does not contain pyroxene and is primarily composed of calcium plagioclase and olivine, it is known as troctolite. The type of gabbro that contains predominantly orthorhombic pyroxene (hypersthene) and the Ca–plagioclase is known as norite. It may also contain some olivine, and then it is olivine norite.

Density of the Gabbro ranges from 2.7 to 3.2 g/cm^3. Compressive strength is approximately 220 N/mm^2. The rock mass is competent and does not exhibit signs of fracturing.

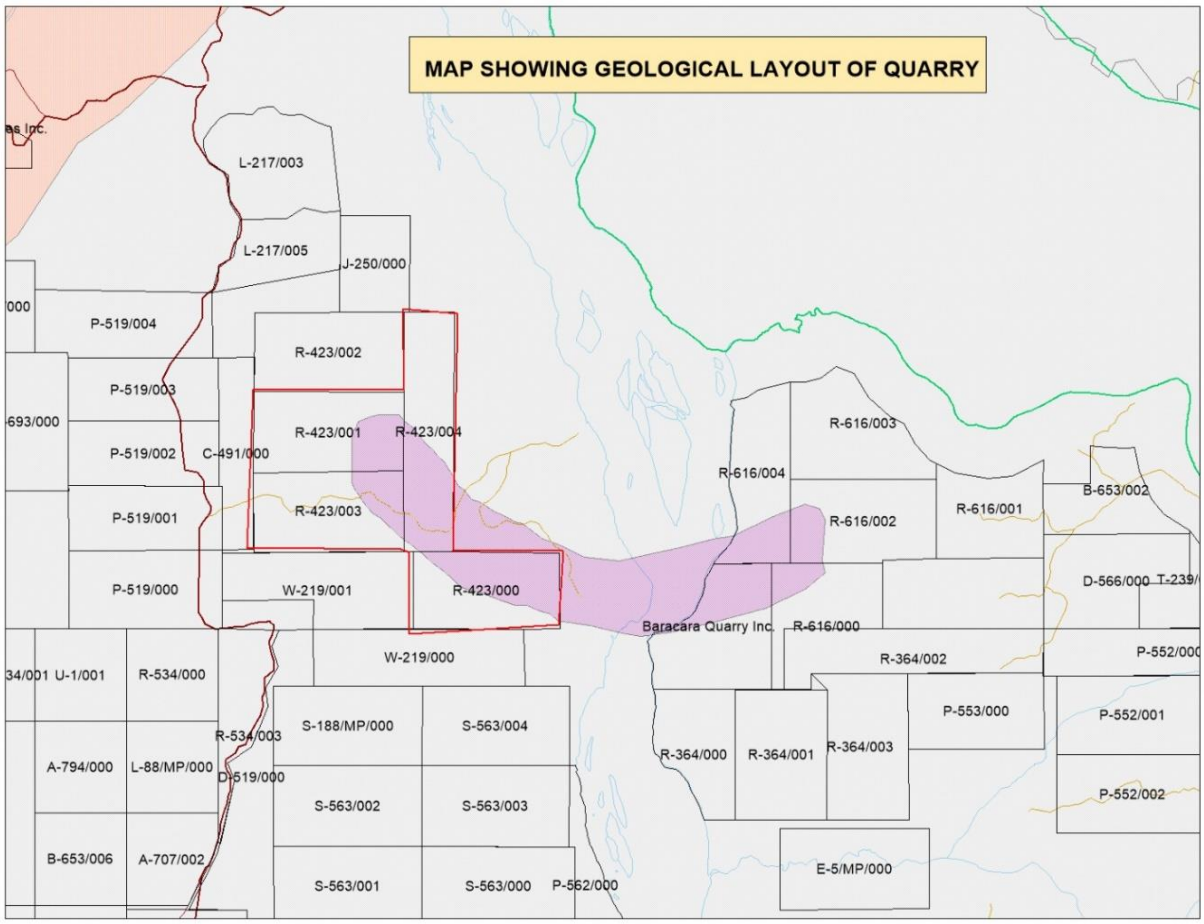

Figure 2: Geological layout of Quarry

POTENTIAL

The proposed project area possesses an inferred resource of **10,650,500** and indicated of 7,900,000 tonnes. It serves as a source of aggregates for the Sherriff Street – Providence road bypass and infrastructure development along the East Coast Demerara to West Coast Demerara. Possible export to the Caribbean can also be explored.

The capital investment in the project is US $3, 019, 324 but initial investment will be USD1,000,000 or GUY $206,000,000. Through the Project's capital investment and the initial life of five years, the estimated annual turnover is USD 2,939,247 (GUY $605,485,000). The Project will see about 50-66 employees for the life.

The production objective for the quarry is to produce rip rap and aggregate for the local market. Based on suitability, most of the rocks will be for aggregate in the initial phase of the 5-year life. Building material will also be produced based on mechanical properties of the rocks.

The development stages of the Project will consist of:

- Exploration/Design Phase – which will include drilling boreholes for the geotechnical and hydrogeological investigation and environmental surveys of the Project area;
- Construction Phase – which will include land clearing, over burden stripping and stockpiling, construction of quarry access roads, on-loading facility, office and camp facilities, and the procurement of the crushing plant;
- Operation Phase – which will include granite/gneiss excavation, ripping and blasting, rip-rap stockpiling, crushing aggregates, screening, on-loading, screening and barge transport;
- Closure Phase - based on extensions and future development of resources and reserves, once exploited, the buildings will be decommissioned, site clean-up, and rehabilitation.

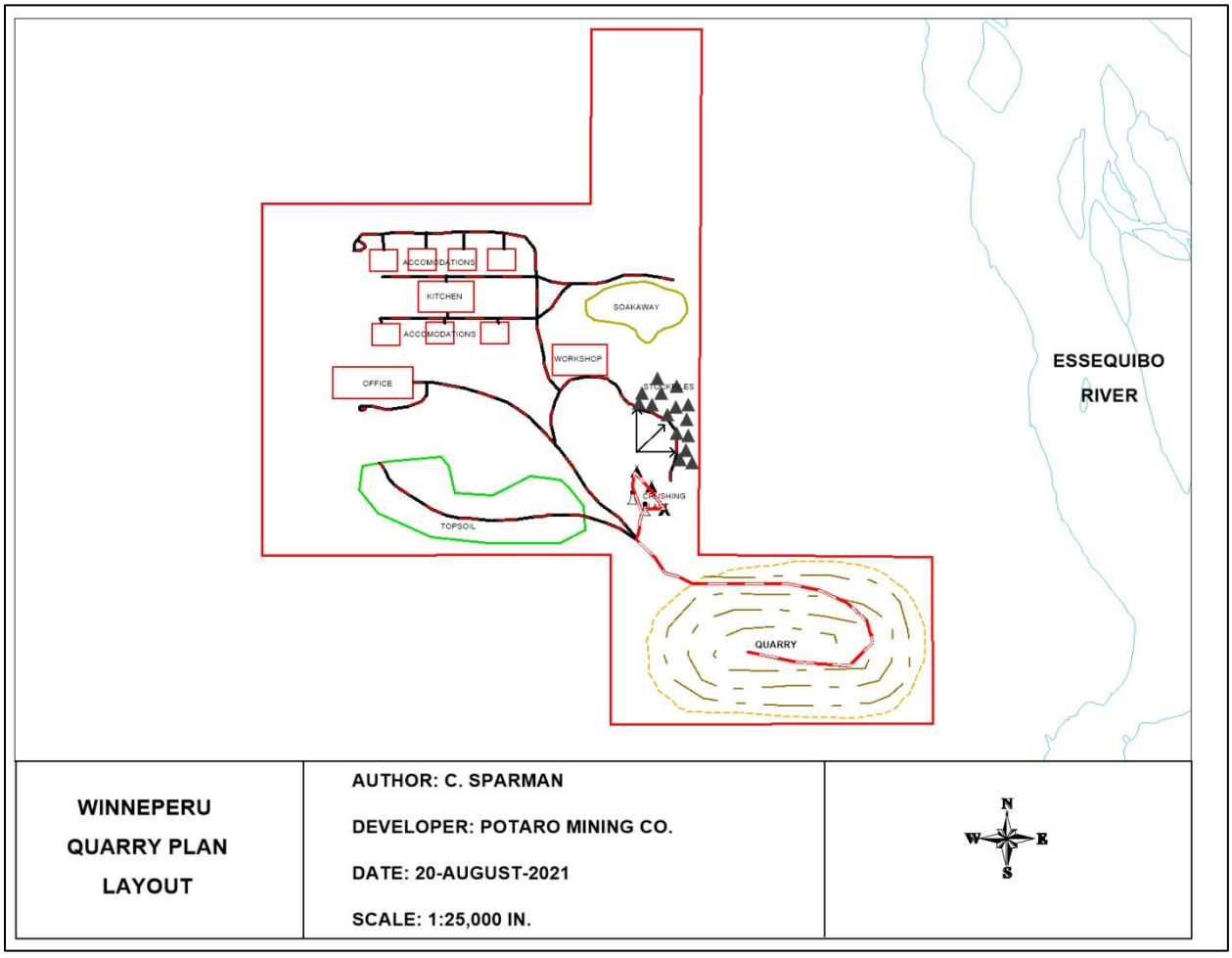

Figure 3: Site layout of Quarry

Mining Process Description

In order to estimate the total volume of stone reserves in the delineated area and in the area after stone exhaustion, the lowest quarrying level of -2.6 m was chosen., which still allows for the quarry floor to be drained by gravity flow into a receiving sump. The final quarry floor of the deposit is proposed to slope slightly by 1.7% from a level of 0 m in the east to be pumped towards settlement ponds, then into the natural drainage system.

The basis of the quarry benches will be horizontal. In order to estimate the tonnage of stone, a raw material density of 2.28 t/yd^3 was used. The level of individual quarry benches, were determined with regard to the bottom, to quarry face heights of 22.5 m and to the Geomorphology, and after testing several other options and possibilities, thus, the quarry bench levels in the proposed quarry were chosen as follows: 7.5 m, 15 m, 22.5 m. The peripheral areas in the west would drop to -2.6 m ASL so as to drain the entire quarry.

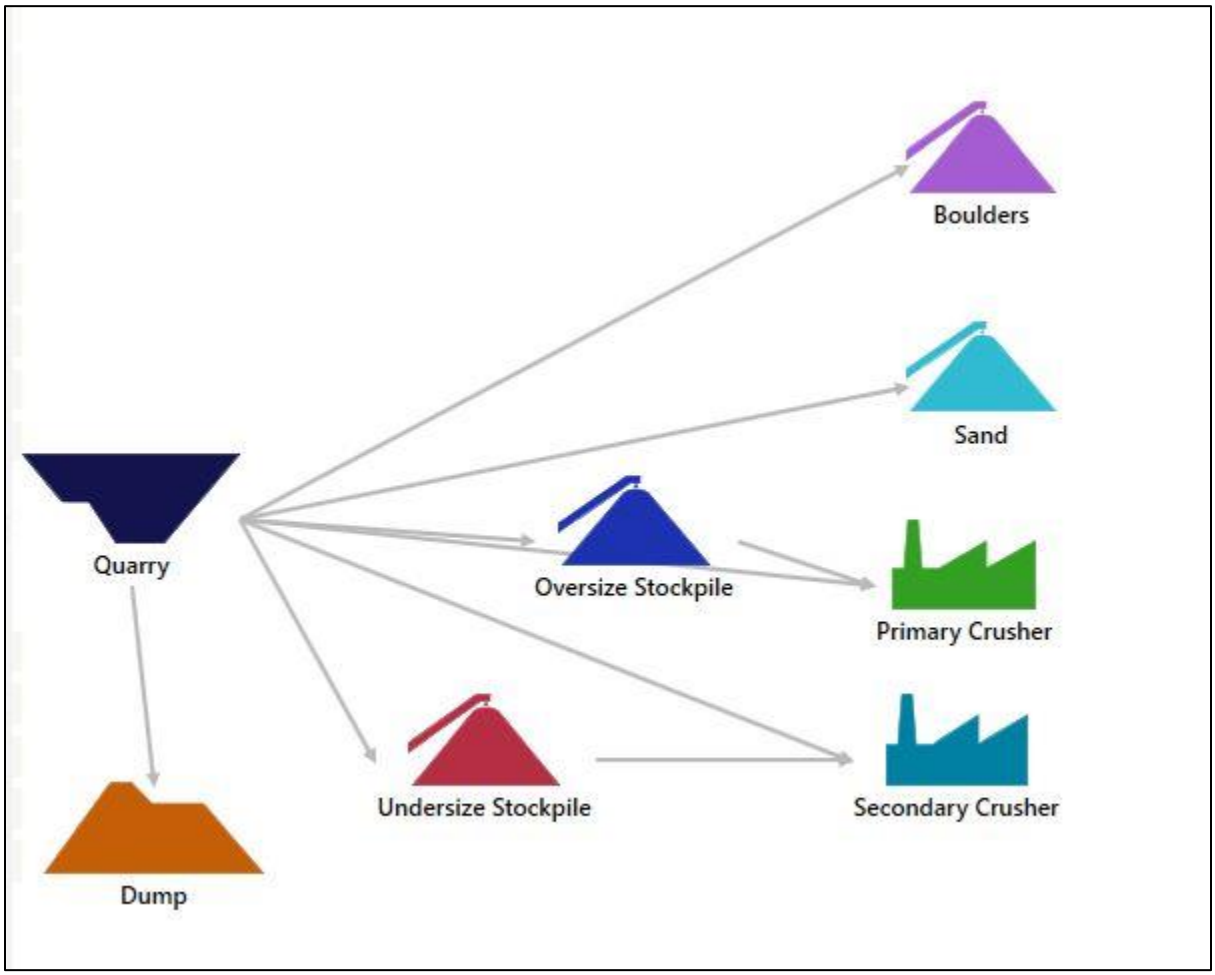

Figure 4: Concept of Quarry

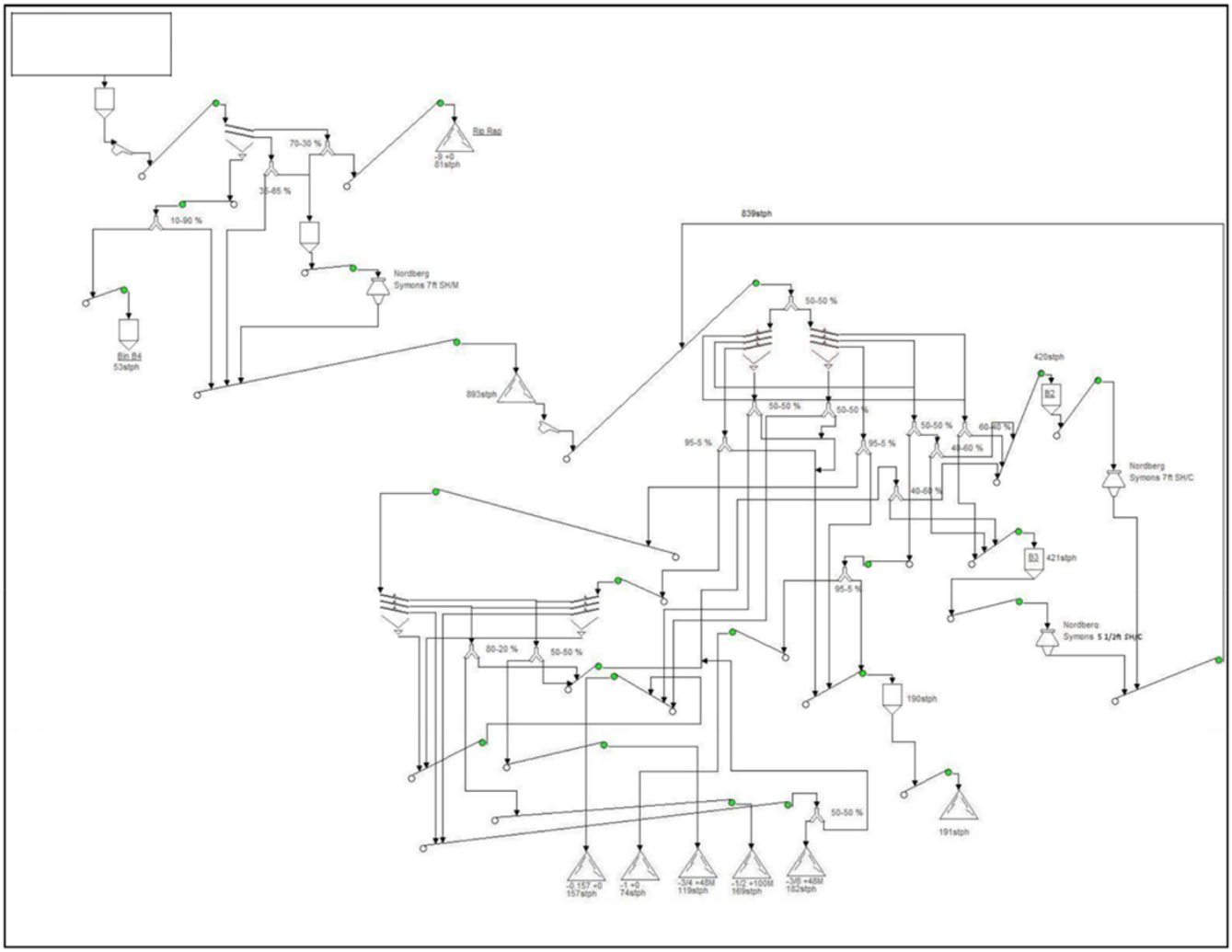

Figure 5: Quarry Flow Chart

Overburden Stripping and Pile and Re-utilizing

The volume of overburden is estimated at 239,912 tons. The characteristics of the soil include vegetative cover, top soil, saprolite and clay. The top soil will be stripped and stored for rehabilitation purposes. The overburden will also be stripped and stockpiled for rehabilitation purposes. Berms will be constructed around overburden spoil heaps to prevent run-offs and sedimentation of natural drainage systems. Overburden spoil piles will be located in areas of poor stone reserves.

Drilling and Blasting

Stone will be fragmented by blasting in the form of several standard bench blasts, rock breakers will be utilized in place of secondary blasting.

If adequate quarry development is achieved with a long face, then it may be possible to consider single row bench blasts, which usually consumes less explosives. It is assumed that the effect of individual bench

blasting will amount to 6,250 tons, once to twice per week to meet the annual production capacity of 300,000 tons as planned.

Bench Design and Construction

The proposed stone quarrying will involve three horizontal benches, a maximum 22.5 m quarry face height and a 37^0 slope. The quarry face height is usually based on the technical possibilities of the drilling technology used to prepare for the bench blasting, on requirements regarding the fragmentation of blasted rocks, and on safety instructions for loading of raw materials.

The slope of the quarry face is basically based on the angle of the drill holes used to prepare for bench blasting. The quarry faces are proposed to set back at least minimum 10 m (working terrace width) for safe operation of loading and hauling equipment.

Proposed Quarry Development- Bench Levels	**Bench 3**	**22.5 m**
	Bench 2	**7.5- 15 m**
	Bench 1	**0-7.5 m**

The proposed quarry floor slopes slightly from 0 m in the east to about -2.6 m in the west in order to drain the quarry. It is possible to use temporary surface drains (gutters) if percolation and run off of rainwater from higher benches proves the sloping inadequate.

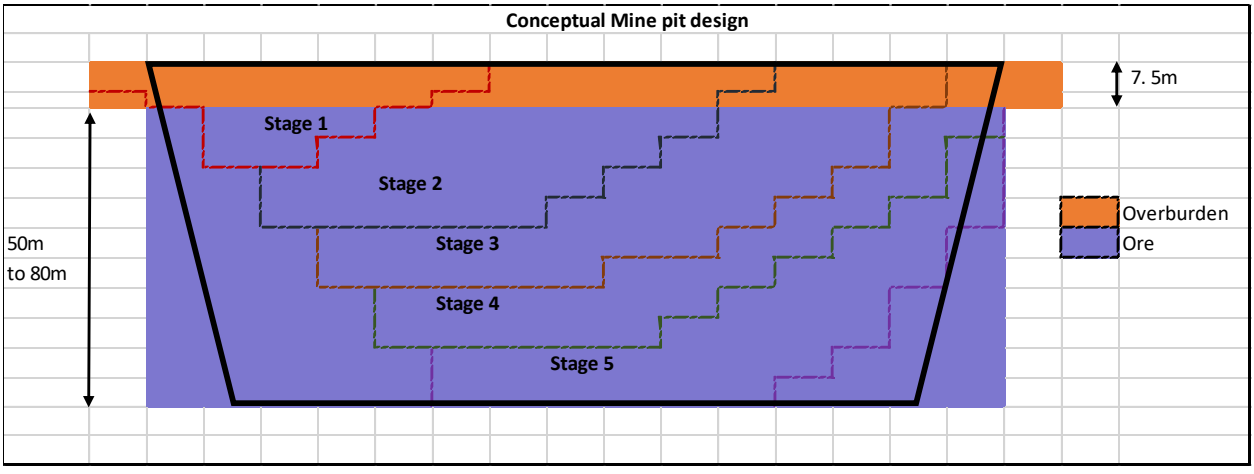

Figure 6: Cross-Section of Quarry

Planned Production Rate

The total reserve will last for approximately five years of quarrying and production, based on the assumption that the proposed initial quarrying phase produces 1.5 million tons of granite stone material.

By deepening the quarry and extending the quarry to the probable reserves in the south east or to other reserves discovered by the drilling program, the life of the quarry can be extended.

Product (Tons)	**Year 2020**	**Year 2021**	**Year 2022**	**Year 2023**	**Year 2024**	**Total**
Aggregates	150,000	150,000	150,000	150,000	150,000	750,000
Boulders	150,000	150,000	150,000	150,000	150,000	750,000
Total	**300,000**	**300,000**	**300,000**	**300,000**	**300,000**	**1,500,000**

Table 1- Potential mineable reserves and production rate

Tonnage per month: 25,000 tons per month

Tonnage per day: 1,250 tons blasting production per day

Stock Pile inventory (end 2019 of boulders and aggregates) - Nil

Total Projected production- 1,500,000.

POTENTIAL ENVIRONMENTAL IMPACTS/MITIGATION

LAND/SOIL

Soil erosion and sedimentation, top soil mixing, compaction and rutting may occur during construction and operation of the mine. Soil contamination may also occur as a result of the accidental release of fuels, waste oils and lubricants.

Mitigation measures:

Soil erosion and sedimentation impacts will be minimized through the implementation of best management practices outlined in the storm water and sediment control, and erosion control management plans of the EMP. Fuels and waste oils will be managed to ensure safety in handling and the prevention of spills to soil.

POTENTIAL IMPACTS TO AIR QUALITY:

Fugitive dust from access roads, the pit excavations and the crusher, and diesel engine emissions are the main elements of air quality concern at the quarry.

Mitigation measures: Fugitive dust emission will be managed by periodic wet suppression on roadways, process areas and accessible working faces. Speed limits will be enforced within the quarry and access road to limit fugitive dust, and spray bars will be installed at several points on crushing equipment to limit dust generation. Vehicles will be maintained according to the manufacturer's manual and are kept in good working order.

NOISE AND VIBRATIONS:

Noise and vibrations will be produced from the operation of heavy equipment, the generator, pit excavation and blasting operations.

Mitigation measures:

Noise emissions will be mitigated by installing sound suppression equipment on vehicles, e.g. mufflers; ensuring vehicles are maintained according to the manufacturer's manual and are kept in good working order. Vegetative buffer zones will be maintained between the mine face and the mine site accommodation and contiguous land uses, which will act as a noise buffer. Mine site buffer zones will be established in accordance with the GGMC Code of Practice for Quarrying. Blasting will be conducted in accordance with a Quarry Blasting Plan to be developed in accordance with the GGMC Code of Practice for Quarrying and approved by the GGMC prior to implementation of the plan.

IMPACTS TO WATER (BOTH GROUND AND SURFACE): The quarry may be excavated below existing groundwater levels. This could result in groundwater infiltration to the quarry floor. Rain induced infiltration and leaching of chemical impurities from exposed spoil piles, and spills of oil and grease from operations can infiltrate and affect ground water quality. Vegetation clearing for construction will reduce rain interception by forest cover and may result in increased discharge to the Essequibo River and Winiperu Creek. During construction and operation of the mine sediment discharge and erosion may potentially impact the water quality of receiver water bodies.

Mitigation measures: Ground and surface water impacts will be mitigated through the implementation the storm water, sediment control, and erosion control management plans of the Quarry and the GGMC Code of Practice for Quarrying.