

# V.P Baichan & Sons Enterprise

PROJECT SUMMARY FOR STONE QUARRY  
CORENTYNE RIVER, REGION 6

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## 1.0 Executive Summary

The Company V.P Baichan and Sons Enterprise owns and operates a Stone Quarry located within Block LM40-B-7, at the confluence of Corentyne and Epira Rivers Region 6. The said quarry was granted an Environmental Permit (Renewed) Ref. No. 20160615-VPBQC (valid for five years – 2022-2027). The Company was also granted an Environmental Permit Ref. No 20220329-VPSMC to operate a wharf and Stone Crushing Plant at Grant 1178 Crabwood Creek, Corentyne Berbice. These two operations supply aggregates mainly to the East Berbice, Corentyne area.

In order to, help meet the need of the increasing demand for aggregates in Guyana, Mr. Baichan is seeking to be granted Environmental Authorization for another quarry block (B-1011/MP/000), which is adjacent to Block LM40 – B-7. The Block was already issued a Mining Permit from the Guyana Geology and Mines Commission (GGMC). The block is currently intact, fully covered with vegetation, and no material has been removed/extracted. The block is approximately 1141 acres, and less than 20 acres will be used only for the extraction of ore. No structures will be constructed at the site, and the materials extracted will be transported to the adjacent block (LM40-B-7) to be processed via stone crushers to various sizes then stockpile. Materials extracted from the site may also be loaded on barges and taken to the Crabwood Creek Location for crushing and stockpiling also to be sold. Quarry Block LM40-B-7 has all the supporting facilities (crushers, office, accommodations, etc.) in place to accommodate the ores extracted from Block B-1011/MP/000.

The proposed quarry location is in the vicinity of Pigeon Island on the left Bank of the Corentyne River in Berbice. According to GGMC, the area above ground resource consists of discontinuous

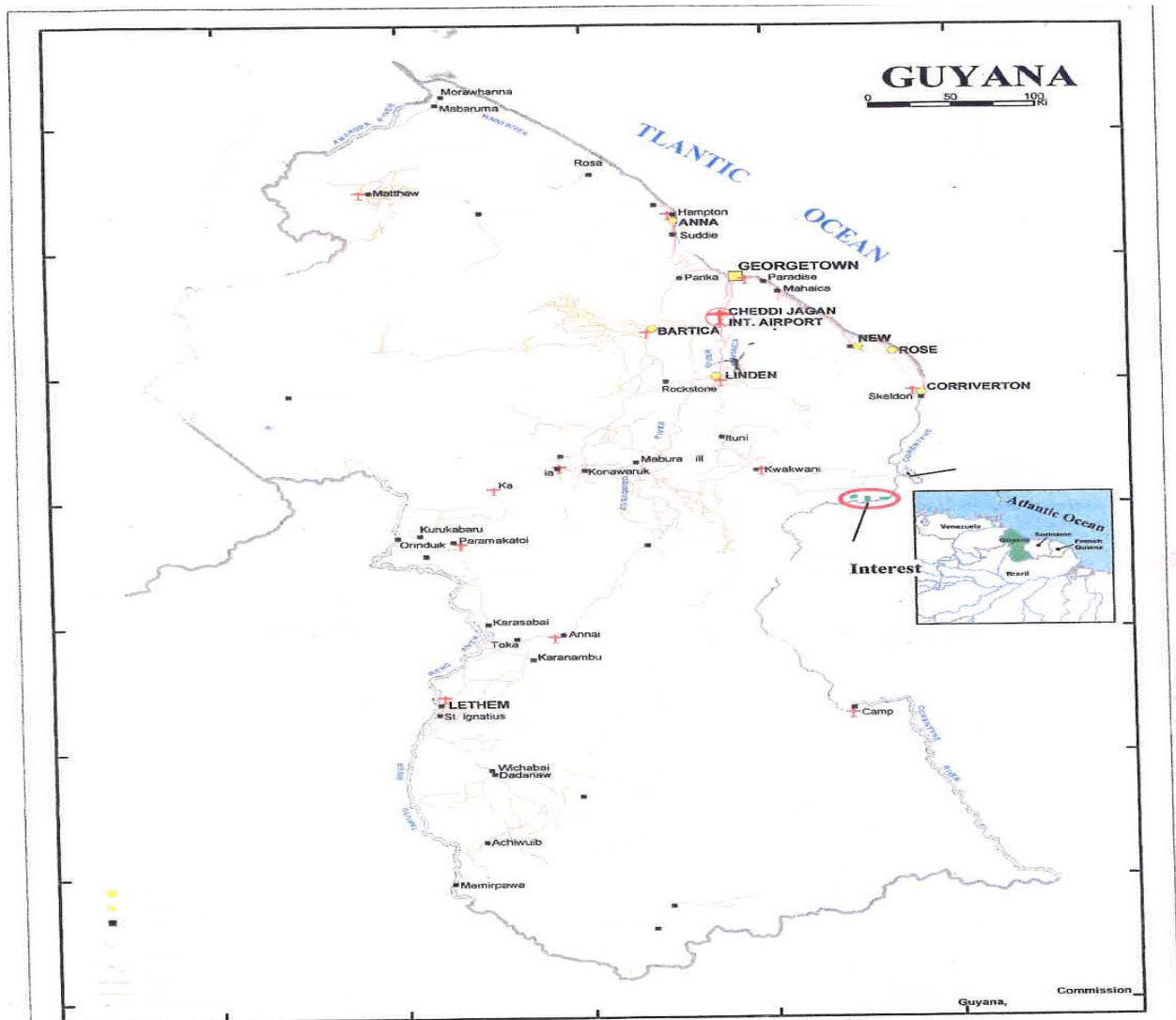
scattered outcrops of Gabbroic Dyke which is of good quality for Construction aggregates. Within the area, the Greenstone Belt rocks are collectively named the Barama – Mazaruni Super Group, and are predominantly metamorphic and occur in the north of Guyana, running from Region one (1) in the north-west to the Takatu Graben in the center. Given the small scale of the operation, the above-ground reserve will provide enough resources for the quarry in the short to medium term.

The area is drained by the Corentyne River and is mostly surrounded by primary and secondary forests. The project area is located in a highly remote area that is predominantly used for logging and laterite mining. The closest community to the area are Amerindian Settlements/Villages (Siparuta and Orealla).

The company has dedicated itself towards ensuring that the environmental impacts resulting from the project's operations are either prevented or minimized through the use of pollution prevention and environmental best practices, relevant technology, and in general, the promotion of highly effective environmental management and sustainability.

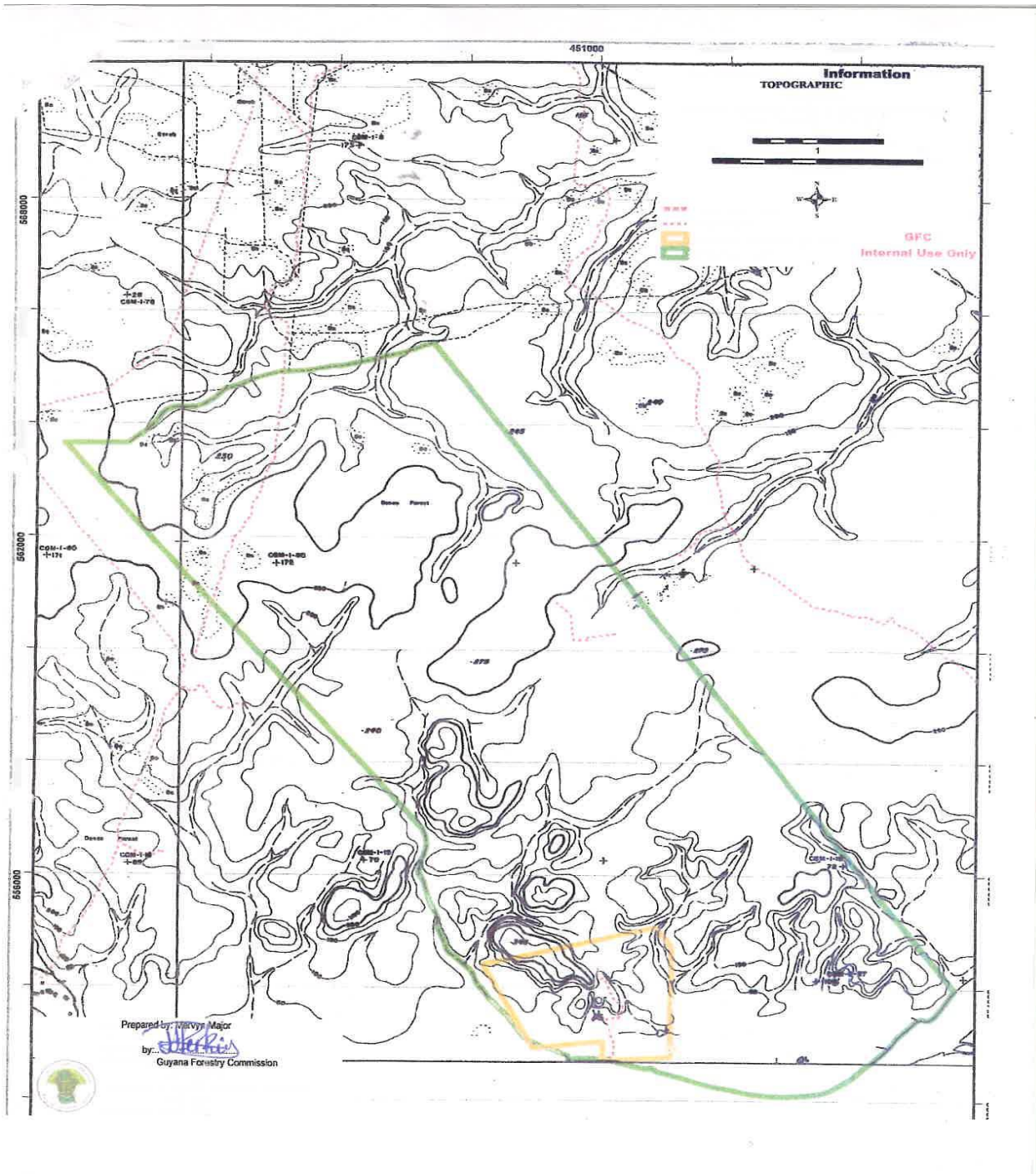
## 2.0 Location and Property Description

The project area is located within the vicinity of Pigeon Island within Block B-1011/MP/000 on the Left Bank of the Corentyne River in Berbice, enclosing an area of approximately 1141 acres. From Crabwood Creek the area is approximately 370 km (230 miles) up the Corentyne River. The Site can also be access by land through Kwakwani.



Located at the confluence of the Corentyne and Epira Rivers with geographical coordinates of longitude  $57^{\circ}18'3.744''\text{W}$  and latitude  $5^{\circ}9'18.403''\text{N}$ . Thence at a true bearing of  $224.67^{\circ}$ , for a distance of 12 miles 1704.3 yards to the point of commencement: **Point A**, located at geographical coordinates of longitude  $57^{\circ}26'.64''\text{W}$  and latitude  $5^{\circ}1'17.854''$ , thence at true bearing of  $144.49^{\circ}$ , for a distance of approximately 464.28 yards, to **Point B**, located at geographical coordinates of longitude  $57^{\circ}25'52.626''\text{W}$  and latitude  $5^{\circ}1'6.665''$ , thence at a true bearing of  $180.41^{\circ}$ , for a distance of approximately 1 mile 96.5731 yards, to **Point C**, located at geographical coordinates of longitude  $57^{\circ}25'53.002''\text{W}$  and Latitude  $5^{\circ}0'11.704''$ , thence at true bearing of  $263.38^{\circ}$ , for a distance of approximately 277.565 yards, to **Point D**, located at geographical coordinates of longitude  $57^{\circ}26'1.2.16''\text{W}$  and latitude  $5^{\circ}0'10.757''$ , thence at a true bearing of  $261.53^{\circ}$ , for a distance of approximately 730.079 yards, to **point E**, located at geographical coordinates of longitude  $57^{\circ}26'22.675''\text{W}$  and latitude  $5^{\circ}0'7.574''$ , thence at a true bearing of  $258.54^{\circ}$ , for a distance of approximately 140.168 yards, to **Point F**, located at geographical coordinates of longitude  $57^{\circ}26'26.758''\text{W}$  and latitude  $5^{\circ}0'6.75''$ , thence to a true bearing of  $1.12^{\circ}$ , for a distance of approximately 185.604 yards, to **Point G**, located at geographical coordinates of longitude  $57^{\circ}26'26.65''\text{W}$  and latitude  $5^{\circ}0'12.244''$ , thence at a true bearing of  $263.11^{\circ}$ , for a distance of approximately 1207.53 yards, to **Point H**, located at geographical coordinates of longitude  $57^{\circ}27'2.275''\text{W}$  and latitude  $5^{\circ}0'7.956''$ , thence at a true bearing of  $332.99^{\circ}$ , for a distance of approximately 1 mile 52.3673 yards, to **Point I**, located at geographical coordinates of longitudes of longitude  $57^{\circ}27'26.737''\text{W}$  and latitude  $5^{\circ}0'55.757$ ,

thence at true bearing of 75.55°, for a distance of approximately 1 mile 1231.73 yards, to the point of commencement a **Point A**.



**Map showing the location of the project area, bordered in yellow.**

### 3.0 Land Use

At the project site itself, activities have been ongoing for in excess of twenty-five years. Logging operations were first conducted at the site by J and Z Sawh which concluded approximately twenty years ago. Since then the area is being logged by Mr. Vishwan Persaud Baichan through a State Forest Permit (SFP) issued by GFC. Subsequently, laterite mining was conducted at the site by H N Sugrim for approximately four years. The mining of laterite continued for another four years thereafter by Mr. Vishwan Persaud Baichan. The mining of laterite was done through a Medium Scale Mining Permit issued by the GGMC.

The general project area has both quarry and laterite resources that are being mined. The resources extends across the Corentyne River into Suriname and there are a few quarrying operations on that side of the River, including one just opposite the project site. Apart from small-scale mining operations, there are also lands in the wider area designated for large scale exploration for bauxite, including lands held by the Bauxite Corporation of Guyana Inc.

However, the general long term land use of the wider project area is logging which has been occurring for several years and there are several current SFPs surrounding the project area. The SFP holders include R. Razack Business Enterprise, which is adjacent to the project area on the south-western side, Cortim Forest Import & Exports, Bibi Nazmoon Nasrudeen, Orealla/Siparuta Council and George Brijnauth. Logs are harvested and transported via the Corentyne River to Crab wood Creek for processing. The forestry sector within this area therefore plays a major role in the local economies of communities such as Orealla and Siparuta, since a large majority of the working population seeks employment within this sector.



There has been some tourism activities along the Corentyne River area, with tours mainly originating from Suriname.

The project area is located in a highly remote area that is predominantly used for logging and mining of laterite. The closest Guyanese settlements are the Amerindian Villages, Siparuta and Orealla. Orealla or Orealla Mission is one of two Amerindian communities which are within range of the project area, the other being Siparuta. These communities are approximately 107.68 km and 89.94 km respectively (via river) from the project area, both of which overlook neighboring Suriname. The two communities are the only Amerindian reservations on the Corentyne River and are structured locally as one. The communities are being managed together as one, with a single Toshao along with a team of councilors.

Orealla is located some 50 miles south of Crabwood Creek, up the Corentyne River in East Berbice, Region 6. This village is home to the Arawak and Warrau tribes with some amount of Caribs, but at present, Wapishanas and Macushis can also be found there. Orealla is an Arawak word that means “white chalk” and is said to have acquired its name from the surrounding chalk hills.

Both communities are surrounded by virgin rainforest, hills and dry open savannahs and are predominantly occupied by Amerindians, along with other ethnic groups, who would have migrated to the area to seek employment or just for their own pleasure.

Both communities have managed to sustain their livelihood through the collection of royalty for sand and logs extraction. Traditional farming, fishing and hunting are also among the major sources of income generation and existence. However, these are generally not done on a commercial scale, but rather for internal consumption. Most importantly, subsistence fishing

forms a part of the village life and economy and the Corentyne River is the village's sole source of fresh fish. Adding to this list of economic activities is eco-tourism which has recently been introduced to both communities as an additional source of income. This has since encouraged the sale of locally produced art and craft as well as several food items while the communities are also able to display their culture and communities as a whole.

## 4.0 Local Geology

The full extent of the ore reserve is not yet determined, however according to GGMC the above ground resource consists of discontinuous scattered outcrops of Gabbrioc Dyke which is of good quality for the construction aggregates, especially for paving and road construction. Research shows that the geology of the area is very similar to that seen in other parts of the greenstone belts of Guyana, with the oldest rocks consisting of the Lower Proterozoic Barama-Mazaruni Supergroup (meta-basic rocks, intermediate meta-volcanics, acid meta-volcanics, meta-sediments and older small granitoid intrusions) (Voicu et al 1999).

The Barama-Mazaruni Super group was formed in the lower Proterozoic some 2.25 billion years ago. The group extends to most of northern Guyana. It is referred to as the Greenstone Belt since most of the rocks are greenish in color, and the outcrops occur in wide linear or curving linear structures. Greenstone belts are extremely common, and are composed of volcanic rocks that also have small amounts of sedimentary rocks interwoven within them.

The project area is not part of one of the three main greenstone belts, but falls within one of the numerous irregular greenstone occurring areas. The site consists of intermediate meta-volcanics formed during the Lower Proterozoic Supracrustals period while younger granites were formed during the Trans-Amazonian Tectono-thermal event age.

The soil type of the project area consist of red yellow latosols, steep phase including red yellow podzolic integrades to red yellow latosols. Immediately bordering the project site is red yellow latosols, light textured phase. These soils are largely very deep, well drained sands over sandy

clays of low fertility with limitations of fertility and low water holding capacity but which have favorable physical properties that could be ameliorated by land management and irrigation.

As it relates to topography of the area, the southern portion of the project site which borders the Corentyne River is relatively low and flat. The elevation increases towards the intended quarry area where the height is between 150 ft. to 250 ft. further north to the project boundary the area is in excess of 300 ft. This is the highest elevation within the property.

## 5.0 Estimated Production

The delineated area designated for quarrying covers an area of 11.46 acres. A density of 1.6 ton/yd<sup>3</sup> is used to calculate overburden tonnage and a density of 3.0 gm. /cc (2.53 ton/yd<sup>3</sup>) for the ore.

### **Resource Modelling**

Based on existing information and samples collected the mineable tons for the initial five years is 2,238,720. The overall rock body is 1,574 acres with some estimated minable tons of 7,532,100 in the 16.44 acres. This will be revised based on weathering and rock compressive strength away from the outcrop.

### **Estimated Movable Tons Phase 1 Quarrying**

Based on existing information, GGMC 2021, the estimated mineable reserve is 7,532,100 tons of gabbro.

Overburden: 149,945 yd<sup>3</sup> (density 1.6 tons/yd<sup>3</sup>) = 239,912 tons

Depth of overburden: 3.23 yd. Ore: 1,500,000 tons

Quarry Life: 5 years with the possibility for expansion

Strip Ratio: 0.365:1

## 6.0 Planned Production Rate

The total reserve is expected to last for more than five (5) years of quarrying (extracting ore).

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 southeast or to other reserves discovered by the drilling program, the life of the quarry can be extended.

Product (Tons)	Year 2023	Year 2024	Year 2025	Year 2026	Year 2027	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
<b>Total</b>	<b>300,000</b>	<b>300,000</b>	<b>300,000</b>	<b>300,000</b>	<b>300,000</b>	<b>1,500,000</b>

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 2021 of boulders and aggregates) - Nil***

***Total Projected production- 1,500,000.***

5- Year Peri od	Produc tion Phase	Quarry AreaYd <sup>2</sup>	Quarry Wa ste Volume (Yd <sup>3</sup> )	Quarry Wa ste Volume (Tons)	Quarry Sto ne Volume (Yd <sup>3</sup> )	Quarry Sto ne Volume (Tons)
1	1	9,278	29,989	47,983	131,579	300,000
2	2	9,278	29,989	47,983	131,579	300,000
3	3	9,278	29,989	47,982	131,579	300,000
4	4	9,278	29,989	47,982	131,579	300,000
5	5	9,278	29,989	47,982	131,579	300,000
<b>Total</b>		<b>46,390</b>	<b>149,945</b>	<b>239,912</b>	<b>657,895</b>	<b>1,500,000</b>

Table 2- Potential mineable reserves and production rate

## 7.0 MINING PROCESS DESCRIPTION

The project will be undertaken in two general phases – Site Preparation and Operational phase.

The materials (rocks) extracted at the site will be transported to a nearby mining block (LM: 40-B-7) for processing, which is also owned and operated by Mr. Baichan. Block LM: 40-B-7 is located immediately southwest of Block B-1011/MP/000, at within this block Stone Crushers and other supporting facilities are already constructed.

The two phases of the operation will include:

Phase One (1). Site Preparation

- Overburden and Topsoil Removal

Phase Two (2). Operational

- Stripping with the use of excavators

- Drilling and Blasting
- Loading of trucks with a front-end loader
- Hauling/ transported to a crusher located at the adjacent block (LM: 40-B-7) or Crabwood Creek

## 8.0 Site Preparation

Site preparation will include the removal of overburden and topsoil with the use of bulldozers.

The material cleared will be used to construct and maintain the haul roads and other areas to be utilized by the project. Afterward, it will be stockpiled and stored to be used for rehabilitation of the quarry area as activities progress. Once the quarry operation progresses the material removed from one panel will be used to rehabilitate already mined-out panels. This will be done as part of the progressive reclamation of the quarry.

## 9.0 Stripping

Most of the granite/ore is exposed at the surface and as such, minimal stripping will be required.

Most of the overburden consists of accumulated soil and vegetation, which have resurfaced the granite area. In some areas there is laterite. At the site, most of the rocks are exposed at the surface and as such, minimal stripping will be required.



## 10.0 Drilling and Blasting

Fragmentation is geared to producing acceptable sizes of rocks for loading and crushing. Fragmentation should be designed therefore to optimize the distribution of particle sizes within the rock pile, compatible with the loading and crushing plant. In order to achieve primary fragmentation the operation will utilize blasting. Blasting will be done to fracture the rock so as to allow for mechanical excavation. Prior to blasting, the hole will be drilled behind the working face of the quarry. This will be done using a Rock Drill 370. The blast pattern to use is a multi-row staggered rectangular arrangement. The holes will be drilled in a pattern 5 ft. by 6 ft. Once the holes are in place these will be filled with explosives. ANFO, which is the most common and acceptable blasting agent for mining operation will be used as the explosive, along with emulsion cartridges. ANFO consists of a mixture of ammonium nitrate and fuel oil. Once there is need for blasting the materials will be inserted into the holes and then mixed. This process will be done by a Certified Blaster. The blasting process will be designed in such a way to ensure maximum fragmentation of the rock in order to secure optimum benefits from each blast since this is an expensive activity. Effective blasting will also reduce the need for secondary breakage of rocks while reducing the amount of fine materials produced. This will be achieved through proper siting of holes location, drilling to the optimum depth, using the correct amount of explosives and careful control of the detonation process and blasting sequence.

## 11.0 Loading and Transporting

Once blasting is completed the material will be fragmented and ready for loading. Loading will be done by the front-end loader into the dump trucks. Trucking of material will be done along the haul road to the raw material stockpile within Block LM40:-B-7. To further transport the materials to Crabwood Creek, barges will be moored at the loading area and loaded with materials. Approximately 2,500 tons of materials will be transported per shipment and it is anticipated that there will be two shipments per week.

## 12.0 Bench Design and Construction

The proposed stone quarrying will involve three horizontal benches, a maximum 22.5 m quarry face height and a 37° 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.

<b>Proposed Quarry Development- Bench Levels</b>	<b>Bench 3</b>	<b>22.5 m</b>
	<b>Bench 2</b>	<b>7.5- 15 m</b>
	<b>Bench 1</b>	<b>0-7.5 m</b>

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 runoff of rainwater from higher benches prove the sloping inadequate.

### 13.0 Environmental Implications and Management.

Some of the environmental disturbance created by quarrying is caused directly by engineering activities during aggregate extraction and processing. Since the only activity occurring on the site is extraction, only the impacts associated with that process will be examined. Most of these impacts will be short-lived and most are easy to predict and easy to observe. Also, most engineering impacts can be controlled, mitigated, kept at tolerable levels, and restricted to the immediate vicinity of the aggregate operation by employing responsible operational practices that use available engineering techniques and technology.

### 14.0 Geomorphic Impacts

The nature of quarrying causes a decrease in the visual aesthetic of an area. The principal geomorphic impact of quarrying is the removal of stone, which results in the destruction of habitat. The extent of the geomorphic impact is a function of the size of the quarry and the location of the quarry, especially with respect to the overall landscape and the local landforms. The influence of quarry size on environmental impact is obvious: all other things being equal, the

larger the quarry, the larger the geomorphic impact. The actual size of the proposed quarry will be less than 20 acres, and will not significantly alter the geomorphology of the area.

## 15.0 Soil and Land Impacts

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

### **Mitigation measures to be implemented**

- Soil erosion and sedimentation impacts will be minimized through the implementation of best management practices outlined in the stormwater and sediment control, and erosion control management plans of the EMP approved in 2017.
- Fuels and waste oils will be managed to ensure safety in handling and the prevention of spills into soil.
- Segregate topsoil or surface soil from subsurface layers during construction activities.
- Site topsoil storage areas;
  - Identify and maintain or salvage topsoil pockets; and
  - Replace segregated topsoil as indicated in the Reclamation Plan.

## 16.0 Loss of habitat

The natural landscape of the project site consists of vegetation types characteristic of riparian forest habitats of the hilly sand and clay region and the Corentyne River. According to Huber et al., 1995 – Vegetation Map of Guyana, the immediate landscape area of the project is characterized by extensive tall, evergreen, flooded riparian mixed forest (including Mora forest) existing along flood plains of the Corentyne River and tall evergreen, seasonally flooded and non-flooded low land mixed forest existing inland of the riparian areas. In addition the Baichan quarry concession is situated within an area of the Corentyne River that has relatively high levels of human activity, particularly from the Suriname side of the river. Thus, there are no critically endangered or endangered species existing within the landscape of the project. Development works at the project site will include clearing small tracts of forest to expose the quarry face.

### **The following mitigation measures will be implemented:**

- Vegetation clearing will be limited to areas required for project activities and to the minimum required.
- Vegetated corridors will be maintained and activities timed to enable wildlife present in the area to relocate to adjacent areas.
- Animals with reduced movement capabilities will be allowed to escape if encountered by workers.
- The preservation of vegetation will be necessitated to the extent practical in areas not earmarked for clearing, for example, vegetative buffer zones along creeks and the Corentyne River. These areas will act as cover for animal passage and provide an escape route for animals during construction and operation. Areas of wildlife crossings will be

identified, and signage placed at such points on roads to indicate vehicle speed limits.

## 17.0 Noise and Air Quality

The primary source of noise from the extraction of aggregates from earth-moving equipment, processing equipment, and blasting. The truck traffic that often accompanies aggregate mining can be a significant noise source. The impacts of noise are highly dependent on the sound source, the topography, land use, ground cover of the surrounding site, and climatic conditions. The beat, rhythm, pitch of noise, and distance from the noise source affect the impact of the noise on the receiver. Topographic barriers or vegetated areas can shield or absorb noise. Sound travels farther in cold, dense air than in warm air and travels farther when it is focused by atmospheric inversions than when inversions are not present. Geology, topography, and weather affect the impacts of blasting. Blasting noise generally increases with the amount of explosive, with specific atmospheric conditions, and with proximity to a blast. The area in front of a blast commonly receives more noise than an area behind a blast.

Dust is one of the most visible, invasive, and potentially irritating impacts associated with quarrying, and its visibility often raises concerns that are not directly proportional to its impact on human health and the environment. Dust may occur as fugitive dust from excavation, from haul roads, and from blasting, or can be from point sources, such as drilling, crushing and screening. Site conditions that affect the impact of dust generated during extraction of aggregate include rock properties, moisture, ambient air quality, air currents and prevailing winds, the size of the operation, proximity to population centers, and other nearby sources of dust. Dust

concentrations, deposition rates, and potential impacts tend to decrease rapidly away from the source.

**Mitigation measures to be implemented:**

- Dust emissions will be mitigated by wetting the haul road and bare areas within the project site such as spoil piles where dust particulates are generated. Two water tanks are available in this regard.
- Workers will be required to wear the appropriate Personal Protective Equipment (PPE) including dust masks or respirators while working in dusty conditions.
- Blasting will be carefully controlled in order that very little dust is generated and to allow particles to dissipate within the quarry area.
- A vegetative buffer will be maintained between the mine face and the waterfront area, as well as contiguous land uses, which will act a dust trap and noise buffer. Mine site buffer zones will be established in accordance with the GGMC Code of Practice for Quarrying.
- Extra care will be taken at times of high winds or during other adverse weather conditions to minimise dust emissions.
- Decreased vehicle speeds, increased watering of roads and stockpiles and reduction of the amount of product transported per load, may be appropriate in adverse weather conditions.
- Noise and combustion 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.

- Operators will be equipped with PPE such as air plugs or ear muffs.
- Generators will be installed in a soundproof room at a safe distance away and downwind from the living quarters.
- As much as possible solar power will be utilized at nights to reduce noise levels.
- No mining or processing activities will be done at nights.
- Quarry operations will comply with the decibel limits outlined in the GNBS Noise Emission Standard which are 100 dB during the day and 80 dB during the night.

## 18.0 Surface and Ground Water Quality

The clearing of vegetation will reduce interception and may result in an increased discharge to streams and creeks around the operation area and increased water levels in these streams and creeks. Surface water quality may potentially be impacted by discharges to surface water of spilled and leaked oils during construction activities. Wastewater during operations will consist mainly of water from quarry dewatering.

The project area drains to the Corentyne River, with small streams serving as the drainage conduits. Vegetation clearing will reduce rain interception by forest cover and may result in an increased discharge to these small streams and the Corentyne River. Sediment discharge and erosion may potentially impact the water quality of these small streams and the Corentyne River. The area proposed for clearing is relatively small and clearing will be limited to those areas required for development. In fact, most of the project areas are already cleared from previous



activities conducted at the site. Impacts resulting from increased discharge to the small streams and the Corentyne River are insignificant, localized, short term and do not require mitigation.

The quarry will not be excavated below existing groundwater levels. However, if this is done it could disrupt the existing groundwater flow regime and would result in groundwater flow into the quarry floor. These impacts are significant, long term, localized, and will not be mitigated. Increased 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.

**Mitigation Measure to be implemented:**

- Sediment and erosion control measures such as silt fences and soak-away will be implemented where appropriate to mitigate impacts on receiver water quality.
- Erosion susceptible areas or areas with a high erosion potential will be sloped, benched or lined with erosion control structures to manage surface runoff, in accordance with the Code of Practice for Quarrying, and the storm water and sediment control, and erosion control management plans.
- Drainage will be provided along the haul road and other areas to aid with drainage.
- Surface run-off water will be directed to a settling pond. Excess water from the settling pond will be discharged through site drains to prevent overfilling and overtopping of the settling pond. Discharge from the settling pond under these circumstances will be monitored to ensure the compliance with water quality standards established by the Mining Amendment Regulation 2005.
- Upper level drainage will be done by gravity flow using ditches. The quarry floor will have

a sump to collect excess water. This water will be pumped to the settling pond to ensure it meets the required limits before discharge to the environment.

- Where roads and land filling interrupt the local area drainage culverts and drains will be installed.
- Spoil piles will be surrounded by perimeter berms and drains to manage discharges of water and sediment. Water from the perimeter drain will be directed to the settlement pond before discharge to surface water.
- Waste will be collected and properly stored and disposed.
- Water from the quarrying dewatering will only discharge to surface water after passing through the water management pond to ensure the attainment of water quality standards. This water will have no impacts on surface water quality

## 19.0 Waste Management

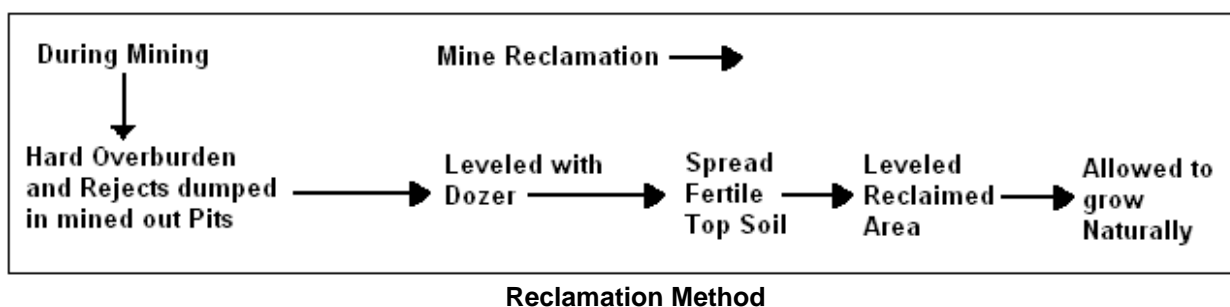
The improper management and disposal of waste generated from the quarry operation can result in unhygienic conditions and degradation of the environment. Since there will be no structures on site, the only waste that will be generated will include the overburden and topsoil, along with spoil ore. These will be strategically piled, to be used during rehabilitation activities.

## 20.0 Closure and Decommissioning

Ideally, a quarrying operation as a temporary use of land, should not impose any permanent constraints on the options for future beneficial use of the site, nor have any permanent effects on the local water resources, biodiversity and overall landscape quality or associated socio-economic development. As such, the company will prepare a Conceptual Closure Plan. This Plan will provide details in a conceptual form and highlight the measures that will be employed during and at the end of mining to allow for proper closure of the quarry so as to ensure that the site is rehabilitated to an appropriate level.

## 21.0 Land Reclamation

Land reclamation envisages backfilling of overburden into mined out areas and topsoil spreading evenly, planting of local species, soil amendments and enrichment of reclaimed land. The reclamation and rehabilitation efforts will be made to mitigate the impacts of quarrying on the environment. In general, mining, including quarrying, is usually blamed for creating an ugly scar on the land and results in its degradation. But this situation can be avoided if rehabilitation programs are implemented in the right way, commencing from the initial planning and development phase. It can be said that mining is the intermediate use of land which can be restored not only to its original form, but for better use.



## 22.0 Reference

- V.P Baichan and Sons Sawmill, Logging and Stone Investment – Environmental Management Plan, 2017.