Project Summary – H-1033,1034,1035,1036/MP/000 (Lakeram Harridat)

Submitted by: Lakeram Harridat

Prepared by: Robert Bostwick

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Summary

The Project developer, Mr. Lakeram Harridat, recognises the demand for quarriable commodities, 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; particularly, the Linden-Lethem road. As such the company sought and has obtained from the Guyana Geology and Mines Commission (GGMC) a Mining Permit to initiate the mining of sand and loam to meet the existing and projected demands. It should be worth noting, thatthis Project isspecific to the extraction of sand and for commercial purposes.

The Project site is located on the left bank of the Essequibo River. The Essequibo Quarry project is centred at Grid Longitude 58º36'35.824"W and Latitude 6º19'55.042"N in the Mazaruni Mining District, north-central Guyana. The area is approximately 92Km south-west of the capital city of Georgetown and the closest town is Bartica, some 19 miles south, all distances along riverain routes. Parika is situated 38 miles east of the project area. This Project has not been subject to any previous phase of operation. The project will produce sand and loam to a great extent form surficial levels. In cases where extraction will occur from subsurface levels, open pits developed above the water table would be developed with gentle gradients.

Project is owned and operated by Lakeram S. Harridat. Lakeram S. Harridat is a lumber yard and sawmill developer who plans to diversify his business interests by mining quarriable materials. The total area of disturbance within the project area comprises approximately 50 acres, including mining pits (8 acres) sedimentation pond (1 X 2 acres), overburden stockpile (4 acres), and product stockpile (1.5 acre), haul Truck park (5.7 acres), mechanical workshop (5.7 acres), fuel depot(0.01 acres), dwellings(3.5 acres) and office (1 acre). The remaining areas are for accessroads and clearing trees to a suitable distance from structures for safety. The total disturbance of the area will be approximately 31.41 acres (not including access roads) which equals approximately 9.81% of the mining permit.

The mining pits will extend to a depth of 18 m at the maximum and does not extend into the water table. The mining operations will operate 5 days per week atsingle shifts of 8 hoursto produce 130,000 tons of materials annually. Typical scrape, load and haul cycles will be used. The mining operations will employ 14 persons, but other personnel will be contracted to complete medical and environmental tasks, and forsecurity purposes. At this juncture, it is worth noting that the Project will utilize some of the technical personnel who are employed in adjoining projects, and hence,the staffing at the operation will also include one site manager, one engineer and one safety professional.

There will be one quarry foreman, haul truck operator, two over road drivers, one loader operator, two mechanics, two plant mechanics and one electrician.

The planned life of the project is twenty-five (25) years with an additional five years for post closure monitoring. All rehabilitation activities will adhere to the standards set forth in the permitted Rehabilitation and Closure Plan.

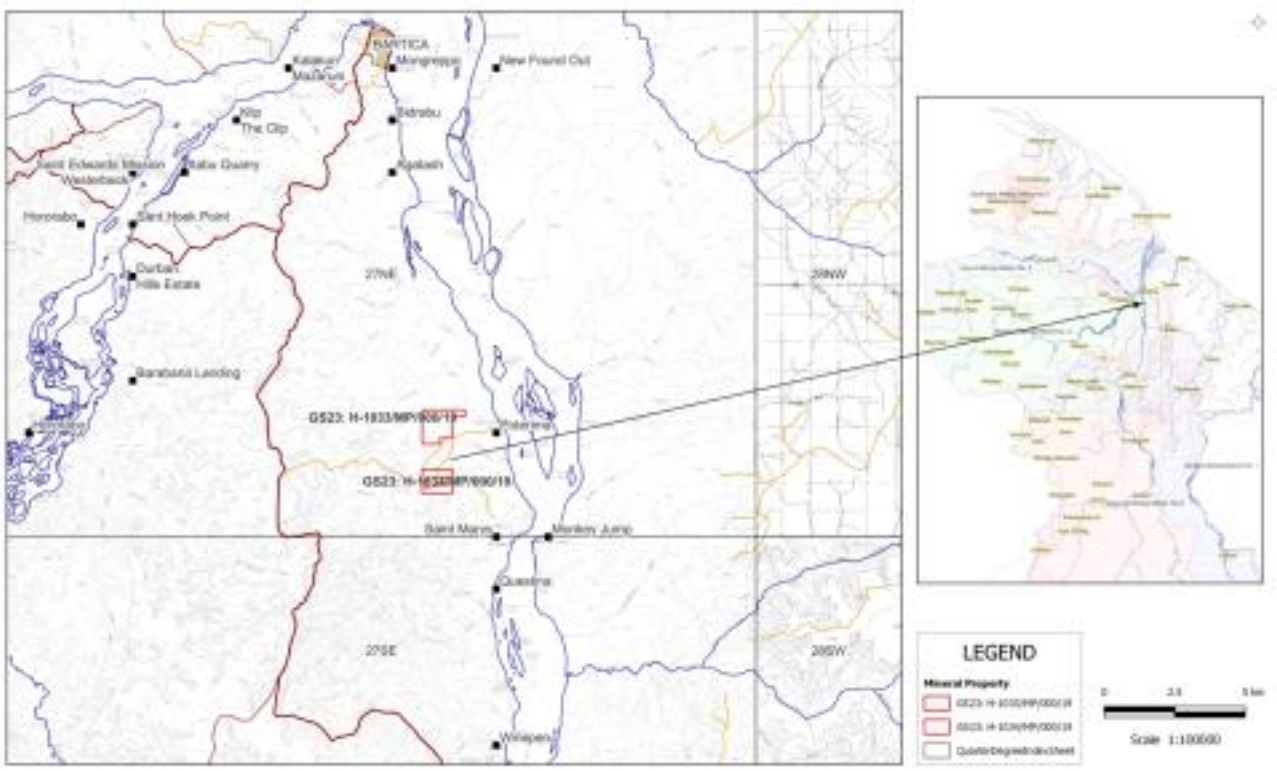
All equipment used in production, material haulage as well as auxiliary operations will be eliminated. Reclamation of the area after production is terminated will depend on the intended end use of the area. It

is realistic to assume that a relatively large area of open-pits (about 8 acres) will be created. The stored overburden would be replaced and re-soiled for planting of trees or other vegetation if biological reclamation of the project area is requested.

An Environmental Management Plan has been designed to manage and, to every extent possible, prevent or mitigate the potential environmental impacts associated with the proposed to be conducted. The EMP applies specifically and exclusively to those activities conducted within the confines of the Mining Permit to further delineate and characterize the extent of the quarriable resources contained within the project area. The plan will be updated as needed.

Location and Access

The property is located on map sheet 27 NE on quarter degree topographical sheet. The proposed project is south of the Sherima Crossing on the left bank of the Essequibo River. The centre of the property is located 21.92Km from the Crossing. The distance from the capital city Georgetown to Sherima Crossing is 142 Km. The area is accessed from Georgetown by asphalt road to Linden and thereby 4-wheel drive road towards the Sherima Crossing. The Project site is also accessed by the Bartica-Potaro Road.



Location and Access Map

Mineral Tenure

The Project area does not overlap any previous properties. The property is GS23:H 1033/MP/000

Project's Regional Geology

The area is located in Trans-Amazonian Tectonothermal province in the Guiana Shield, part of the Amazonian Craton (Plate 6). The Trans-Amazonian Tectonothermal province is a granitoid-greenstone terrane between 2.25 and 2.0 Ga in age (Gibbs and Olszewski, 1982; Cox et al., 1993; Santos et al. 2000) whose structural trends broadly parallels the Atlantic coast from Venezuela, through the Guianas to Amapa state in Brazil. In Guyana, the region's rocks, collectively known as the Barama-Mazaruni Supergroup, are Paleoproterozoic in age and comprise an east-west trending series of mafic through felsic volcanic flows with intercalated clastic sediments (Gibbs, 1980; Gibbs and Barron, 1993). The Barama Mazaruni Supergroup sequences formed through orogenic collision events, which developed due to juvenile plate tectonic processes (Gibbs and Barron, 1993). These strata were deformed by the Trans Amazonian Tectonothermal Episode (2.1-2.0 Ga). They were subsequently intruded by granite intrusions known as the Younger Granite Group, which probably were emplaced coevally with a regional sub greenschist facies metamorphic event (Williams et al., 1967)

Mafic dykes belonging to the Younger Basic Group or the Avanavero Suite (1.78 Ga) cut the metamorphosed rocks as seen at Toolsie Persaud's Quarry. The Bartica Assemblage in northern Guyana consists of various ortho-and Para gneisses and amphibolites, generally metamorphosed in the almandine facies (Gibbs and Barron, 1993). The development of hypersthene in some Bartica Assemblage bands suggests that these may have reached the granulite facies, possibly reflecting an original dried composition (Cannon, 1964). The northern Guyana metallogenic Province, which includes Barama Mazaruni Supergroup, is the principal metallogenic province of Guyana.

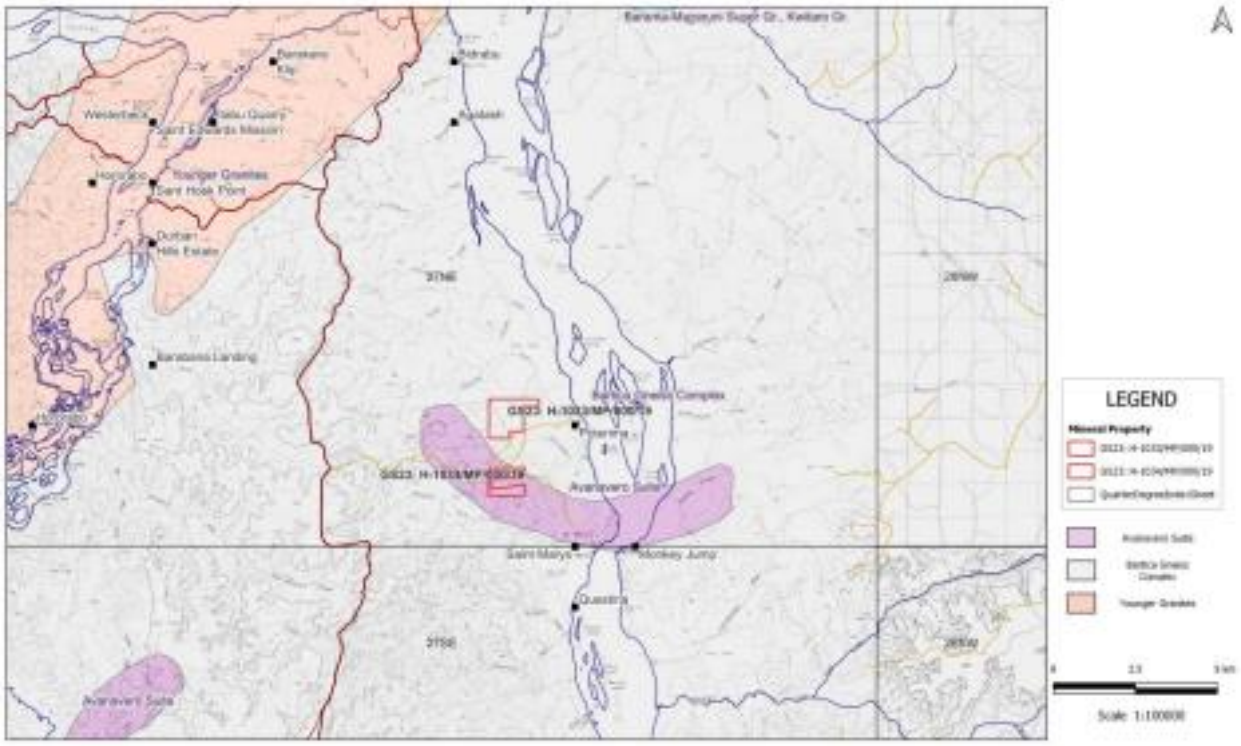
Local Property Geology

Three distinct lithological units are found within the area (Figure 2). The oldest unit being the Bartica Gneiss complex with ages of 1.9 Ga – 1.8 Ga, then the pluton was emplaced (younger granites) approximately 1.7 Ga – 1.6 Ga ago. The PAPA dykes (Post Avanavero Pre Apatoe) then intruded the Bartica gneiss complex

around 0.2 Ga.

The geology of the deposits was essentially defined by drilling and trenching, that cumulatively have allowed to construct an overall stratigraphic column.

Superficial white sand, carrying a distinctive xerophytic scrub vegetation, associated with the Berbice Formation extends to depths of over 30 m. and has gradational contacts with flanking material. Discontinuous pans of humic material occur below. Shallower profiles show pronounced development of a humic B horizon overlying red sandy loam. The results suggest that the white sand was derived from sediments of a ferruginous nature with greater clay content, which supported a higher forest formation.



Geology of Project Area

Vegetation

The main area of direct influence of the proposed project is characterized by vegetation which can be described as mixed tropical rainforest. This area has been logged for the commercial species in the past and it was observed that smaller trees of secondary growth are widely distributed over the study area. The canopy of the forest in the area is fairly open, reflecting the

impact of logging, allowing light penetration to support understory growth.

The proposed Project is dominated by sharp and steep hills with elevations reaching over 250 feet. The Hill raises to different topographic elevations ranging from 50 feet to 250 feet.

The general description of the vegetation present in the area is consists of mixed forest central Guyana, White sand forest south Guyana and mixed forest on steep hills. There are a number of species are abundant, and even locally dominant in the area (ter Steege 1998). Such species include Potaro Kakaralli (Eschweilera potaroensis), Greenheart (Chlorocardium rodiei), Clump wallaba (Dicymbe altsonii), and Sand baromalli (Catostemma altsonii). Several species endemic to the three Guianas are also characteristic of the forests of the area: Mora (Mora excelsa), Morabukea (M. Gonggrijpii), Soft wallaba (Eperua falcate), Ituri wallaba (E. grandiflora), Dakama (Dimorphandra conjugate), and others. Individuals of endemic species may account for over 50% of all individuals of the forest stands over relatively large areas.

Physical and Chemical Properties

The soil type consists of gravelly sandy clay, clay loam, gravelly clay loam, sand, loamy sand, peat muck and silt loam. These are further classified as follows: ferralic Cambisols, dystric Leptosols, lithic Leptosols, acri-haplic ferralsols, albic arenosols, carbic podsols, ferralic/luvic Arenosols, acri-haplic/acri-xanthic Ferrasols, terric Histosols, terric Histosols/gleyic Cambisols, gleyic Cambisols, and Fluvisols.

The white sands in the project area are excessively drained, very deep soils which consist for almost 100% of quartz sand. They are mainly located on the nearly flat interfluves but locally also on the slopes. These soils are acid and have extremely low levels of plant nutrients. Also the soil moisture storage capacity is very low.

The white sands are generally bordered by brown sand soils, sometimes forming a strip of only 50 to 100 m after which more loam soils are encountered. Only few mapping units could be separated which were sufficiently large to map them. The soils are somewhat excessively drained, very deep and have sand to loamy sand textures and yellowish brown to strong brown colours. These soils are chemically very poor and have low available soil moisture.

Bordering the white sands and the brown sands, loamier soils are present. In many cases the soil series could not be separated from each other on the map. Most of these soils occur on the slopes of the

dissected sedimentary plains. Although no clear relationship between soil type and position on the slope could be defined, a general rule of thumb is that heavier textured soils occur on the more dissected areas and thus on steeper slopes.

Although the soils on the hills have clayey textures and gravelly and/or stony characteristics, a separation was made in the map units based on the relative height of the hills and the dominating parent materials. Within the hills, flatter parts with shallow, lateritic soils over massive laterite occur but could not generally be separated on the map.

In some sections of the project area hills dominate. In these sections, soils vary in depth from 50 to over 120 cm, and are gravelly (commonly laterite) and locally stony, brown to red, clay loams to clays. Soils have low nutrient reserves although locally the vegetation might profit from weathering rocks. It should be noted that the soils are heavily influenced by ironstone (laterite) which occurs as gravel in the soil and locally as massive rock below it. Soil depth varies from less than 50 cm where massive laterite occurs, to over 120 cm. Textures are clayey and subsoil colours brown to red.

The foot slope soils are very deep, well drained, brown to yellowish red, clay loams to clays which are gravelly and in places stony.

On average, as is generally the case with deeply weathered soils under humid tropical conditions, soils are strongly acid, with remarkably low levels of nutrient reserves, very low cation exchange capacities and very low base saturations.

With respect to chemical properties, there is some differentiation among the various units within this overall very low chemical fertility class within the project area. This is mainly linked to soil texture which, in tum is related to parent material.

Potential of Project

The Ministry of finance reported that in 2018 there was an increase of 12% in the construction industry (CDB, 2018) and there continues to be a steady increase in the demand for construction material including sand, loam and laterite. Based on the current market trends and prices for sand and loamthe market

forecast over the next few years is extremely viable for these commodities.

The figures obtained after conducting financial analysis within the current market structure would support the case that based on the current and projected market prices and trends, that a project of such a nature as this one would be viable to execute.

Reserve Estimation for Sand and Loam

The reserve estimation was done to guide the long term feasibility of the project; in calculating the reserve, the boreholes data collected played a critical role. The data collected from the boreholes are, depth to bedrock, depth to water table and bulk density. The bedrock was intersected at 30 m and the water table was intersected at 22 m. factoring the environmental implications of possible contamination of the water table, and the feasible operating parameter of the equipment selected, it was determined that the mine would not go beyond a 10 m depth. The mine would be restricted to an area of 100 acres. The reserve has been calculated below.

Allotted area = 471 acres

Area of mine = 50 acres

Depth to bedrock = 30 m

Depth of mine = 10 m

Bulk density = 1600 kg/m^3

Mineral Property (471 acres)

1acre = 4046.86 m^2

Tonnage = V x BD

V= A x H

Total area in m2 = 471 x 4046.86 = 1,906,071.06 m2

V = 1,906,071.06 m2 x 30 m = 57,182,131.8 m3

Tonnage = 57,182,131.8 m3 x 1600kg/m3

T = 91,491,410,880 x .001 = 91,491,410.88 Tonnes

Mine (50 acres)

Total area in m2 = 50 x 4046.86 = 202,343 m2 V

= 202,343 m2 x 10 m = 2,023,430 m3 Tonnage

= 2,023,430 m3 x 1600kg/m3 T = 3,237,488,000

x .001 = 3,237,488 Tonnes

The production target for the Project is 130,000 tons ofsand and loam annually for a mine life of 25 years. Mining operations for the Project will be five (5) days per week, operating on one (1) eight (8) hour shift. Sand and loam will only be mined on dayshifts.

Mining Methods

The mining method selected forthe Project is conventional truck and shovel for both overburden stripping and sand and loam mining. The shallow pit depth, relatively low production levels and soft ground conditions favour a fleet of backhoe oriented hydraulic excavators and small rigid frame mining haul trucks, as no rock blasting is required.

The mine would be developed using straight trenches, Thickness of the bench is limited to 3.0 m only and width will be more than 1.5 the height of the bench. The sand and loam will be excavated using a backhoe. The commodities would be loaded onto a truck which will use already established trails. Sand and loam

extracted would be trucked a few km away to the waterway where these are stockpiled and then barged to various coastal and regional locations.

As it relates to the vegetation and topsoil, these will be cleared by a bulldozer ahead of the mining operation. Suitable organic material will be stockpiled for future reclamation use. Overburden and clays will be stripped with backhoe exposing the siliceous zone.

At this juncture, it is important to note that no drilling and blasting is required to facilitate the extraction of the sand or loam.

To properly manage water infiltration into the pit, a sump will be established at the lowest point on the pit floor. Water collected in this sump will be pumped to a collection point at surface.

Production Schedule/sequence

A production schedule is developed for the life of the Project. The schedule realizes the pre- production requirements and meets the annual production target of 130,000 tonnes.

The stripping ratio is very low, and a total of 60 tons of waste material will be excavated during pre production along with 100,000 tons of sand and loam.

Unsuitable grade of materials mined during pre-production will be used for capping of the haulage road. All other waste will be hauled to an area designated for the waste dump.

During the first five (5) years of production, mining will progress in Southern half of the pit, establishing the Eastern and western portion of the final pit wall.

Sufficient waste will be stripped each year in order to expose the materials to be mined for the following year's production. The stripping operation would be carried out in approximately 30 m wide panels that run the 200 m length of the western half of the pit. To reduce the slope of the advancing face, the stripping will be carried out in two (2), 5 m high blocks.

Facilities Construction

The project will see housing facilities made from local wood produce and aggregate materials.

This will occur simultaneously with equipment mobilization to the site. Local skills and labour will be used for construction.

Equipment selection

The haul truck selected for the Project is a tipper truck 4x2 light dumper. This light weight and rigid frame mining truck will be robust enough to manage the soft ground conditions expected in the pit and be able to satisfy the 7 km haul. The nominal payload of the tipper truck 4x2 light dumper is 10 tons. Four (4) trucks are required during production and this can be increased or decreased subject to market demand. The debushing and excavation will be done using a Kobelco hydraulic excavator (backhoe/shovel), this will suffice the tonnages presented in the mine plan. A CAT 950 bucket wheel loader will then be used to load the sand onto the dump truck. Upon offloading, another CAT 950 bucket wheel loader will be used to load the feed hopper which will feed a 1500 ft. conveyorthat will then feed the stackerthat will load the barge.

One Toyota land cruiser will be used to transport personnel in and out of the mine, and a service truck will be used for supplies and this will complete the mining fleet.

Environmental Management

Our Vision is to be leaders in environmental management in the quarry industry of Guyana. We will be committed to ensuring that all activities are undertaken and managed in a responsible manner to promote our fundamental responsibilities to the environment in which we will be operating in. Our activities and operations will support the principles of sustainability and be managed to minimise effects on the environment.

Harridat Policy (July 2021) which will be utilized in the Project will aim to embrace the principle of sustainable development through implementation of the following commitments which are of relevance to this EMP:

· Conducting Project operations to minimize environmental risk and, where practicable, eliminate adverse environmental impacts.

· Continual improvement of Project environmental performance including regular review and the setting

of rigorous environmental objectives and quantified targets- particularly with regards to: - Efficient use of energy (including appropriate use of alternative fuels);

- Conservation of water;

- Minimisation and recycling of wastes;

- Prevention of pollution; and - Effective use of virgin and recovered resources and supplemental materials.

· Open and constructive engagement with communities that surround Project Operations.

· Reducing the greenhouse gas emissions from Project processes, operations and facilities.

· Protecting and where possible, enhancing biodiversity values at and around Projectfacilities

Water Management

At the Project there will be discharge points. The first allows discharge from the Water Management Pond (WMP1) into the drainage system along the Creek. The second discharge is from the Water Management Pond (WMP2).

Water Management Strategy

The water management system at the operation has been designed so that all rainfall runoff is contained within the quarry sump then pumped to a sedimentation pond. This water will then be reused within the quarry operation or discharged into the Nearby Creek. Discharges of water into the Nearby Creek will only be under controlled circumstances. Discharges from the quarry will not exceed 50 NTUs

and pH 6.5-8.5, and visibly free of oil and grease.

Utilities

Electric power will be sourced from 1000 KVA generators onsite. This will be responsible for power to the plant, office and housing areas. Electrical poles and approved wired for the load will be used for overhead conveyance.

Water will be sourced from the Nearby Creek and rainfall. All water will be treated using Puritabs and filtered through a sand filter. The sand filter will discharge into three (3) sets of water-polishers to remove bacteria and fines.

Potential impactsto 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, haulage, 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 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, and pit excavation.

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.

IMPACTS TO WATER (BOTH GROUND AND SURFACE):

The quarry occasionally 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 Nearby 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.

Conclusion

The increased demand and the induced shortages of quarriable materials is a major problem in Guyana. This is affecting the implementation and execution of critical infrastructural projects – private and governmental. The implications of this situation are far reaching and impact negatively on the economic development of the country. As a sawmill operator, the investor is faced with prolonged shortages of quarriable materials from time to time that has halted the housing sector. This has prompted him to pursue the establishment of a quarry operation. The operation will be carried out with the main objective of addressing these shortages.

The quarrying activities that are to be carried out by the Project will be guided by:

· The 1980 Constitution of Guyana provides the foundation for the national environmental institutional and legislative framework, stating that:

“In the interests of the present and future generations, the State will protect and make rational use of its land, mineral and water resources, as well as its fauna and flora, and will take all appropriate measure to conserve and improve the environment”.

· Within this constitutional mandate, the Environmental Act Cap. 20:05 of 1996 is the primary environmental legislation in Guyana and establishes the Environmental Protection Agency (EPA) and provides for the management, conservation, protection, and improvement of the environment through

the prevention or control of pollution, the assessment of the impact of economic development on the environment, and the sustainable use of natural resources. Their functions are stipulated in Part II 4 (1) of the Guyana Environmental Act Cap. 20:05.

The Environmental Act Cap. 20:05 and the EPA form the basis for the environmental institutional framework of Guyana. Within this framework, each sector is administered by its corresponding ministry.

· The mining sector is administered jointly by the EPA, the Guyana Geology and Mines Commission (GGMC), and the Minister of Environment and Natural Resources. The GGMC is responsible for the promotion and administration of the mining industry, including permitting, licensing, infrastructure development, and other technical aspects of the industry. The Minister of Environment and Natural Resources manages and collaborates with the GGMC and is responsible for the negotiation of large scale exploration, prospecting and mining agreements.

· The Guyana Mining Act of 1989, which seeks to make to provisions with respect to prospecting for and mining of metals, minerals and precious stones, for regulating their conveyance and for matters connected therewith. The agency in charge of making sure this act is complied with is the Guyana Geology and Mines Commission (GGMC) which was established in 1970. The functions of this agency are as follows:

- ✔ Promotion of mineral development;
- ✔ Provision of technical assistance and advice in mining, mineral processing, mineral utilisation and marketing of mineral resources;
- ✔ Mineral exploration;
- ✔ Research in exploration, mining, and utilisation of minerals and mineral products; Enforcement of the conditions of Mining Licences, Mining Permits, Mining Concessions, Prospecting Licences (for Large Scale Operations), Prospecting Permits(for Medium and Small Scale operations) and Quarry Licences;
- ✔ Collection of Rentals, fees, charges, levies etc. payable under the Mining Act;
- ✔ Hall Marking

· The Occupational Safety and Health Act of 1997 (Cap. 99:06), which provides for the registration and

regulation of industrial establishments, for occupational safety and health of persons at work, and for purposes connected therewith or material thereto.