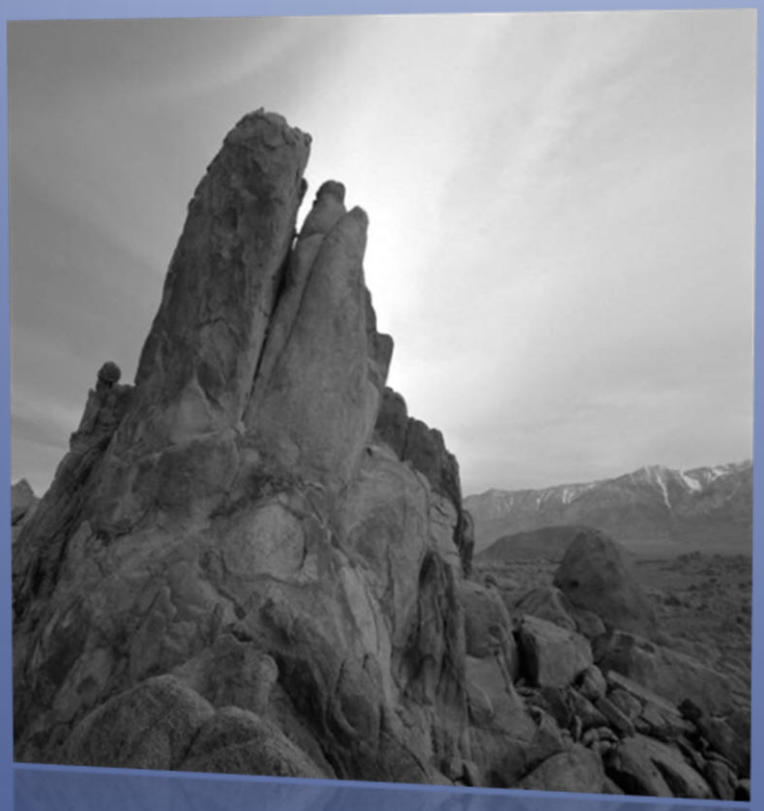


B-227/SMP/001 Stena Project

Prepared by: Robert Bostwick

Geological Engineer

656-9507

Contents

Executive Summary

Remaliah Bhaskaran has applied for contiguous mining permits from the Guyana Geology and Mines Commission under file number B-227/SMP/001 to operate a sand and loam quarries. This document outlines the key operational features of the proposed quarries, focusing on the extraction of quarriable materials and the management practices required for safe and efficient operations.

The project areas cover 569 and 644 acres respectively, with a total acreage of 1,213 and is located at Stena, approximately 45 km southwest of Georgetown and 11 km east of Timehri. The quarries will operate 24 hours a day, selling sand and loam at USD $9 per ton, with customers providing their own barge for material loading. The project's operational lifespan is set at 10 years, ensuring a long-term contribution to Guyana's construction and agricultural sectors. An estimated 1,125,074 tonnes of sand and loam can be extracted annually, supporting both local and national infrastructure demands.

Overview of the Project Proponent

Ms. Bhaskerran is a Guyanese businesswoman with office headquartered at Tract D, Timehri Public Road, East Bank Demerara. She is actively involved in multiple sand and loam quarrying projects and collectively with her team have over 30 years of experience in the industry. Ms. Bhaskaran ensures compliance with regulatory requirements and oversees corporate governance for all ongoing projects.

Extensive Industry Experience

Ms. Bhaskerran brings a wealth of knowledge and practical experience to the overall operations. Having worked on numerous quarrying projects and have gained expertise in:

- Efficient extraction techniques, particularly in open-pit mining for sand and loam.

- Managing large-scale, high-volume quarry operations, such as the current project, which targets an annual production of 1,125,074 tonnes/year

- Implementing logistical and operational strategies that streamline production while maintaining environmental standards.

Capabilities in Quarry Operations

The team is fully equipped to handle the complexities of sand and loam quarrying projects. The current project will utilize heavy machinery, including excavators and front-end loaders, to operate on a 24-hour basis, ensuring uninterrupted production. Key capabilities include:

- Excavation and loading: Efficiently removing sand and loam using modern equipment.

- Customer transportation: Allowing customers to provide their own Barges for material collection, reducing logistical burdens.

- Sustainable mining practices: With a focus on minimizing environmental impact through dust control, noise reduction, and effective land reclamation.

Environmental Stewardship

The proponent maintains a strong commitment to environmental sustainability. The operation will employs strict dust suppression measures, utilizes noise-dampening equipment, and follows guidelines for land reclamation after mining activities are completed. This approach not only ensures compliance with local environmental regulations but also demonstrates dedication to responsible resource extraction.

Local Economic Contributions

As a Guyanese entrepreneur the proponent is dedicated to contributing to Guyana's economic growth. The sand and loam quarries project will provide local employment opportunities, helping to develop skills and boost the economy in the surrounding communities. Ms. Bhaskaran actively engages with local stakeholders to ensure that its projects align with national development goals.

Conclusion

With over 30 years of combined experience in sand and loam quarrying, Ms. Bhaskaran and team are well-positioned to successfully execute this large-scale project. The operational efficiency, environmental responsibility, and commitment to local development makes Ms. Bhaskaran a key player in Guyana's resource extraction industry.

Project Location and Access Overview

The project site, located within a 1,213-acre tract of state land near the confluence of the Hubudebu River and Labba Creek at Stena, offers multiple access routes for efficient transportation of materials and personnel.

Geographical Location

- The project is situated on the left bank of the Demerara River, upstream of key logistical points, and is precisely located near Longitude 58º20'34.066"W and Latitude 6º26'18.618"N.

- The proximity to major waterways makes this site well-positioned for transportation via both overland and water routes.

Access to the Project Site

1. Overland to Timehri Dock:

The project site can be accessed via overland transportation to the Timehri dock, located on the right bank of the Demerara River. The Timehri dock serves as a major logistical hub, where materials can be transferred for onward transportation by boat.

2. Boat Access to Stena:

After reaching the Timehri dock, materials and personnel can be transported by boat to Stena, which is approximately 5 miles upstream on the left bank of the Demerara River. This river route offers a direct connection between the dock and the project site.

3. Barge and Boat Access via the Demerara River:

For larger cargo, barges and boats can access the project site directly from the Demerara River, traveling approximately 30 miles upstream. This river journey provides a reliable and efficient transportation route for bulk materials, reducing overland transport and improving the logistical flow.

Strategic Advantages of the Location:

- Proximity to the Demerara River: The site's location along the Demerara River offers excellent access to barges and boats, allowing for the movement of large quantities of sand and loam.

- Overland and Waterway Integration: The combined use of overland transport to the Timehri dock and water-based transport from Timehri to Stena or directly to the site provides flexible and efficient access for quarry operations and material transport.

This strategic location, with its dual access via overland routes and riverways, positions the project site for seamless logistics and transport, supporting the efficient operation of B-227/SMP/001.

Description of block

DESCRIPTION OF BLOCK B-227/SMP/001

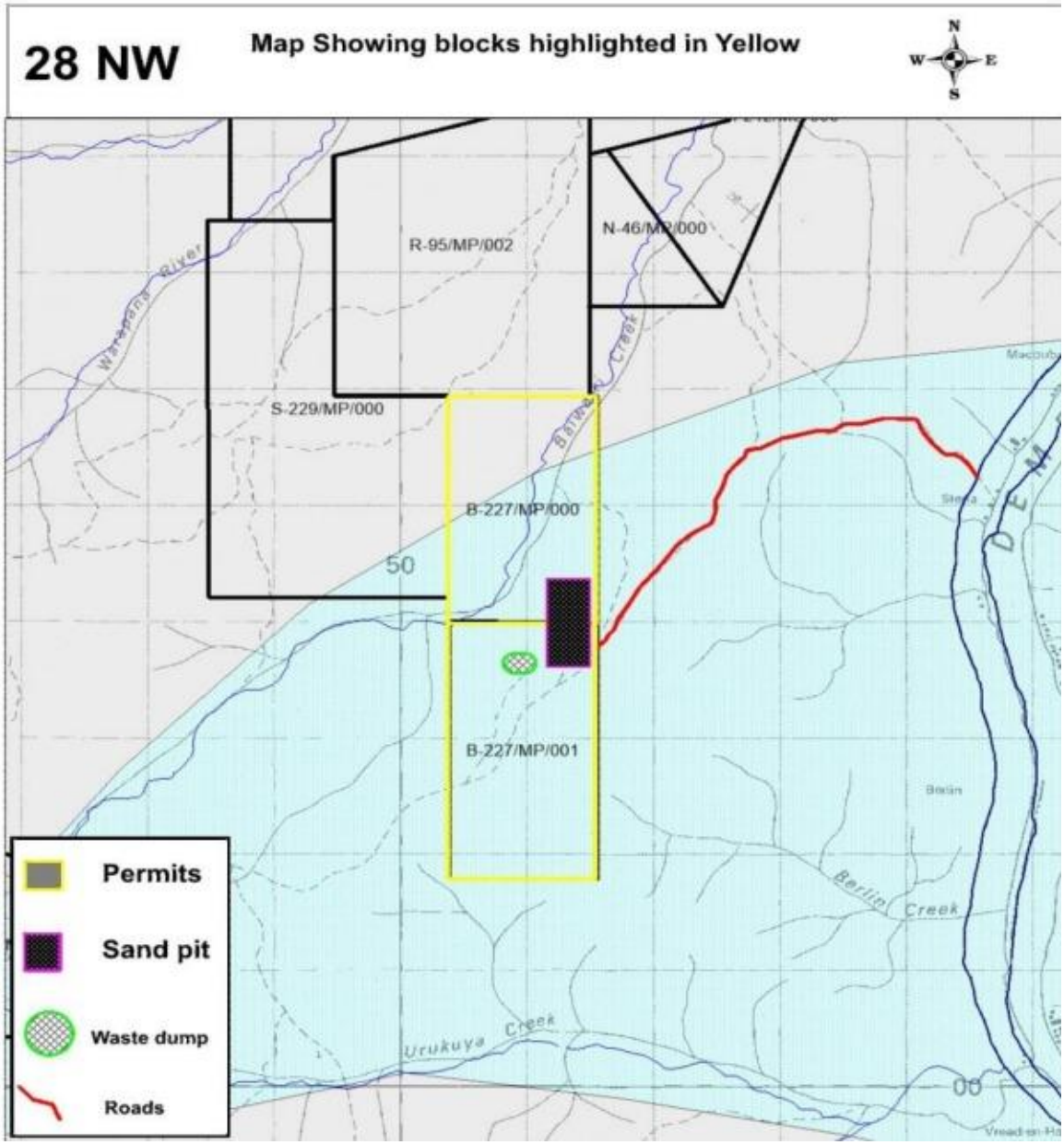
Track of State land located in the Coastal Area- No Mining as shown in Terra Surveys Topographic Map 28NW, at scale 1:50,000 with reference point "X" located at confluence of the Hubudebu River and Labba Creek with geographic coordinates of Longitude **58°20'34.0"W** and Latitude **6°26'19.0"N.**

Thence at the true bearing of **190°**, for a distance of **4 miles 1719 yards**, to the point of commencement:

Point A, located at geographical coordinates of longitude **58°21'9"W** and Latitude **6°22'2"N**, thence at true bearing of **91°**, for a distance of approximately **1283 yards**, to **Point B**, located at geographical coordinates of longitude **58°20'31"W** and Latitude **6°22'1"N**, thence at true bearing of **180°**, for a distance of **1 mile 667 yards, to Point C**, located at geographical coordinates of longitude **58°20'31"W** and Latitude **6°20'49"N**, thence at true bearings of **270°**, for a distance of approximately **1273 yards, to Point D**, located at geographical coordinates longitude **58°21'9"W** and Latitude **6°20'49"N**, thence at true bearing of **360°**, for a distance of approximately **1 mile 690 yards**, to the point of commencement at **Point A.**

Thus, enclosing an area of approximately **644 acres**, save and except all lands lawfully held or occupied.

Map


28 NW
Map Showing blocks highlighted in Yellow
N
W
E
S
R-95/MP/002
N-46/MP/000
S-229/MP/000
B-227/MP/000
B-227/MP/001
50
Permits
Sand pit
Waste dump
Roads
Berlin Creek
Urukuya Creek

Geology of the Project Site

The project area, located within a 1,213-acre tract on the left bank of the Demerara River, falls within the broader geological region of Guyana's Coastal Plain. This area is characterized by sedimentary deposits that have accumulated over millions of years due to the action of rivers and the ocean. The geology of the region is ideal for the extraction of sand and loam, which are important resources for construction and agricultural industries.

1. Coastal Plain Geology

The Coastal Plain in Guyana is primarily composed of alluvial deposits. These are materials transported and deposited by rivers, which include sands, silts, and clays. The sedimentary layers in the area are typically well-sorted and contain significant quantities of sand and loam.

- Sand Deposits: The sand found in the region is composed mainly of quartz, which is suitable for use in construction, particularly for concrete production, road building, and other infrastructure projects.

- Loam: Loam, a mixture of sand, silt, and clay, is abundant in this area and is highly valued for its agricultural properties due to its excellent drainage and nutrient retention capabilities.

2. Soil Composition

The soils in the Coastal Plain are often fertile and composed of a mix of sand, silt, and clay. The presence of loam in the project area makes it particularly useful for both construction and agricultural purposes.

- Topsoil: The top layer consists of loose, fertile soil, supporting the local vegetation and providing a rich layer for reclamation after quarrying.

- Sand and Loam Layers: Below the topsoil, significant deposits of sand and loam are present, forming the primary resources targeted by this quarrying operation.

3. Hydrology and Water Table

The Demerara River plays a crucial role in shaping the geological characteristics of the area. The water table in the region tends to be relatively shallow due to the proximity of the river and nearby creeks, such as Hubudebu River and Labba Creek. Seasonal changes, including the rainy season, can cause fluctuations in the water table.

- Water Table: The depth to the water table may vary but is generally not very deep. This factor is important to consider during extraction activities to avoid water intrusion into the quarry.

- Water Management: Proper drainage systems will be needed to manage surface runoff and prevent flooding of the quarry, particularly during the rainy season.

4. Topography and Surface Features

The topography of the project area is relatively flat, typical of the Coastal Plain. This flat terrain is beneficial for open-pit mining operations, as it simplifies the excavation and transport processes.

- Flat Terrain: The flat topography reduces the need for significant earthmoving operations and makes the area easier to navigate for heavy machinery.

- Surface Drainage: The project area’s proximity to water bodies ensures good natural drainage, but careful management will be required to prevent soil erosion and maintain the integrity of the excavation site.

5. Stratigraphy

The stratigraphy of the project area includes a series of sedimentary layers formed by river deposition over time. These layers typically include:

- Topsoil: A thin layer of organic material, supporting vegetation.

- Sand and Loam Layers: Thick layers of sand and loam beneath the topsoil, which are the primary targets for extraction. These materials are easily accessible due to the shallow depth of the deposits.

- Clay: In some parts of the Coastal Plain, clay layers may be found beneath the sand and loam. While not typically the focus of quarrying in this area, clay may have potential uses in other industries.

6. Mineral Composition

The sand in the region is primarily composed of quartz grains, making it ideal for use in construction. Loam, due to its mixture of sand, silt, and clay, is versatile and highly sought after for both construction and agriculture.

Conclusion

The 1,213-acre project area on the left bank of the Demerara River is geologically well-suited for the extraction of sand and loam, both of which are abundant in the region’s sedimentary deposits. The area's relatively flat topography and proximity to water bodies make it an ideal site for sustainable quarrying operations. Understanding the geological structure and hydrological features of the project site will be crucial in ensuring efficient extraction, proper water management, and long-term environmental sustainability.

Key Operational Features

Overview of Quarry Operations Using Open-Pit Mining Method

The open-pit mining method will be employed at B-227/SMP/001 Sand & Loam Quarries for the efficient extraction of sand and loam. This method is suitable for the site's relatively flat terrain and shallow deposits of sand and loam. The operation will focus on the extraction, loading, and transportation of materials from the quarry sites to barges located on the left bank of the Demerara River, ensuring seamless logistics from the quarries to market.

1. Quarry Operations Overview

The quarries will operate on a continuous 24-hour basis with rotating shifts to maximize production. The mining process will follow a well-defined sequence to ensure operational efficiency, worker safety, and minimal environmental impact.

a. Site Preparation and Clearing

Before extraction begins, the quarry sites will be cleared of vegetation, and topsoil will be stockpiled for future land reclamation. Access roads within the sites will be constructed to facilitate the movement of equipment.

b. Excavation

The open-pit mining method involves the removal of surface layers to access the sand and loam deposits beneath. The excavation process will use heavy-duty equipment to extract the materials efficiently.

2. Key Equipment Used in the Quarry

The quarries will utilize a range of equipment to ensure smooth operations, from excavation to loading and transportation.

- Excavators: Large hydraulic excavators will be used to remove the sand and loam from the pit. These machines are capable of digging to the required depth and are efficient in extracting large volumes of material.

- Front-End Loaders: Front-end loaders will be deployed to scoop the excavated material and transport it to the loading point near the Demerara River for barge loading.

- Conveyor System: A conveyor system will be installed to transport the extracted sand and loam from the excavation site to the loading area on the riverbank. This system will reduce the need for multiple-loading trips and ensure a continuous flow of material.

- Water Tankers: To control dust levels, water tankers will be used to regularly spray the roads and loading areas, ensuring compliance with environmental standards.

- Barge Loading Systems: A barge loading system, including a conveyor belt, will be set up at the riverbank. This will transfer the material directly from the stockpile or conveyor into the waiting barges, streamlining the loading process and reducing handling time.

3. Loading and Transportation of Material

Once the sand and loam are excavated and transported to the riverbank via the conveyor system, the material will be loaded onto barges for transportation.

- Barge Loading: The conveyor system will deposit material directly into barges stationed at the left bank of the Demerara River. The barges will be equipped to handle large volumes of sand and loam, ensuring efficient transport downstream.

- Barge Transport: The barges will then travel approximately 30 miles downstream on the Demerara River, allowing the material to be transported to various markets or storage facilities located closer to coastal or urban areas. Barges offer a cost-effective solution for bulk transport, minimizing the need for overland trucking.

4. Material Handling and Stockpiling

Temporary stockpiles may be established near the conveyor loading area to ensure a continuous flow of material. These stockpiles will be managed to minimize dust and erosion.

- Stockpile Management: Stockpiles will be carefully monitored to ensure that they do not exceed capacity and are located away from water bodies to prevent contamination.

- Dust Control: Water spray systems and strategically placed barriers will be used to control dust during the stockpiling process, ensuring minimal environmental impact.

5. Safety and Environmental Management

Safety is a priority in open-pit mining operations, and several measures will be implemented to protect workers and the surrounding environment.

- Personal Protective Equipment (PPE): Workers will be equipped with the necessary PPE, including helmets, gloves, high-visibility vests, and safety boots, to prevent accidents.

- Emergency Response Plans: In case of emergencies, such as machinery failures or extreme weather conditions, the quarries will have well-established response plans to ensure the safety of all workers.

- Environmental Management: The site will follow stringent environmental guidelines, including:

- Dust control using water tankers and fogging systems.

- Noise mitigation by maintaining equipment and using noise-dampening technologies.

- Surface water management to prevent runoff and protect nearby water bodies, including the Demerara River.

6. Reclamation and Land Rehabilitation

Post-extraction, the quarries will implement a land rehabilitation plan. The topsoil, which was initially stockpiled, will be redistributed across the site to facilitate revegetation. Native plant species will be reintroduced to restore the natural ecosystem, ensuring that the land is suitable for future use.

Conclusion

The open-pit mining operation at B-227/SMP/001 Sand & Loam Quarries will be an efficient, environmentally responsible process, focusing on the safe extraction, transportation, and loading of sand and loam onto barges. The use of modern equipment and conveyor systems will enhance productivity while minimizing environmental impacts and maintaining a safe working environment.

Environmental Baseline Conditions

Topography & Geology

Gently undulating terrain with elevations between 10–30 meters above sea level. Predominantly sandy loam soils, underlain by quartzose sand and minor clay lenses. Geologically part of the Pleistocene and Holocene alluvial sequences.

Hydrology & Drainage

In the area of Stena, they're hills which poses risks of sediment runoff and water contamination. Local ephemeral creeks and drainage channels facilitate water movement during the rainy season.

Flora & Fauna

Lowland secondary vegetation with regenerating forest patches. Faunal diversity includes small mammals, birds, and reptiles typical of riparian ecosystems. No known critical habitats or endangered species directly on-site.

Socioeconomic Context

Nearest communities: Sand Hills Landing, and Stena. Area traditionally used for subsistence farming, river transport, and small-scale logging.

Potential Environmental Impacts and Mitigation

Aspect	Impact	Mitigation Measures
Land Degradation	Removal of topsoil and alteration of natural landforms	Phased excavation and concurrent reclamation; soil stabilization using grassing
Water Quality	Sediment runoff into the Demerara River	Buffer zones; silt screens; sedimentation ponds; proper drainage design
Air Quality	Dust emissions during dry season from haul roads and excavation	Regular wetting of roads; covered trucks; vegetation screens
Noise Pollution	Equipment operation disturbing nearby residents and wildlife	Restricting work hours; using low-noise machinery; community notifications
Biodiversity Loss	Habitat disturbance	Avoidance of forested areas; maintaining buffer around water bodies
Traffic & Safety	Increased barge and truck traffic along river and access roads	Implementing traffic management plan and signage; community engagement
Waste Management	Improper disposal of lubricants, fuel, and domestic waste	Waste separation and secure disposal; spill kits; training for employees

Socioeconomic Impacts and Benefits

Positive Impacts:

- - Local employment opportunities (10–20 persons)
- - Boost to river transport and logistics sector
- - Revenue generation and local economic growth

Potential Negative Impacts:

- - Temporary influx of workers may strain local services
- - Dust and noise may affect nearby households and schools
- - Conflicts with other land users if access is not clearly demarcated

Mitigation & Engagement:

- - Conduct stakeholder meetings with Stena and riverine communities.
- - Provide job training and prioritize local hiring.
- - Develop grievance redress mechanisms.

Environmental Management Plan (EMP)

The EMP will include:
- Monitoring program for dust, water quality, noise, and biodiversity.
- Emergency response plan for spills and accidents.
- Rehabilitation plan post-extraction: slope stabilization, revegetation, and land reshaping.
- Annual audits and reporting to the EPA and GGMC.

Conclusion

This project area presents moderate environmental and social risks that can be managed through a well-structured EMP and active community engagement. The project offers economic opportunities for surrounding communities and can be executed sustainably with strict adherence to Guyana's environmental regulations and best practices.

Environmental Management Plan (EMP)

Ms. Bhaskaran is committed to responsible environmental stewardship. The following measures will ensure minimal negative impacts on the surrounding ecosystem:

Dust and Noise Control

Water trucks will spray access roads and operational areas regularly to suppress dust, particularly during the dry season. Equipment will be maintained with noise-dampening features, and the quarry's rural location will help minimize disruption to nearby communities.

Land Rehabilitation

Ms. Bhaskaran will implement land rehabilitation measures to restore the mined land for future use. Topsoil will be removed and stored for future reclamation. After mining operations are completed, native plant species will be reintroduced to promote biodiversity.

Water Management

Drainage systems will manage surface runoff, preventing contamination of nearby water sources. Sediment ponds will be constructed to trap sediment, ensuring that debris from operations does not affect local waterways.

Occupational Safety and Health (OSH) Plan

Safety is a priority for Ms. Bhaskaran's operations. The following protocols will be enforced to ensure a safe working environment:

Personal Protective Equipment (PPE)

All workers will be provided with PPE, including helmets, safety vests, steel-toe boots, gloves, and hearing protection. PPE use will be mandatory.

Equipment Safety

- All operators will receive training to ensure safe machinery handling.
- Equipment will undergo daily safety inspections to ensure operational integrity.
- Emergency stop procedures will be clearly marked and accessible on all machines.

Emergency Response Plan

A robust emergency response plan will be in place:

- **Fire Safety**: Fire extinguishers will be located strategically across the site.
- **First Aid**: First aid kits will be available, and designated personnel will be trained in first aid.
- **Evacuation Routes**: Clearly marked evacuation routes will be implemented, and personnel will receive regular training.

Health Monitoring

Routine health check-ups will be provided to monitor workers' exposure to dust and noise, ensuring long-term health and well-being.

Socio-Economic Benefits of the B-227/SMP/001 `Project

The B-227/SMP/001 Sand & Loam Quarry Project is poised to deliver a wide range of socio-economic benefits to both local communities and the broader economy of Guyana. These benefits extend beyond direct employment and revenue generation, impacting infrastructure development, skill enhancement, and community engagement.

1. Job Creation and Employment Opportunities

The quarry project will generate significant employment opportunities for local communities, particularly in regions surrounding the Demerara River and the project site. This will include both direct and indirect employment in various sectors:

- Direct Employment: The project will require a skilled and semi-skilled workforce, including:

  - Excavator Operators

  - Front-End Loader Operators

  - Barge Crew

  - Conveyor System Operators

  - Safety Officers

  - Administrative Staff

  Approximately 30-40 jobs are expected to be created directly within the quarry operations.

- Indirect Employment: The project will also create indirect jobs in industries supporting the quarry's operations, including:

- Equipment Maintenance: Local businesses will benefit from contracts to maintain heavy equipment, conveyors, and other machinery.

- Logistics and Transportation: Employment will be created in the transport sector, including barge operators, fuel suppliers, and logistics coordinators.

- Suppliers and Vendors: Local businesses supplying goods and services, such as fuel, safety equipment, and construction materials, will also benefit from the increased demand generated by the project.

2. Skills Development and Training

The project will provide opportunities for the development of technical skills and vocational training in the local workforce. The project Proponent. is committed to investing in the professional development of its employees, ensuring a long-term, sustainable workforce. Key areas of skill development include:

- Heavy Equipment Operation: Training programs will be offered to operators of excavators, loaders, and conveyor systems, improving their skills and enhancing job prospects.

- Safety Standards: Workers will receive specialized training on safety protocols, personal protective equipment (PPE) usage, and emergency response, ensuring adherence to best practices in occupational safety.

- Environmental Management: Employees will be trained in sustainable quarrying practices, including dust control, water management, and reclamation strategies.

3. Contribution to Local Infrastructure Development

The sand and loam extracted from the quarry will directly support local infrastructure projects by providing essential raw materials for construction. These materials will be used in:

- Road Construction: Sand is a critical component for roadbeds, foundations, and other civil engineering projects. The project will contribute to the development and maintenance of roads, bridges, and highways in the region.

- Building Construction: Loam and sand will support the construction of residential, commercial, and public buildings in both urban and rural areas.

- Agricultural Land Improvement: Loam is a valuable resource for improving soil quality, which will help enhance agricultural productivity in the surrounding areas.

4. Revenue Generation and Economic Growth

The quarry project will generate significant revenue streams for the local economy and the national government through various channels:

- Taxes and Royalties: B-227/SMP/001 operations will contribute to the national economy through corporate taxes, mining royalties, and export duties. These funds will support public services and infrastructure development across Guyana.

- Local Business Growth: By sourcing materials and services locally, the project will stimulate growth in the local business community, increasing demand for goods and services.

5. Community Engagement and Development

Ms. Bhaskaran is committed to engaging with local communities near the project site, ensuring that the project aligns with their social and economic needs. This will include:

- Community Liaison: Appointing community liaison officers to maintain open communication with residents, ensuring that their concerns and suggestions are considered during the project's operation.

- Support for Local Initiatives: The project will invest in local community initiatives, such as education, healthcare, and infrastructure improvements, enhancing the overall quality of life in the region.

6. Environmental Sustainability and Land Reclamation

While the quarry will be a significant source of economic development, Trident Marine Trading Inc. is also focused on minimizing environmental impacts and ensuring that land is restored for future use post-mining. This includes:

- Land Reclamation: After extraction, the land will be restored to a state that supports agricultural or commercial use, benefiting future generations.

- Sustainable Practices: The project will implement dust control, water management, and reclamation measures that minimize the environmental footprint of operations, ensuring long-term sustainability for the local ecosystem.

7. Long-Term Economic Stability

With a projected lifespan of 10 years, the sand and loam quarry project will contribute to the long-term economic stability of the region. This extended period of operation provides:

- Sustained Employment: Stable employment over the life of the quarry, allowing workers to build long-term careers and support their families.

- Ongoing Revenue Generation: Consistent tax and royalty contributions to the government over the quarry's lifespan will support public services and infrastructure investment.

Conclusion

The B-227/SMP/001 Sand & Loam Quarry Project will deliver substantial socio-economic benefits to the local community, the region, and the national economy of Guyana. By providing employment, contributing to infrastructure development, and supporting local businesses, the project will play a vital role in the long-term development of the region. Additionally, the focus on environmental sustainability and community engagement ensures that the project aligns with broader social and economic goals for the country.

Need for the Project

The B-227/SMP/001 sand and loam quarry project is critical to meet the rising demand for construction materials in Guyana. As the country's infrastructure development accelerates, there is a significant need for high-quality sand and loam to support various construction applications. The demand is driven by a surge in public infrastructure projects, residential and commercial construction, and roadworks, all of which rely heavily on these materials.

Key factors driving the need for the project in the construction sector include:

1. Government Infrastructure Projects: The Government of Guyana is investing heavily in infrastructure, particularly roads, bridges, and public facilities. Sand and loam are essential for constructing and maintaining these projects. Sand is widely used in concrete production, while loam plays a crucial role in roadworks for stabilizing foundations and preventing soil erosion.

2. Urban and Rural Development: The rapid expansion of urban areas and the development of rural communities have increased the demand for construction materials, especially sand and loam, for building new residential, commercial, and industrial structures.

3. Road Construction and Maintenance: Road infrastructure is a priority for both urban and rural development. Loam, known for its soil-binding properties, is frequently used in roadworks to create stable, compact surfaces. It is often laid beneath roads and highways to provide a smooth foundation, ensuring durability, and reducing wear on the asphalt or concrete surface.

Uses of Sand and Loam in the Construction Sector

Both sand and loam serve essential functions in construction, particularly in building and roadworks.

- Concrete Production (Sand): Sand is a vital component in concrete, used for constructing buildings, bridges, and other infrastructure. The strength and durability of concrete directly depend on the quality of the sand used in its production.

- Road Construction and Foundations (Loam and Sand): In roadworks, loam is used for creating a stable base layer beneath the road surface, helping to prevent settling, erosion, and water drainage issues. It binds well with other materials, reducing soil displacement and maintaining the integrity of the road foundation. Sand is used in road surfaces (asphalt or concrete) to improve grip and ensure durability.

- Earthworks and Foundation Preparation: Sand is a popular choice for leveling and filling during the construction of building foundations. Loam, on the other hand, helps in soil stabilization around foundations and construction sites, preventing soil erosion and improving drainage.

- Cement Blocks, Mortar, and Paving: Sand is also crucial in the manufacture of cement blocks, mortar, and paving materials. These materials are integral to constructing walls, pathways, and structural elements of buildings.

Closing the Supply-Demand Gap for Construction Materials

Currently, there is a significant gap between the supply of locally sourced sand and loam and the growing demand in Guyana's construction sector. This shortage forces construction companies to import materials at higher costs, leading to project delays and increased budgets. The B-227/SMP/001 sand and loam quarry project aims to:

- Provide a stable, local supply of high-quality sand and loam to meet the demands of the construction industry.

- Reduce reliance on imported materials, cutting costs and project delays.

- Offer competitive pricing at USD $9 per ton, making construction and infrastructure projects more affordable and accessible.

Sand and Loam Quarry Reserve & Financial Estimation

1. Reserve Estimation

The reserve estimation is based on a 200-acre compartment mined over a 10-year period with a cutoff depth of 30 feet. The calculations yield the following results:

• Total Volume: 9,682,222 cubic yards

• Estimated Reserves: 11,250,737 tonnes

- Sand: 8,200,837 tonnes

- Loam: 3,049,900 tonnes

• Annual Production Target: 1,125,074 tonnes/year

2. Equipment List and Capital Cost

Equipment	Quantity	Capacity	Unit Cost (USD)	Total Cost (USD)
Hydraulic Excavator	2	150.0	$180,000.00	$360,000.00
Wheel Loader	2	100.0	$120,000.00	$240,000.00
Articulated Dump Truck	3	120.0	$200,000.00	$600,000.00
Screening Plant	1	250.0	$300,000.00	$300,000.00
Water Truck	1	nan	$100,000.00	$100,000.00
Dozer	1	80.0	$160,000.00	$160,000.00
Fuel Storage & Pump System	1	nan	$50,000.00	$50,000.00
Weighbridge	1	nan	$70,000.00	$70,000.00

Total Capital Cost: $1,880,000.00

3. Financial Summary (10-Year Projection)

Total Revenue (USD): $101,256,633.00

Capital Cost (USD): $1,880,000.00

Operating Cost (USD): $28,126,842.50

Administrative Cost (USD): $2,500,000.00

Net Profit/Loss (USD): $68,749,790.50

Financials

This document presents the financial analysis of the B-227-SMP/000-1 Sand & Loam Quarry project over a 10-year lifespan. The analysis assumes a selling price of USD $9 per ton of loam and considers the project's operational costs, revenue, and profits.

Key Assumptions:

- Annual Production: 1,125,074 tonnes/year
- Price per Ton: USD $9.
- Annual Operational Costs: USD $2,812,684.
- Lifespan of the Project:10 years.
- Capital Equipment: $1,880,000.00.
- Customers Provide barge: No barging costs incurred by Ms. Bhaskaran.

Revenue Analysis:

- Annual Revenue: With an annual production of 1,125,074 tonnes and a selling price of USD $9 per ton, the annual revenue is calculated as: 1,125,074 × 9 USD/ton = 10,125,666 USD/year.

This analysis demonstrates that the project is financially viable and will generate substantial profits for Ms.Bhaskaran over the 25-year period, assuming stable production levels and operational costs.

Forecasting & Scheduling Plan

Objective

This plan ensures alignment between production targets and financial projections, enabling proactive identification of potential deviations such as downtime, cost overruns, and logistical bottlenecks. The plan covers:

• Production Forecasting – Setting clear extraction targets and aligning with financial projections.

• Operational Scheduling – Structuring daily, monthly, and annual production schedules.

• Risk Management Strategies – Identifying potential risks and mitigation plans.

Production Forecasting

Annual & Monthly Targets

To meet the production demand, the following has been considered and allocated accordingly

Resource Allocation

Resource	Requirement
Excavators	1-2 units (continuous operation)
Front-end Loaders	1 units
Barge Loading System	1 conveyor system
Transport Barges	Customer-supplied
Manpower (Operators & Support Staff)	10-20 employees

3. Operational Scheduling

Daily & Weekly Operations Plan

Activity	Frequency	Description
Excavation & Extraction	24/7	Continuous extraction using excavators & loaders
Material Transport to Stockpile	Daily	Front-end loaders move material to stockpile
Barge Loading	Weekly	Conveyor system loads material onto barges
Maintenance & Equipment Checks	Weekly	Routine inspections to prevent breakdowns
Environmental Control (Dust & Water Management)	Daily	Water spraying & sediment control

Monthly & Annual Review

Period	Review Focus	Actions
Monthly	Production vs. Targets	Adjust equipment usage or shifts if needed
Quarterly	Cost Control & Efficiency	Analyze expenses & optimize processes
Annual	Financial Review & Forecasting	Adjust projections based on market & costs

Risk Management & Mitigation Strategies

Downtime Risks & Solutions

Risk	Potential Impact	Mitigation Strategy
Equipment failure	Production delays	Implement predictive maintenance using real-time monitoring
Weather disruptions	Slowdown during rainy season	Stockpile dry material for uninterrupted supply
Labor shortages	Reduced productivity	Cross-train employees for flexible workforce management

Key Indicators

Return on Investment (ROI): 3656.90%

Annual Revenue: $10,125,663.30

Annual Operating Cost: $2,812,684.25

Annual Administrative Cost: $250,000.00

Annual Net Profit: $6,874,979.05

Breakeven Point (tonnes): 3,611,871 tonnes

Operating Margin: 69.75%

Profit Margin: 67.90%

Payback Period: 0.27 years

Appendix

Forward thinking

As part of its commitment to optimizing operations, Ms. Bhaskaran is actively considering the implementation of several advanced technological solutions. These innovations are aimed at improving efficiency, ensuring safety, and minimizing the environmental impact of the sand and loam quarry project, while still relying on conventional heavy-duty machinery and customer-supplied trucks for transport.

1. GPS-Enabled Fleet Management and Equipment Tracking

Ms. Bhaskaran is evaluating the use of GPS-enabled tracking systems to monitor the movement and performance of excavation and loading equipment. This will help the company optimize the deployment of machinery and ensure efficient resource utilization.

- GPS for Equipment: Equipping excavators and loaders with GPS systems allows for the ability to track the location and movement of equipment in real-time, reducing delays and improving operational efficiency.

- Real-Time Monitoring: Ms. Bhaskaran is exploring the option of integrating real-time monitoring tools to track fuel consumption and operational hours, helping to identify areas where improvements can be made.

2. Real-Time Data Monitoring and Predictive Maintenance

To reduce downtime and increase the reliability of its machinery, Ms. Bhaskaran is considering the implementation of real-time data monitoring and predictive maintenance systems. These technologies will allow for better equipment management by anticipating maintenance needs based on usage data.

- IoT Sensors for Equipment Health: Installing sensors on heavy machinery will provide data on wear and tears, enabling the ability to address maintenance needs before they cause breakdowns.

- Predictive Maintenance: The use of predictive maintenance tools will allow Ms. Bhaskaran to plan servicing schedules, thereby reducing operational disruptions and prolonging the lifespan of the equipment.

3. Drones for Site Surveying and Monitoring

Bhaskaran is also considering the use of drones to conduct aerial surveys and monitor the quarry's progress. Drones can provide real-time data on stockpile levels, extraction zones, and environmental conditions.

- Aerial Surveys: Drones will be used to map the quarry site with high precision, allowing for better planning and resource management.

- Progress Tracking: Regular drone flights will monitor ongoing operations, ensuring that work stays on schedule and within the boundaries defined by the regulatory authorities.

4. Advanced Dust Control Systems

To enhance environmental compliance and improve working conditions, Bhaskaran is exploring smart dust control systems that can automatically adjust water spray levels based on dust conditions in the quarry.

- Automated Water Spraying: Considerations are being made for systems that can detect dust levels and adjust the amount of water sprayed accordingly, minimizing water waste while ensuring effective dust control.

- Fog Cannons: Ms. Bhaskaran may also introduce fog cannons at key locations, such as loading zones and stockpiles, to capture airborne dust and maintain air quality standards.

5. Energy-Efficient Machinery and Renewable Energy Solutions

Ms. Bhaskaran is evaluating the potential use of energy-efficient machinery and renewable energy sources to reduce operational costs and minimize environmental impacts.

- Hybrid or Electric Equipment: Plans include exploring options for introducing hybrid or electric-powered excavators and loaders, which will reduce fuel consumption and emissions while maintaining productivity.

- Solar Power: Ms. Bhaskaran is considering installing solar panels to power administrative buildings, lighting, and small-scale equipment, reducing the overall reliance on non-renewable energy sources.

6. Water Management Systems

Given the proximity to Cheong's Creek and Arobaio Creek, effective water management systems are being considered to manage runoff and prevent contamination of nearby water sources.

- Water Recycling: Ms. Bhaskaran is assessing water recycling systems that could filter and reuse water for dust suppression and equipment cleaning, reducing the project's overall water footprint.

- Sediment Control: Ms. Bhaskaran is exploring systems to capture and manage sediment from runoff before it reaches nearby water bodies, ensuring the protection of local ecosystems.

7. Digital Twin Technology for Operational Optimization

To optimize resource allocation and improve decision-making, considerations for the implementation of Digital Twin technology. This technology creates a virtual model of the quarry, allowing the company to simulate different scenarios and plan operations more effectively.

- Operational Simulations: Digital Twin technology will enable testing of various operational strategies, such as altering shift schedules or adjusting the layout of extraction zones, without disrupting actual operations.

- Maintenance Optimization: The digital twin can also predict when maintenance is required based on operational data, helping to avoid unexpected equipment failures and improve overall efficiency.

8. Worker Safety Technologies

Ensuring the safety of workers is a top priority, and Ms. Bhaskaran is considering the introduction of wearable safety devices and hazard detection systems to enhance the safety of its workforce.

- Wearable Devices: These devices can monitor the health and safety of workers in real-time, tracking environmental conditions and worker vitals to prevent accidents such as heat stress or overexposure to dust.

- Proximity Sensors: Ms. Bhaskaran is exploring the installation of proximity sensors on equipment to warn operators when workers or other machinery are too close, reducing the risk of collisions and accidents.

9. Automated Reporting and Compliance Management

Bhaskaran is evaluating the use of automated reporting systems to streamline compliance with environmental and operational regulations. These systems will automatically generate reports on production levels, environmental impact, and regulatory compliance, ensuring the company remains in line with legal requirements.

- Compliance Reporting: Automated systems will track and report on key environmental metrics such as water usage, dust levels, and sediment control, ensuring that the project complies with regulatory standards set by the Guyana Geology and Mines Commission (GGMC).

- Financial Reporting: These tools will also help monitor financial performance, including tracking revenue, operational costs, and profitability, allowing for better resource management.

Conclusion

By considering the integration of these technological innovations—without the use of automated heavy-duty equipment or trucks— Ms. Bhaskaran aims to improve the efficiency and sustainability of its sand and loam quarry project. These technologies will help optimize production, ensure regulatory compliance, and enhance worker safety while maintaining a responsible approach to environmental management.