Project Summary

Project Name: Harry Narine Sand and Loam Operations

Developer: Mr. Harry Narine (Proponent) – Carmichael Street,

Georgetown

Date Prepared: November 27, 2025

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Contents

Site Description

The proposed sand and loam mining site is located at Hill Foot, Soesdyke, along the Soesdyke–Linden Highway in Guyana's Demerara-Mahaica region. The project area covers approximately 33 acres of state land under Mining Permit N-1021/MP/000. Geographically, the site lies just north of the confluence of the Madewini River and Yarowkabra Creek (around 6°30′26″N, 58°13′12″W). It is situated south-southwest of Timehri (near Cheddi Jagan International Airport) and inland from Soesdyke village. Primary access is via the East Bank Public Road and the Soesdyke–Linden Highway, with existing laterite tracks leading to the pit area. An exhausted sandpit adjacent to the site will provide internal haul roads connecting extraction zones to stockpiles and the highway exit.

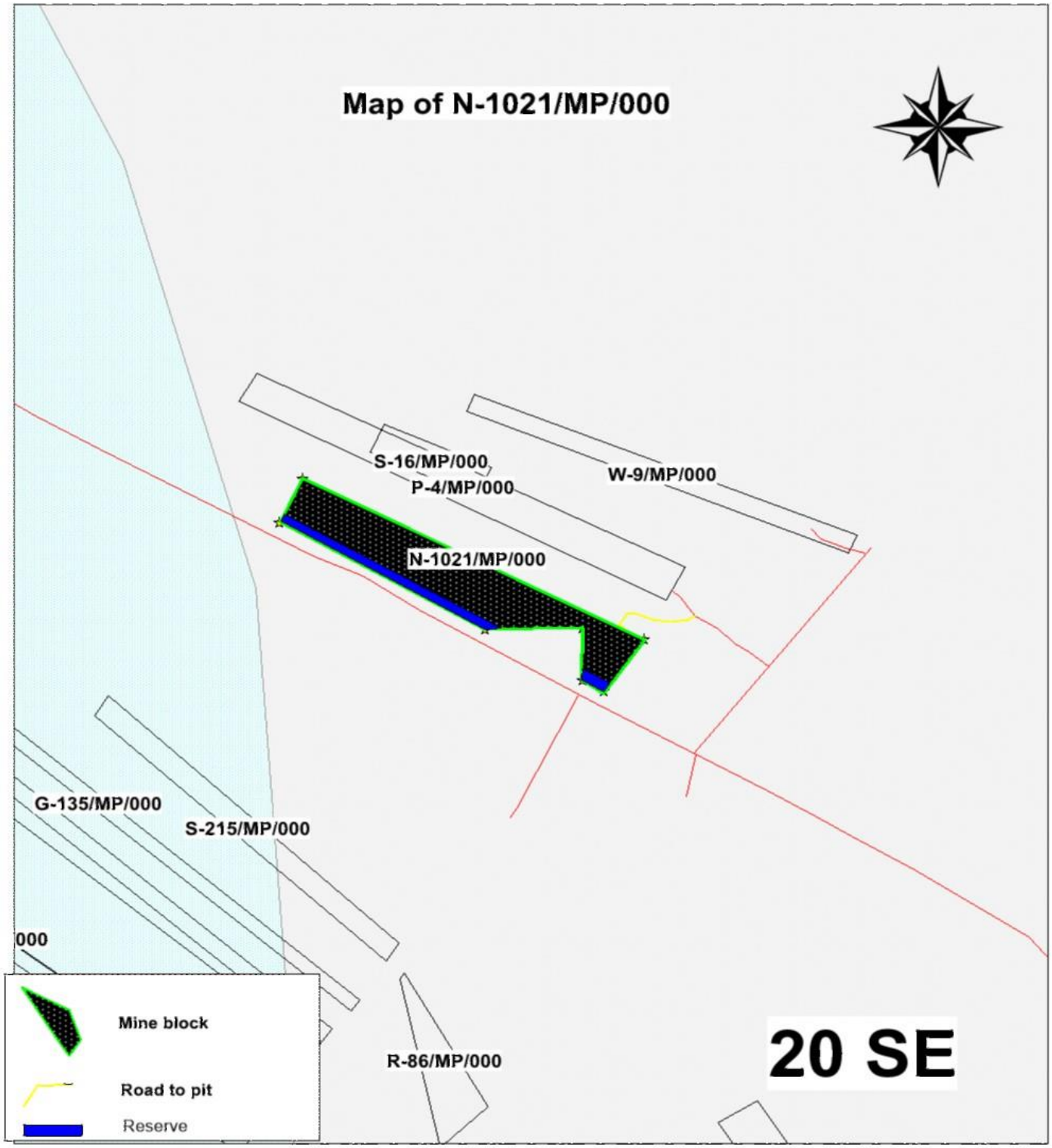
Figure 1: A sand mining pit in the Soesdyke-Linden region (Yarrowkabra), illustrating terrain and open-pit conditions similar to the proposed Hill Foot site. The project site is currently undeveloped land with sandy soil and scrub vegetation. Proper drainage controls and a buffer of at least 60 m of intact vegetation will be maintained next to the highway to protect the road and surrounding environment.

Spatial and Temporal Boundaries: The project's direct footprint is the 33-acre permit area, but its area of influence extends to immediate surroundings such as the access road and nearby receptors (e.g. the highway and closest communities). There are no settlements on the site itself; the nearest villages include Hill Foot (approximately 1 mile away), Timehri, Sand Hills Landing, and Kuru Kururu, where small-scale farming and logging are practiced. The temporal boundary of active operations is expected to span about 10 years (the mine's life), plus additional time for site closure and post-closure monitoring.

Land Use and Layout: The project site is on vacant state land characterized by mixed bush and sandy soils. Surrounding land use includes forestry and previous mining – notably, a worked-out sand pit adjacent to the permit area. The Soesdyke-Linden Highway runs near the site, making it a sensitive receptor that will be protected via setbacks and engineering controls (e.g. berms and drainage) to prevent any impact from mining. A site layout will be established with defined zones for excavation, material stockpiling, and equipment parking. No permanent buildings are planned; only temporary structures (containers or sheds) for equipment storage and crew shelter will be installed. Any fuel storage will be in designated, bunded areas away from waterways.

Receiving Waters and Discharge: Notably, there are **no natural streams or creeks within the project area** – the site consists of well-drained upland sands with rainwater percolating directly into the ground. The nearest surface water is the Madewini River/Yarowkabra Creek confluence just south of the site, which are uphill to the site and as such direct discharge to these waterways will occur. All runoff from rainfall will be managed on-site. Drainage channels and interceptor ditches will direct stormwater to settling ponds or natural gullies well away from the pit before release. There are no planned intake or outfall structures into natural water bodies. Overall, the absence of on-site creeks significantly reduces the risk of water pollution, as any potential sediment-laden runoff can be contained and treated within the project area.

Map of Project site



Project Design

Development Stages: The project will progress through distinct stages – from site preparation and construction, through full-scale operation, to eventual closure and rehabilitation:

- **Construction Phase (Site Preparation):** This initial stage involves clearing vegetation and stripping topsoil within the 33-acre permit to expose the sand deposit. Topsoil will be stockpiled for later use in land reclamation. Basic infrastructure will be established, including upgrading the access road from the highway, preparing internal haul roads, and grading areas for stockpiling sand. No permanent buildings are required; however, small support facilities (e.g. a fuel storage area and maintenance shed) will be set up. Erosion control measures (such as perimeter berms or silt fences) will be installed before excavation begins to protect surrounding areas during construction. This phase is relatively short (estimated a few weeks to a couple of months) given the small to medium scale of the operation.

- **Operation Phase (Extraction and Processing):** The operational stage will utilize **open-pit mining methods** to extract sand and loam. Standard earth-moving equipment – hydraulic excavators, front-end loaders, and haul trucks – will be employed for excavation and material handling. The mine will be developed in small segments (bench by bench), with a maximum pit depth of around 30 feet as guided by the sand deposit depth. Excavators will loosen and dig sand, which loaders then transport to a central stockpile area. From there, trucks will carry the sand off-site to customers. No complex processing is required, as the sand will be mined and sold in its natural state (apart from basic screening or sorting if needed). The layout will be organized for efficiency and safety – designated haul routes, one or two stockpile/loading zones, and slope angles maintained within safe limits. **Conventional open-pit design** features such as benches (approximately 5 m high) and gentle slope angles will ensure stability. During operations, **progressive reclamation** will be practiced: as one section of the pit is mined out, it will be contoured and rehabilitated even while extraction moves to a new section. This minimizes the active disturbed area at any time and facilitates easier closure. Throughout the mine life, the project will adhere to the standards of the Guyana Geology and Mines Commission (GGMC) and the Environmental Protection Agency (EPA) for safe mining, including proper traffic management on-site, dust and noise control, and environmental monitoring. Alternative mining methods are limited for this type of shallow sand deposit; open-pit excavation was chosen as the safest and most practical approach over any hypothetical alternatives (such as dredging or remote extraction), given the site's geology and dry land setting.

- **Closure and Rehabilitation Phase:** Once the economically recoverable sand is depleted (or at end of the permit term), the project will transition to closure. All mobile equipment and temporary facilities will be removed from the site. The pit areas will be re-contoured to safe, gently sloping profiles. Stockpiled topsoil will be redistributed over backfilled areas and pit floors to facilitate re-vegetation. A combination of natural regeneration and active planting of native species will be used to restore vegetation cover, aiming to return the land to a stable condition (such as grassland or mixed bush habitat). Any water control structures (e.g. ponds or ditches) will either be neutralized or left in a state that supports natural drainage. The closure plan will also include measures to prevent access to any remaining highwalls or deep spots (for example, fencing or signage), until the site is deemed fully safe. Monitoring will continue for a period after closure, checking for issues like erosion, revegetation success, or water quality in runoff. Ultimately, the goal is to rehabilitate the land such that it can be productive or safe for future use (whether for forestry, agriculture, or community purposes) in line with regulatory requirements and landowner expectations.

Production Process: The sand extraction process begins with clearing and overburden removal, after which mining proceeds in horizontal slices (benches). Material is excavated and directly loaded into dump trucks or piled for loading. There is no chemical processing involved in this operation – it is a straightforward excavation of sand (and loam) and transportation to market. The only on-site processing might be rudimentary screening to remove oversized debris. Water will be occasionally used for **dust suppression** but not for washing the sand, so process water use is minimal. As such, the operation is relatively simple: **from raw material (sand in situ) to finished product (stockpiled construction sand)** in a single step of excavation. This simplicity reduces potential waste streams and water requirements compared to other mining projects.

Utility Requirements: Utility needs for the project are modest: - **Water Supply:** Water will be required primarily for dust control on roads and working faces. Water tankers (mobile bowsers) will periodically sprinkle the haul roads and pit area to suppress dust emissions. The project may source water from a nearby river (Madewini) via small pumps or from rainwater collected in the pit sump, supplemented by commercial water delivery if needed. Potable water for workers will be brought in from external sources. There is no on-site stream to serve as a continuous water source, but the volume needed for dust suppression is manageable and will be stored in tanks on-site. - **Power/Energy:** There is no connection to the public electricity grid at the remote site. All equipment (excavators, loaders, trucks) will run on diesel fuel. A diesel generator may be used

for any small electrical needs, such as lighting, pumps, or office containers, but power demand is minimal. Fuel will be stored in a secure, contained area and refueled via a service truck. The anticipated fuel usage is moderate, consistent with a small fleet of heavy machinery, and will be monitored to optimize efficiency. - **Communications:** The site is within reach of existing communication networks (cellular service along the highway). A two-way radio system will also be used for coordination between equipment operators and the site office, enhancing safety. The project will maintain communication links for emergency response as part of its safety plan (e.g. the ability to contact medical services or authorities via cell or satellite phone if needed).

Waste Management: The operation will generate several waste streams, all of which will be managed to minimize environmental impact: - **Mining Waste (Overburden):** Topsoil and any unusable overburden material will be stockpiled carefully on site and later used in land rehabilitation. There is negligible waste rock since the deposit is primarily clean sand; almost all excavated material is marketable or usable for reclamation. - **Solid Waste (Domestic/General):** The workforce will generate minor domestic waste (packaging, food scraps, etc.). Covered bins will be provided, and solid waste will be collected and disposed of off-site at an approved landfill or waste facility via a contracted waste disposal service. - **Industrial Waste (Oils, Lubricants, Parts):** Machinery maintenance will produce waste oils, filters, and used parts. All used oil and lubricants will be captured and stored in drums. These will be transported to a certified waste oil recycler or disposal facility (in line with national regulations) – they will **not** be dumped on the ground. Spill kits will be on hand to manage any minor leaks or spills. Used parts and scrap metal will be collected for recycling where possible. - **Sewage:** For any on-site personnel (if a temporary camp or guard post is used), portable sanitary facilities (e.g. chemical toilets) will be provided and periodically serviced by licensed contractors, so sewage will not be released to the environment. - **Hazardous Materials:** Aside from fuel and oils, few hazardous materials are present. Any empty chemical containers (such as grease tubes, paint cans, etc.) will be treated as hazardous waste and stored securely for proper disposal. The project will maintain a log of hazardous materials and ensure compliance with EPA guidelines for their handling and disposal.

Overall, the project's design emphasizes **operational efficiency and environmental protection** at all stages. By following best practices in open-pit mining and incorporating mitigation measures from the outset, the design seeks to minimize the project's footprint and prevent incidents. The proponent has committed to operate in **full compliance with GGMC and EPA standards**, using qualified personnel and adhering to all permit conditions. In addition, an alternative analysis was implicitly conducted in choosing this site and method: the Hill Foot location was selected under the mining permit as it contains a known sand resource needed for the construction market, and the chosen open-pit method is the industry standard offering the least risk and most

practicality for sand extraction. No viable alternative site was considered since the permit confers rights to this specific area, and the local demand for sand makes this project strategically important to supply nearby development projects.

Project Size

Capital Investment: The estimated capital cost for establishing the sand and loam operation is on the order of GYD $300 million (approximately USD $1.5 million). This includes the mobilization of equipment, site preparation, and installation of necessary facilities. Much of the heavy machinery (excavators, loaders, etc.) may be leased or already owned by the proponent, which helps keep the upfront investment modest. Operating costs are expected to be recovered through steady production, and financial projections indicate a healthy return on investment (annual net profit around USD $0.6 million, yielding a payback period of under 2 years).

Workforce: The project will provide direct employment for an estimated **10 to 20 persons** during the operational phase. This workforce includes equipment operators, truck drivers, supervisory staff, and general laborers. In the **construction phase**, a smaller crew (perhaps 5–10 workers) will be engaged for land clearing and site setup, many of whom can transition into the mining operation roles thereafter. During **full operations**, personnel will likely comprise: 4–6 heavy equipment operators (for excavators and loaders), 4–6 truck drivers (if hauling is done by the operation itself for delivery), and about 2–4 support staff for maintenance, security, and administration. The project is committed to sourcing labor locally as much as possible, which will benefit communities in the Soesdyke-Linden corridor. In the **closure phase**, the workforce will taper off, retaining a small team for rehabilitation works and monitoring. The project will also create **indirect employment** opportunities for service providers such as fuel suppliers, maintenance contractors, and transportation/logistics services in the area.

Production Rates: Based on geological assessments, the sand reserve in the 33-acre pit to an average depth of 30 ft is approximately **1.22 million cubic meters**, or about **2.1 million tonnes** of sand. The mine plan targets a production rate of roughly **122,000 cubic meters per year**, equivalent to **around 200,000 tonnes of sand per year**. This rate translates to about 16,000–17,000 tonnes per month (assuming steady output) and positions the operation as a **small to medium-scale supplier** in Guyana's construction materials sector. The production volume may ramp up gradually in the first year as the site is developed, then stabilize at the annual target. At peak capacity, daily extraction could be on the order of 700–800 tonnes (approximately 25–30 truckloads per day leaving the site, depending on truck size). The **loam** component (topsoil or clayey material) is smaller; any loam recovered will be sold or used in parallel with sand, but sand is the primary product by volume. No blasting is involved since the material is unconsolidated.

Project Lifespan: The operation is planned with a **mine life of about 10 years** based on the reserve estimate and projected extraction rate. This 10-year lifespan covers the active sand extraction. If market demand

increases or if only a portion of the reserve is mined in that period, the project duration could extend accordingly (subject to permit renewals). However, current projections are that the available sand will be depleted or the site will be fully mined out within a decade of operation. After mining ceases, an additional period is allocated for closure and rehabilitation (approximately 6–12 months for intensive reclamation activities, followed by a few years of post-closure environmental monitoring as required). Therefore, the **total project timeline** from start to final completion may span around 11–12 years.

Non-Technical Summary

Mr. Harry Narine, a Georgetown-based accountant and entrepreneur, is proposing to develop and operate a **33-acre sand and loam quarry at Hill Foot, Soesdyke**. The purpose of this project is to extract construction-grade sand to meet the growing demand in Guyana for housing, infrastructure, and general development projects. The site is ideally located along the Linden-Soesdyke Highway, which will facilitate easy transport of sand to consumers in Georgetown and surrounding regions. Over an anticipated **10-year period**, the operation will produce on the order of **200,000 tonnes of sand per year** for the local market. Sand from this pit will be used for making concrete, mortar, and fill material, essential inputs for building homes, roads, and commercial facilities. By tapping into a new sand source, the project will help **close the supply gap** and stabilize the price of sand in the construction industry.

The mining process is straightforward: vegetation is cleared, and sand is dug from the ground with excavators, and then loaded into trucks for delivery. No chemicals or complex processing are involved; it is essentially **mining and moving earth**. Because of this simplicity, the environmental footprint is easier to manage compared to other types of mining. Even so, the project will implement several safeguards. For example, water trucks will dampen the roads to **reduce dust**, and machinery will have proper mufflers to **limit noise**. Operations will be conducted in daylight hours to minimize disturbance. Importantly, the mining will happen in phases; as one section is mined out, it will be **rehabilitated with sand reshaping and tree planting** even as work moves to a new section. This way, the land is not left scarred at the end – it is being healed continuously.

In terms of benefits, the project will **create jobs for local residents** – heavy equipment operators, laborers, drivers, and support staff – boosting the economy in the vicinity of Hill Foot and along the highway. It will also spur indirect employment for those providing services like trucking, equipment maintenance, and catering. Mr. Narine, leveraging his business experience (including managing the Jubilee Resort at Timehri), intends to run the operation efficiently and in compliance with all regulations. The sand pit will supply much-needed raw material for construction, thereby supporting Guyana's national development goals. In summary, this project aims to **responsibly extract sand** to support development while **safeguarding the environment and community well-being**. It will be **financially viable** and **environmentally managed**, contributing positively to Guyana's construction supply chain and local livelihoods.

Project Duration

The project's timeline is broken down by phase, from initial preparations through to closure:

- **Construction/Preparation:** *Timeline:* Late 2025 – Early 2026 (approximately 1–3 months). This includes mobilizing equipment, clearing the site, and constructing access and stockpile areas. By the end of this phase, the site will be ready for full-scale sand extraction.

- **Operational Phase:** *Timeline:* 2026 – 2035 (up to 10 years of mining operations). During this period, the pit will be actively mined. Sand extraction will likely ramp up to steady-state in the first year and continue at 200,000 tonnes per year. The operational phase may be divided into sub-phases internally (e.g., Phase 1 might target one section of the 33 acres for 2–3 years, then Phase 2 moves to another section, etc.), but overall it spans a decade of production. Regular monitoring and mid-term reviews (e.g., after year 5) will assess if the project is on track or if adjustments in rate are needed due to market conditions or resource variability.

- **Closure and Rehabilitation:** *Timeline:* 2035 – 2036 (approximately 6–12 months for active closure, followed by ongoing monitoring for 2–3 additional years if required). As the sand reserve is exhausted around year 10, closure activities will commence. This involves removing equipment, grading the pit slopes, spreading topsoil, and replanting vegetation. Most of the physical reclamation work should be completed within a year after mining stops. Post-closure, the site will be observed (perhaps until 2038) to ensure re-vegetation is successful and no environmental issues persist. Final closure documentation will be submitted to regulatory agencies to demonstrate that all lease and permit conditions (like land rehabilitation) have been satisfied.

It should be noted that these timelines are estimates. The actual duration could shift based on operational factors , for instance, if demand is high, the resource might be mined faster (shortening the operational phase), or if market slows, mining could be extended at a lower rate (lengthening the timeline within permit allowances). Any extension or significant change would be done in consultation with the EPA. However, a 10-year active life is the basis for planning.

Throughout all phases, **environmental management activities are integrated** (e.g. progressive rehabilitation during operations and environmental monitoring post-closure). This ensures that the transition between phases is smooth and compliance is maintained from start to finish.

Potential Environmental Effects

The project will have various interactions with the environment. The following are the key potential effects anticipated from the sand mining operation:

- **Land and Soil:** Clearing of vegetation and removal of topsoil will disturb the land surface and alter the natural landform of the area. Approximately 33 acres of land will be transformed from secondary bushland to an open pit over the life of the mine, resulting in localized land degradation if not managed. Soil structure will be impacted, the top 0.5 meters of fertile soil will be stripped, and there will be the creation of spoil piles and pit walls. Without mitigation, this could lead to increased erosion and loss of soil productivity in the project area.

- **Air Quality:** Mining activities will generate **dust and emissions**. During the dry season, exposed soil and sand can produce dust, especially from haul roads and as trucks travel to and from the site. Excavation, loading, and the movement of machinery will also suspend particulates into the air. If uncontrolled, this dust could reduce air quality in the immediate vicinity and pose a nuisance or health hazard to workers and nearby residents. Additionally, heavy equipment and trucks emit exhaust (diesel engines), contributing pollutants like NOx, SOx, CO, and particulates, although these are limited by the relatively small scale of the operation.

- **Noise and Vibration:** The operation of excavators, loaders, and trucks will create elevated noise levels on-site. This noise could propagate beyond the site boundaries, potentially disturbing wildlife and the residents of any nearby communities (such as Hill Foot village). Typical equipment noise (engine noise, reverse alarms, etc.) may be noticeable along parts of the Soesdyke-Linden Highway adjacent to the site. Vibration effects from heavy equipment movement are expected to be minor (no blasting is involved), but sustained operation could cause slight ground vibration perceptible very close to the site. Overall, noise pollution is a concern to be addressed, mainly during active daytime operations.

- **Water (Surface Water and Groundwater):** Although no perennial streams run through the site, heavy rainfall can cause runoff that might carry sediment off-site. Disturbed soil on pit walls or stockpiles can erode, leading to **sediment-laden runoff** that, if unmanaged, could flow into nearby low-lying areas or creeks, increasing turbidity in natural waters. Because the site is well-drained and there are no direct waterways, the risk is mainly during intense rain when overland flow occurs. Regarding groundwater, the pit may intersect the water table at about 2–6 m depth during wet seasons. This could lead to

localized groundwater inflow into the pit. Over-extraction of water is not a concern (since water will not be pumped in large quantities), but care must be taken that fuel or oil spills do not contaminate the groundwater. Overall, water-related impacts revolve around sediment control and preventing any contamination, as the **absence of surface water on-site greatly reduces aquatic impact potential**.

- **Flora and Fauna (Biodiversity):** The project will necessitate clearing of the existing vegetation cover on 33 acres, which means loss of habitat for local flora and fauna. Fauna in the area likely include small mammals, reptiles, birds, and insects typical of the Soesdyke hinterland. They will be displaced by the removal of vegetation and the noise/disturbance of mining. Some mortality of less mobile creatures (e.g. slow-moving reptiles or ground-nesting birds) could occur during land clearing. The change in land cover could also alter local microhabitats and drainage patterns. However, since the site is not known to host any rare or endangered species (it's a previously disturbed area near other sandpits and a highway), the **biodiversity impact is expected to be moderate**. Still, habitat loss and edge effects (changes in conditions at the boundary of the clearing) are potential environmental effects that need addressing.

- **Use of Natural Resources:** The operation will extract a non-renewable resource, approximately 2 million tonnes of sand over the mine's life, thereby depleting that natural mineral deposit. While sand is abundant regionally, this represents a permanent removal of material from the environment. The project will also consume diesel fuel for machinery, which indirectly uses petroleum resources and generates greenhouse gases. Additionally, water will be used (for dust control), which is taken from local natural sources, albeit in relatively small quantities. These constitute an impact in terms of resource utilization. The extraction and consumption are necessary for the project purpose, but they do mean the **natural resource base (sand, water, and fuel) is drawn down** to an extent to support the project's objectives.

- **Visual/Scenic Impacts:** (Optional consideration) the creation of an open pit and clearing of vegetation will alter the visual landscape of the area. What is currently a green, wooded tract will become an excavated terrain visible from certain vantage points (potentially from the highway or from higher ground). This could be considered an aesthetic impact, though in the context of an area that already has other sand mining activities and industrial use, the change may not be stark to casual observers.

In summary, the project's main environmental effects include **disturbance of land (landform and soil)**, **dust and noise generation**, **potential for sediment runoff affecting water quality**, **habitat loss**, and the **utilization of natural resources (sand and fuel)**. Each of these potential impacts will be further evaluated and will be the focus of mitigation measures to reduce their severity.

Mitigation Measures

To address the above potential impacts, the project will implement a comprehensive set of mitigation and management measures. These measures are part of the Environmental Management Plan (EMP) and operational best practices, ensuring that the sand mining is carried out responsibly and in compliance with Guyana's environmental regulations. Key mitigation strategies include:

- **Land and Soil Management:** Employ **phased excavation and concurrent reclamation** of mined-out areas. This means the site will not be open and barren all at once; instead, sections will be mined and then restored while the operation moves on. Topsoil removed at the start will be conserved and later spread back during rehabilitation to facilitate regrowth of vegetation. Slopes will be graded to gentle angles to prevent erosion, and exposed soil will be stabilized (for instance, by sowing fast-growing grass or using erosion control blankets on idle slopes). By progressively rehabilitating the land, soil erosion and degradation are minimized throughout the project life rather than waiting until the very end.

- **Dust Control (Air Quality):** Implement a rigorous dust suppression program. Water trucks will regularly spray water on internal roads, loading areas, and any other dust-prone surfaces. During dry and windy conditions, the frequency of spraying will increase. Additionally, the project will enforce **speed limits** on haul roads to reduce dust kick-up and require that trucks leaving the site with sand are covered (tarped) to prevent dust and spillage on public roads. A strip of natural vegetation will be maintained as a **buffer around the site**, which can act as a windbreak and dust filter for dust leaving the premises. With these measures, particulate matter emissions will be significantly reduced, protecting air quality for workers and neighbors.

- **Noise Abatement:** Noise impacts will be mitigated by several approaches. All equipment will be fitted with manufacturer-recommended **mufflers or noise suppressors** to dampen engine sound. Wherever possible, newer, low-noise models of machines will be used. The hours of operation will be restricted to **daytime** (e.g., 7 AM to 5 PM) so that there is no heavy noise during evenings or night when it would be most disruptive to nearby residents. If particular machines are exceedingly noisy, additional physical barriers (such as temporary earthen berms or sound barricades) will be placed between the source and the highway/villages. Workers on-site will wear hearing protection as part of occupational safety. Through these steps, noise levels at the boundary will be kept within acceptable limits (and certainly within EPA noise regulations for industrial activities).

- **Water and Sediment Control:** The project will **prevent off-site sedimentation** by installing proper drainage and runoff control systems. Perimeter drains (interceptor ditches) will be dug upslope of the pit to catch any runoff and divert it away from excavation areas, thereby reducing water entering the pit. Within the pit, sumps or settling ponds will be excavated at low points to capture silty runoff; water in these ponds will either infiltrate gradually or be pumped out after allowing sediment to settle. The clarified water can be released in a controlled manner to natural drains. Silt fences or sediment traps will be placed at strategic locations, particularly near the southern boundary where water could escape. **No process water** will be discharged directly to any creek; all water will be treated or allowed to settle before release. If groundwater seepage occurs in the pit, it will likely be minor; still, any pit water that needs to be pumped out will first pass through an oil-water separator (to remove any hydrocarbons) and then a settling basin to ensure quality. With these measures, the risk of muddy water reaching natural streams is negligible. Regular water quality monitoring (turbidity, pH, etc.) will be conducted downstream of the site as part of the EMP to verify that no impact is occurring.

- **Habitat and Biodiversity Protection:** To reduce ecological impacts, the project will **limit land clearing to the essential areas** and preserve vegetation buffers around the site, especially near any water bodies or public roads. For instance, a strip of trees/vegetation 60 meters wide will remain along the highway frontage to serve as both a visual/noise buffer and a habitat corridor for wildlife. Wildlife rescue protocols will be in place during clearing; workers will be trained to gently relocate any animals (like tortoises or iguanas) encountered during land clearing to safe habitats nearby. No hunting or harassment of wildlife by workers will be permitted. Additionally, the progressive rehabilitation plan will ensure that new vegetation (native species) is planted as mining phases are completed, gradually **restoring habitat**. Over the life of the mine, this means parts of the site will start returning to green cover even as other parts are being mined, softening the overall impact on local fauna. The timing of clearing can also be adjusted to avoid sensitive periods (for example, avoiding broad-scale clearing in peak bird nesting season if practicable). These efforts will mitigate the loss of flora and fauna, aiming to leave a functioning ecosystem post-closure.

- **Resource Use Efficiency:** While extraction of sand is the objective, the project will ensure **efficient use of resources** to minimize waste. All sand and loam extracted will be put to use (sold for construction or used in rehabilitation) so that there is no wastage of the mineral resource. In terms of energy, machinery will be maintained for optimal fuel efficiency (e.g., regular engine tune-ups to avoid excess fuel burn). The project will implement a preventative maintenance schedule to avoid fuel wastage due to poorly

running engines. By maximizing fuel efficiency, greenhouse gas emissions per tonne of sand are also reduced. Water use for dust control will be optimized by recycling (e.g., using pit water or capturing rainwater) and by focusing spraying only where needed, thus conserving freshwater. These practices ensure the natural resources consumed (sand, fuel, water) are used judiciously, yielding maximum benefit from minimal quantities.

- **Waste Management and Pollution Prevention:** Proper waste handling protocols will prevent environmental contamination. All hydrocarbons (fuels, oils) will be stored in lined and bermed containment areas to prevent soil or water pollution in event of a spill. Spill response kits (with absorbent materials, etc.) will be stationed near fuel storage and refueling areas. Employees will be trained in spill response so that any accidental leaks are swiftly contained and cleaned. Solid wastes will be segregated on-site (hazardous vs non-hazardous); hazardous wastes like used oil and oily rags will be transported to licensed disposal facilities, while general garbage will go to municipal waste disposal. The site will have a strict no-dumping policy – nothing is to be buried or burned on site. In addition, sanitation facilities will ensure no raw sewage enters the ground or water. By managing wastes rigorously, the project will **prevent soil and water pollution** and keep the site tidy, which also improves safety and wildlife protection (e.g., avoiding attracting pests).

- **Safety Measures and Monitoring (EMP):** Many mitigation measures overlap with safety and regulatory compliance. The project will implement an **Environmental Management Plan (EMP)** covering dust, noise, water, and biodiversity monitoring. Regular environmental monitoring (e.g. weekly dust visual checks, monthly noise measurements at the boundary, quarterly water sampling in rainy season) will be done to ensure that control measures are effective and regulatory limits are respected. An **Occupational Health and Safety Plan** will also be in force: all workers will have proper PPE (helmets, earplugs, dust masks, etc.) and will be trained in safe operating procedures. Emergency response plans will be prepared for scenarios like fuel spills, accidents, or fire. The project management will maintain open communication with the EPA, submitting periodic reports as required and facilitating site inspections. By proactively monitoring and adapting, the project can catch any emerging issue early and apply corrective actions, thereby continuously mitigating impacts.

- **Community Engagement:** (As a social mitigation, also relevant to environment) the project will keep nearby communities informed about its activities, especially those that could cause temporary inconvenience (like increased traffic or noise). A grievance mechanism will be established for residents

to voice concerns so they can be addressed promptly. Traffic management (signage, speed control) will be coordinated with the local authorities to reduce any road safety risks from trucking. These steps help maintain good community relations and indirectly support environmental goals (since an informed community can help spot issues like dust blowing off-site, etc.).

Conclusion

In conclusion, with the above mitigation measures in place, the **residual environmental impacts** of the Harry Narine Sand and Loam Operations are expected to be within acceptable levels. Land will be progressively rehabilitated, preventing long-term degradation. Dust and noise will be controlled to protect air quality and community well-being. Water resources will be safeguarded through robust sediment and pollution controls. Biodiversity loss will be minimized and partially offset by reclamation efforts. The project's planning has drawn on successful practices in similar operations (both locally and internationally) to ensure that environmental protection is woven into every aspect of the mine's lifecycle. By committing to these mitigation strategies and an active EMP, the proponent will **ensure the project remains compliant** with environmental regulations and that any impacts are **mitigated to as low as reasonably practicable**. This responsible approach will enable the sustainable supply of sand to the Guyanese construction sector while preserving the integrity of the environment and safety of the public.