

Royal Timbers Inc.

**SFEP 02/2020 – UPPER RIGHT BANK PURUNI RIVER REGION
NO.7**

REPORT OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

PREPARED FOR THE EPA



GLOSSARY

Base camp: A field based administrative operations centre, over an area of about 600km² set up by forest concessionaires for managing field operations. The base camp is organized to accommodate field operatives and carry out simple preventive maintenance of machines.

Biodiversity - the variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.

Business Community: All persons engaged in the transport, trade or sale of fuel, oil, mining gear, rations, and beverages, or providing services in the areas of mechanical, vulcanizing, or entertainment) services in the Kartabu Triangle.

Code of Practice (2018) -A set of rules on ethical, environmental, technical and social practices and protocols that the GFC published in 2018 and that embody mandatory standards for sustainable timber harvesting and ancillary practices in Guyana.

Climate Change - a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Ecosystem Services - The benefits people obtain from ecosystems.

Environmental and Social Impact Assessment (ESIA) - A process for predicting and assessing the potential environmental and social impacts of a proposed project, evaluating alternatives and designing appropriate mitigation, management and monitoring measures.

Forward camp: Simple, temporary tarpaulin covered camps set to accommodate forest operatives conducting forest inventory, road and skid trail construction and logging crews.

Gold Shout: Any news or rumours about a gold rush at a particular location.

Guidelines for Forest Operators (GFFO) (small concessions/large concessions): a document developed by GFC to provide forest concessionaires with guidance on timber harvesting and allied environmental and social practices in Guyana.

Depot: A site, generally on a riverbank, normally used for the temporary storage of containerized fuel or logs (see Landing).

Draaga: A floating, self-contained and self-propelled barge that dredges and processes earths from riverbeds and sometimes from river banks for the purpose of retrieving gold.

Landing: A clearing on an interior riverbank used as transit points for people, rations, equipment, and fuel transported by boat to access land based operations.

Logging community: all concession holders, their employees and contractors, and any other field operatives associated with harvesting timber on forest concessions in a given region or district.

Mining community: the entire array of large scale and small scale miners, their employees and contractors, and gold traders and other persons engaged with the retrieval, sale or purchase of gold from areas under mineral licences.

Rapids: A hydrological feature characterised by a river section where the riverbed has a steep gradient, causing a marked increase in water velocity and turbulence.

Sailor: An itinerant unskilled labourer who has no mineral license and who drifts from one mining operation to another doing odd jobs, including loading goods.

Sustainable Development: Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (WECD 1987).

Sustainable mining: According Strongman (2021) sustainable mining involves projects that are financially viable, environmentally sound, and socially responsible implemented with sound governance and it must bring lasting benefits especially for communities. <https://www.ombudsman.gov.ph/UNDP4/wp-content/uploads/2013/01/PrimerPolicy-Brief-on-sustainable-mining.pdf>

Timber depot: an area, generally within a forest concession or a riverbank designated for the sorting and temporary storage of logs.

Timber path: A road or path approved by the GFC within State forests for the purpose of allowing any logger to transit areas held by another forest concessionaire.

Timber harvesting: The aggregation of all operations, including pre-harvest planning and post-harvest assessment, related to the felling of trees and the extraction of their stems or other usable parts from the forest, for subsequent processing into industrial products (ILO 1998).

ACRONYMS

ACTO	Amazon Cooperation Treaty Organization
AOP	Annual Operations Plan
BCL	Barama Company Limited
CDC	Community Development Council
CI	Conservation International (Guyana)
COP	Code of Practice for Forest Operations, 2018
Dbh	Diameter at breast height
DFID	Department for International Development, UK
DOE	Department of Environment, Office of the President
EAB	Environmental Assistance Bureau
EPA	Environmental Protection Agency
EPPA	Environmental Protection and Protected Areas (Policy)
ESIA	Environmental and Social Impact Assessment
EU	European Union
FLEGT	Forest Law Enforcement, Governance & Trade
FMP	Forest Management Plan
FPA	Forest Products Association of Guyana
FTCI	Forestry Training Centre Incorporated
GDF	Guyana Defence Force
GEF	Global Environmental Facility, United Nations
GFC	Guyana Forestry Commission
GFFO	Guidelines for Forest Operations, 2018 (Large concessions)
GGDM A	Guyana Gold and Diamond Miners Association
GGI	Guyana Goldfields Inc.
GGMC	Guyana Geology and Mines Commission
GL&SC	Guyana Lands & Surveys Commission
GMSTC	Guyana Mining School and Training Centre
GOG	Government of Guyana
GPF	Guyana Police Force
GRA	Guyana Revenue Authority
ICT	Information and Communications Technology
IIC	Iwokrama International Centre
IPCC	Inter-Governmental Panel on Climate Change
ITTO	International Tropical Timber Organization
KPR	Kartabu-Puruni Road
LCDS	Low Carbon Development Strategy
MNR	Ministry of Natural Resources
MOAA	Ministry of Amerindian Affairs
MOH	Ministry of Health
MOHA	Ministry of Home Affairs
MOPW	Ministry of Public Works
NBSAP	National Biodiversity Strategy and Action Plan 2012-2020
NDC	Neighbourhood Democratic Council
NDS	National Development Strategy 2001-2010

NFP	National Forest Plan, 2018
NFPS	National Forest Policy Statement, 2018
NGO	Non-Governmental Organization
NIS	National Insurance Scheme (Guyana)
NLUP	National Land Use Plan
NPAS	National Protected Area System
OCC	Office of Climate Change
OOTP	Office of the President
OSH	Occupational Safety & Health
PAC	Protected Areas Commission
PMS	Permanent Monitoring Stations
PWI	Puruni Wood Products Limited
SDG	Sustainable Development Goals
SFA	State Forest Organization
SFEP	State Forest Exploratory Permit
SFM	Sustainable Forest Management
TEEB	The Economics of Ecosystems and Biodiversity
TFF	Tropical Forest Foundation (based at Virginia, USA)
TOR	Terms of Reference for the ESIA study
TPTTI	Timber Traders Inc.
UAV	Unmanned Aerial Vehicle
VPA	Voluntary Partnership Agreement
WCED	World Commission on Environment and Development
WTTCL	Willems Timber & Trading Company Ltd.
WWF	World Wildlife Fund

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ESIA REPORT-SFEP 02/20-RTI

NON TECHNICAL SUMMARY

1.0 INTRODUCTION-THE DEVELOPER, ROYAL TIMBERS INC. (RTI)

This Environmental Impact Assessment is based on a proposed logging and sawmilling operation to be carried out by Royal Timbers Inc. (RTI), over a sixty year period. Royal Timbers Inc. acquired a State Forest Exploratory Permit (SFEP) 02/2020 from the Guyana Forestry Commission for an area of 107,670.54 ha of State forests situated on the right bank Puruni River, west of Puruni Landing.

The SFEP allows the company, inter alia, to access the area and to determine the feasibility of conducting logging operations there, subject to the interest of other stakeholders, including public agencies, other loggers, and nearby communities. Once such feasibility is established and satisfied, then RTI would apply to the GFC for a State Forest Authorisation (SFA-TSA) which will formally grant the right to undertake timber harvesting subject to all applicable provisions of the Forest Act 2009, the EP Act, Cap. 20:05, and the Guidelines for Forest Operations, 2018. An Environmental Permit from the Environmental Protection Agency (EPA) is also (and first) a prerequisite for the acquisition of a State Forest Authorisation (SFA) from the Guyana Forestry Commission (GFC).

Royal Timbers Inc. will focus on basic materials for the construction and infrastructure sectors. Specifically, the company seeks to be a supplier of primary and secondary timber products to satisfy local and foreign customers (logs, piles, poles and lumber products) and, at the same time, is committed to creating and maintaining a harvesting system that corresponds to the modern way in which sustainable timber is harvested.

RTI will harvest logs from the concession area and will process a portion of these via portable sawmills within the area. All timber produced at the concession will be transported by trucks via the Kartabu-Puruni Road to the base camps where they will be processed using portable mills.

Timber harvesting will be guided by all applicable guidelines, Codes of Practices and legislations. It is estimated that RTI will harvest 22,249.46 m³ per year from 11 blocks (1112.470ha).

The concession area falls within the mining District No.4 – Cuyuni Mining District, Region 7 where GGMC has approved within the same area some 1,207 mining units. There are no indigenous communities within (the vicinity) of the concession area. However, surrounding communities include Puruni Landing, Kumong-Kumong among others. Timber will be transferred to Iteballi, about 120km east of the concession area. (See figure 1).

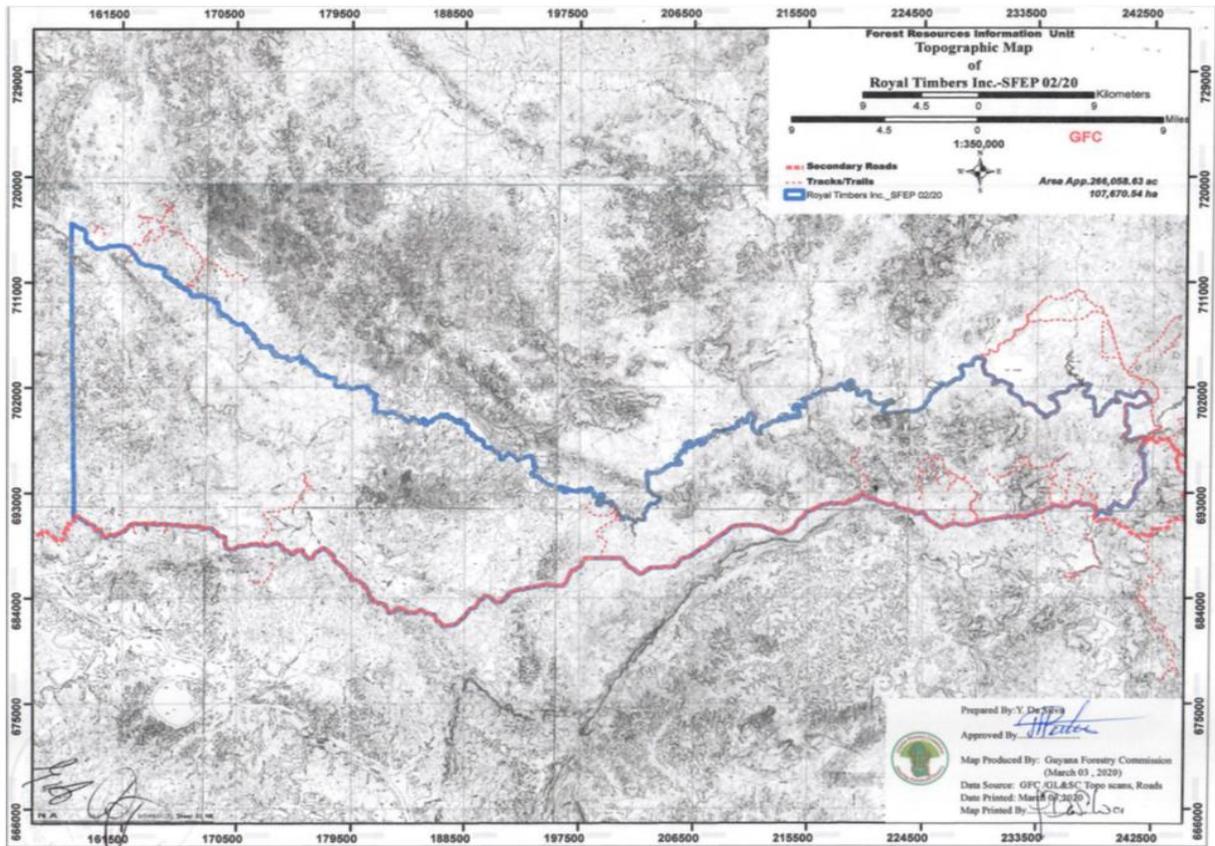


Figure 1: Map showing the geographic location of SFEP 2/20

The Kartabu-Puruni Road (KPR) represents the primary access route to the Kartabu Triangle and the forest concessions there. The road has two segments, the eastern segment from Itembali to Puruni Landing (left bank Puruni River) and the western segment from Puruni Landing (right bank Puruni River) to Pappy Show; the two segments are connected by a barge service at Puruni Landing.

Additionally, the Company intends to construct and maintain, a non-towered airstrip in the vicinity of its main camp to support its logging operations. This airstrip will also allow directors to visit the main camp area, allow for the rapid conveyance of critical supplies, such as spare parts to RTI's operation centers and allow for rapid evacuation of ill persons to medical facilities at Bartica or Georgetown. It is hoped that this service will be extended to the wider community.

The company has signaled its intent to adopt best-practice approaches in its operations. Approximately 10% of the concession was previously logged by the previous owner Puruni Woods (PWI). However, there are significant resources still available to allow for sustainable harvest and development. There are also existing infrastructures in place such as trails and roads which will contribute to the reduction of the cost of production.

RTI plans to establish a composite forest project which would essentially involve logging and sawmilling operations as well as downstream processing. The logging operation would include: the building of secondary roads, bridges, culvert rehabilitation and/or construction and felling, bucking and skidding

activities. Logs will then be transported to the Sawmilling Complex via log trucks for primary processing. Primary processing of logs will be done by portable mills before being loaded onto barges for trans-shipment. The materials will be sold at the local market as well as exported. RTI expects to generate 10,000m² of high grade lumber per annum and all its research point to an annual incremental increase in the price obtained per cubic meter of high grade lumber. RTI is convinced the company will its investments comfortably within ten (10) years. A Base Camp will be established within the concession to support the operation.

RTI plans to invest one million, US dollars (US\$1,000,000) during the first five (5) years of the operation. It is expected that approximately one hundred (100) workers will be employed by the project.

As part of the permitting process, and in order to secure the State Forest Authorisation RTI was required by the Environmental Protection Agency (EPA) to conduct an Environmental and Social Impact Assessment (ESIA) Study of the project. In April 2021, RTI contracted the FTCI as the independent consultant to undertake the study.

OBJECTIVES OF THE ESIA STUDY

The objectives of this ESIA study were:

- To investigate and document the physical, ecological and socio-economic baseline conditions of the study area;
- Inform, obtain and address contributions from stakeholders including relevant authorities and the public;
- Identify the relevant laws, guidelines, regulations and standards that would define the operating framework of the project;
- Assess in detail, the environmental and social impact that would result from the project;
- Identify mitigation measures that would reduce the significance of predicted negative impacts or enhanced predicted benefits of the proposed project;
- Develop an Environmental Management Plan (EMP) and appropriate Monitoring Plan for the proposed project including a Conceptual Closure Plan; and
- Meet the requirements of the environmental regulatory agencies (EPA and GFC) in Guyana as well as international best practice for a project of this nature.

This ESIA study was conducted by an EPA approved team of specialists and has been guided by:

- EPA - Environmental Impact Assessment Guidelines Vol. 5: Forestry
- Issues raised during public scoping meeting, at field exercises and stakeholder engagements;
- Reduced impact logging principles and practices;
- GFC's Code of Practice for Timber Harvesting;
- GFC's Pre-Harvest Inventory Procedures; and
- GFC's Forest Management Plan Guidelines
- Section II of the Environmental Protection Act, 1996;
- Terms of Reference (ToR) agreed to by the ESIA Team and EPA. (Attached as Appendix A)

2. CONSULTANCY SERVICES-FTCI

The FTCI has been conducting ESIA's in the Kartabu Triangle since 2006. In line with the multidisciplinary approach to ESIA's, FTCI recruited two external consultants, utilized four of its professional staffs as well as two of its forest technicians, and obtained additional support from two resource persons with expertise in ESIA's (see Table 1).

Table 1: List of experts that conducted the ESIA

No.	Consultant	Area(s) of expertise
External Consultants		
1	Environmental Engineering Solutions (EES) (3 Persons)	• The collection and the analysis of environmental data such water quality and air quality respectively
FTCI Staffs (6 persons)		
2	Luann Nero (Ms.)	• Environmental Management, Social Science, Community Development
3	Mariea Suegrim (Ms.)	• Business Administration
4	Ms. Kischeiba Higgins	• Sustainable Forest Management, Community Development
5	Delyon Roberts	• Forest surveys, forest inventory
6	Benny Lane	• Sustainable Forest Management, Community Development
7	Bevin Dundas	• Forest Botany
Resource Persons (2 Persons)		
1	Jagdesch Singh	• Sustainable Forest Management; Forest Law, Policy and Governance; Environmental Law and Policy; Sustainable Development and Climate Change.
2	Godfrey Marshall	• Forester, Team Coordinator

In the preparation of the ESIA, FTCI carried out a number of tasks, including:

- Conducting extensive consultations with key stakeholders, such miners and forest operators currently operating within SFEP 02/2020;
- developed sampling plans for the collection of baseline data;
- traversed a total of about 1,000 km: on foot, by road (ATV and 4 x 4 vehicle), and by river;
- evaluated negative environmental impacts and developed applicable mitigation measures; and
- prepared an environmental management plan

Based on the remoteness of the concession area, the identification of access options for data collection took a considerable amount of time while the emergence of the COVID-Pandemic stymied consultations with stakeholders as well as the collection of baseline data.

3.0 BASELINE CONDITIONS FOR SFEP 2/20

3.1 LOCATION AND ACCESS

The State Forest Exploratory Permit (SFEP) 02/2020 is within the State forests estate and is located on the right bank Puruni River, west of Puruni Landing and has a land area of 107,670.54 ha. This area was previously allocated to Puruni Woods Ltd. Approximately 18% was logged by PWL during period 2006-2010. The concession is surrounded by other logging concessions and the BCL main road passes through the area.

Royal Timbers Inc. forest concession is based on the natural environment, that is on the North and Eastern side by the Puruni River and on the Southern side RTI is bounded by the Kartabu – Puruni road and on the western side with Jetoo’s Forest Concession / Lumber Yard and Sawmill (SFEP 10/15). RTI lies within the Mazaruni – Pataro District, Region 7 (see Figure 2).

The primary means of access to the concession area is via Iteballi, left bank Mazaruni River then via the KPR for about 108km to Puruni Landing, thence across the Puruni River to the eastern boundary of the concession. A 99.8km segment of the KPR west of Puruni Landing forms the southern boundary of SFEP 2/2020 (see Figure 3) and this road segment will be used to access the concession area and extract forest produce.

Figure 2: Map showing general geographic location of SFEP 2/2020

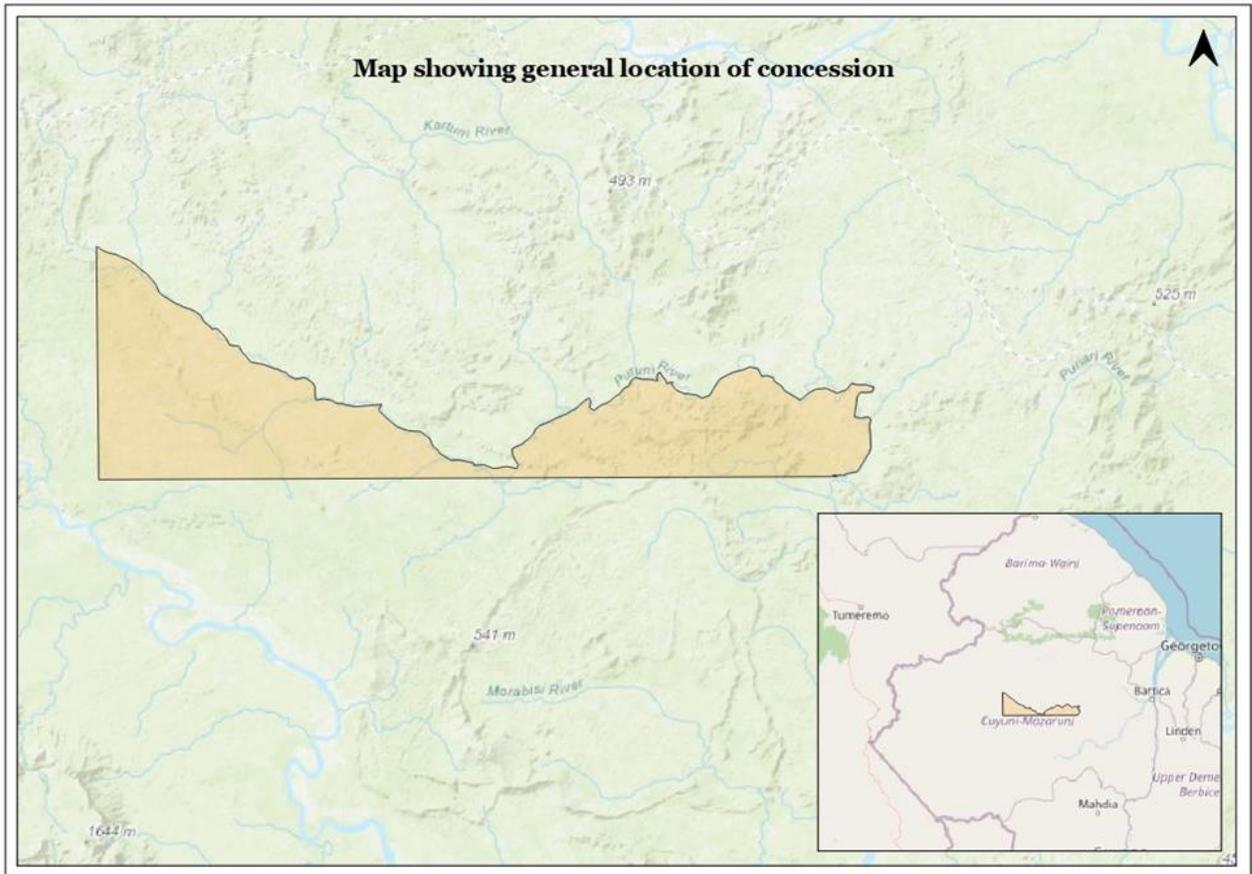
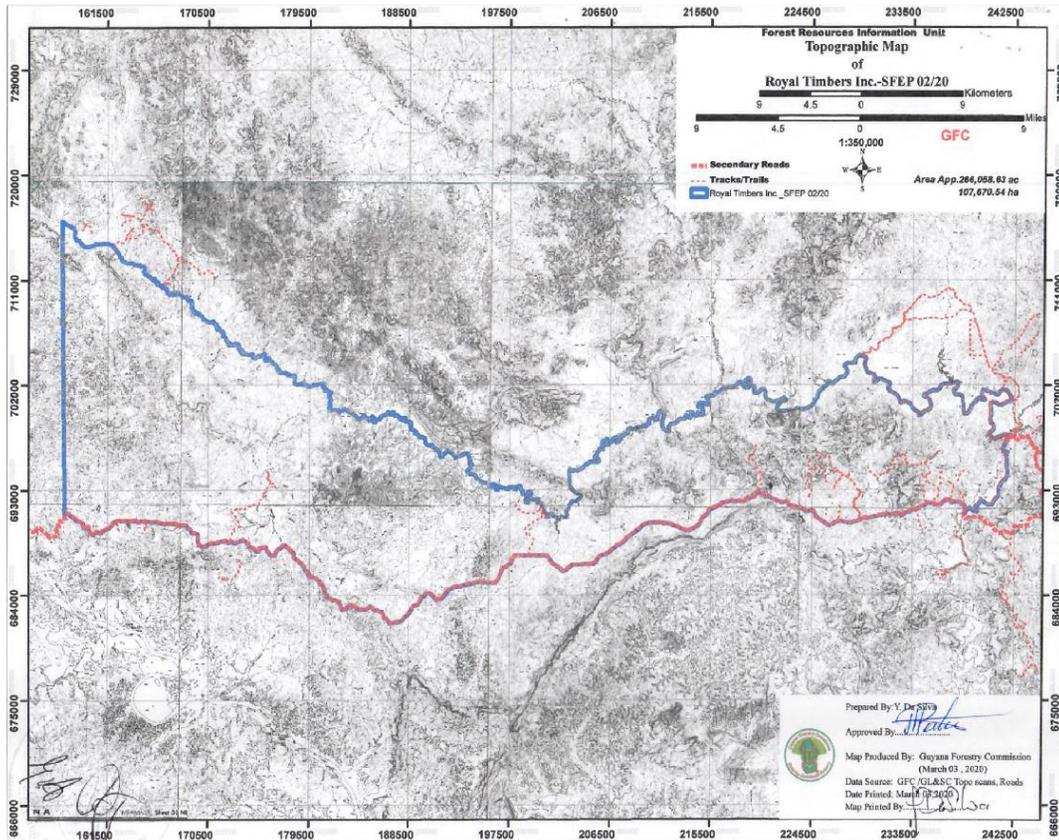


Figure 4: Topographic map of SFEP 2/2020 showing primary access option



RTI will acquire a State Forest Authorisation (SFA) (for the same area) that grants it exclusive commercial rights to the timber resources. The company plans to log the concession on a sustainable basis, by carrying out a number of activities, including:

- a. Zoning the concession into productive and non-productive forests and identifying biodiversity reserves and other areas for protection;
- b. Zoning productive forest areas into compartments and blocks to allow for an orderly and systematic approach to road construction, log market construction and timber harvesting operations;
- c. Carrying out pre-harvest forest inventories to produce proper stock maps and using the stock maps for planning skid trails, log markets and sawmill sites;
- d. Carrying out directional felling of commercial trees;
- e. Carrying out skidding operations with the use of a winch;
- f. Ensuring the use of occupational health and safety practices;
- g. Ensuring that GFC's guidelines are implemented as far as practicable
- h. Carrying out proper seasoning and grading of sawn lumber;
- i. Carrying out proper hygienic practices by managing all forms of waste.

3.2 NEIGHBOURING FOREST CONCESSIONS, PROPERTIES

There are no villages or communities within the RTI forest concession except for a handful of temporary and semi-permanent houses in the Oranapai Diamond and Gold Mining Camps on the southwest corner of the Kartabu–Puruni Road, which demarcated the border of the RTI concession in the south. There are a variety of gold and diamond mines along the banks of the Puruni River.

However, east of the concession, and along the Kartabu-Puruni Road in an easterly direction and approximately 0.5 kilometers southwest of the Puruni River crossing is the derelict Peter’s Mine Camp where a transient, but steadily growing settlement, mainly due to the influx of Brazilian miners, has emerged and referred to as Puruni Landing, given its proximity to the Puruni River used as a checking point for vehicular traffic traversing between Iteballi and other interior locations. At present, there are at least ten (20) new houses since the 2002 Census that counted nine buildings in the area. The area has seen the influx of retailing shops, colloquially referred to Puruni Landing is an entertainment center for miners comprised of shops/beer gardens/cookshops/discos/grocery and brothels all in one. Estimating the population is difficult due to its transient nature, but it was calculated that there are at least fifteen (20) permanent residents, consisting of at least three (3) extended families. Most of the residents appear to be women between the ages of 15 and 40 that self-employ. There a newly established Health Center which will provide aid for the residence, persons exposed to puncture wounds and lacerations from tools and equipment within the Puruni working environment and further afield.

Transportation being used are ATV vehicles, 4x4 Picks ups, cars, buses (passengers) and trucks (Bedford) that are also used to transport food ration and drums of fuels for the mining operators (See Figure 5). The concentration of most miners is along the Kartabu – Puruni Road and Puruni / Mazaruni River up to Kurupong and along the Puruni River. Mining operations in these areas is very alarming, some hills and riverbanks are being wash-out / drained into these two rivers. At some portions, the river course had changed because of these uncontrolled mining activities, new sandbanks are being formed due to the excessive silting of the river. Also, the Puruni and Mazaruni River and tributaries are the heavy concentration of miners up to the Kurupong River and beyond.

Available records reveal the existence of various categories of indigenous/archaeological assets (such as pieces of ceramic and pottery, pictographs, chipping stations, quarries, and tools-stone adzes, axes, projectile points, whet stones and shields) in neighbouring concessions but those same records do not indicate any specifically within the concession held by RTI¹. However a large number of indigenous assets are believed to exist within the concession area. These are expected to be located and identified primarily during 100% enumeration activities.

¹ The National Trust of Guyana and the Amerindian research Unit, University of Guyana. 2003: Map of Region Seven-Mazaruni-Cuyuni: Archaeological Sites.

Figure 5: Puruni Landing-transfer of fuel from truck to boat



3.3 THE PHYSICAL ENVIRONMENT

3.3.1 LANDFORM AND HYDROLOGY

3.3.1.1 Landform

The Cuyuni-Mazaruni Region contains two of the four natural regions: forested highlands and a small portion of the hilly sand and clay region.

This Region brings to mind the majestic Pakaraima mountain range. Mount Roraima (2,810 metres high, standing at the point where Guyana, Brazil and Venezuela meet) and Mount Ayanganna are in this mountain range.

Most of the 15,342 people of this Region are involved in mining for gold and diamonds.

Under the Upper Mazaruni Hydroelectric Scheme, a hydroelectric plant was to provide electricity for the Region was planned.

There are eight Amerindian settlements in the area of the Pakaraimas, where crops are grown. These crops supply the settlements and gold and diamond mines in the Region.

The general configuration of the area is mostly level or undulating and hilly. The northwest and eastern districts are marked by very hilly terrain. The highest elevation is the East Puruni Mountain, which exceeds 427 meters (1,500 feet) and the lowest is 76 meters (250 feet) above the Mean Sea Level (MSL).

3.3.1.2 Hydrology

The concession area lies between two major rivers, the Mazaruni River in the south and the major tributary of the Mazaruni River, the Puruni River, in the north. A 175km segment of (right bank) Puruni River forms the northern boundary of the concession area. The central and eastern areas of the concession are drained mainly by right bank tributaries of the Puruni River, including the Kamiguin (Kumong-Kumong)

River and the Pashanamu River. The western end of the concession area is drained primarily by the Putareng River, itself a left bank tributary of the Mazaruni River.

Several smaller rivers and creeks form an intricate drainage pattern that creates a mostly well-drained area, interspersed with small swamps. The average drainage density for the entire concession area is about 0.8km/km² but there are several areas where the drainage density reaches 2.5km /km². Along the Kartabu-Puruni Road corridor, there are several ponds in the rainy season, due to flooded ex-borrow pits in low lying areas, at the margin of the road. Further way from the road corridor, ponds and swamps have their origin in natural depressions as well as poorly managed, ex-gold or diamond mining sites.

The concession area experience mean annual rainfall of 2600 mm.

3.2.2 Geology & Soils

3.3.2.1 Geology

Most of the geology of northern Guyana consists of Palaeoproterozoic Orosirian greenstone belts (Barama-Mazaruni Supergroup) intruded by granites. These are overlain unconformably by the Statherian Burro-Burro Group, which consist of the Muruwa Formation sandstones and Iwokrama Formation felsic volcanics. Both are intruded by granites associated with the Iwokrama Formation. Some folding occurred before these were overlain by the locally unconformable almost flat lying Roraima Group.²

The concession area is situated within Guyana's Northern Province where the dominant lithology is the Greenstone Belt. The greenstone belt comprise predominantly metamorphic rocks and are reputed to be common in the Earth's oldest rocks, including the Guiana Shield.

3.3.2.2 Soils

The GFC has at hand detailed soil maps for the concession area. The dominant soil type, Kanhapludults, occupy some 84.45% of the concession area. Kanhapludults are very deep well drained soils, with slight to high erosion hazard. The other major soil type present is Ustchrepts, occupying 9.89% of the concession area: Ustchrepts are deep alluvial soils, mottled in the subsurface, poorly drained, and not suitable for road works.

The consultants were able to validate the soil types through the collection and analysis of soil samples. Soils within allocated forest concessions in Guyana are generally weathered and relatively low in nutrients and organic matter. Usually, these soils are moderate to low in permeability. The dominant soil type Kanhapludults (< 85 per cent) divided into approximately equal sections of the corresponding subsoil classes Hapludoxs / Dystrochrepts and Dystrochrepts / Endoaquults. Typically, the latter type may hold water close to the surface most of the year.

² Gibbs, A.K & Barron, C.N (1993). The Geology of the Guiana Shield. Oxford University Press.

The concession also includes small patches of heavily leached soils with a high content of clay (associated soil category Dystrochrepts / Kanhaplustuls) as well as medium texture soils with a low nutrient amount (Ustorthents / Kanhaplustuls). Figure 6 below shows the major soil types found within the forest concession.

The national land use land of Guyana 2013 and Food and Agriculture soil Map of North British Guyana (1964) have shown similarities of the description and topography of the soils found with RTI forest concession.

The Southern side of the concession comprises of soils that originated from sedimentary loam and red clay. However, some parts along the Kartabu – Puruni Road consist of sandy loam and gravelly soils. This type is found widely and plenty over the units’ hillsides and the hilltops where there is no white sand. Commonly, this deep loamy soil is intermediate in texture between the heavy clay of mixed forest and brown sand and gravelly soil of the Greenheart association.

The soil is strongly acidic, includes a small amount of organic material and is a yellow - brown color, not suitable for agricultural purposes. This form is likely to occupy the optimal forest habitat, as shown by the lack of a single dominant species. The soil is quite black on the forest floor and muddy, but not as dark and damp as the vegetation of Mora and Morabukea. Liana flora is present in some places in all compartments, suggesting a certain amount of disturbance the understory structure of the forest is occupied by seedlings. However, no Greenheart has been detected or reported in compartment 3&4. Similar observations were made by the previous owners of the concession. However, the two compartments consist of Wamaradan, a prime commercial species in Guyana, and also found in the Iwokrama Forest Reserve.

#	Soil Description	Area (hectares)	%	Key properties	Management implications
1	Dystrochrepts, Endoaquults	48,052	44.8	Coarse textured, strongly leached soils; relatively low in nutrients, either without any distinctive properties; low in permeability, subsurface horizons with strong reddish or yellowish colours; in some cases, water lies near the surface for much of the year	Soils suitable for land fills
2	Dystrochrepts, Kanhaplustuls	10,301	9.6	Coarse textured soils, strongly leached soils, low native fertility, acidic, high clay content	Not suitable for road construction
3	Hapludoxs, Dystrochrepts	45,055	42.0	Highly weathered soils, low native fertility, rich in iron and aluminum oxides, moderate permeability, without distinctive subsurface properties	Moderate use for road fills
4	Ustorthents, Kanhaplustuls	3,928	3.7	Medium textured soils, retains water in superficial layers, fairly moderate in nutrient level.	Not suitable for road construction
		107,334			

Figure 6: Major soil types found within the forest concession

3.3.2.3 CLIMATE

The climate in Guyana is strongly influenced by the Inter-tropical Convergence Zone (ICZ). Due to the movement of the ICZ, most climate variables show a bi-modality through the year. There are two (2) wet season and two (2) dry seasons, the dry season months have an average of more than 150 mm of rain per month. The long-wet season occurs from May to August, and a short-wet season from December to

February. October is the driest month. The Royal Timbers Inc. concession lies at the North-Western side of the Pakaraima Mountains and has an annual rainfall of 2700 mm. The dry season periods of lower clouds cover and thus have higher sunshine hours. The average sunshine amounts to 45% of the total daytime.³

Annual Potential Evapotranspiration (PET) amounts to 1350 – 1500 mm, which correspond well with values reported in neighboring countries (Poels 1984, Fritsch 1990). Relative humidity is high and fairly constant throughout the year. In the early morning the average is approximately 95% then it drops by mid-afternoon to an average of approximately 74%. Both temperature and relative humidity are closely related to incoming radiation. Average daily temperature is 25.9 degrees Celsius; and while the annual variations in average daily temperature are only about 2°C the average diurnal variation is about 6°C. Warmest months are September and October. Coldest months are January and February. Air temperature is also high with an average/maximum at 31°C and minimum at 22°C.

The nearest meteorological station to the concession area is based at Mazaruni Prisons, some 80 km from the eastern most tip of the concession area, while there is another station, Onderneeming, some 185 km to the northeast. At the Mazaruni Station, for the period 1987 to 2002, May, June and July were the three wettest months averaging over 178 mm per month. March, September and October were the driest averaging 86 mm per month. For Onderneeming Station, for period 1990 to 1991 and 1995 to 2002, May, June and July were the three wettest months averaging over 150 mm per month. January, February and October were the driest averaging 30 mm per month. Figure 4 below shows rainfall records over the last seven (7) years for Mazaruni Prisons Station and Onderneeming, respectively.

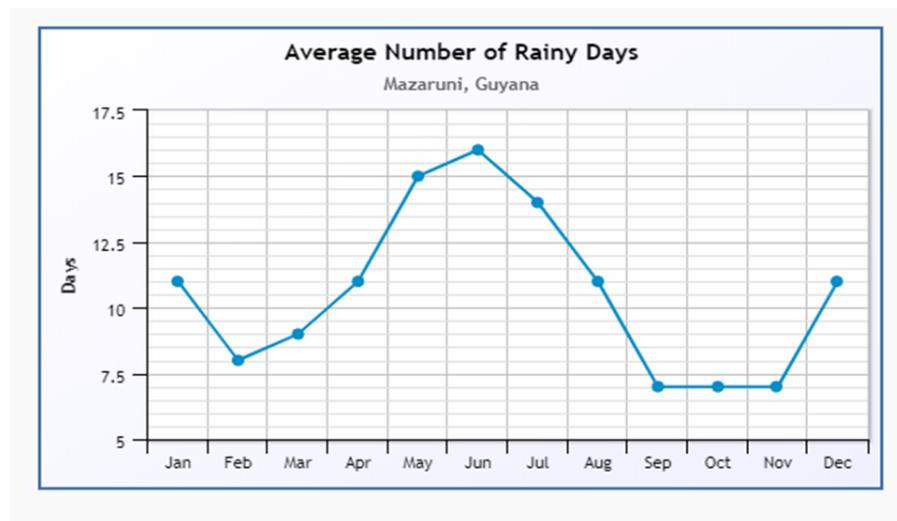


Figure 7: Showing rainfall information for Mazaruni Prisons and Onderneeming, region respectively

³ Ter Steege, Hans et al. 1996. Ecology and Logging in a tropical Rain Forest in Guyana, With recommendations for improvement. Tropenbos Series 14. The Tropenbos Foundation, Wageningen, the Netherlands. 123pp

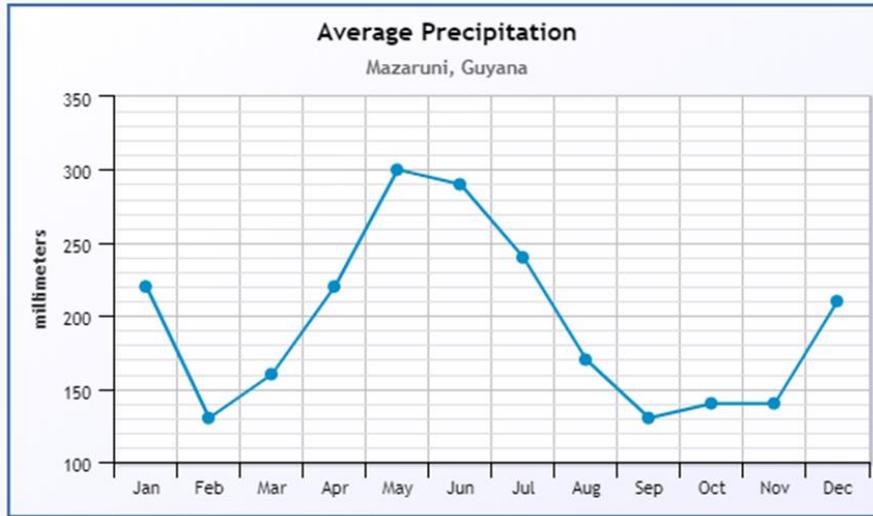


Figure 8: Showing Average Precipitation for Mazaruni and Onderneeming Region respectively

3.3 THE BIOLOGICAL ENVIRONMENT

3.3.1 Vegetative and forest types

Forests cover the entire concession area save for small gaps linked to mining activity. Satellite maps from the GFC’s FAAU show that the forests within the concession area are relatively intact. Small patches were cleared by miners operating within the forest concession area. GFC records show approximately 9732.4ha of forests has been cleared for period 2001-2019.

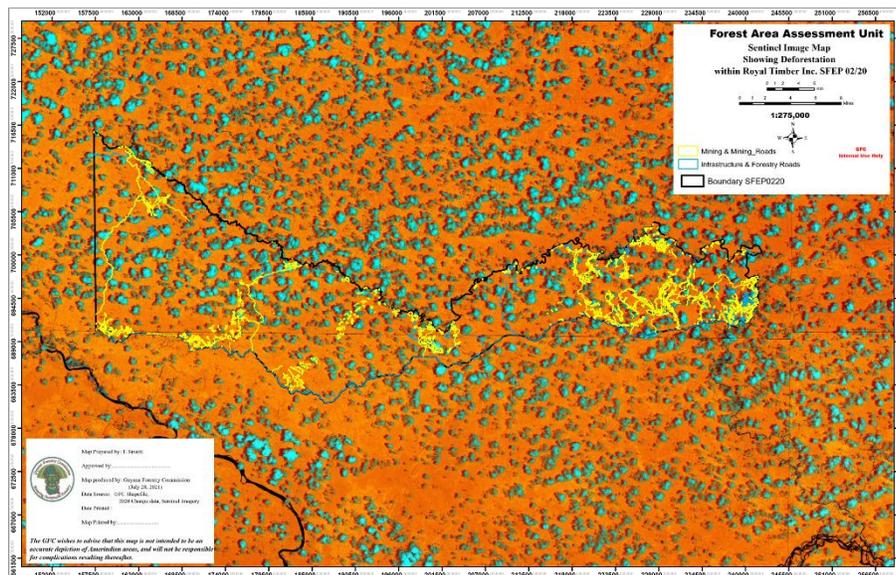


Figure 9: Satellite map of concession showing deforestation

Data based on GFC's vegetation maps indicate that Mixed forests on undulating to hilly terrain is the dominant forest type within the concession area. The concession area embraces the transition between two national forest types.⁴ 75.8% of the forest area contain productive forests, while 54.9 % of forests occur on hilly terrain.

The forest resources in the concession area are typical of that within the Kartabu Triangle, which Ter Steege (2000) described as Central Guyana Wet Forests: forests characterized by a high abundance of commercial species including Wamara (*Swartzia leiocalycina*), Greenheart (*Chlorocardium rodiei*), Mora (*Mora excelsa*), Morabukea (*Mora gonggrijpii*), Haiariballi (*Alexa imperatricis*) and Aromata (*Clathrotropis* spp.)

3.3.2 Fauna

No logging has occurred in the area since 2013 after Puruni Woods abandoned the area. No evidence of any commercial scale hunting or vending of wild meat or fish was observed in the Puruni area.

Mammals, especially the smaller species, constitute a primary component of the tropical rainforest. Through pollination, seed dispersal, and control of insect populations and as part of the food chain for carnivorous animals, the smaller mammals such as opossums, rodents and bats assist in the natural functioning of the ecosystem. The concession area is quite rich in faunal species. The red-rumped agouti *Dasyprocta agouti* and the labba, *Agouti paca* were the most abundant species of mammals recorded. Two species of Marsupials or opossums were recorded in the project area.

Anteaters: two arboreal species, the Tamandua and the Pygmy Anteater, were recorded in the study area.

Sloths: Two species are known and both were reported occurring in the area.

In the project area, two species of the family Cebidae namely the Howler Monkey, *Alouatta seniculus* and the Wedge-capped Capuchin Monkey, *Cebus olivaceus* were observed.

Rodents occupy a wide range of habitats in the tropical forest ecosystem. Two species the *Dasyprocta agouti* familiarly known as the Accuri, and the *Agouti paca* or labba occur in the project area in fairly large numbers.

Eight of the ten species of species of carnivores or flesh-eating mammals known to occur in Guyana can be found in the concession area. All species are wide-ranging and their presence in a particular area depends on the abundance or scarcity of prey. The family Felidae is classified as endangered by C.I.T.E.S. Jaguar *Panthera onca* was observed in the concession.

3.4 THE SOCIO-ECONOMIC ENVIRONMENT

⁴ *Northwest Wet Forests and Central Guyana Wet Forests* (ter Steege H. , 2000)

3.4.1 Communities

There are no villages or communities within the RTI forest concession except for a handful of temporary and semi-permanent houses in the Oranapai Diamond and Gold Mining Camps on the southwest corner of the Kartabu–Puruni Road, which demarcated the border of the RTI concession in the south. There are a variety of gold and diamond mines along the banks of the Puruni River.

However, there are several communities which surrounds the concession area.

Iteballi Community

Iteballi is a small village located more than 100km from the proposed project site; however, the company plans to join other logging companies that use Iteballi as a timber transshipment facility. WTTCL set up Iteballi as a timber in the late 1950s, but persons began occupying the site in the early 1970s. According to the 2002 Population Census, there were 84 houses with evidence of extended family structures in some homes. Iteballi is primarily a farming community, with bananas, pears, and ground provisions being the main produce. Faming is carried out mainly on a subsistence basis, with the surplus sold to shops in the area and other residents. The main economic activities of the residents there are gold mining and subsistence farming.

Kartabu Community

Kartabu is a small village set up at the confluence of the Mazaruni River and the Cuyuni River in the 1920s. The village lies some 108km from the eastern end of the concession area. The KPR starts at Kartabu, but in fact traffic was diverted to Iteballi in the 1970s after the startup of the Upper Mazaruni Development Authority in the 1970s and the establishment of a barge service between Iteballi and Teperu. According to the 2002 Population Census there were twenty-one (21) single family dwelling houses in the community, which seems to be supported by the Community Development Council (CDC) Secretary who estimated the population at 130 individuals, comprised mostly of children. The ethnic make-up of this small community is mixed, though Amerindians are in the majority.

Puruni Landing Community

Puruni Landing, situated at the junction of the KPR and the Puruni River has a resident population of about 300 persons. The village is a major commercial hub that supports the regional mining industry: the community has several large grocery stores, several hotels with moderate basic amenities and several restaurants. GGMC maintains an office there and there is a MEDEX Centre. There are reportedly plans to establish a police station there.

Puruni Landing has critical strategic crossing due to the barge crossing there. There is ongoing discussion between agencies in MNR and the MOPW respectively in relation to a bridge across the Puruni River, at or near Puruni Landing. As a matter of fact, the GoG/MNR has recently issued a call for submission of expression of interest for the construction of a bridge for the Puruni river crossing.⁵

⁵ <https://forestry.gov.gy/2021/10/12/request-for-expression-of-interest-construction-of-bridge-for-the-puruni-river-crossing/>

Kumong-Kumong

Kumong-Kumong is a small mining community at the confluence of left bank Kumong-Kumong River and right bank Puruni River. The population there is about 90 persons engaged in in gold mining and/or ancillary enterprises or vending groceries and fuel. Residents of Kumong-Kumong by virtue of their location will be impacted directly by RTI's logging operations.

In addition, there are small clusters of miners and/or businesses along the western segment of the Kartabu-Puruni Road: the main ones adjacent to the concession area are Pashanamu (30 persons) and Turtle Creek (35 persons). Most residents are miners.

There is an airstrip with a few dwellings at Olive Creek, left bank Mazaruni River, opposite the mouth of Kurupung River on right bank Mazaruni River and there is the Pappy Show Landing at the western extremity of the KPR. Both areas lie outside the concession area but persons travelling there by road will be sharing the use of the KPR with RTI.

3.3.1 Land-use

3.3.1.1 Mining

Mining is the dominant land use within the concession area and has been occurring since the early 1900s. Active mining occurs on just 970.38ha (0.2%) of the concession area⁶.

The concession area falls within the Mazaruni Mining District (District # 3) and the entire area has been allocated under some form of mining claim. There has been a history of mining in the area since the late 1920s, with a particular surge in scale of mining the past 30 years with a significant increase in the use of excavators and 'dragas'. RTI's projections are that about 2,500 persons occupy the concession area: these comprise artisanal, small and medium scale miners as well as merchants trading mainly in fuel and rations.

Ongoing and past gold mining on right bank Puruni River, especially in the north-eastern part of concession area has left extensive forest resources along the river bank, to a depth of up to one kilometer, in a degraded or fragmented state. A typical example is the Million Dollar Mountain District. Also there are numerous 'deforested' landings on right bank Puruni River, for example Kumong-Kumong and Bush Cow Landing.

RTI estimates that since 2007, the area of forests in the concession area has declined by 15%.

It is also apparent however that the concessionaire will be able to salvage timber from trees felled and set aside to facilitate mining activity.

⁶ GFC, 2020

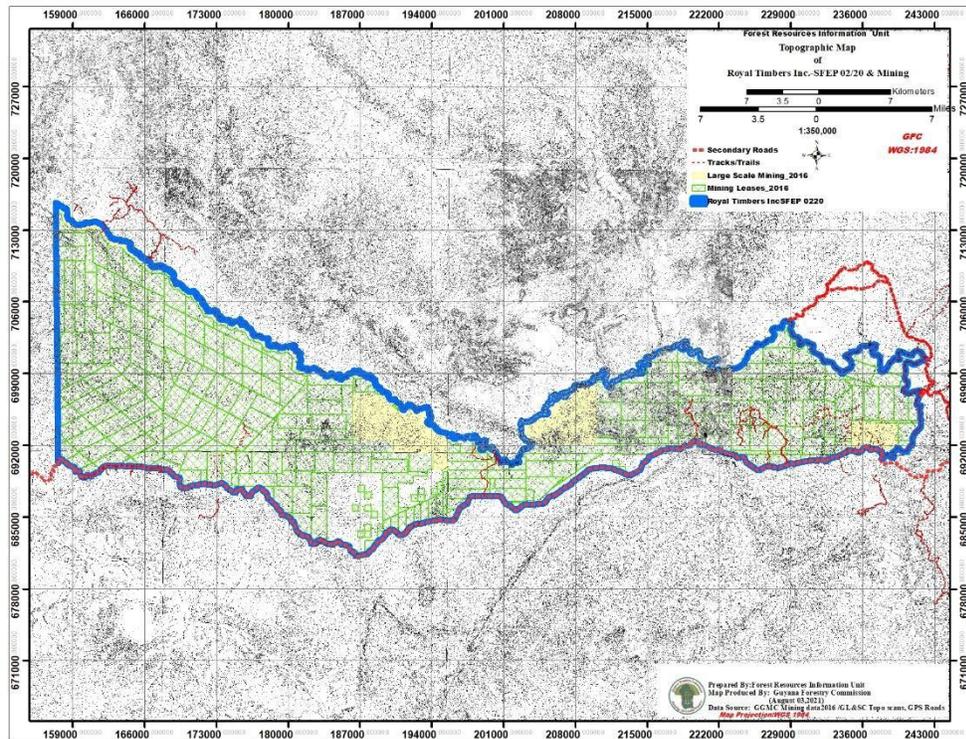


Figure 10: Map showing the extent of mineral licences on the concession area.

3.3.1.1 Logging

GFC’s projections are that by mid-2021, active timber harvesting operations will extend from Pappy-Show to Iteballi. RTI shares common boundaries with three SFAs, one of which is already active; however the development of timber harvesting operations at the other two SFAs have reportedly been stymied by the size of barge used to traverse the Puruni Crossing.

The GFC GIS database revealed that the entire Kartabu-Triangle is occupied by large concessions, small concessions and State Forest Exploratory Permits (see Figure 11). RTI access road traverses two forest concessions before ‘joining’ the Kartabu Puruni Road, and the requisite consultations with the respective holders of those concessions have occurred.

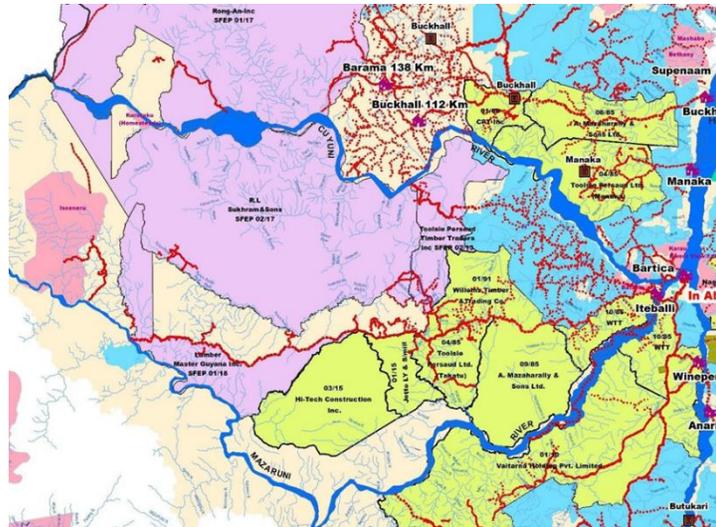


Figure 11: Map showing forest concession allocation within the Kartabu-Triangle.

3.3.1.1 Other Land Use

There is no evidence of any other kind of land use of significance in the concession area: specifically there are no commercial scale agricultural cultivations and no ecotourism resorts. The consultants have never seen any fishing crew or hunting crew respectively; in addition, the consultants have never seen wild meat on sale.

4.1 RTI' LOGGING PROJECT

4.2 RTI' FOREST MANAGEMENT OBJECTIVES

RTI plans to establish a composite forest project which would essentially involve logging and sawmilling operations as well as downstream processing. The company will adopt and implement best-practice approaches in its operations. RTI's vision and strategic goals position the company to aggressively pursue sustainable forestry and associated infrastructural development in Guyana, while contributing to the overall improvement in Guyana's social, economic and environmental development.

RTI will emphasize the conservation, sustainable management and equitable use of the tropical rainforest to ensure perpetual ecological, economic and social benefits to its people. The environment, forest ecosystems and watersheds will be protected.

RTI management objectives are to ensure a sustainable yield harvesting system while safeguarding other values of the forest under GFC standards and regulations.

Within this framework, RTI objectives are:

The business objectives of RTI include the following:

- a. To conduct sustainable logging operations fully compliant with local standards;
- b. To promote forest conservation generally, including supporting initiatives targeting the conservation of biodiversity, fauna and the protection of unique landscapes;
- c. To support initiatives linked to mitigation of climate change generally;
- d. To support the enhancement of a new low-carbon economy in Guyana, including initiatives emerging under the LCDS 2030; and
- e. To promote the development of the forestry sector.

4.3 FOREST ORGANISATION

4.3.1 Legal Classification-Productive and Non-productive forests

GFC's legal framework sets out the legal parameters to be met to ensure the SFM requirements are met. This includes the identification and classification of both productive and non-productive forests within the area of interest. In RTI case, productive and non-productive forests include those classified based on the GFC vegetation map and ground surveys.

Further, according to FAO SFM guidelines, mined out forest areas are rendered inoperable due to the absence of vegetation. Thus, ongoing and past gold mining on right bank Puruni River, especially in the north-eastern part of concession area has left extensive forest resources along the river bank, to a depth of up to one kilometer, in a degraded or fragmented state. A typical example is the Million Dollar Mountain District. Also there are numerous 'deforested' landings on right bank Puruni River, for example Kumong-Kumong and Bush Cow Landing. RTI estimates that since 2007, the area of forests in the concession area has declined by 15%. It is also apparent however that the concessionaire will be able to salvage timber from trees felled and set aside to facilitate mining activity.

Basic parameters of the vegetation within the concession area are set out in Table 2. RTI has validated the forest types above through reconnaissance work in the forest areas.

Table 2: Basic parameters of the vegetation on the concession area (GFC, 2021)

Forest Type	Area (ha)	% of area	Remarks
1: Mixed forest on undulating to hilly terrain	61,870.65	57.5	Productive forests
1b: Mixed forest on flat to undulating terrain	23,289.95	21.6	Productive forests
1c: Mixed forest on deeply dissected terrain	2,206.39	2.0	Non-productive(subject to verification)
1h: Mixed forest on high hills	18,986.40	17.6	Non-productive(subject to verification)
3: Low swamp forests	1,308.07	1.2	Non-productive(subject to verification)

No data	9.08	0.0	
Total	107,670.54		

Based on the productive area, and, as per GFC guidelines RTI has computed that it requires a Biodiversity Reserve of 3,592.52ha. The biodiversity reserve includes both productive forest as well as some non-productive forests; in addition, the topographic conditions ensure a diversity of habitats.

RTI's projections are that each year, based on parameters for a sustainable harvest, it will harvest 22249.46 m³ per year from 11 blocks.

4.3.2 Administrative Classification

Ground verification, is used to segregate concession mapping into productive and unproductive areas. Pre-harvest inventory and blocking was restricted to productive areas. Due to its size, the concession was divided into 4 operating compartments (see table 3 below). The compartments were then divided into Management units based on the AAC. For the duration of this plan; the company intends to concentrate all operations in compartment 1,2 and 3.

No.	Description	Compartment Code	Area in Hectares	Area in Acres	Remarks
1	East Puruni Compartment	PUCO	21,641.30	53,476.50	Flat/High Hills
2	West Puruni Compartment	WECO	15,894.40	39,275.60	Hilly/High Hills
3	Kamiguin Compartment	KACO	30,381.00	76,072.90	Flat/Hilly
4	Pashanamu Compartment	PACO	39,754.10	98,234.10	Flat/Hilly
Total	Four (4) Compartment		107,670.50	266.058.6	

Table 3: Division of concession area by Compartment

The limits of the compartment were chosen, where possible, based on natural landscape features. Although the size of the compartment varies, it is helpful to schedule the management process over the medium term. Where operationally successful, two or more compartments can be harvested at the same time.

Table 4: Summary of timber stocking by forest type within RTI's concession area.

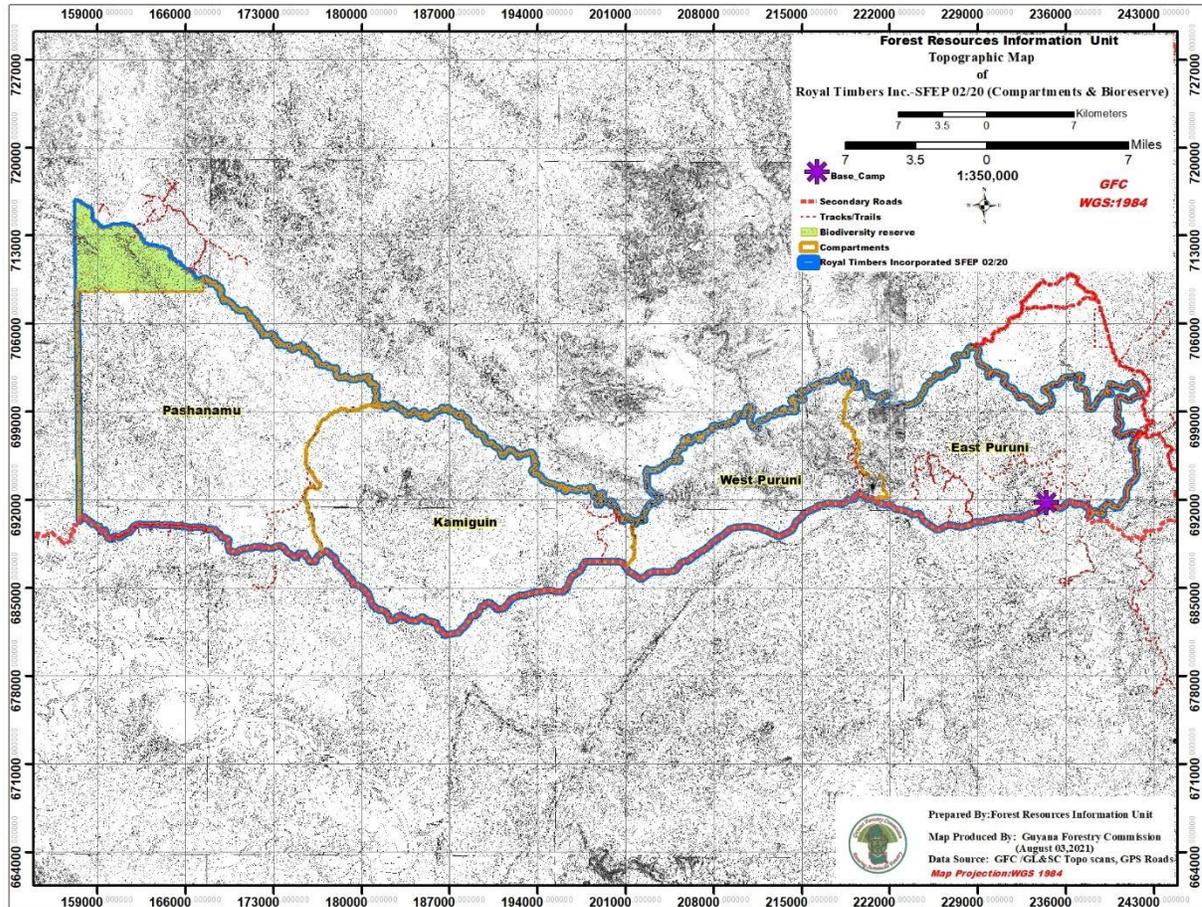
Forest Type	Area In Hectares	Area in Acres	Area Percentag e	Volume in M ³	Volume Per Hectare	Remarks
1	61,741	152,566	57.5%	1,988,173	32.20	Average per Hectare in all Forest Types= 32.2 m ³
1h	18,978	46,895	17.7%	612,011	32.25	
1b	23,105	57,087	21.5%	743,404	32.18	
1c	2,205	5,454	2.1%	72,611	32.93	
3	1,305	3,226	1.2%	41,493	31.80	
Total	107,334	265,227	100%	3,457,692		32m³

Extrapolated from Ivan Welch Inventory on the Mazaruni/Cuyuni Area conducted in 1975.

4.3.3 Primary road network.

RTI has been able to plan the primary road network in compartment 1, using the areas of productive forest as well as the nature of the terrain.

Figure 12: Organization of the concession area into compartments and a biodiversity reserve



4.4 PRODUCTION PARAMETERS

4.4.1 Yield Regulation

Yield regulation, or allocation, involves making decisions that lead to clear specifications of where and under what conditions a harvest may be cut using AAC and technical information about a forest. It is a critically important part of sustainable tropical forest management. The GFC SFM guidelines set out the parameters for yield regulation. Thus, yield regulation is generally determined by the following:

1. the average volume/ha of different species based on preharvest inventories,

2. diameter class distribution and the minimum diameter that may be cut,
3. distribution of trees on the ground in relation to topography and practical road access,
4. characteristics of the silvicultural system, or systems, such as cutting cycle and annual allowable cut, specified in a management plan that are being applied in the forest

In this regard, based on discussions with the GFC and reconnaissance data and ground verification, RTI has agreed to the following parameters to guide the development of timber harvesting operations:

General parameters	
A. Concession size (ha)	107,670.5 4
B. Felling Cycle (yrs.)	60
C. Sustained yield re 60yr. cycle (m ³ /ha)	20

Operational parameters:	
D. Total sustained yield (m ³)	1,334,967.60
E. Annual Allowable area (AAA) (ha)	1112.47~(11 blocks)
F. Annual allowable cut (AAC) (m ³)	22,249.46

4.4.2 Schedule of inventory and production

RTI commits to the principles of sustainable forest management. Thus, based on the agreed annual allowable area and annual allowable cut, RTI will prepare and submit both a Forest Management Plan for five year period and an Annual Operations Plan for each calendar year. The AOP will contain all blocks in which it plans to conduct forest inventory and those which it plans to harvest respectively for the approval of the GFC within the FMP.

4.4.3 Logging practices

Logging activity within the concession will proceed in a specific cyclic sequence as outlined in the COP Forest Harvesting (2018). Thus, RTI will only conduct timber harvesting operations on 1112.47ha or 1% of the concession area per annum. The objective of this approach is that any unit area harvested will, theoretically at least, not be logged again by RTI until after 60-years.

In this regard, RTI' core operations may be summarized as follows:

- a) Training of all field personnel in order to ensure full compliance on matters of occupational safety and health;
- b) Full compliance with standards in COP for earthworks required for road construction to eliminate any potential environmental hazard due to poorly designed and constructed road.
- c) Conduct 100% forest inventory to identify the number, volume and spatial distribution

- of merchantable species within the forest concession
- d) Full compliance with established standards in COP required for pre-harvest inventory, including tree marking in order to validate the condition of the merchantable stock, to establish felling direction and to plan skidding trail routes, and to identify and address restrictions, linked to buffer zones or other criteria;

4.4.4 Operational Challenges

4.3.5.1 The mining community

Mining is a major economic activity within the concession. RTI is cognisant that the mining community has displayed keen interest in its road network. Thus, it is likely that there will be a significant increase in mining once timber harvesting starts due to improved accessibility. However, an increased in mining activity may result in more opportunities for conflict. Therefore, the challenge for RTI is how to engage the mining community and other stakeholders in a practical and meaningful way.

RTI' concerns are based on the following:

- a. It is onerous task to identify the bona-fide miner. Most miners on the ground are not the actual owners of the mineral concessions. Many 'miners' encountered on the ground do not provide their (true names and addresses).
- b. There exists no overarching plan for the development of the mining district that RTI can tap into.

4.3.5.2 The Kartabu-Puruni Road

The state of the Kartabu-Puruni Road is critical to RTI log flows. RTI will be faced with maintenance costs for its concession based road networks as well as its 23km access road and will not be able to afford maintenance costs for extensive segments of the Kartabu-Puruni Road.

The project area is located within the Kartabu-Triangle, an area with a substantial history of mining and logging. The Kartabu-Puruni Road (KPR) represents the primary access route to the Kartabu Triangle and the forest concessions there. The road has two segments, the eastern segment from Iteballi to Puruni Landing and the western segment from Puruni Landing to Pappy Show; the two segments are connected by a barge service at Puruni Landing. RTI will use the KPR to extract timber and in doing so will share about 200km of the KPR with a diversity of stakeholders (that include several loggers, miners, and other transporters of fuel, mining gear, personnel and rations utilizing heavy-duty trucks). The distance from Kartabu Point to the Puruni Crossing-the eastern boundary of the concession area - is 108.5km while a 99.80km segment of the KPR west of the Puruni Crossing forms the southern boundary of SFEP 2/2020.

In addition, apart from the KPR itself, RTI is expected to share another 120km of secondary roads that link KPR to areas being logged by RTI. About 30% of such roads already exist as 'mining roads' while about 70% will be constructed by RTI.

4.3.5.3 Labour issues

RTI is currently developing a human resources policy which guides its personnel management issues.

RTI will stress the need for flexible working hours to address the peculiarities of logging operations and time sensitive production targets to ensure profitability. However, most logging companies are finding it challenging to get young people to do extended field time in the forest, even though the companies pay competitive wages, provides reasonable field accommodation and invests in an internet service.

4.3.5.4 Emergencies

The concession area is rather remote. Therefore, RTI intends to construct and maintain, a non-towered airstrip in the vicinity of its main camp to evacuate sick persons to Bartica (or Georgetown) as rapidly as possible from the concession area.

5.1 PROJECTED ENVIRONMENTAL IMPACTS

5.2 GENERAL POSITIVE IMPACTS

It is expected that they may be some amount of impact on the environment due to the nature of the proposed operation. However, RTI is confident that the proposed development will bring positive benefits to the Kartabu Triangle district. In general, all stakeholders within the project area have expressed the hope that the proposed development will materialize, since:

- a. More employment opportunities may become available within the Kartabu Triangle district.
- b. RTI proposed road network within the concession area may provide the mining community with more reliable and faster access to areas in the upper Puruni District and which may facilitate the expansion of gold mining operations.
- c. Expanded economic performance in the area will lead to a corresponding growth in revenues for public agencies and wealth for local communities.

5.3 NEGATIVE ENVIRONMENTAL IMPACTS

5.2.1 Environmental impacts

Generally, road construction and other related earthworks will be a major source of environmental impacts in the project area. This is due mainly to the soil type and the hilly nature of the terrain. It is anticipated that elevated sediment levels in streams may occur if heavy rainfall occurs within a few days after earth works due to erosion. Further, the felling of trees may alter the aesthetic qualities of the various landscapes within the project area. It is also expected that any leaching or spillage of petroleum products may alter the soil chemistry and the quality of waterways.

5.2.2 Biological impacts

Generally, it is expected that the selective felling of merchantable trees within the project area may result in the degradation of residual forests, altering species composition and the normal distribution of diameter classes.⁷

⁷ <https://www.fao.org/3/ae359e/ae359e09.htm>

However, such degradation may be short term given the dynamic nature of tropical forests. The harvesting of trees that form the main canopy layer may alter the forest environment by modifying the conditions in the understory in terms of light, temperature, and humidity, this in turn result in changes in the understorey environment which may affect seed germination and seedling establishment for merchantable species.

Further, timber harvesting within the forest may alter the habitats of many species of fauna and the use of heavy machines in the forest may scare or even kill some fauna or may force some species to migrate from the project area. Generally, it is expected that timber harvesting may alter animal-animal, and animal-plant relationships, respectively⁸.

5.2.3 Socio-economic impacts

Direct negative impacts relate to conflict between different stakeholders sharing the use RTI's concession-based logging roads because non-RTI users may resent restrictions or protocols that RTI could introduce for the use of its roads. For example, RTI may restrict the use of its roads during and perhaps up to four hours after heavy rainfall; other road users may resist this kind of restriction.

The construction of roads and skid trails elsewhere in State forests have set the pace for an influx of miners (and allied support businesses) who promptly use such roads and skid trails at a higher intensity than the loggers themselves). In fact, in many cases, loggers become minor users of their own logging roads. Where miners or any other stakeholder deprive loggers of the opportunity to harvest merchantable timber there is opportunity for conflict.⁹

6.0 MITIGATION MEASURES TO BE IMPLEMENTED BY RTI

On the basis of the projected environmental impacts in Section 5.0, RTI has developed a mitigation plan (see Table 5) to address the impacts projected.

7.0 PROJECT RISKS

The presence of several mining properties within the concession area could be a major risk for RTI's logging operations if all the allocated properties hold extensive commercial deposits of gold ore.

Small itinerant mining operations could have a nuisance value when RTI were to convince customers overseas that it is not responsible for forest degradation produced by mining activities. In its management of small scale concessions, RTI has maintained a respectful distance from mining operations and deliberately avoided any confrontation with them, to the extent that RTI has never had any major confrontation with miners. It is a fact though, that the proximity of miners to areas being logged add to RTI's administrative burden, especially from a security perspective, because RTI will not know who the bona-fide miners are. Further RTI anticipates major problems in engaging miners for meaningful discussions.

It is critical that RTI develops and retains a cadre of highly trained field operatives to take forward the quality of forest management that RTI envisages. (The Kartabu Triangle offers many competing job opportunities, for example experienced heavy-duty operators are always in demand.

Finally, for RTI, it is vital that Kartabu Puruni Road remains open for use throughout the year so that RTI

⁸ <https://news.mongabay.com/2013/09/climate-change-pushing-tropical-trees-upslope-exactly-as-predicted/>

⁹ <https://www.fao.org/3/ae359e/ae359e09.htm>

can maintain is log flows between the concession area and Puruni Landing.

Table 5: Mitigation plan to address the impacts projected

Predicted impact.	Proposed mitigation measures	Lead agency	Time frame for implementation
1. Physical Environment			
1.1 Earthworks will lead to , scarification of soil surface, sub-soil exposure , erosion, soil compaction, and water logging	<ul style="list-style-type: none"> Plan roads, bridges and culverts paying attention to topography and the use of stock maps. Use appropriate machines for all earth works to reduce the time taken to complete each activity. Consider the weather pattern before initiating major earthworks. Follow the recommendations of the CoP (Sections 4.5-4.7, Section 5) 	RTI	During the entire time frame for the project.
1.2 Air quality: Dust and smoke (especially along roads) minor changes in micro-climate	<ul style="list-style-type: none"> Vehicles will travel slowly <25 km/hr. whenever they pass Takutu village. All machines must be fully functional to maintain emissions within manufacturers' parameters. 	RTI	During the entire time frame for the project.
1.3 Water resources: negligible increases in turbidity, temperature, ph.; oil spills	<ul style="list-style-type: none"> Strict adherence to RIL principles and prescriptions of the CoP, especially regarding buffer zones along waterways. Maximum care to be taken to ensure all vehicles and machinery are in a proper state. Dispense or change lube oil only in designated areas. EPA's Brochure on Water conservation to be placed at all public points around the concession. Regular briefing sessions for field staff would be formalized. Care taken to avoid excessive spillage of borax solutions whenever used to treat (some species of) timber. 	RTI, GFC	During the entire time frame for the project.
2. Biological/ecological environment			
2.1 Timber harvesting: destruction of juvenile trees, genetic erosion of species, decline in soil fertility, spillage of oil, increased potential for blow downs	<ul style="list-style-type: none"> Implement a system for conducting pre-harvest inventories and preparing stock maps. Use directional felling techniques for felling trees. Plan skid trails based on stock maps. Use winching techniques. Use heavy duty machines that are fully functional. Training all field operatives in RIL practices 	RTI	During the entire time frame for the project.
2.2 Wildlife: modification, destruction of habitats, population changes	<ul style="list-style-type: none"> Ensure a systematic manner of timber harvesting so that once a block is harvested, the operation moves on, so that no further disturbances occur. Prohibit employees from hunting and fishing. Unique ecosystems, habitats and species will be conserved, by restricting logging in areas where they occur. 	RTI	During the entire time frame for the project.

Predicted impact.	Proposed mitigation measures	Lead agency	Time frame for implementation
2.3 Ecological relationships; Modifications of ecological relationships.	<ul style="list-style-type: none"> Implement proper RIL practices and prescriptions of the CoP (Sections 8, 9 & 10) Prohibit the use of fires on the forest floor. 	RTI, GFC	During the entire time frame for the project.
3. Socio-economic environment			

3.1 Conflicts: restrictions of access, alienation of rights	<ul style="list-style-type: none"> Engage residents in discussion and consultations to address mutual concerns: ensure the company is positioned to receive and address complaints. 	RTI	As required
3.2 Social problems: crime, use of alcohol, other disagreeable behaviour; increase in life threatening behaviour through exposure to various illnesses.	<ul style="list-style-type: none"> Work with public agencies (Police, staff of the Ministry of Health, and staff of the Ministry of Regional Development) in Regions 2, 3 to address emerging issues. Keep proper records of emerging problems and pass these on to the appropriate agencies. 	RTI	As required
3.3 Road safety: high probability of road accidents.	<ul style="list-style-type: none"> Work with MOPW, the GPF, the mining community and other stakeholders to ensure adherence to proper road use practices and to identify road locations requiring special attention. Make sure that each vehicle is in a full functional state prior to its use on the roadways, within and outside of the concession area. Place appropriate cautionary signs at sharp turns, steep grades, and bridges and near populated areas. Promote proper skills set among drivers through training. 	RTI	During the entire time frame for the project.
3.4 Waste management: illnesses resulting from a polluted environment	<ul style="list-style-type: none"> Observe prescriptions of the Code of Practice for forest operators. 3rd Ed. Sections 8.0, 9.1, 9.2. Hold frequent briefing sessions with staff to ensure a shared understanding of the consequences of poor control over waste management. Distribute and put-up EPA's brochure on waste management at all camps. 	RTI	Monthly
3.5 Indigenous, archaeological assets: loss, destruction modification of habitats, landscapes	<ul style="list-style-type: none"> Identify and isolate any assets encountered and post appropriate advisory signs and notices; ensure such sites are recorded on all stock maps. Consult with the Amerindian Affairs Ministry and the Walter Roth Museum on collaborative efforts to protect any assets discovered. Collaborate with communities to address the conservation of existing and emerging assets. Offer training & incentives where appropriate 	RTI	As required

8.0 PROJECT VIABILITY

RTI has prepared a SWOT Analysis prior to the start-up of operations for its own guidance (see Table 6).

Table 6: RTI's SWOT Analysis prior to the start-up of operations

<p>STRENGTHS</p> <ul style="list-style-type: none"> ● Location: RTI's concession boundaries are well defined, virtually no problems with neighbours, and there are no (Amerindian) Communities within the concession area. ● Large stocks of merchantable timber are available. ● Wide ranging experience: RTI has a strong and experienced, management team. ● Markets: RTI has access to markets based on current operations. 	<p>WEAKNESSES</p> <ul style="list-style-type: none"> ● Itinerant nature of mining: this refers to miners starting operations in blocks targeted for harvesting, extensive use of RTI' logging roads and skid trails, etc.: these situation can complicate RTI's strategic planning. ● Unfamiliarity with the mining community <i>in situ</i>: it will take considerable time and effort for RTI to get to know the owners of mining concessions so that the enterprise can begin positive collaboration with them.
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> ● New technologies: RTI can capitalise on new emerging technologies for wood processing. ● New product lines: RTI can capitalise on the large number of merchantable species to generate new wood products, including outdoor furniture. ● New market opportunities: RTI is in a position to adapt to new market conditions and customer behaviour. 	<p>THREATS</p> <ul style="list-style-type: none"> ● Competing land use-need to share road use: RTI will share its concession road network with many people who use a wide assortment of vehicles: conformity with RTI's road use protocols can lead to time consuming conflicts. ● Strong national policy support for miners, whose activity drive economic activity in Region 7. ● Inability to compete with the mining sector re remuneration packages for heavy-duty operators.

All RTI's financial analysis indicates that logging on the SFEP area will be profitable. A major cost centre will be the long-haul distance for conveying logs from the concession area to Puruni landing.

To date, RTI has been very skillful in navigating the variables and costs associated with the local logging and sawmilling activities, respectively. RTI also understands the vagaries of timber sales on the local market.

9.0 MANAGEMENT OF STAKEHOLDER ISSUES

For RTI, it is vital that any conflict with stakeholders sharing the use of the Kartabu-Puruni Road be addressed as quickly as possible. Failure to fully consider stakeholders concerns can severely impact the proposed logging operation. Thus, RTI will engage stakeholders to learn of any emerging issues that may lead to conflict or stymie log flows. Suitable remedies will be developed to address emerging issues.

10.0 CONSULTANTS CONCLUSION/STATEMENT

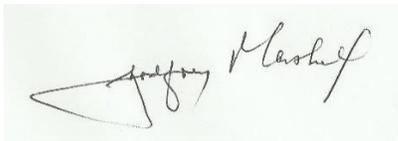
Stakeholders' expect that RTI' operations will be a major driver of economic development within the Kartabu Triangle, with many positive outcomes for the forestry sector and the mining sector respectively. RTI expects to inject millions of dollars into the economy of the Kartabu Triangle through remuneration packages and purchases of fresh vegetables, meat and fuel. With about 150 persons to be employed, the revenue base for the GRA and NIS will expand markedly

RTI anticipates an 18% increase in national timber output once its operations get fully on stream by June, 2022. RTI will expand its network of timber yards to include available markets in Region 6 and Region 7. RTI will pay attention to the local market for tropical hardwoods used by the furniture sub-sector.

Less than 1.5 % of the concession area will be logged over per annum. The consultants believe that RTI's logging operations will not lead to forest fragmentation nor degrade forest resilience nor lead to major incremental change in environmental parameters such as water quality and air quality. Note that RTI will continue to monitor environmental data at permanent monitoring points within the concession area.

Research elsewhere has demonstrated that well run forest concessions are major drivers of forest conservation. The consultants believe that RTI will abide by all local laws and forest management and environmental management standards, in line with its environmental authorization. The consultants also believe that the company is sincere in its commitment to regular engagements with stakeholders.

The consultants strongly recommend that an environmental authorization be granted to RTI.

A handwritten signature in black ink on a light green background. The signature is cursive and appears to read 'Gregory Marshall'.

G. Marshall
Coordinator/Team Leader
FTCI Team.

MAIN REPORT

1.1 INTRODUCTION AND BACKGROUND

1.2 The Developer- Royal Timbers Inc. (RTI)

1.2.1 Introduction

Royal Timbers Inc. is a privately-owned company, managed by a CEO/ Managing Director Mr Parmeshwar Jagmohan and is registered in the legal system of Guyana.

Royal Timbers Inc. (RTI) acquired SFEP 2/2020, over an area of 107,670.54 ha on right bank Puruni River, west of Puruni Landing, for the purpose of developing an integrated logging and sawmilling business. RTI plans to set up three (3) portable sawmilling facilities within the concession area to process the logs harvested from the concession area. The lumber produced will be transported by trucks via the Kartabu-Puruni Road (KPR), to Itballi, left bank Mazaruni River, from where the lumber will be shipped by barge to Georgetown or other coastal locations.

Royal Timbers Inc. (RTI) was incorporated as Company # 8612 under the Companies Act of Guyana on the 23 of November 2016. RTI's registered address is Lot 15 Garnett Street, Campbellville, Georgetown, Guyana. The Company garnered significant operational experience through previous work within hinterland areas such as Port Kaituma.

RTI's vision and strategic goals position the company to aggressively pursue sustainable forestry and associated infrastructural development in Guyana, while contributing to the overall improvement in Guyana's social, economic and environmental development.

The management of Royal Timbers Incorporated (RTI) is committed to the implementation of environmentally sound forest management that ensures sustainable commercial and economic harvesting in its service. At the same time, protecting and safeguarding its biodiversity and other uses and values to mitigate the adverse social and environmental effects of its forestry and sawmill operations.

To begin the activity, the company will install between February-August 2022 a 527 Cat Skidder, a Cat D6R Bulldozer, a Cat 66F Log loader, a 6 Log Truck Mack RD 888 SX, 3 Land Cruiser, a 4000 Watt Lister Generator, a 6-066 Stihl Chainsaw and an LT70 Titan Woodmizer Band sawmill, among others, in the PACO (East Puruni compartment) on the right bank of the Puruni River.

Logs and sawn lumber are transported by Log Truck Mack RD 888 SX and (container) or Log Truck Mack RD 888 SX using Karabu-Puruni Road to Itballi. At Itballi, the Logs and sawn timber are to be loaded onto a barge towed by a Tug Boat to Georgetown in the Demerara River. Logs or timber will be shipped to P&N International Log yard on Linden Soesdyke Highway, where timber and logs will be put in containers for export.

Timber harvesting will be carried out routinely in accordance with the Code of Practice for Timber Harvest Operations of the Guyana Forestry Commission (GFC). Harvesting control will be carried out and the concession will be divided into compartments and sub-divided into 100 hectares square blocks. These

operating blocks will be identified on the ground, delineated by cut lines 2 meters wide, flagged, painted (G.I sheets plates) showing block numbers at each block corner and road crossing to facilitate easy block identification. Inventory of the management level was carried out at 2.5 per cent sample strength and the pre-harvesting inventory will be made at 100 per cent for all harvestable blocks.

RTI will ensure a safe working environment, sound living condition for its workers/employees and responsibly manage its operation with the forest industry. The company will also work together with the GFC / Ministry of natural resources and shall comply with the laws and regulations that contribute favorably to the economy and well-being of Guyana.

1.1.1 Business Objectives

The business objectives of RTI include the following:

- a) To conduct sustainable logging operations fully compliant with local standards;
- b) To promote forest conservation generally, including supporting initiatives targeting the conservation of biodiversity, fauna and the protection of unique landscapes;
- c) To support initiatives linked to mitigation of climate change generally;
- d) To support the enhancement of a green economy in Guyana, including initiatives emerging under the GSDS; and
- e) To promote the development of the forestry sector.

The primary business of RTI is therefore logging and it is for this reason that RTI acquired SFEP 2/2020 over an area of 107,670.54 hectares of forest resources under the provisions of the Forests Act 2009.

The SFEP affords RTI the opportunity to gather baseline data on the concession area, evaluate the variables impacting on timber production from the area and determine whether logging the area would be feasible.

1.1.1 Corporate Structure

RTI's Board of Directors, is comprised of an array of professional that have consistently met defined objectives and performance targets and includes highly qualified engineers, architects, project accountants, skilled tradesmen and machine operators, foresters, and an environmental specialist.

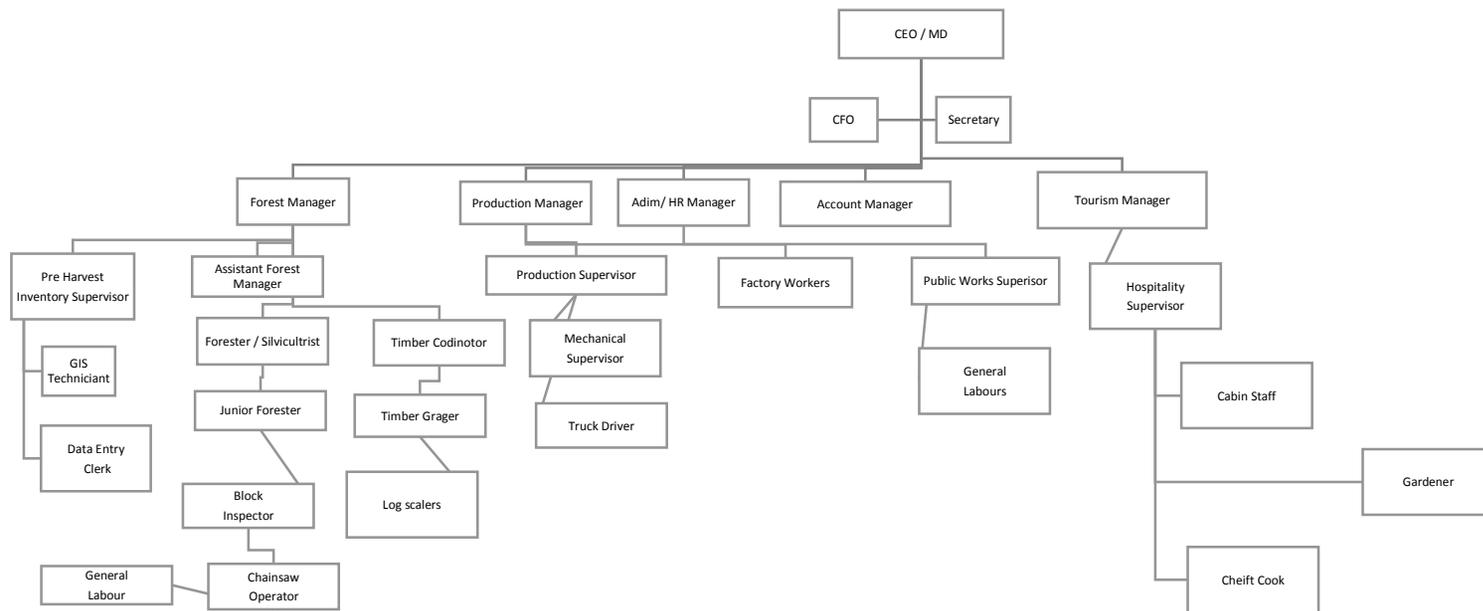
In taking forward its logging & sawmilling project, RTI's organizational structure would be based on the following:

- a) **Chairman Managing /Chief Executive Officer:** The Director of RTI will maintain overall responsibility for the design, planning and implementation of all aspects of the development and promotion of Royal Timbers Inc., including timber products, training and further future development of the company.

- b) **RTI Forest Manager** - The Forest Manager will maintain overall responsibility for the design, planning and implementation of all forest management activities including, but not restricted to:
- ✓ harvesting block layout, forest inventories, data compilation, mapping, and related reports
 - ✓ long-term forest management plans, 5-year harvesting plans and annual operating plans
 - ✓ road, bridge, skid trail and log market design, layout, construction and maintenance
 - ✓ supervision and monitoring of all RTI harvesting activities (felling, bucking, skidding, loading, transport), ensuring that all activities are carried out as per CoP and RIL specifications
 - ✓ all log scaling and grading, including related monthly reports to the RTI Director
 - ✓ operating cost data collection, analysis and reporting
 - ✓ all silvicultural activities, including PSPs and impact monitoring activities
 - ✓ forest certification
 - ✓ RIL training
- c) **RTI Assistant Forest Manager** - The Assistant Forest Manager will assist the Forest Manager in the design, planning and implementation of all forest management activities as stated above.
- d) **Accounts Managers** - The Accounts Managers will maintain overall responsibility for all book-keeping, accounting, auditing and procurement activities related to the activities of RTI.
- e) **Admin/Human Resources/Occupational Safety and Health Coordinators** - The HR/OS&H Coordinators RTI will maintain overall responsibility for establishing and ensuring compliance with, RTI policies and procedures as they relate to employment and benefits guidelines, working conditions and safe operating practices.
- f) **RTI Pre-harvest Inventory Supervisor** - The pre-harvest inventory supervisor will work under the direct supervision of RTI's Forest Manager and will be responsible for the layout and execution of pre-harvest inventories, according to procedures established by RTI and the GFC, promptly and as required for the preparation of annual operating plans.
- g) **Timber Operations Coordinator** - The Timber Operations Coordinator (RTI) will work under the direct supervision of the Forest Manager and will be responsible for providing quality control oversight in the execution of the pre-harvest inventories, as well as the design and layout of all roads, skid trails and log markets according to GFC and RIL guidelines.
- h) **Timber Operations Supervisors** - The Timber Operations Supervisors (RTI) will work under the direct supervision of the Forest Managers and will be responsible for the day-to-day supervision and monitoring of all harvesting operations, including, but not restricted to:
- ✓ daily production by activity (felling and bucking, skidding, loading, transport);
 - ✓ operating cost data collection (productive vs. non-productive hours, fuel and oil consumption, etc.);
 - ✓ ensuring compliance with RTI harvesting plans, including CoP, RIL and OS&H guidelines;
 - ✓ supervision of timber graders;
- i) **RTI Timber Graders** - The Timber Graders (RTI) will work under the direct supervision of the Timber Operations Coordinators and will be responsible for maintaining the day-to-day control of log volumes produced by harvest block.

- j) **RTI Database/GIS Technician** - The Database/GIS Technician will maintain over-all responsibility for the efficient functioning of the Geographic Information System for RTI. Responsibilities will also include the conversion of survey data into the GIS database framework for map production.
- k) **Data Entry Clerks** - The Data Entry Clerks (RTI) will work under the direct supervision of the Database/GIS Technician and will be responsible for all data entry activities, including forest inventory data, timber grading data and operational productivity and cost data.
- l) **RTI Mechanical Supervisor - Responsible** for the repairs and maintenance of machine and equipment for the company, also procurement of fuel, lubricants and spare parts.
- m) **RTI Road Construction supervisor** - The supervisor will be responsible for road construction, maintenance, bridges & culverts construction and all other related activities for the logging operations. Preparation of weekly, monthly progress reports and scheduling of a road-building program and road maintenance in the forest operation.
- n) **RTI Block Inspector - Responsible** for tagging stumps as felling activities are ongoing and taking GPS coordinates.
- o) **RTI Trucking Supervisor - Ensures** that all trucking documents are prepared and correct. Coordinate with supervisors and managers to plan trucking schedules.
- p) **RTI Truck drivers - Responsible** for the safe transportation of logs or any other produce from one location to another.
- q) **RTI Chainsaw Operators** - Responsible for felling trees for extraction and the clearing of road shoulders during road construction.
- r) **RTI General Labour** - Employed to help in any area within the various departments where they may be necessary.
- s) **RTI Kitchen Supervisor** - Responsible for the daily preparation of meals and snacks. including, but not restricted to:
 - ✓ the preparation of provisions orders and daily menus
 - ✓ prepare and serve healthy, nutritious meals
 - ✓ ensure that provisions are safeguarded from spoiling, theft and other hazards;
 - ✓ ensure that all employees receive their fair proportion of meals;
 - ✓ Provide such other services as may be necessary to achieve the goal and purpose of the company

ORGANISATIONAL STRUCTURE OF ROYAL TIMBERS INCORPORATED



The company **will employ about 75 workers for the logging operations** including;

- a) technicians, tally clerks & machine operators and for its timber harvesting operations;
- b) technicians, timber graders and tally clerks for its sawmilling and timber grading operations on the concession area;
- c) technicians for its timber depot and wharf;
- d) forest monitoring staffs; and
- e) security staffs.

1.1.2 RTI' Corporate Discipline

In the course of its business, RTI ensures full compliance with all applicable statutory obligations, forest management standards and all applicable guidelines. RTI **is currently** fully compliant with **all applicable conditions** set down by the following agencies:

- a) Environmental Protection Agency
- b) Guyana Forestry Commission
- c) Guyana Revenue Authority
- d) National Insurance Scheme
- e) Ministry of Home Affairs/Guyana Fire Service)
- f) Ministry of Public Works/MARAD
- g) Guyana National Energy Authority
- h) Regional Development Council Region #7

1.1.3 Corporate Social Responsibility

In keeping with its Corporate Social Responsibility, RTI will provide support for educational, religious and youth development projects promoted by a diverse grouping of public, civic, and private agencies.

1.1.4 Investment

The Kartabu Triangle has an estimated population of about 4,000 persons of which 90% are employed in the logging and mining sector. The two communities that are critical for development of enterprises in the area are Iteballi (~400 persons) and Puruni Landing (~300 persons). The principal investor, Mr. Parmeshwar Jagmohan, plans to invest within the first three (3) years three (3) million USD part of which will be equity and the balance from a bank loan.

An investment of US\$1 million will be done on exploratory operations by December, 2021 while another US\$2 million will be spent to conduct management level inventory, develop a road network, organize the concession area into compartments and blocks, and conduct 100% forest inventories for all blocks to be harvested. Annual investments will be made in the economy of the Kartabu Triangle, as well as road maintenance works along the Iteballi-Puruni Road.

1.1 The Consultant-FTCI

1.1.1 Profile of FTCI

RTI engaged FTCI to conduct its ESIA development process. FTCI was incorporated on May 1, 2003 as a result of a partnership between GFC, FPA and TFF (Virginia, USA) with financial support from ITTO and from DFID.

FTCI is situated at 17 Access Road, Kinston Georgetown and its main training facility is situated on right bank Mariwa river, left bank Cuyuni River. At the time of its establishment, FTCI became part of an international network of vocational training institutions offering practical hands-on training in skills necessary for planning and implementing reduced impact logging.

FTCI offers vocational training in the areas of forest surveys, forest inventory, planning of forest roads, skid trails and log markets, stock map preparation, tree marking, chainsaw use and maintenance, directional tree felling, skidding, and the use and maintenance of heavy-duty machines, such as skidders, front-end loaders. For its training programmes, FTCI targets field operatives attached to forest enterprises, forestry students (UG, GSA), representatives of environmental NGOs and communities respectively, public officers –including GFC staffs.

FTCI's training fees do not cover its costs and it relies on consultancies within the forestry sector to sustain itself. FTCI has been doing ESIA's since 2007.

1.1.2 The ESIA for RTI

1.2.2.1 Overview

FTCI agreed to provide consultancy services for RTI. On the signing of the contract with RTI, FTCI engaged in four main activities: hiring of consultants, forest reconnaissance, development of a stakeholder plan, the development of a sampling plan, and the collection of baseline information.

1.2.2.2 Recruitment of consultants

The TOR agreed with the EPA requires a multi-disciplinary approach to generate an ESIA Report acceptable to the EPA. FTCI has staffs with a diversity of skills that it assigns for consultancies: these persons are skilled in social surveys, introductory anthropology, aspects of forest surveys and forest inventories, forest technology and reduced impact logging, social surveys at the community level. The list of consultants used for this exercise is set out in Table 7.

Table 7: List of experts that conducted the ESIA

#	Name	Area of core expertise
I.	FTCI Staffs	
1	Mariea Suegrim	Socio-economic studies
2	Luann Nero	Social studies and environmental
4	Delyon Roberts	Forest technician

II. External Consultants		
5	Environmental Engineering Solutions (EES) (3 Persons)	The collection and the analysis of environmental data such as water quality and air quality respectively
III. Resource persons		
7	Jagdish Singh	Forestry, Environmental Science, and Forest Law
8	Godfrey Marshall	Coordinator

2.1 APPROACH AND METHODOLOGY, SIGNIFICANCE CRITERIA, AREA OF INFLUENCE

2.2 Overview

This section outlines the manner in which the consultants approached their task of compiling the necessary information required in completing the ESIA, identification of the key criteria associated with the project and the projected area of impact based on the proposed project.

2.3 Approach and methodology

2.3.1 Organization of activities

The concession area is among the largest block of intact forest in the Kartabu Triangle. Puruni Wood Products Inc. (PWPI) held the same concession area under SFEP 05/2004 between 2004 and 2007. Subsequently, PWPI conducted logging operations at the site for a brief period and then terminated its logging operations.

RTI developed the previous ESIA report, taking care to, *inter alia*:

- a) Review new sectorized developments in the policy and legal framework for natural resources sector generally and the forestry sector in particular;
- b) Review changes in land use, in and around the concession area;
- c) Review the current structure of the stakeholder community; and
- d) Include environmental data on water quality and air quality not included in the previous ESIA Report.

The specific activities undertaken by the consultants and the developer may be summarized as follows:

- a) Consultations
- b) Desk reviews
- c) The development of a stakeholder plan
- d) The collection and analysis of baseline data
- e) Discussion with the developer on its proposed project
- f) Scoping meetings
- g) Identification of and review of predictable direct, indirect, and cumulative impacts linked to the project
- h) Drafting of the ESIA Report

2.3.2 Consultations

FTCI has been working on ESIA's for developers in the Kartabu Triangle since 2007 and representatives of the organization have made numerous trips to the area. Consultations within the riverine communities or homesteads were informal due to two reasons. Firstly many of the few operatives or businesses encountered in the concession area were reluctant to engage in conversation, either because of mistrust of the consultants or disinterest in environmental matters. (It is apparent that persons carrying large amounts of cash or gold are naturally reticent in confrontations with strangers, eschewing any conversation or even physical contact, wherever possible). Secondly, many of the persons encountered near the concession area are self-employed, small scale, itinerant miners or business persons who do not live or own property or mineral licenses in the area; they live in Bartica or Linden or coastal communities but travel across all mining districts plying their trade.

FTCI interviewed and/or consulted about 60 persons during period March 2-8, 2021 within the Kartabu-Puruni-Pashanema District in relation to Royal Timber Inc.'s SFEP 2/2020 and the company's application to the EPA for an Environmental Authorization. The interviewees included large and small miners, loggers, the business community, and residents of Kartabu Village. (Information on the scoping was shared with representatives of the GGMC and GDF respectively at Puruni: the staff(s) were all recently posted to Puruni Landing). FTCI also interviewed a representative the Regional Administration (#7), the Police, the NIS, the Bartica Public Hospital and the GFC respectively, all in Bartica-the capital of Region 7.

2.3.3 Desk reviews

Thematic maps covering topography, soils, vegetation types and mineral licenses were sourced from the GFC.

The more important documents reviewed included the following:

- a) Ter Steege (2000) offered major indicative information about forest stocking;
- b) Cole, et al (2013) provided data on previous faunal research in the Kartabu Triangle;
- c) GL&SC (2013) was a major source of information for the concession area;
- d) Pasha, Wenner & Clarke (2017) provided very useful information and perspectives on the mining sector in Guyana; and
- e) APA et al (2019) provided recent and detailed information on Kurutuku Amerindian Village, Kartabu Village and Batavia Amerindian Village.
- f) Websites for all agencies in the natural resources were scanned on a weekly basis.

2.3.4 Development of a stakeholder plan

FTCI developed a stakeholder plan to guide its consultations (see Chapter 3.0). Unfortunately, the advent of the COVID-19 pandemic significantly affected the intensity and range of engagement with stakeholders and the consultants relied on previous work in the area.

2.3.5 The collection and analysis of baseline data

More than 50% of the consultants' time was spent on procuring access to the locations identified in the sampling plan. This proved very challenging as it required that the consultants traverse up to 40km on foot. However, RTI believes that sufficient initial information has been garnered to give a credible account of site conditions and prospects to stakeholders.

2.3.6 Discussion with the developer

The consultants engaged the developer about the structure of the proposed logging operations and associated log flow and also reviewed with the developer the pros and cons of traversing areas with a well-entrenched mining community. The consultants also worked with the developer to develop a suite of activities to mitigate the adverse impacts of the logging operation and on methods to develop partnerships with stakeholders.

2.3.7 Scoping meetings

The consultants drew upon other scoping meetings conducted for other developers within the Kartabu Triangle, and particularly how the issues raised affected the more permanent communities such as Iteballi and Kartabu Point, Iteballi and Batavia.

2.1.1 Identification of and review of predictable direct, indirect, and cumulative impacts linked to the project'

Please see Section 16.0.

2.1.2 Drafting of the ESIA Report

The major problem with the drafting of the report was to develop ways of presenting information on maps for an area exceeding 107,670.54 ha. Traditional methods of appending maps to the report would be onerous for stakeholders because large scale maps would be too bulky and small scale maps could make it difficult to discern the information presented.

2.2 Significance criteria

2.2.1 Overview

This section describes the transformative nature of the project in terms of its socio-economic impacts and the potential impacts on key ecological elements in the area.

2.2.2 Impacts on mining, the current driver of economic activity

Loggers, such as RTI, use heavy-duty trucks carrying about 40m³ and using pole trailers to carry full length logs 10-18M. Loggers must maintain their roads in a satisfactory state in order to ensure unobstructed log flows, conserve their vehicle, reduce operational costs, and to reduce driver fatigue. As such roads built by loggers are ideal for miners who wish to access their mining permits but do not have the resources to construct their own roads.

Experiences elsewhere (Mabura, Buckhall, Bissaruni) indicate how miners populate areas along new roads as soon as these are constructed. In fact, in many areas, miners and other parties use roads built by forest concessionaires at a higher rate than the forest concessionaires, themselves.

Many loggers experience difficulty in getting the mining community to adhere to the same protocols that the loggers themselves follow for the proper or safe use of logging roads. For example, loggers impose restrictions on road use during heavy rainfall. Of course loggers must take care not to fell trees anywhere without posting signs or otherwise communicating to third parties that tree felling is in progress.

2.2.3 Impacts on livelihoods

Logging offers employment opportunities and varied skills sets for young and old men and women. Women take up clerical jobs on forest enterprises but these can also extend to forest surveying, tree identification, and timber grading. Young people at Kartabu Point, Iteballi and Batavia can therefore garner a skill from RTI that make them employable elsewhere.

A major concern for parents in the district is secondary school education for their children. Once the children at primary school at Iteballi and at Kartabu Village transition to secondary schools in Bartica, parents must find extra regular cash to sustain them at Bartica. Employment with mining enterprises attract higher enumeration but payment dates are not necessarily predictable. Employment with mining enterprises also require the extended absence of fathers from their homes. It follows then that nowadays, many fathers prefer jobs nearer to their homes and jobs with a predictable pay date, and therefore many residents of the villages in the area prefer to work with logging enterprises.

2.3.5 Impacts on the environment

The first major impact on the environment are the interventions associated with the establishment of a network of roads. These works are unavoidable, however the proposed network of roads in a hitherto inaccessible area will bring major economic benefits through expanded logging and mining projects respectively. Road networks help the mining sector in two major ways: firstly roads allow miners to access hitherto inaccessible claims; and secondly, road networks allow miners more options for transporting fuel and other goods to riverine areas (along the Puruni River) in the dry season.

No hunting has been observed in the area to date; firearms carried by field operatives are more for their personal protection. However there has been numerous and frequent sightings of fauna: mammalian fauna such as agouti, deer and tapir, are always encountered along road ways and they seem to relish the new growth primary vegetation at road sides.

2.3 Area of Influence

2.3.1 Overview

The scale of activities required to operationalize logging activities at SFEP 2/2020 will transform economic activity in the entire Kartabu Triangle.

RTI' timber harvesting activities will not impact directly on the main communities in the Kartabu Triangle: specifically, the activities will all be far away from Puruni Landing, Iteballi and Kartabu Point. Logs harvested on the concession area will be extracted via the KPR to Pine Tree Landing, and it is only in the use of the KPR that RTI' operations will coincide or overlap with the activities of other developers. RTI will use six to eight heavy-duty logging trucks with pole trailers per day, each capable of conveying 40-45m³ of logs at speeds of 40-40km/hr. To main that output, RTI cannot rely on ad-hoc road maintenance programmes currently in place for the KPR. RTI will assist with road maintenance.

2.3.2 The KPR

All businesses or developers in the Kartabu Triangle, including those at Pappy Show and Kumong-Kumong Village, use the KPR. And therefore these would all be impacted in some way by RTI' use of the KPR. RTI estimates that, once it gets into production, the logging community will only be responsible for less than 8% of the vehicular traffic along the KPR.

2.3.3 Communities

In the hey-day of its operations in 2022, RTI will recruit a total of up to 180 persons for its operations.

The company will prioritize the recruitment of forest surveyors, tree spotters, timber graders, chainsaw operators and heavy-duty machine operators. RTI will also prioritize the recruitment of field operatives from Batavia, Kartabu and Iteballi. RTI also expects to purchase fresh meat, fruits and vegetables from villages in the Kartabu Triangle.

2.3.8 Public agencies

More prosperous expanded villages will attract more public services and the GOG is likely to allocate more resources for the development of those communities. For example, Puruni Landing, in just the past three years have acquired a MEDEX facility, a Police Outpost and a GDF Outpost. GGMC has a large station at Puruni Landing and the GFC is expected to set up three outstations in the Puruni District.

RTI estimates that its operations will lead to a 20% increment in the volume of business in the Kartabo Triangle. That should be enough to persuade the MOPW to expend more sums annually on KPR road works. Recently, the Ministry of Natural Resources has issued a call for submission of expressions of interest for the construction of a bridge across the Puruni River, in the vicinity of Puruni Landing.

3.1 PROJECT ALTERNATIVES

3.2 Overview

The land area contained within SFEP 2/2020, is primarily located in a relatively remote geographic area of Guyana. The area is to some extent devoid of communities and road infrastructure. The upper Cuyuni River and the upper Cuyuni River are not suitable for large scale commercial movement of goods and services due to existing rapids, rock bars and sand bars. Peripatetic mining has occurred in the area for many years, but it was only in 2015 that a large scale mine was developed at Aurora. Importantly, the Cuyuni-Puruni watershed is not part of any major development such as the Amaila Falls Project. The only protected areas in the area are those located within allocated large scale forest concessions.

According to the National Land Use Plan (NLUP) produced by the GL&SC, the project area has been classified under ‘North Western Guyana’ that includes Region 1 and part of Region 7.¹⁰ The GL&SC NLUP went on to report that the area is classed generally as poor agricultural land on rolling to hilly terrain, save for valleys located within the Cuyuni, Puruni and Mazaruni valleys. The area is further classified as ‘a major mining area with almost the entire area covered by prospecting leases’.¹¹

3.3 The case for no action-that is no forest concession issued

In order to fully address the project alternatives, two scenarios must be considered. Thus, if no forest concession was issued over the target area of 107,670.54 ha, mining would continue to be the dominant land use activity due to the high number of mineral licenses already issued. Existing mining operations would contribute to deforestation and forest degradation with loss of potential revenue for Government and massive waste of merchantable timber. Thus, RTI believes that it is only a matter of time before a mining enterprise initiates heavy investment in the area.

3.4 The case for forest concessions

On the other hand, the case for issued forest concession within the proposed project area must also be considered. Thus, according to the FAO, “Governments can use their forest capital to meet socio-economic and environmental objectives, such as generating foreign exchange, creating employment, maintaining ecosystem services and earning government revenue” (FAO, 2018).¹² In this regard, the GFC collects revenue from concessionaires through a combination of area based charges and volume of timber extracted.¹³

Consequently, “In many tropical countries, the large size of timber production forests represents an opportunity to complement existing protected areas systems, providing critical habitat for wildlife (vertebrate and invertebrate fauna) and native plant species. Although production forests are not a

¹⁰ GL&SC. 2013. Guyana National Land Use Plan. Georgetown: GL&SC.

¹¹ Ibid.

¹² FAO. 2018. Rethinking forest concessions. Improving the allocation of state owned forests for better economic, social and environmental outcomes. Forestry Working Paper 4. Rome: Food and Agricultural Organization of the United Nations.

¹³ GFC, May 2016. Proposal for the Revised Revenue Structure for the Forest Sector of Guyana.

substitute for nature preserves, they provide a complementary role when sustainably managed for both timber and non-timber resources” (Fimbel, Grajal, & Robinson, 2001).¹⁴

Thus, loggers must set aside biodiversity reserves which eventually become national assets, and an integral part of the national system of protected areas. In the case of the Cuyuni-Puruni District, the proposed biodiversity reserve within RTI concession area may eventually become part of the national system of protected areas in the district.

Historically in Guyana, both loggers and miners are known to create micro-villages in wherever they operate, following which the Government adds social and health care services. For example, the Mabura Township was established during the Demerara Timbers logging operation, subsequently the Government moved to set up a school, medical centre and police station there.

3.5 Peculiarities of local forest resources

In Guyana, local forest resources are usually characterised by many species of trees of various ages and sizes distributed randomly, and not all of which are currently merchantable.¹⁵ In addition, the Guyana Forestry Commission has established standards for the minimum diameter size of trees that can be felled, the maximum volume of timber that can be felled per hectare, and restrictions on sites where trees could be felled. This implies that loggers must follow the selection system (not a clear-felling system) for harvesting trees and therefore there will always be (residual) trees remaining in logged over forests.¹⁶

3.6 Peculiarities of logging activity

In the logging operation, the selection of merchantable trees is based on stem condition, dbh, species, and site conditions. Historically, loggers retrieve on average about 8m³/ha, or less than six trees/ha. In areas where there is full application of RIL principles, to the extent that the timber harvest is informed by pre-harvest inventory data, directional felling is practiced and skid trails are planned, the intervention in the forest environment is minimal. Therefore, based on the residual post-harvest conditions, selective logging is generally compatible with other major stakeholders’ interest such as ecosystem services, watershed management, wildlife conservation and the conservation of biodiversity. Other main sources of environmental impacts are, road construction, road maintenance and related earthworks such as the establishment of borrow pits.¹⁷

3.7 RTI’ project

RTI’s guarantees that its proposed timber harvesting practices will confirm with national standards and in full compliance with GFC’s COP and GFFO. More importantly, RTI’s practices represent best practices, used across the forest sector in Guyana.

Thus, RTI will ensure that the concession area will be organized in compartments and blocks in line with local standards. Logging will be cyclic, where a particular area will be subject to logging for about no more than 30

¹⁴ Fimbel, Robert A, Alexandro Grajal, and John G. Robinson. 2001. “Logging-Wildlife Issues in the Tropics. An Overview.” In *The Cutting Edge: Conserving Wildlife in Logged Tropical Forests*, by Robert A Fimbel, Alexander Grajal and John G. Robinson. New York: Columbia University Press E-Book.

¹⁵ ter Steege et al. Ecology and logging in a tropical rain forest in Guyana: with recommendations for forest management. Tropenbos International January 1996

¹⁶<https://www.forestry.gov.gy/wp-content/uploads/2015/09/CoP-Timber-Sales-Agreement-and-Wood-cutting-License-Holders-3rd-v2-May-2013.pdf>

¹⁷ Ibid.

days, then left alone. Only areas near to primary roads will continue to be impacted. It is expected that RTI will harvest less than 1.5% of the concession area every year.

Given the proposed cyclic nature of the proposed operation, the consultants have concluded that technically, RTI's operations are technologically sound and in line with what would constitute sustainable forest management in a natural tropical forest.

The consultants further believe that the award of a forest concession to RTI would lead to a more structured and sustained development of the upper Cuyuni-Puruni District in Region 7. A forest concession would harness considerable economic value for the Guyanese society increased timber production and subsequently increased gold production.

4.1 STAKEHOLDER IDENTIFICATION AND CONSULTATION

4.2 Overview

Due to the historical nature of mining and logging activities within and surrounding the project area, it is expected that the proposed logging operation within SFEP 2/2020 will bring significant benefits to the economic, social and environmental profile of the Kartabu Triangle.

Importantly, the current extractive route for timber within the project area somewhat overlaps with existing infrastructure used by the mining and logging communities in the Kartabu Triangle district. Therefore, from an environmental and forest conservation perspective, a relatively intact forest concession comprising 107,670.54 hectares of prime forests, will attract significant stakeholders' interests and investment.

Historical, mining and logging already occur within the Kartabu triangle. Also, the entire Kartabu-Puruni Road traverses forest concessions and mining concessions. There are small clusters of miners and/or businesses along the western segment of the Kartabu-Puruni Road. Most residents are miners.

The Kartabu-Puruni Road (KPR) represents the primary access route to the Kartabu Triangle and has two segments. The eastern segment from Iteballi to Puruni Landing and the western segment from Puruni Landing to Pappy Show that are connected by a barge service at Puruni Landing. The GFC and the MNR recently issued a call for tenders for the construction of a bridge at Puruni Landing.

RTI will use the KPR to extract timber and in doing so will share road access with stakeholders that include several loggers, miners, and other transporters of fuel utilizing heavy-duty trucks.

RTI has identified the stakeholders with whom it must collaborate in the development of the concession area (see Table 8).

4.3 Consultations

4.3.1 Overview

In accordance with the Environmental Protection Act Cap 20:05, the EPA published a notice of the project and made available to members of the public a summary of the proposed project. The public had 28 days to make written submissions setting out those questions and matters which they require to be answered or considered in the environmental impact assessment. During this period, public scoping meetings were held with nearby communities to the proposed Project and one meeting (1) with sectors.

In this regard, RTI and FTCI conducted several consultations with relevant stakeholders, including communities that surrounds SFEP 02/2020. FTCI interviewed and/or consulted about 60 persons during period March 2-8, 2021 within the Kartabu-Puruni-Pashanema District in relation to Royal Timber Inc.'s SFEP 2/2020 and the company's application to the EPA for an Environmental Authorization. The interviewees included large and small miners, loggers, the business community, and residents of Kartabu Village. (Information on the scoping was shared with representatives of the GGMC and GDF respectively at Puruni: the staff(s) were all recently posted to Puruni Landing). FTCI also interviewed

a representative the Regional Administration (#7), the Police, the NIS, the Bartica Public Hospital and the GFC respectively, all in Bartica-the capital of Region 7.

Mining has been the primary driver of economic activity in the Kartabu Triangle/Puruni District since the late 1920s. There has been logging in the lower Mazaruni-Cuyuni area since the 1950s, however it was only recently (~2009) that logging started west of the Puruni River. Apart from the construction of the Iteballi-Pappy Show Road in the 1970s & 1980s, communities such as Puruni Landing, Kumong-Kumong, Turtle Creek, and Pashanema were developed entirely at the initiative of miners.

The Iteballi-Pappy Show road is used by every operative within the Kartabu-Triangle. A major concern is the barge crossing at Puruni Landing, however there is currently a committee comprising representatives of the MNR, GGMC, GFC, Ministry of Public Works, the mining community, and the logging community reviewing options for a bridge across the Cuyuni River.

Malaria is still the major concern for residents of region 7. However, apart from MEDEX facilities at Kartabu, Iteballi and Puruni Landing, the Ministry of Health provides extension services covering a range of medical issues to the communities in the area. Units of the Police and the GDF respectively are now stationed at Puruni. GGMC has a checkpoint near Iteballi and stations at Puruni Landing and Olive Creek. GFC has a station at Iteballi and is planning to set up a network of forest stations in the western part of the Kartabu Triangle.

Table 8: Core stakeholder communities for RTI' Operations.

#	STAKEHOLDER	INTEREST
A	Public Agencies	
	· EPA	Environmental protection and management
	· GFC	Forest resources conservation and management
	· GGMC	Sustainable mining and management
	· GLSC	Land management
	· MOAA	Amerindian matters
	· MOPW	Maintenance of the Kartabu-Puruni Road and auxiliary infrastructure
	· GPF	Public security and protection
	· PAC	Conservation of ecosystems, biodiversity, wetlands
B	Environmental NGOs	
	· WWF	Mining practices; forest conservation, conservation of flora and fauna
	· CI	Mining practices, forest conservation, conservation of flora and fauna
	· GGDMA	Sustainable mining development
	· APA	Land titling matters within the Kartabu-Puruni Road district

C	Logging community	Shared approach to the management of the Kartabu-Puruni Road corridor; collaboration on environmental management.
D	Mining community (general)	Shared approach to the use of internal roads and bridge infrastructure
E	Mining community-	
	Puruni Landing	Shared approach to the use of RTI' access road and concession based roads.
E	Indigenous communities	
	<ul style="list-style-type: none"> - Kartabu Village - Iteballi Community - Kartabu Community - Puruni Landing Community - Kumong-Kumong - Pashanamu - Turtle Creek 	Conservation of livelihood values
F	Business Community	Collaboration on environmental management

4.1.1 Public Agencies

Most of the concerns of public agencies and environmental NGOs, and Amerindian NGOs and other relevant parties involved in the ESIA process were addressed at the formal and informal meetings. These concerns were considered in the elaboration of the TOR for the ESIA process and report.

In short, there were no categorical rejection of timber harvesting operations in the area. In fact, the general opinion was that more economic development in the Kartabu Triangle will be beneficial for all stakeholders.

4.1.2 Mining Communities

4.1.2.1 Mining community: Riverine Communities/Business community

Generally, mining communities develop from the association of miners and business persons within a specific area. The business persons vend rations, fuel, mining supplies and clothes to miners in transit. Some business persons may also involve in the gold trade.

Large miners within the concession area value privacy as a consequence of the need to protect the extensive assets they deploy in the field. To this end, many have installed barriers (such as locked gates) on their private roads. They expect and look forward to consultations on the way forward with loggers. Small miners support logging and they are prepared to work with them. The general opinion is that not all potential areas of conflict are easy to address and they would like to see loggers afford

them an opportunity to ventilate their concerns.

Residents at Iteballi are concerned about the dust nuisance created by logging trucks. Residents at Kartabu Point believe that wood debris discarded at the beaches at Iteballi pollutes the water downstream-the water from the river residents depend on for domestic purposes.

4.1.2.2 General concerns about mining activity re SFEP 2/2020

Several studies have addressed the vagaries, modalities, and consequences of mining practices in Guyana.¹⁸

Thus, in the context of RTI's project, the primary challenges with mining are as follows:

- a) Each miner has his own plan and timetable for the development of his mineral license and there is no overarching exploration development plan with which RTI could align its operations with to avoid conflict;
- b) There is currently no post mining rehabilitation plan and mining pits are simply abandoned at the conclusion of mining activities
- c) Generally, the mining community expressed a willingness to work along with loggers. The general problem however is that in practice it is difficult to organise meetings for itinerant miners and so it is difficult to get them to commit to any obligations or agreement.

4.1.3 Indigenous Communities

4.1.3.1 Overview

There are no communities within the concession area. However, there are several communities surrounding the concession. These are; Iteballi, Kartabu, Puruni Landing, and Kumong-Kumong.

Iteballi is a small village located more than 100km from the proposed project site; however, the company plans to join other logging companies that use Iteballi as a timber transshipment facility. WTTCL set up Iteballi as a timber transshipment facility in the late 1950s, but persons began occupying the site in the early 1970s. According to the 2002 Population Census, there were 84 houses with evidence of extended family structures in some homes. Iteballi is primarily a farming community, with bananas, pears, and ground provisions being the main produce. Farming is carried out mainly on a subsistence basis, with the surplus sold to shops in the area and other residents. The main economic activities of the residents there are gold mining and subsistence farming.

Kartabu is a small village set up at the confluence of the Mazaruni River and the Cuyuni River in the 1920s. The village lies some 108km from the eastern end of the concession area. The KPR starts at Kartabu, but in fact traffic was diverted to Iteballi in the 1970s after the startup of the Upper Mazaruni Development Authority in the 1970s and the establishment of a barge service between Iteballi and Teperu. According to the 2002 Population Census there were twenty-one (21) single family dwelling houses in the community, which seems to be supported by the Community Development Council

¹⁸ Lowe, 2006; Hammond, et al, 2007; Bulkan & Palmer, 2016; and APA-FPP, 2016.

(CDC) Secretary who estimated the population at 130 individuals, comprised mostly of children. The ethnic make-up of this small community is mixed, though Amerindians are in the majority. Puruni Landing, situated at the junction of the KPR and the Puruni River has a resident population of about 300 persons. The village is a major commercial hub that supports the regional mining industry: the community has several large grocery stores, several hotels with moderate basic amenities and several restaurants. GGMC maintains an office there and there is a MEDEX Centre. There are reportedly plans to establish a police station there.

Puruni Landing has critical strategic crossing due to the barge crossing there. There is ongoing discussion between agencies in MNR and the MOPW respectively in relation to a bridge across the Puruni River, at or near Puruni Landing.

Kumong-Kumong is a small mining community at the confluence of left bank Kumong-Kumong River and right bank Puruni River. The population there is about 90 persons engaged in in gold mining and/or ancillary enterprises or vending groceries and fuel. Residents of Kumong-Kumong by virtue of their location will be impacted directly by RTI's logging operations.

4.1.4 Other Communities

4.1.4.1 Communities-Kartabo Triangle Batavia, *Kartabu Point*

The consultants conducted consultations with Iteballi on March 2, at Kartabu Point on March 3, 2021 and at Batavia March 4, 2021 (see Annex).

All the communities were essentially in favour of economic development and there were no major objections to RTI' proposed logging project, especially as RTI' timber harvesting operations will not occur in their vicinity. In the case of Batavia, residents have collaborated with RTI' current operations near Batavia and they enjoy a sound working relationship. Batavia residents intend to capitalize on employment opportunities with RTI.

There were some general concerns about the needs for predictable pay dates for employees of timber enterprises. (Most of the concerns also dealt with logging trucks traversing Iteballi Community, but these were not applicable to RTI proposed logging operations).

There are small clusters of miners and/or businesses along the western segment of the Kartabu-Puruni Road: the main ones adjacent to the concession area are Pashanamu (30 persons) and Turtle Creek (35 persons). Most residents are miners.

There is an airstrip with a few dwellings at Olive Creek, left bank Mazaruni River, opposite the mouth of Kurupung River on right bank Mazaruni River and there is the Pappy Show Landing at the western extremity of the KPR. Both areas lie outside the concession area but persons travelling there by road will be sharing the use of the KPR with RTI.

4.3 The way forward

In planning for stakeholders' issues in the management of the forest concession, a stakeholder map (see Table 9) was prepared and in addition detailed stakeholder analysis is set out in Table 9).

Table 9: Stakeholder map for RTI' Project, SFEP 2/2020.

	Disinterested Stakeholders: FMP, AOP, other reports available for scrutiny)	Extremely interested stakeholders: (Documents –FMP, AOP, other reports provided for scrutiny)
	<ul style="list-style-type: none"> ● MOPW ● MOH ● GGMC ● GGMDA 	<ul style="list-style-type: none"> ● EPA ● MNR ● GFC ● ENV. NGOS ● EMPLOYEES, RTI
	Disinterested parties: their interests and concerns to be monitored closely.	Extremely interested stakeholders: information provided on request:
	<ul style="list-style-type: none"> ● RDC-REG 7 ● Logging Community ● Timber Dealers ● MOAA 	<ul style="list-style-type: none"> ● MOHA/GPF ● Indigenous (Amerindian) Communities ● Mining Community ● Business Community
I N T E R E S T →		

5.1 POLICY, INSTITUTIONAL AND LEGAL FRAMEWORK FOR FOREST AND ENVIRONMENTAL GOVERNANCE

5.2 The natural resources sector

This section relates the suite of policies, legislation, standards, and guidelines applicable to the natural resources sector.

Guyana is endowed with considerable natural resources, including a diversity of forest resources. The importance of the conservation of local forest resources is reflected in the provisions of the Constitution and diverse ancillary policies, legislation, and standards across the natural resources sector.¹⁹ Several public agencies are involved in the management of local forest resources (see Figure 30).

In addition, NGOs OR CIVIC groups and communities are routinely consulted about the development of sectoral initiatives.

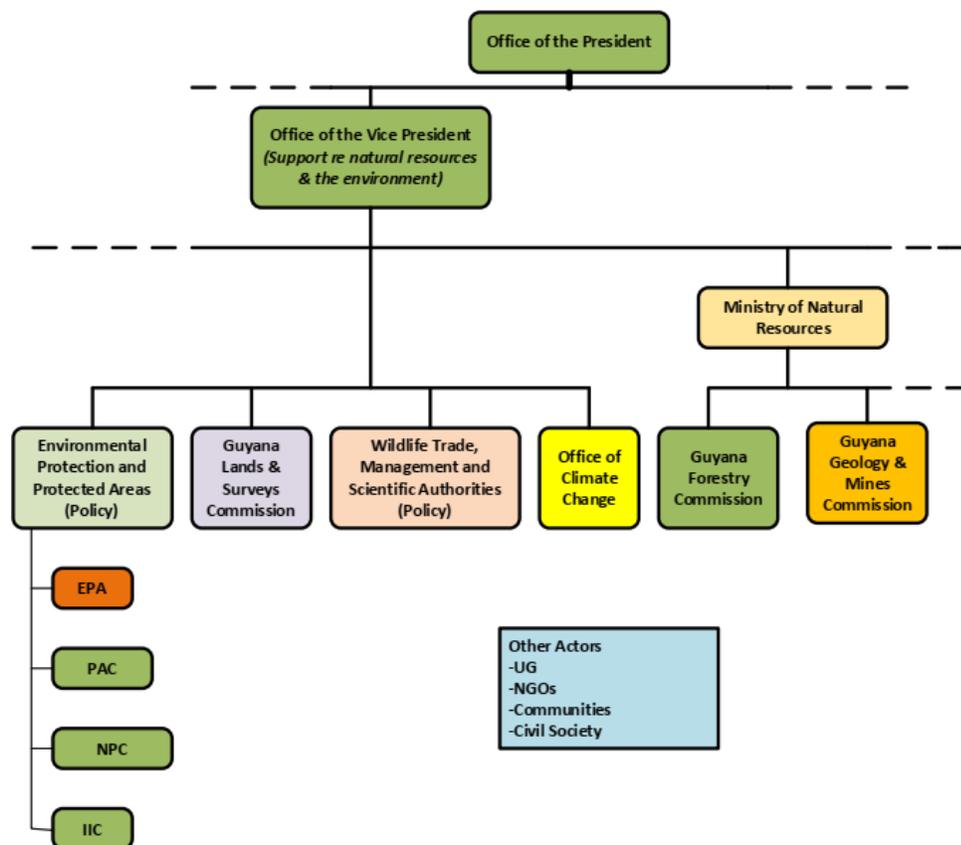


Figure 13: Chart showing the core organizational framework for the natural resources sector.

Major drivers of recent changes in the forestry sector were the overarching LCDS, GSDS 2040 and the FLEGT-VPA between GOG and the EU. Other drivers of change emerged from engagements with FAO, ITTO, ACTO, the NGO community, and bilateral arrangements such as that between GOG and (the Kingdom of) Norway.

¹⁹ <https://forestlegality.org/risk-tool/country/guyana>

RTI keeps abreast of developments in the natural resources sector primarily through direct engagements with the GFC, regular scanning of the websites for public agencies and for NGOs, and review of applicable content in the local newspapers.

5.3 Overarching frameworks

5.3.1 The Constitution of Guyana

Only a few states in the Commonwealth Caribbean have enshrined a right to a clean environment in their written constitutions. The Guyana Constitution is one of the few exceptional states that protects this right. The constitutional laws in Guyana are very liberal and advance in this respect. Several other Constitutions in the Commonwealth Caribbean have provisions from which an implied right to a clean environment has been inferred but there is no expressed provision regarding protection of the environment. For instance, in the Constitution of Trinidad and Tobago, the word “environment” does not appear. Trinidad and Tobago have a number of legislation that protects the environment.²⁰

Article 36 of the Constitution of the Cooperative Republic of Guyana Act (1980) is the primary basis for the environmental initiatives across the entire natural resources sector by prescribing the following: *‘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 measures to conserve and improve the environment’*. The provisions of the Environmental Protection Act, 1996 and supplementary legislation in 2000, among others, lead the translation of the provisions of the Constitution into practical measures.²¹

5.3.2 National Environmental Action Plan (NEAP) 1994 (GOG 1994).

The major objective of the NEAP is to identify major (emerging) environmental problems and to formulate appropriate policies to manage them.²²

This ESIA study is consistent with the general aims of the NEAP1994, including the following:

- a) Assure all people living in the country the fundamental right to an environment adequate for their health and well-being;
- b) Achieve a balance between the use and conservation of the nation's resources to meet the needs of economic development and improved standards of living;
- c) Ensure that, where environmental damage occurs, remedial action will be taken with the cost being covered by those responsible for causing the damage;
- d) Conserve and use the environment and natural resources of Guyana for the benefit of both *present and future generations*, based on the principle of the exercise of sovereignty;
- e) Maintain ecosystems and ecological processes essential for the functioning of the biosphere to preserve biological diversity and to observe the principle of optimum sustainable yield in the use of renewable natural resources and ecosystems, both on land and the sea;
- f) Rehabilitate damaged ecosystems where possible and reverse any degradation of the environment. Ensure prior environmental assessments of proposed activities which may significantly affect the environment;
- g) Ensure that conservation is treated as an integral part of the planning and implementation of

²⁰ See, Trinidad and Tobago Environmental Management Act, 2000

²¹ <http://parliament.gov.gy/constitution/>

²² <https://www.cbd.int/doc/world/gy/gy-nbsap-v3-en.pdf>

development activities;

Due to heightened environmental awareness, public interest in sustainable development, and stringent environmental protection laws and regulations, RTI is passionate about forest conservation and allied areas such as the conservation of wildlife.

Further, RTI is cognizant of the fact that the management of forestry resources has been reinforced by the UN driven SDG 15 which aims to ‘protect, restore and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss’.

According to the UN, technology will help to address the challenges for sustainable forestry in the 21st century²³. Thus, RTI has conducted research and has noted that the trend in literature shows that ICTs have been used in two key areas for forest management: firstly, mapping and monitoring of forest resources and environmental threats, and secondly, raising awareness of the need for sustainable forestry practices.²⁴

Further RTI has noted studies which showed that ICTs have been used effectively for forest management (Castren and Pipai 2011); (Jacob, et al. 2013).²⁵

Thus, in light of this, RTI’s operations will be based on the use of ICT and RIL principles and will in effect comply with established standards and guidelines on sustainable forest management that emphasizes planning of all forest interventions and machine use. RTI is also fully committed to compliance with all national standards, including those set out in GFC’s COP.

To ensure this is accomplished, RTI will establish an in-house GIS/RS department that will collaborate with various land-use agencies to compile and build up a functional GIS/RS database for use in its logging operations. RTI will invest in UAV technology to map and monitor the forests at every stage of the logging operation. All data collected will be shared with the GFC and EPA. RTI will utilise the information gathered from the GIS/RS database to ensure that the company is in full compliance with the GFC log tagging and tracking system which will be integrated in the GIS database.

5.3.3 The National Biodiversity Strategy and Action Plan (NBSAP), 2012-2020 (GOG 2014).

The NBSAP, 2012-2020 was developed by the MNR and the EPA in partnership with several stakeholders, with funding from GEF. The NBSAP seeks to align Guyana’s initiatives on biodiversity with those of regional and global partners.

In the context of this ESIA report, priority areas for action set out in the Plan include:

- a) Expansion of protected areas to meet the goal of 17% of terrestrial area in-situ conservation in legal protection by 2020. To ensure that these areas would also be effectively managed, capacity would be built for planning, establishment, and management of protected areas. A National Protected Areas Trust Fund would be established which is expected to contribute significantly to the financial sustainability of these protected areas.

²³ <https://unstats.un.org/sdgs/report/2016/goal-15>

²⁴ FAO and UNEP. 2020. The State of the World’s Forests 2020. Forests, Biodiversity and People. Rome.; <https://doi.org/10.4060/ca8642en>

²⁵ <https://unstats.un.org/sdgs/report/2016/goal-15>

- b) Reviews of existing legislation and outcomes of Environmental (and Social) Impact Assessments (ESIAs) and their roles in protecting biodiversity.
- c) Compilation and consolidation of biodiversity data from local, international, and web-based sources including traditional knowledge and development of a database system for biodiversity which makes data freely available to users.

RTI expects that any lessons learnt from the management of its biodiversity reserve can support national initiatives. On acquisition of a TSA, RTI will set up a network of permanent monitoring stations within its biodiversity reserve.

RTI recognizes and has noted the issue of illegal logging and the significance of its impacts on forest degradation, climate change, and habitat loss, and community livelihoods. In collaboration with the GFC, RTI will establish a GIS/RS database to collect and analyse geospatial data for use in monitoring land use activities within the concession area. RTI will build in-house capacity using best practice guidelines and technology to detect and prevent any illegal harvesting and land clearing activities not sanctioned by the company and will utilise UAV technology to map and to monitor the forest concession.

5.3.4 The National Land Use Plan (GL&SC 2013)²⁶

The National Land Use Plan (NLUP) provides *'a strategic framework to guide land development in Guyana'* and is distilled from several national policies and strategies that have a direct relevance for land use and land management. The NLUP further attempts to *'provide for the co-existence of multiple land uses and provide clear, implementable guidelines for making decisions on multiple land uses and mutually exclusive, competing land uses'*. The NLUP is administered principally by the Guyana Lands & Surveys Commission (see Section 5.6.1.6).

RTI believes in a multiple-use approach to natural resources management. Specifically, RTI has no specific objections to mining. RTI will always try to coordinate the development of parcels of forest resources so that its objectives and those of the miner(s) can move forward amicably.

Further RTI recognizes that mining operations trigger multiple impacts, both positive and negative. Examples of positive impacts include road upgrades, access to a greater range of health services, upgrades to community facilities and greater education and employment opportunities for surrounding communities. Potential negative impacts range from increased crime rates to higher cost of living and respiratory health risks caused by dust pollution.

In order to address negative impacts, RTI plans to conduct a strategic impact assessment to identify and assess environmental, social and health impacts and other land-use activities within the forest concession. The outcome of the strategic impact assessment will be utilised to ensure that management and mitigation strategies minimise adverse impacts and enhance the benefits of surrounding communities and the environment.

In collaboration with the GFC and GGMC, RTI will compile the location of all allocated and active mining concessions/lease within the concession area. This will inform the development of a

²⁶ <https://observatorioplanificacion.cepal.org/sites/default/files/plan/files/2013%20NLUP%20Guyana.pdf>

comprehensive logging and mining plan which will be submitted to GFC for approval. New roads and trails will be mapped and shared with MNRE, GFC, GGMC and EPA.

5.2.5 The LCDS, 2013 (GOG 2013)²⁷

The Government of Guyana launched a *Low Carbon Development Strategy (LCDS)* on June 8, 2009. The strategy elaborates Guyana's vision for promoting economic development while at the same time combatting climate change. The context for the LCDS included deliberations on climate change and its consequences for Guyana's low-lying coastland, the fact that Guyana's forest resources could be used to mitigate climate change, and the dilemma that with its current development goals, Guyana cannot simply keep all its forest resources intact. Essentially, Guyana was willing to put measures in place to conserve its forests providing that it could realize alternative options for meeting its developmental needs. As a policy instrument, the LCDS was intended to provide the framework in which all interventions in local forest resources occur.

In November 2009, the Governments of Guyana and of Norway signed an MOU that entailed Norway contributing the sum of US\$ 250 million to the Government of Guyana provided that the avoided deforestation rate for Guyana can be kept within agreed values for a specific period. After a series of consultations, revised versions of the document were published in May 2010 and March 2013.

Many aspects of the LCDS, 2013 has been subsumed by the GSDS, 2040 (see Section 5.3.7)

RTI is aware that the recent development of oil and gas sector will bring considerable development and benefits to Guyana. RTI notes that the recent commitment by GOG to reinstitute an expanded LCDS to include wider environmental services, water resources management, climate resilience, biodiversity, renewable energy, and the marine economy.

Guyana stands to earn substantial revenue and benefits from Payments for Ecosystem Services (PES). In light of this recent development, RTI commits to the development and implementation of policies and best practice principles that will ensure the conservation and sustainable management of the forest resources within concession areas.

5.2.6 LCDS 2030

LCDS 2030 advances a vision first articulated in 2008 by the then President, Vice President, Bharrat Jagdeo. The vision was further developed in 2009 when it was encapsulated in the world's first low-carbon development strategy from a developing country.

The new reworked LCDS focuses on harnessing Guyana's unique advantages to create a new low-carbon economy, built on the platform provided by the monitoring, reporting and verification system (MRVS) and other areas of enhanced capacity in Guyana.

LCDS 2030 will create a new low-carbon economy by establishing incentives which value the world's ecosystem services, and promoting these as an essential component of a new model of global development with sustainability at its core.

In Guyana's case, harnessing the value of the country's ecosystem services can build a long-term, low-carbon diversification opportunity.

²⁷ <https://www.lcds.gov.gy/index.php/the-lcds/207-low-carbon-development-strategy-update-march-2013/file>

The draft LCDS addresses four main objectives, namely forest climate and other ecosystem services; how to stimulate future growth through clean energy and sustainable economic activities; protecting humanity and biodiversity against climate change and, how to align Guyana with global climate goals.²⁸

RTI fully supports the vision set out in LCDS 2030 and commits to the development and implementation of policies and best practice principles that will ensure the conservation and sustainable management of the forest resources within concession areas for the creation of a sustainable bio economy.

5.2.7 National Development Strategy, 2001-2010 (GOG 1997)

The Ministry of Finance held responsibility for the NDS 2001-2010. The strategy attempted to identify the entire array of socio-economic factors that stymie the development of Guyana. It represented the sum of consultants' efforts firstly to collate and analyse critical statistics for each sector and secondly, to present detailed, objective, and overarching policy measures to achieve national economic development.

The NDS, 2001-2010 is organized into thematic areas; within the thematic area '*the productive sectors*', Chapter 30 deals with *Forest Management*.

Many of the ideas articulated in the NDS have been the basis for other developments such as the NLUP2013, the NEAP1994, and *recent* sectoral (forest) policies.²⁹

5.2.8 Environmental Protection Act, 1996

(Cap. 20:05), The Environmental Protection Act, 11 of 1996 revised by Act 17 of 2005 prescribes the basic institutional and regulatory framework within which all activities that impact on the natural, social, and cultural environments are assessed. The Environmental Protection Agency (EPA) is mandated under the Act to make assessments and to issue environmental permits prescribing conditions for developmental activity. The EPA has established guidelines for conducting and reviewing environmental impact assessments; the guidelines explain provisions of the Act in relation to the environmental impact assessment procedure and outline the level of detail required in the environmental baseline study, impact assessment and the environmental impact statement.³⁰

5.2.9 Green State Development Strategy (GSDS), Vision 2040

In April 2017, the Government of Guyana, with support from UNEP, launched the Green State Development Strategy (GSDS) to pilot the development of a *green* economy. Since then, the document evolved into the GSDS: Vision 2040, published in May 2019.

The GSDS Vision 2040 "provides a comprehensive development policy to guide public investment over the next 20 years. It captures a holistic view of the country's social, economic, and environmental well-being in line with the United Nations Sustainable Development Goals (SDGs). It aims to foster sustained economic growth that is low carbon and climate resilient (consistent with the LCDS) but also promotes social cohesion, good governance, and careful management of finite resources in accordance with green economy principles"

²⁸ <https://www.minfor.gov.gy/featured/address-by-president-ali-on-the-launch-of-the-national-consultation-on-lclds-2030/>

²⁹ <https://finance.gov.gy/wp-content/uploads/2017/06/nds.pdf>

³⁰ <https://parliament.gov.gy/publications/acts-of-parliament/environmental-protection-act-1996>

Section 2.3 Development Objective B addresses ‘*Sustainable Management of Natural Resources*’. There is the recognition that conflicts routinely arise from activities in the extractive sector. The document also indicates an ‘*immediate concern*’ about the loss of forests from mining activity, and looking ahead, the loss of forests from factors including ‘*expanding industry, commerce, infrastructure and settlements*’. There is the assertion that henceforth ‘*economic development must be considered alongside social development, and source conservation practices should be adopted at every scale wherever a planning-design- implementation cycle exists within the public, private and civil space*’.

Section 2.3.2 contains the goal that ‘by 2040, Guyana preserves its natural capital through institutionalized and prudent management of natural resources (land, forests, minerals and water) for the purposes of meeting the objectives and intent of Sustainable Development Goal #15 (land use and biodiversity)

RTI believes that its own passion for sustainable forest management aligned to prescriptions in a SFA-TSA agreement, especially in relation to the COP and GFFO, and GFC led approval of its FMPs and AOPs throughout its production cycle will ensure that RTI’s practices are fully aligned with the GSDS-Vision 2040.

Further, RTI recognizes that the climate change issue has become an important part of development planning given the recent commitment by GOG to review and renegotiate a new LCDS regime that will bring more funding and initiatives for Guyana. This will open up opportunities in emerging international markets for forest climate services. Importantly, however, the LCDS of itself will be expanded to include wider environmental services, water resources management, climate resilience, biodiversity, renewable energy and the marine economy.

Thus, given the commitment by GOG to revise and update the LCDS, RTI will ensure that vulnerable ecosystems within the allocated area that are important for the provision of ecosystem and environmental services are preserved through the development of suitable guidelines and by adhering to GC’s established guidelines for SFM.³¹

5.2.10 Environmental Protection Regulations

In 2000, under the EPA Act, regulations on Water Quality, Air Quality and Noise Management (among others) were established. These pollution management regulations were developed to prescribe standards for developmental projects during construction and operation.³²

5.2.10.1 Environmental Protection (Water Quality) Regulations (Reg.6/2000)

These regulations require, among other matters the registration and environmental authorization by any person whose construction, installation, operation, modification, or extension of any facility cause the discharge of effluents. Guidelines on the discharge of effluents and disposal of waste are detailed in these regulations. A Standard for water quality has been developed by the Guyana National Bureau of Standards²⁴. The provisions of these regulations have been considered during baseline studies conducted by RTI.

RTI will collaborate with the EPA to monitor water quality at the *permanent monitoring stations* it will

³¹

<https://observatoriop10.cepal.org/en/instruments/green-state-development-strategy-vision-2040#:~:text=The%20Green%20State%20Development%20Strategy,education%20and%20social%20protection%2C%20low%2D>

³² <https://doe.gov.gy/published/document/5ae18245e7817b35f82fe625>

operate throughout the life of the concession. Water samples will be tested by recognized laboratories as mandated in the regulations. RTI will establish a database containing the location of sample stations and the corresponding water quality results. Information from the database will be shared with the EPA, Hydro-meteorological Department and other GOG agencies involved in the management of fresh water resources in Guyana.³³

5.2.10.2 Environmental Protection (Air Quality) Regulations (Reg.9/2000).

The requirements for registration and environmental authorization by persons with facilities that emit air pollutants from any process into the atmosphere are outlined in these regulations. Elements related to parameter limits on air contaminants and emission samplings are also stated in the regulations. *The EPA and the GNBS are currently developing air quality standards.* RTI will use RIL practices which emphasize planned interventions in the forest environment and will use fully functional mechanical equipment to manage air quality in the forest environment.

Further RTI has noted the parameter limits as outlined in the regulations and will therefore develop a comprehensive database that will be populated with air quality measurements collected at various stages of its logging operations. This information will be shared with the EPA and will be made available to any other GOG agency for scrutiny. The data collected will be analysed to identify any inherent trends and patterns that may be of significance as required by the regulations.³⁴

5.2.10.3 Environmental Protection (Noise Management) Regulations (Reg. 8/2000).

The EPA is responsible for the establishment of standards for permissible noise levels in industry, construction, and other areas. The categories for which permissible noise levels are to be fixed by the EPA were identified as follows: Residential, Institutional, Educational, Industrial, Commercial, Construction, Transportation and Recreational.³⁵

The GNBS, in collaboration with the EPA, has published guidelines (see Table 10).

RTI will ensure that all its machines are maintained properly to keep noise levels within the manufacturers’ standards and the local standards. Normally, no work will take place after 18:00 hrs. However at least one generator will be used at night at the base camp on the concession.

RTI will develop a register and comprehensive database that will be populated with noise quality measurements collected at various stages of its logging operations. This information will be shared with the EPA and will be made available to stakeholders for scrutiny. The data will be analysed to ensure that noise emanating from various stages of the logging operation are within the required parameters prescribed by the regulations.

Table 10: GNBS' Guidelines for Noise Emission into the Environment (GNBS: GYS263:2010)

Categories	Daytime (06:00h-18:00h) Limits in dB (A)	Night-time (18:00h-06:00h) Limits in dB (A)
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³³ <https://www.ecolex.org/details/legislation/environmental-protection-water-quality-regulations-2000-lex-faoc121165/>

³⁴ <https://www.global-regulation.com/law/guyana/5959503/chapter-20%253a05---environmental-protection.html>

³⁵ <https://www.ecolex.org/details/legislation/environmental-protection-noise-management-regulations-2000-lex-faoc121169/>

Residential	75	60
Institutional	75	60
Educational	75	60
Industrial	100	80
Commercial	80	65
Construction	90	75
Transportation	100	80
Recreational	100	70

5.2.10.4 Environmental Protection (Authorization) Regulations (Reg. 10/2000, Reg. 14/2005)

These regulations cover the legal basis and modalities for the application and receipt of an Environmental Authorization, the management of the conditions under which the Authorization is granted, and the conditions under which the Authorization may be renewed.

This ESIA Report is a direct consequence of Section 3 ‘Environmental Impact Assessment’ of the Environmental Protection (Authorization) Regulations 2000, 2005.³⁶

5.2.10.5 Environmental Protection (Hazardous Waste Management) Regulations (Reg. 7/2000, Reg.13/2005)

These regulations cover the management of (hazardous) substances that may modify the environment in a negative way. RTI will take due care to avoid any form of potential contaminant within the forest environment. Specifically, only petroleum products (fuel, oil, grease) and OTC drugs for the combat of mosquitoes at the base camp and at forward camps are contemplated for use on the concession area.³⁷

5.4 Forestry Policy & Forestry Legislation

5.4.1 Forest Policy, and applicable standards and guidelines

5.3.1.1 The National Forest Policy Statement, 2018 (GFC 2018).

The **National Forest Policy Statement** (NFPS), 2018 is projected to cover the period 2018 to 2028. The Guyana Forestry Commission (GFC) is the lead agency for the implementation of the NFPS 2018. However, the actual implementation is carried in partnership with other stakeholders. The overall objective of the NFPS, 2018 is “to conserve, protect and utilise the State’s forest in a manner that ensures social, economic, and environmental attributes and benefits, are sustained, and enhanced for current and future generations”.

The NFPS, 2018 is the continuation of the various forest policies used by the then Forestry Department and subsequently the GFC since its inception). The policy includes forest resourced based considerations

³⁶ <https://www.global-regulation.com/law/guyana/5959503/chapter-20%253a05---environmental-protection.html>

³⁷ *ibid*

set out in the LCDS, GSDS: Vision 2040 and other policy documents. The NFPS was developed in 1997 and was later revised in 2011 in response to the development of the Low Carbon Development Strategy (LCDS). A further revision of the Policy was made in 2018 after the development of the Green State Development Strategy (GSDS) following a series of multi-stakeholder consultations country wide.³⁸

5.3.1.2 National Forest Plan, 2018 (GFC 2018).

The National Forest Plan (NFP), 2018 was developed with the intention of complementing the NFPS. The NFP comprises seventy (70) activities to operationalize and implement the overall objectives, goals, and strategies of the NFPS 2018. The NFP also outlines a performance-based framework for the goals, strategies, and activities by providing a timeframe and activity indicators for the successful accomplishment of expected outcomes. The implementation of the Plan will be facilitated by the GFC. RTI has committed to comply fully with the requirements outlined in the NFP.³⁹

5.3.1.3 Code of Practice for Forest Operations for State Forest Authorizations, 2018 (GFC, 2018)

The original Code of Practice for Timber Harvesting, 2nd Ed. 1996 was based on FAO's Model Code of Forest Harvesting Practice and provided applicable standards for local forest conditions. The COP was subsequently revised in 2001, 2013 and 2018.

The revised Code of Practice for Forest Operations for State Forest Authorisation (COP), 2018 is a gazetted document. This 2018 version of the COP is based on practical experience locally and abroad, multi-stakeholder consultations, and the need for its alignment with other forest management standards and practices, including measures developed and expanded under the LCDS, GSDS and FLEGT/VPA framework.

The Code provides mandatory standards, on forest harvesting and allied practices for all holders of Timber Sales Agreements, Wood Cutting License, State Forest Exploratory Permits, State Forest Permissions, and Community Forestry Management Agreements. In so doing the COP aims to ensure sustainable management of the forest; keep forest activities compatible with international directives; conserve biological diversity, help forest regeneration, and protect wildlife. The COP also aims to promote enhanced productivity, sustainability, and economic viability of forest harvesting; improve living conditions and safety of the workforce; and improve relations between logging companies and local communities.⁴⁰

In this regard, RTI fully embraces the COP and will ensure that all its operations are fully aligned with the COP. In addition, full and continuous compliance with the GFC legality requirements and other ancillary documents and guidelines at all stages of the logging operation will ensure that the requirements for SFM are met and maintained.

5.3.1.4 Guidelines for Forest Operations for State Forest Authorizations 2018 (GFC 2018)

The Guidelines for Forest Operations for State Forest Authorisations are associated with the Code of

³⁸ <https://www.forestry.gov.gy/wp-content/uploads/2018/06/Guyana-National-Forest-Policy-Statement-2018.pdf>

³⁹ *ibid*

⁴⁰ <https://www.forestry.gov.gy/wp-content/uploads/2018/07/CoP-for-Forest-Operations-2018.pdf>

Practice for Forest Operations (large concessions). The guideline requirements were developed based on the 2018 edition of the Code of Practice for Forest Operations (large concessions), which itself benefitted from research and practical experience, locally and abroad, over a period of 20 years. The guidelines developed were also informed by extensive multi-stakeholder consultations of the Code over the last four (4) years.

The document therefore provides guidance on the specific activities which the Forest Sector Operators of large concessions may undertake to comply with the principles and objectives of the COP for Forest Operations (large concessions). The guidelines are enforced by the GFC and thereby regulates any class or description of forest operations for holders of SFAs.⁴¹

Thus, RTI intends to share responsibility for the sustainable development of the forestry sector by ensuring that all its interventions in the forests are in line with the GFFO. Hence, full compliance with GFC's robust forest monitoring system and guidelines will ensure that SFM principles are maintained.

5.3.1.5 Forestry Management Plan Guidelines

The Forestry Management Plan Guidelines, first published in 1999, elaborates the basis for strategic and operational planning. Guidelines for annual plans of operational (AOP) have also been published. RTI has used the guidelines to develop an FMP and an AOP for the SFEP. These documents were subject to heavy scrutiny and interrogation by the GFC before approval.⁴²

5.3.1.6 Environmental Impact Assessment Guidelines: Volume 5 – Forestry, 2000

These guidelines produced by the EPA and the EAB and in consultation with the GFC, provide a framework for conducting and reviewing EIAs for forestry projects in Guyana. RTI endeavours to keep track of these requirements and all changes made from time to time. RTI had taken note of the revised ESIA Guidelines developed by the EPA and had committed to ensure full compliance therewith.⁴³ However, the company also notes that the Environmental Protection Agency (EPA) has withdrawn the recently revised Environmental Impact Assessment (EIA) guidelines to facilitate consultations with the general public. A public notice by the EPA informed that the revised EIA for Mining, Forestry, Hydropower, Thermal Power, Electricity Transmission, and Offshore Petroleum Exploration and Production has been withdrawn to facilitate broader consultations on those documents.⁴⁴ Nevertheless, RTI will ensure that all interventions within the forest concession will be done in a sustainable manner.

5.4.2 Forestry Legislation

5.3.2.1 Forests Act 2009

The Forests Act 2009 authorizes the GFC to, among other things:

- (a) Grant forest concession agreements to individuals and companies to harvest timber or

⁴¹ *ibid*

⁴² <https://www.forestry.gov.gy/wp-content/uploads/2018/03/Final-Guideline-For-Large-Concession.pdf>

⁴³ https://www.elaw.org/system/files/Volume3Mining_20EIA_20guidelines.2.pdf

⁴⁴ <https://www.stabroeknews.com/2021/06/26/news/guyana/epa-withdraws-revised-impact-assessment-guidelines/>

non- timber products or to undertake research or to carry out approved community-based activities or to generate approved forest services (including ecotourism) from defined tracts of State forests;

- (b) Regulate the conveyance of timber along public roads, and timber exports;
- (c) Regulate the rights and privileges of Amerindians in relation to State Forests

The Act also outlines the ownership of forest produce, offences and legal proceeding under the Act, and penalties that may arise as a result.

RTI has committed to contribute to all matters on forest policy and forest legislation as often as the opportunities to do so present themselves.

RTI has noted that the Act provides for the protection and conservation of forests, and include measures to conserve biological diversity, protect specific trees and plants, conserve soil and water resources, and protect forests against degradation, fires, pests, and diseases. The Act further states that the EPA may declare specially protected areas, prohibiting any disturbance of the soil, vegetation, rivers, or creeks in any specially protected area(s). The Act also provides for the prevention of fires, the protection of trees and plants, forest conservation on private lands and provides rules for forestry operations.

Therefore, RTI endeavours to develop and expand its geospatial database in order to ensure that the Company complies with the requirements of the Forests Act and Forest Regulations, respectively.⁴⁵

5.3.2.2 Forests Regulations 2018

The Forest Regulations No. 2 of 2018 made under the Forest Act was developed to guide the management of State Lands inclusive of the State forest, protected areas, and research areas. The regulations address the requirements and stipulations for a State Forest Authorisation inclusive of exploratory permits, forest concession agreements, use permits, community forest management agreements, transfers, and registrations.

The regulations also outline requirements for forest conservation, establishment of primary conversion plant, movement of forest products, the resale, export and import of forest products. Additionally, the regulations provide a framework for the fees, charges & levies imposed and any offences & penalties which occur.⁴⁶

RTI has noted that the key requirement of the Forest Regulations is to promote sustainable forestry through participation with local communities. The Regulations also provide forest conservation by formulating fire protection plans, the management of programs for protected species and the management plans for specifically protected areas with a particular focus on biodiversity.

Moreover, regarding forest management, communities are permitted to use forest resources to meet local needs in terms of income generation and economic development on a sustainable basis and with due consideration to the enhancement of environmental stability.

⁴⁵ <https://www.forestry.gov.gy/wp-content/uploads/2016/07/Forests-Act-2009.pdf>

⁴⁶ <https://www.forestry.gov.gy/wp-content/uploads/2018/07/Forests-Regulations-2018.pdf>

RTI will ensure full compliance with the forest regulations so that all activities are conducted in keeping with the legal requirements of the Country. Thus, full compliance with GFC's SFM guidelines will ensure de facto compliance with the Forest Regulations, 2018.

5.3.2.3 Guyana Forestry Commission Act, 2007

The Guyana Forestry Commission Act No. 20 of 2007 provides specifically for the establishment, organization, mandate and functions and responsibilities of the Guyana Forestry Commission. The object of the Commission is to encourage the development and growth of forestry in Guyana on a sustainable basis.

The primary functions of the Commission include:

- a) Develop, advise the Minister, and carry out Forestry Policy.
- b) Research, collate, analyse, and prepare and disseminate data, statistics, and other information about forests and all aspects of forestry and forestry related jobs; and
- c) To administer the Forests Act, 2009⁴⁷

5.5 Other Relevant/Applicable Laws

5.5.1 The Protected Areas Act of 2011

The Protected Areas Act of 2011 provides for (a) the protection and conservation of Guyana's natural heritage and natural capital, (b) the creation, management and financing of a national system of protected areas; (c) the maintenance of ecosystem services of national and global importance including climate regulation; (d) the establishment of a protected areas commission; (e) the establishment and management of a protected areas trust fund; (f) the fulfilment of Guyana's international environmental responsibilities; (g) participation in protected areas and conservation; and (h) related purposes.

The Act aims to provide for the conservation of biological diversity, natural landscapes, seascapes, and wetlands and to safeguard ecosystem services. RTI's conservation practices will have to be aligned with the objectives of this Act.⁴⁸

RTI will establish several biodiversity reserves throughout the concession in keeping with GFC's COP. This will ensure compliance with GFC SFM guidelines and systems.

RTI intends to manage the biodiversity reserves and other freshwater ecosystems and important watersheds in a prudent manner so that they may be added to the NPAS as a means of combatting climate change.

5.5.2 The Wildlife Conservation and Management Act 2016

This 'ACT' provides for the protection, conservation, management, sustainable use, and internal and external trade of Guyana's wildlife.⁴⁹

⁴⁷ <http://faolex.fao.org/docs/pdf/guy141375.pdf>

⁴⁸ <https://parliament.gov.gy/publications/acts-of-parliament/protected-areas-act-2011>

⁴⁹ <https://parliament.gov.gy/publications/acts-of-parliament/wildlife-conservation-and-management-act-2016>

RTI will do its utmost to conserve Guyana's wildlife; the company's employees and contractors will not be allowed to hunt or fish on the concession area. RTI intends to create a supportive mechanism cognisant of the national goals for wildlife protection whereby local indigenous villages may participate in the effective, protection, conservation, management and sustainable use of wildlife on their titled lands. Thus, any observed cases of illegal wildlife trade will be reported to the relevant authority in keeping within the ambits of the Wildlife Conservation and Management Act 2016. RTI will utilise UAV technology to monitor its forest concession and will document and report any suspicious activities to the relevant authorities.

5.5.3 National Insurance and Social Security Act 1969

The Act establishes the national insurance and social security system, which covers and protects workers. The individuals to be insured under this act by payment of contributions are sixteen (16) years to under sixty (60) years of age; both self-employed and gainfully employed. The national and social security system provides benefits for old age, invalidity, survivors' benefits, sickness, maternity, funeral, and industrial benefits.⁵⁰

RTI will ensure compliance with NIS to maintain workers contributions.

RTI will establish a register to ensure that records of contributions and annual compliance reports will be provided to employees on an annual basis. Such records will be available for scrutiny by the Ministry of Labour, the GFC and other stakeholders upon request and in a timely manner. Records of accidents or diseases in the course of legal employment will be kept.

5.5.4 Labour Act 1942

The Labour Act of Guyana provides for the establishment of the Department of Labour, for the regulation of the relationship between the employer and the employees. The Act stipulates and establishes procedures regulating wages paid; minimum rate wages payable; hours of work; the rights and obligation of the employees; and provides for settlement of differences between employees and employers.⁵¹

RTI is therefore committed to ensure that all workers are paid within the confines of the law.

RTI will collaborate with the Ministry of Labour (MoL) in data collection on labour and skill availability in order to recruit workers and persons who are seeking employment. RTI will also collaborate with the MoL to ensure that all matters concerning the welfare of workers are addressed according to the law.

5.5.5 Occupational Safety and Health Act 1997

This Act provides for the registration and regulation of industrial establishments/operations and ensures the occupational safety and health of workers. The Act requires the safety of machinery and plants; provision of enough sanitary facilities and access to potable drinking water; identification of hazardous chemicals and regulation of its use and storage.⁵²

RTI notes the requirements of an employee under the OSH Act requires employers and employees

⁵⁰ http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=&p_isn=17912

⁵¹ https://www.ilo.org/ifpdial/information-resources/national-labour-law-profiles/WCMS_158900/lang-en/index.htm#:~:text=In%201942%20the%20Labour%20Act,that%20impact%20on%20employment%20relationship.

⁵² http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=72147

to ensure a safe work environment and for the appointment of safety committees in workplaces. RTI will work closely with the GFC and MOL to ensure that workers' rights are protected through the establishment of OSHA committee. The company will collaborate with the Inspector of Labour and Medical Inspector in any OSHA matters through safety and health representatives and joint workplace and health committees with defined functions and powers.

The company also notes the requirements of the Trade Union Act, 1921 which sets out the basis for the establishment and registration of trade unions in Guyana. The company intends to honour the requirements as set out under the law for employees to freely join a trade union.

In relation to hazardous chemicals, physical and biological agents, the Act requires their identification hazardous nature with appropriate inventories, and regulates their use, storage, instruction and training. Notification of accidents and occupational diseases, in case of death by accident or occupational disease are further requirements of the Act. RTI is fully committed to comply with the law to protect and safeguard the welfare of employees.

5.5.6 Amerindian Act, Cap 29:01

The Amerindian Act provides for 'the good Government of the Amerindian Communities of Guyana. RTI is particularly concerned with Section 3 that includes provisions for 'Amerindian Villages' and how these are defined, Sections 18 and 23 which more or less set out the modalities for communicating with Amerindian Villages and Section 33 which deals with the employment of Amerindians.⁵³

RTI values the natural abilities and intellectual capital of Amerindians particularly in tree identification and 'bush craft' and will offer employment to any Amerindian who has attained the age of eighteen years and who has voluntarily expressed interest in working for the company and on the concession area.

RTI also notes the recent commitment by GOG to revise and update the Amerindian Act through consultation and has committed to utilize every opportunity to contribute to the revision of the Act⁵⁴.

5.5.7 Combating of Trafficking in Persons Act 2005

This Act is intended to 'provide comprehensive measures to combat trafficking in persons'. RTI will not engage in any unethical behaviour in the recruitment of employees. RTI will only employ persons who are not less than 18 years of age and who express an interest in working for RTI via a written application, accompanied by an acceptable form of identification. For foreigners, the applicant must present evidence of a work permit issued by Ministry of Home Affairs.⁵⁵

RTI will also ensure that its contractors have employees who are working voluntarily with them and who have proper enumeration packages and job descriptions. RTI will establish a database and register to gather data on any reported cases. Any such cases will be reported to the relevant authorities as mandated by the Act.

5.5.8 Employment of Young Persons and Children Act, Cap. 99:01

⁵³ https://parliament.gov.gy/documents/acts/4680-act_no_6_of_2006.pdf

⁵⁴ <https://guyanachronicle.com/2020/12/13/revision-of-amerindian-act-2006-is-of-highest-priority/>

⁵⁵ https://parliament.gov.gy/documents/acts/4653-act_no_2_of_2005.pdf

This Act relates to certain Conventions relating to the employment of young persons and children. RTI will employ persons who are not less than 18 years of age. RTI will insist that its contractors do not employ anyone whose age is less than 18 years. RTI will maintain a register of all employees and this register will be available for stakeholders' scrutiny as prescribed by the Act. RTI will at all times comply with the requirements of the Act and take any necessary steps to avoid human rights and environmental violations in the course of conducting its business.⁵⁶

5.5.9 Prevention of Discrimination Act, Cap 99:09

This Act provides for the elimination of discrimination in employment, training, recruitment and membership of professional bodies and the promotion or equal remuneration to men and women in employment who perform work of equal value, and for matters connected therewith.⁵⁷

RTI has committed to be an equal opportunity employer. Thus, RTI will employ women at its Base Camp as soon as adequate facilities are available for them. Given the hazardous nature of logging, RTI will not employ more than 20% of its field operatives as women. From January 2022, more women will be employed mostly for record keeping, timber grading and forest monitoring tasks.

The Company will adhere to the provisions of the Act and instruments which provide for the promotion of equal remuneration for work of equal value and prohibits discrimination in employment, and protection against discrimination in other areas.

5.6 Regulatory Agencies/Departments

5.6.1 Office of the President

5.5.1.1 Office of Climate Change (OCC)

The Office of Climate Change has direct responsibility for managing consultations and other liaison responsibilities for the LCDS. The OCC manages GOG's engagements with the Forest Carbon Partnership Facility (FCPF), the Forestry Investment Programme, and UN-REDD.⁵⁸

RTI's forest monitoring officer will scan the OCC's website regularly.

The Office of Climate Change and the Department of Environment has been merged to form a Department of Environment and Climate Change.

5.5.1.2 Environmental Protection Agency (EPA)

The Environmental Protection Act provides for the establishment of the (Guyana) Environmental Protection Agency (EPA) as the principal authority for environmental management in Guyana. In Sec. 4 (1) (a), the EPA is given the mandate to "take such steps as are necessary for the effective management of the natural environment so as to ensure conservation, protection and sustainable use of its natural resources" In addition the Agency is given the overall responsibility to "coordinate the environmental activities of all persons, organizations and agencies" [Sec. 4(1) (c)]; and is mandated "to play a coordinating role in the preparation and implementation of cross sectoral programmes of environmental contents" [Sec. 4(1) (1)]. The mandate to serve as the highest authority for granting

⁵⁶ [https://parliament.gov.gy/documents/acts/6464-act_no.9_of_1999_employment_of_young_persons_and_children_\(amendment\)_act_1999.pdf](https://parliament.gov.gy/documents/acts/6464-act_no.9_of_1999_employment_of_young_persons_and_children_(amendment)_act_1999.pdf)

⁵⁷ https://parliament.gov.gy/documents/bills/4731-bill_9_of_2003.pdf

⁵⁸ <https://climatechange.gov.gy/en/index.php/about>

Environmental Authorizations, where they are required, is supported by Sec. 5 which states that “any person or authority under any other written law, vested with power in relation to the environment shall defer to the authority of the Agency....”⁵⁹

The EPA has been aggressive in fostering awareness on environmental management (EPA, 2017). Apart from environmental clubs countrywide, the agency produces a weekly article published in the national newspaper highlighting critical aspects of environmental management. In addition, it publishes a biannual magazine and a monthly news bulletin.

The EPA has recently been working with holders of SFAs-small concessions to alert them about the requirement of environmental authorizations for timber harvesting practices and the process towards achieving such authorizations.⁶⁰

Of course, the EPA does extension works outside the natural resources sector. The EPA’s Monthly bulletin for June-July 2019 proudly proclaimed that the agency had trained 33 additional police officers in noise management.

5.5.1.3 The Protected Areas Commission

This Commission enforces the Protected Areas Act, 2011.⁶¹

5.5.1.4 The Guyana Wildlife Conservation and Management Commission

This Agency inter alia is the designated CITES management authority for Guyana. RTI looks forward to liaising with the Commission in any of its work on the concession area.⁶²

5.5.1.5 Guyana Lands and Surveys Commission (GL&SC)

The core function of the Guyana Lands and Surveys Commission is to survey and map the land and water resources of Guyana, to be custodians of all public lands, to administer these effectively in the national interest, and to provide land-based information to a broad range of public and private sector entities and interests.⁶³

The GFC consults with the Guyana Lands and Surveys Commission before issuing forest concession agreements. GL&SC is the authority for the determination of boundaries of Amerindian Villages. RTI looks forward to working with GL&SC and MOAA on Amerindian land issues and will explore opportunities for collaboration with GFC’s community MRV program.

5.6.2 Ministry of Natural Resources (MNR)

5.5.2.1 Overview

The Ministry manages the overarching initiatives to coordinate policy development for the following agencies in the natural resources sector: the GFC, the GGMC and the GGB. The MNR is expected to oversee the multiple use approach to natural resources generally and the resolution of emerging conflicts. The MNR also helps determine priorities for hinterland road construction and toll structures; for example, the MNR, is responsible for the toll on the Buckhall Road.⁶⁴ The

⁵⁹ <https://www.epaguyana.org/epa/>

⁶⁰ <https://www.epaguyana.org/epa/news/151-epa-completes-final-three-workshops-under-the-eu-flegt-programme>

⁶¹ <https://www.facebook.com/pages/category/Government-Organization/Protected-Areas-Commission-314675811967929/>

⁶² <https://wildlife.gov.gy/about-the-wildlife-division/>

⁶³ <https://glsc.gov.gy/>

⁶⁴ <https://nre.gov.gy/>

Government of Guyana, through the Ministry of Natural Resources recently issued a call for submission of interest (EOI) for the construction of a bridge for the Puruni river crossing. The Puruni River is a tributary of the Mazaruni River, and is located in Administrative Region 7 (Cuyuni-Mazaruni) of Guyana. The river flows through an area of rich mineral resources and dense forested vegetation. Mining and forestry activities are concentrated along the Puruni River and the Kartabu-Puruni Road, and as such, the river and road serve as a means of access to the resources within the area.⁶⁵

RTI will provide MNR (via GFC) with biannual maps of its primary and access road network. The company will also share spatial data and information from its GIS/RS database with MNR and other stakeholders.

5.5.2.2 Guyana Forestry Commission (GFC)

Of the 214,970 km² of which nearly seventy-five percent is covered with natural vegetation, approximately four fifths are classified as State Forests under the jurisdiction of the GFC. The GFC is responsible for advising the subject Minister on issues relating to forest policy, forestry laws and regulations and forestry practices. The Commission is also responsible for the administration and management of all State forests. The work of the Commission is guided by a National Forest Plan that has been developed to implement the National Forest Policy. The Commission develops and monitors standards for forest sector operations, develops and implements forest protection and conservation strategies, oversees forest research, and provides support and guidance for forest education and training. The functions and responsibilities of the GFC are assigned under the Guyana Forestry Commission Act. The GFC is the institution responsible for prescribing conditions for the use of forest resources and implementing forest monitoring programmes.⁶⁶

The GFC works with FAO (Caribbean), UNDP, ITTO and ACTO to develop the local forestry sector, including the provision of technical assistance to loggers' associations and community-based organizations.

The GFC has been partnering with the EPA to create awareness within the forestry sector on the need for environmental management generally, the need for an Environmental Authorisation for timber harvesting practices and the process for achieving an Environmental Permit. The GFC has been partnering with its Associate Body-the FPDMC –to create awareness of the FLEGT-VPA and its implications for the sector. Finally, the GFC has been partnering with another Associate Body to provide training in RIL and other ancillary forestry practices.⁶⁷

RTI keeps track of all developments at the GFC to inform its own operations.

5.5.2.3 Guyana Geology & Mines Commission

The Guyana Geology and Mines Commission (GGMC) was created in 1979 from the Department of Geological Surveys and Mines which itself was the successor to the Geological Survey of British Guiana Department.⁶⁸ The objectives of the GGMC, include:

⁶⁵ <https://nre.gov.gy/2021/10/12/request-for-expression-of-interest-construction-of-bridge-for-the-puruni-river-crossing/>

⁶⁶ <https://forestry.gov.gy/>

⁶⁷ *ibid*

⁶⁸ <https://www.ggmc.gov.gy/>

“Reduce the occurrences of identified pollution violation levels associated with mines and production processing facilities from year end 2014 levels by identifying and correcting existing environmental threats and by working with and using the financial and other resources of the property owners, the government and GGMC.

The functions of the Commission include:

- a) Promotion of mineral development;
- b) Mineral exploration; research in exploration, mining, and utilization of minerals and mineral products; and
- c) Enforcement of the conditions of Mining Licenses, Mining Permits, Mining Concessions, Prospecting Licenses (for Large Scale Operations), Prospecting Permits (for Medium and Small-Scale operations) and Quarry Licenses;

GGMC, in association with the GMSTCI and partners (WWF and CI,) are engaged in several initiatives to manage mining practices. The mining community is well established within the same area in which RTI intends to conduct its logging operations. To the maximum extent possible, RTI will support ‘greener mining’²⁶ piloted by the GGMC and the GMSTCI.

RTI will work closely with MNR, GGMC and GFC in developing a mining and logging plan for the forest concession area. The Company will plan its logging operation within blocks that are targeted for mining to extract all commercial species from those blocks before the commencement of mining. The Company recognizes that ad hoc arrangements may result in conflicts and as such will work closely with MNR, GGMC and GFC to identify suitable alternatives to avoid the destruction of prime commercial species found within pre-harvest blocks in the concession area.

5.6.3 Other Relevant Agencies

5.5.3.1 Ministry of Labour

The Ministry regulates the relationship between the employers and employees. Specifically, the Ministry deals inter alia with wage agreements, industrial relations, industrial training and occupational health and safety.⁶⁹

RTI’s field operations depend on the quality of its field staff, especially in sharing responsibility for environmental management even as the company pursues sustainable production levels. RTI will therefore build up and maintain adequate corporate discipline to promote the overall welfare of its employees.

5.5.3.2 National Insurance Scheme (NIS)

NIS is a social security organization which maintains a system of social security by securing contributions from both employees and employers to generate benefits during sickness/ accidents. NIS also provides other benefits such as old age, invalidity, industrial etc.⁷⁰

RTI will ensure that its obligations in respect of NIS matters are addressed in a timely manner.

⁶⁹ <https://parliament.gov.gy/about-parliament/parliamentarian/joseph-hamilton>

⁷⁰ <https://www.nis.org.gy/>

5.7 Treaties & Conventions

Guyana has signed on to several international and regional treaties and conventions (see Table 11) to ensure that forest-based developments in Guyana are consistent with global and regional approaches to such development.⁷¹

5.8 Environmental NGOs & International Agencies

WWF-Guyana and Conservation International (Guyana) Inc. are two very proactive environmental NGOs⁷² in the natural resources sector. For example, since 2013, a grant agreement was signed between WWF and GGMC which provides financial and technical support for national capacity building through education and awareness activities, baseline studies and training of stakeholders within the gold mining sector. Also, CI in partnership with the GGDMA and GGMC, is implementing a programme to advance green development of the mining sector by enhancing efficiency, reducing pressure on the environment, and improving livelihoods. There is evidence that GGMC staffs have been sharing pamphlets at camps within the concession area with a view to promoting responsible behaviour during mining operations.⁷³

RTI will be sharing an extensive forest area with miners in the long term and therefore will endeavour to develop partnerships with the miners and so that everyone shares responsibility for proper environmental management.

Table 11: List of multilateral environmental conventions and agreements to which Guyana is a party.

No.	Conventions	Ratification/Accession
II. Biodiversity		
1	+United Nations Convention on Biological Diversity +Cartagena Protocol on Biosafety +Nagoya protocol on Access to genetic Resources and the fair and equitable sharing of benefits arising from their utilization.	+Signatory in 1992, ratified in 1994. +Acceded to in 2008. +Acceded to in 2014
2	+Convention on International Trade in endangered species of wild fauna and flora (1973)	+Ratified in 1977
3	+Cartagena Convention on the Protection and development of the Marine environment of the wider Caribbean region (1983). +Specially protected Areas and Wildlife (SPAW) Protocol (1990)	+Ratified in 2010. +Ratified in 2010
4	+International plant protection convention (1952)	+Acceded to 1970
5	+Convention on the Protection of the World Cultural and the Natural.	+Acceded to in 1977
6	+Ramsar Convention on Wetlands (1971)	+Party
7	+Convention on the Protection of the World Cultural and Natural Heritage (1972)	+Signatory 1977
8	+International Tropical Timber Agreement 1994, 2006	+Signatory 2006
III. Environmental conventions to which Guyana is a party		
9	+United Nations Framework Convention on Climate Change +Montreal Protocol +Kyoto Protocol +Paris Agreement	+Signatory in 1992, ratified in 1994. +Acceded to in 1993. +Acceded to in 2003. +Acceded to in 2016

⁷¹ <https://observatoriop10.cepal.org/en/countries/39/treaties>

⁷² <https://www.nre.gov.gy/environmental-management-in-the-mining-sector-wwf>

⁷³ <http://dpi.gov.gy/small-and-artisanal-miners-are-learning-how-to-mine-greener/>

10	+Vienna Convention on the protection of the Ozone Layer	+ Acceded to in 1993
11	+United Nations Convention to Combat Desertification	+Signatory in 1996, ratified in 1997
12	+International Convention for the Prevention of pollution (MARPOL 73/78)	+Acceded to 1997
13	+Basel Convention on the Control of Trans-boundary Movement of Hazardous Waste and their Disposal	+Acceded to in 2001
14	+Stockholm Convention on Persistent Organic Pollutants	+Acceded to in 2007
15	+Rotterdam Convention on Prior Informed Consent for Certain Chemicals and pesticides in International Trade	+Acceded to in 2007
	+International Plant protection Convention (IPPC), 1951	+Adherence 1970
16	+Minamata Convention on Mercury	+Signatory in 2013
17	International Treaty on Plant Genetic Resources for Food and Agriculture (2001)	+ 2015
IV. Other relevant items		
18	+Caribbean Planning for the Adaptation to Climate Change CPACC (and its sequel Mainstreaming Adaptation for Climate Change in the Caribbean (ACCC)	+Signatory 1997
19	+Caribbean Regional Environmental Programme (CREP)	+Signatory 2001
20	+Caribbean Environmental Programme and its Specially Protected Areas and Wildlife (SPA W Protocol)	+Signatory 1990
21	+Treaty for Amazonian Cooperation	+Signatory 1978
22	+Guiana Shield Initiative (and Guiana Shield Facility)	+Signatory 1993

6.1 DESCRIPTION OF PROPOSED LOGGING PROJECT

6.2 Overview

This section will address matters relating to RTI' proposed logging project and the overall operational framework driving the enterprise's options.

As such, section 6.2 describes the national context for forestry projects, section 6.3 describes the structure of RTI' proposed operations, and Section 6.4 and 6.5 set out RTI' corporate management objectives and philosophies. Section 6.6 describes the overarching preparatory activities undertaken by RTI and Section 6.7 provides the forest management parameters driving RTI' production options. Section 6.8 sets out the requisite planning activities and Section 6.9 provides details of RTI operational practices.

6.3 Context for forestry projects

It is a legal requirement that all holders of large forest concessions are required to produce forest management plans for a 3-5 year period, as well as an annual operation plan for the year at hand. The GFC has developed detailed guidelines for the preparation of these important documents.⁷⁴

Thus, RTI' primary objective is the sustainable extraction of merchantable logs from the concession area. Such logs will then be used to produce high grade, value added products for sale locally and for international export.

It is the general norm that logging operations are conducted in three phases, as follows:

⁷⁴ <https://www.forestry.gov.gy/wp-content/uploads/2018/03/Final-Guideline-For-Large-Concession.pdf>

- a. **Preparatory works** - these are related to overarching events and activities such as management of concession boundaries, organization of the concession area into management units, i.e. compartments and 100ha blocks, the acquisition of the required permits or licenses or instruments applicable to logging and sawmilling, staff recruitment and training, the establishment of a field base, forest monitoring programmes, and stakeholder liaison events.
- b. **Planning works** - these are activities that are normally confined to a period of time and a unit area, either a compartment or set of 100ha blocks in keeping with the annual allowable cut (AAC), as outlined in the annual operation plan. Planning works over a five year period are normally set out in a FMP, while planning events over a calendar year is set out in an AOP. Planning works are repeated cyclically and sequentially as the logging occurs in one block then moves on to another block. GFC's requirements for all planning to be documented and approved ensures that loggers comply with GFC's robust systems and guidelines for sustainable forest management and environmental protection.
- c. **Operations** - these are the actual interventions in the forests (road, skid trail and log market construction, directional felling activities) that occur on a block by block basis, based on pre planning works already completed, and set out in an annual plan of operations, and duly approved by the GFC. Operations are repeated cyclically and sequentially as logging moves from one unit area (block) to a next in keeping with sustainable forest management principles. The operator is required by law to comply with GFC's procedures and guidelines for the entry, re-entry and closure of blocks approved for harvesting.

It is settled knowledge then that normally logging operations only occur at one geographic area on the concession area at any one time. GFC prescribes the maximum area harvested annually and the GFC and the concessionaire routinely agree on the geographic location. Concessionaires choose geographic areas in line with ground conditions, merchantable tree stocking and their marketing goals.

The GFC and local and international stakeholders support third party certification of local forest enterprises, their forest management systems and ancillary corporate social practices. The GOG is engaged with the EU to develop a FLEGT based VPA that would eventually facilitate the acceptance of local timber within the EU markets.⁷⁵

The Guyana Forestry Commission (GFC) has also recently engaged a diverse group of stakeholders on the proposed establishment of a national forest management standard and certification system for approval by the Programme for Endorsement of Forest Certification, also known as (PEFC). On the global market, the PEFC is a recognised forest management and chain of custody certification system that can be used to demonstrate sustainability in addition to the legality of timber and timber products.⁷⁶

6.4 Over view-Structure of RTI' Logging project

In pursuit of its business objectives, RTI will harvest a wide range of species using the

⁷⁵ <https://www.euflegt.efi.int/background-guyana>

⁷⁶ <https://forestry.gov.gy/how-will-the-certification-system-work/>

principles of reduced impact logging (RIL) and rules and prescriptions of the COP. The concession area is organized into compartments (see Table 12). In addition, the area is organized into 1000mx1000m blocks, each block having a unique alpha-numerical code. RTI will adopt a systematic system of forest development in line with the AAC, FMP and AOP agreed with the GFC.

Table 12: Division of concession area by Compartment

No.	Designation	Code	Area (ha)	Remarks
1	<i>East Puruni</i>	PUCO	22,188	Flat/High Hills
2	<i>West Puruni</i>	WECO	17,556	Hilly/High Hills
3	<i>Kamiguin</i>	KACO	23,963	Flat/Hilly
4	<i>Pashanamu</i>	PACO	39,162	Flat/Hilly
-	Bio-Reserves	BIO-RES	4,465	Flat/Hilly
Total			107,334	

RTI's projections are that each year, based on parameters for a sustainable harvest, it will harvest 22,249.46 m³ per year from 11 blocks. RTI also expects to salvage timber from trees discarded from mining operations. The logs produced within the concession will be converted onsite (within the concession area) to lumber. The lumber will then be brought to coastal locations for sale to local merchants or for export in value-added form to merchants overseas.

6.5 RTI' vision, mission, and values

6.4.1 RTI' Vision

RTI' vision is to develop and grow Royal Timbers Inc. into a company that can consistently achieve and sustain its objectives that is to produce world class products and contribute to Guyana's development.

RTI's vision and strategic goals position the company to aggressively pursue sustainable forestry and associated infrastructural development in Guyana, while contributing to the overall improvement in Guyana's social, economic and environmental development.

6.4.2 RTI' Mission

RTI primary mission statement is to promote and consistently follow the highest standard and ethical values in sustainable forestry management, add value to harvested logs, to promote and develop our employees' skills and their wellbeing, to contribute to the development of the forestry sector and to leave a negative carbon foot print.

6.4.3 RTI Values

RTI has adopted the following values:

- a) Upholding national and international standards in the forest operation
- b) Human resources development-trained employees are critical to successful forest enterprises.
- c) Technology: RTI will invest in and exploit technology in every applicable area of its operations
- d) Forest conservation and conservation of items with archaeological and/or indigenous significance
- e) Corporate discipline that ensures full compliance with statutory requirements
- f) Corporate social responsibility
- g) Innovative and competitive advantage

6.6 Forest Management Objectives

6.5.1 Core forest management objectives

Royal Timbers Inc. focuses on basic materials for the construction and infrastructure sectors. Specifically, the company seeks to be a supplier of primary and secondary timber products to satisfy local and foreign customers (logs, piles, poles and lumber products) and, at the same time, is committed to creating and maintaining a harvesting system that corresponds to the modern way in which sustainable timber is harvested. In this context, the following objectives / commercial interest have been developed:

- a) To maintain a good production of quality logs that ensures customer satisfaction and generates a healthy profit margin.
- b) To provide a wide range of primary and secondary timber products to local, regional and international customers, efforts are being made to reliably serve such markets by delivering quality products within scheduled timeframes.
- c) To function in cooperation with all regulatory bodies to ensure that sound management protocols and procedures are implemented and followed at all times.
- d) To obtain maximum production by using a proactive management approach to reduce factors in harvesting operation that may contribute to poor or timely performance.
- e) To create jobs with a reasonable salary scale in an ergonomically friendly environment that adequately reflects each employee's commitments and obligations, ensuring that all workers and their family needs are met.
- f) To protect all employees ' social well-being by creating a safe, healthy work environment. Hence, all health and safety regulations will be strictly enforced and implemented.
- g) To encourage a knowledge-sharing work environment that enables employees to develop their skills and pursue advancement through personal development as a result of a well-developed promotion system.
- h) To build and maintain a company that contributes to Guyana's GDP through consistent exports of forest products.

6.5.2 Silvicultural and other forest conservation considerations

6.5.2.1 Passive ecological restoration of the forest environment

RTI will practice passive ecological restoration of the forest environment in keeping with international best practice guidelines. RTI will use RIL principles and practices that have been introduced into tropical forests explicitly for the purpose of reducing the environmental and social impacts associated with industrial timber harvesting.⁷⁷

In the course of its timber harvesting operations, RTI will carry out simple restoration wherever feasible: for example, practices that eliminate water ponding or practices that free up natural drainage channels blocked by sediments due to accelerated erosion. RTI will attempt to log every block in a single logging operation so that when the block is closed, no more interventions will occur there in the short term and the block will remain closed.

RTI will pay attention to prescriptions of the GFC Code of Practice, especially in relation to Chapter 5-Construction of road networks, Chapter 6-Logging operations, Chapter 8-Operational Hygiene, and Chapter 9-Camp Hygiene (GFC, 2018 (a)).⁷⁸

6.5.2.2 Conservation of fauna

RTI will respect the relevant legislation and guidelines for the protection of Guyana's fauna. As such, RTI will discourage hunting and fishing, fires and pollution hazards and any other measure necessary to avoid mortality of fauna that facilitate plant pollination and seed dispersal. Interconnections between plants and animals in the ecosystem are essential for its functioning⁷⁹, and timber management of tropical forests has both direct and indirect effects on wildlife populations and their habitats.⁸⁰

6.5.2.3 Forest Research

RTI is prepared to collaborate with local stakeholders such as the GFC, UG, EPA and any other stakeholder to foster forest management and conservation activities engaged in

- a) Ecological or botanical studies approved by the GFC and EPA within the forest concession area.
- b) Use of emerging technology such as UAV for forest inventory planning and harvesting
- c) Development of mobile and cloud-based applications to capture pre and post-harvest activities for forest planning purposes
- d) Research activities or projects targeting the rehabilitation of mined out areas or degraded areas generally.
- e) Integrating GIS and Remote Sensing technologies for forest planning
- f) New growth and yield studies for local species

6.5.2.4 Permanent Sample Plots

Collection of data is important in planning. Given the scarcity of botanical data for this region, RTI will set up permanent sample plots within the biodiversity reserve within the concession, by 2023. RTI will also collaborate with GFC to set up MRV sample plots within the forest concession to collect and report on Forest Carbon Stock/Forest Area Change Assessment thereby contributing to the MRVS.

⁷⁷ Dykstra, D.P.2001. The old and the new of reduced impact logging. *Tropical Forest Update* 11(2): 3–4.

⁷⁸ <https://www.forestry.gov.gy/wp-content/uploads/2015/09/CoP-Timber-Sales-Agreement-and-Wood-cutting-License-Holders-3rd-v2-May-2013.pdf>

⁷⁹ Whitmore, T.C., 1998. *An Introduction to Tropical Rain Forests*. Science Publications, Oxford

⁸⁰ Fimbel, R.A., Grajal, A., Robinson, J.G. (Eds.), 2001. *The Cutting Edge*. Columbia University Press, New York.

6.7 Overarching preparatory activities

6.6.1 Forest organization

6.6.1.1 Overview

Puruni Wood Products Inc. (PWPI) held the same concession area under SFEP 05/2004 between 2004 and 2007. PWPI conducted logging operations at the site for a brief period and then terminated its logging operations. Thus, RTI's initial actions on the ground has been reconnaissance work in Compartment 1 to establish prevailing land use. For the systematic management of the concession, RTI has organized the concession into compartments and blocks, respectively, building on the prior work done by PWPI.

6.6.1.2 Compartments

RTI has organized the concession area into seven compartments and a biodiversity reserve (see Figure 14, Table 13).

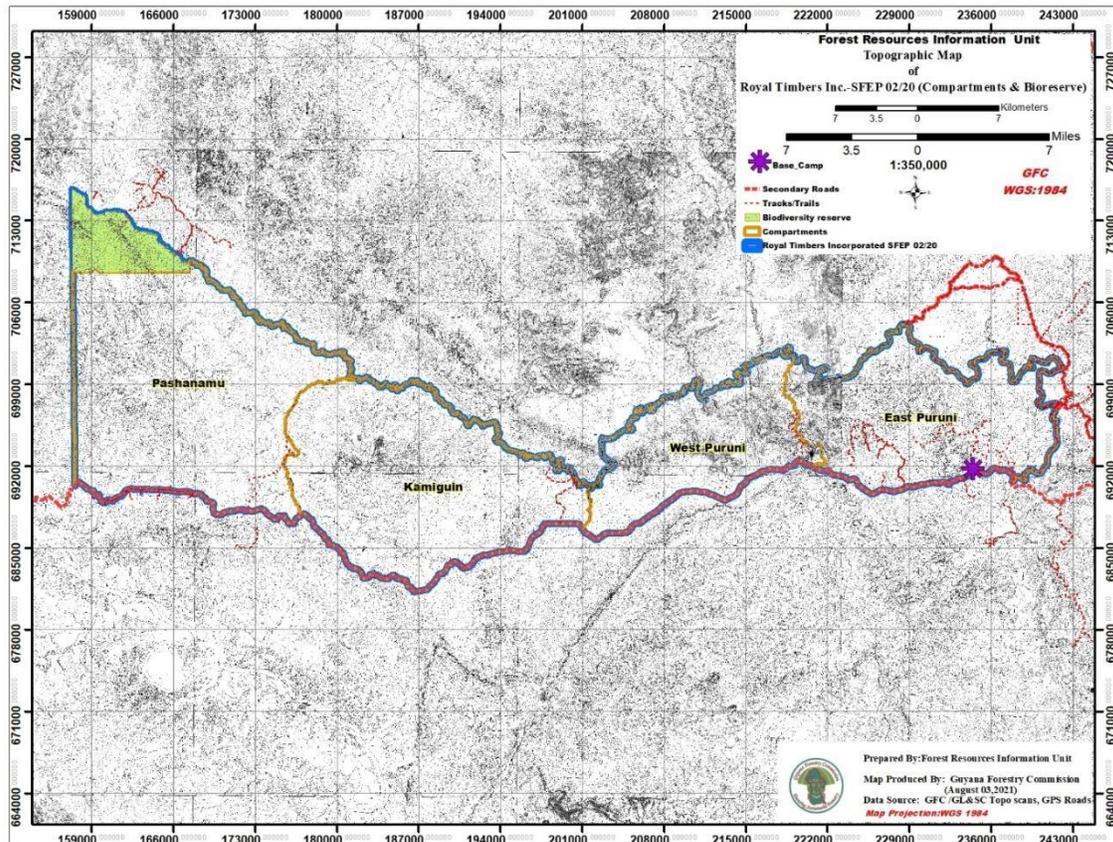


Figure 14: Map showing organization of the concession area into compartments, biodiversity reserve.

Compartments are delimited by rivers or creeks for easy identification and demarcation. Although the size of the compartment varies, it is helpful to schedule the management process over the medium term. Where operationally successful, two or more compartments can be harvested at the same time. Signs indicating the respective compartment names will be put up along the compartment boundary, with the signpost for the adjacent compartment posted on the opposite side of the boundary.

6.6.1.3 Description of Compartments boundaries

East Puruni Compartment - East Puruni is bounded to the south by Kartabu – Puruni Road, to the north and east by the Puruni River, while to the west by an unknown tributary as shown on the map (see Figure 14 above)

West Puruni Compartment - The western Puruni compartment is bounded on the eastern side by an unknown tributary (creek). On the western side of the Kamiguin River, on the northern and southern sides of the Kartabu – Puruni Route. (see Figure 14 above)

Kamiguin Compartment - The Kamiguin Compartment is bounded on the Eastern side by the Kamiguin River, on the Western side by the Pashanamu River a tributary on the Puruni River, on the Northern side by the Puruni River and the Southside by the Kartabu – Puruni Road. (see Figure 14 above)

Pashanamu Compartment - The Pashanamu Compartment is bounded on the Northern side by the Puruni River, on the Southern side by the Kartabu – Puruni Road, on the Eastern side by the Pashanamu River and the Western side via a cut line and the common boundary with Garner Forest Industries Inc. (see Figure 14 above).

Table 13: List of compartments and the biodiversity reserve.

No.	Designation	Code	Area (ha)	Remarks
1	<i>East Puruni</i>	PUCO	22,188	Flat/High Hills
2	<i>West Puruni</i>	WECO	17,556	Hilly/High Hills
3	<i>Kamiguin</i>	KACO	23,963	Flat/Hilly
4	<i>Pashanamu</i>	PACO	39,162	Flat/Hilly
-	Bio-Reserves	BIO-RES	4,465	Flat/Hilly
Total			107,334	

6.6.1.1 Pre-harvest Blocks

The concession area is further divided into blocks 1000m x 1000m (100ha) blocks (see Figure 15) that serve to:

- a) Provide the basic unit for 100% inventory (see GFFO, Section 4.3 Pre-harvest Inventory), the selection of harvesting stock, yield control, and the application of;
- b) Provide the basic unit for skid trail planning and tree marking;
- c) Provide the basic unit for implementing prescriptions of the COP for example Sections 6.5.1 (Ground conditions) and 6.5.2 (soil conditions).

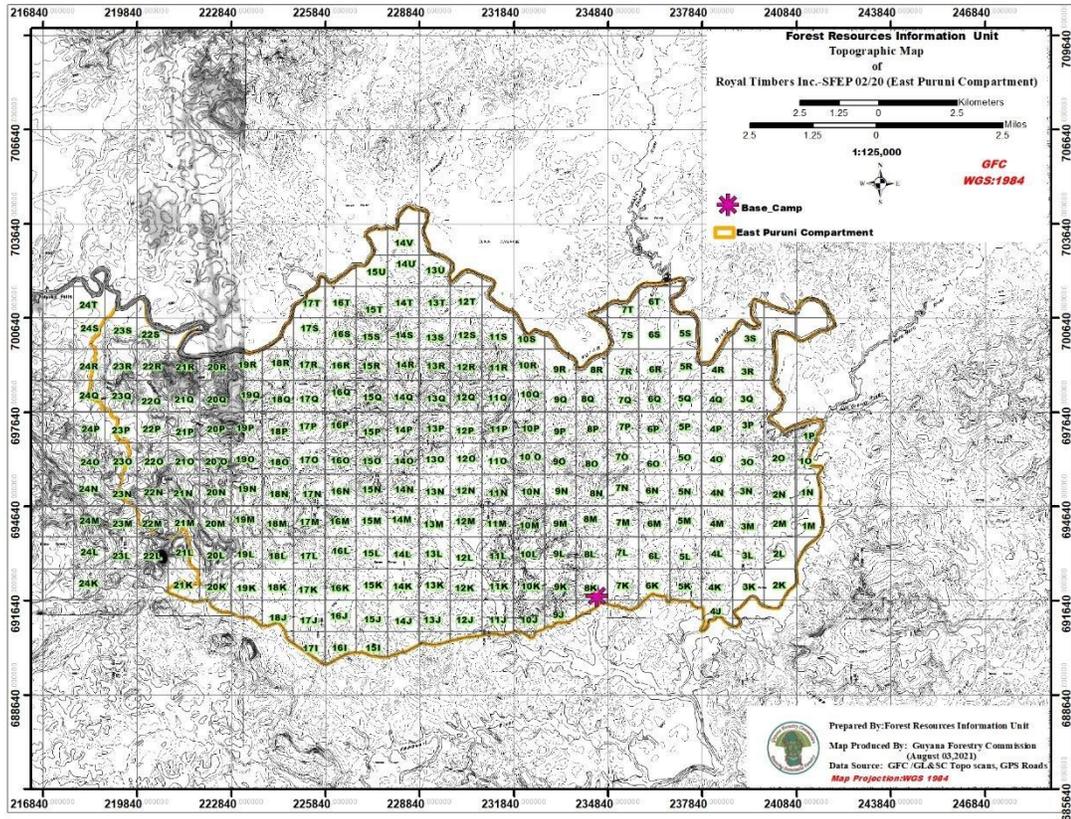


Figure 15: Map of Compartment 1, SFEP 2/2020 showing layout of blocks.

6.6.1.4 Other activities

a) Base Camp

RTI has established its primary base camp within Block 8K, Compartment 1. The UTM Coordinates for the Camp are 21N 0237840, 0691640. (See figure 16 below). The completed base camp is expected to have facilities for up to 50 persons, including women.

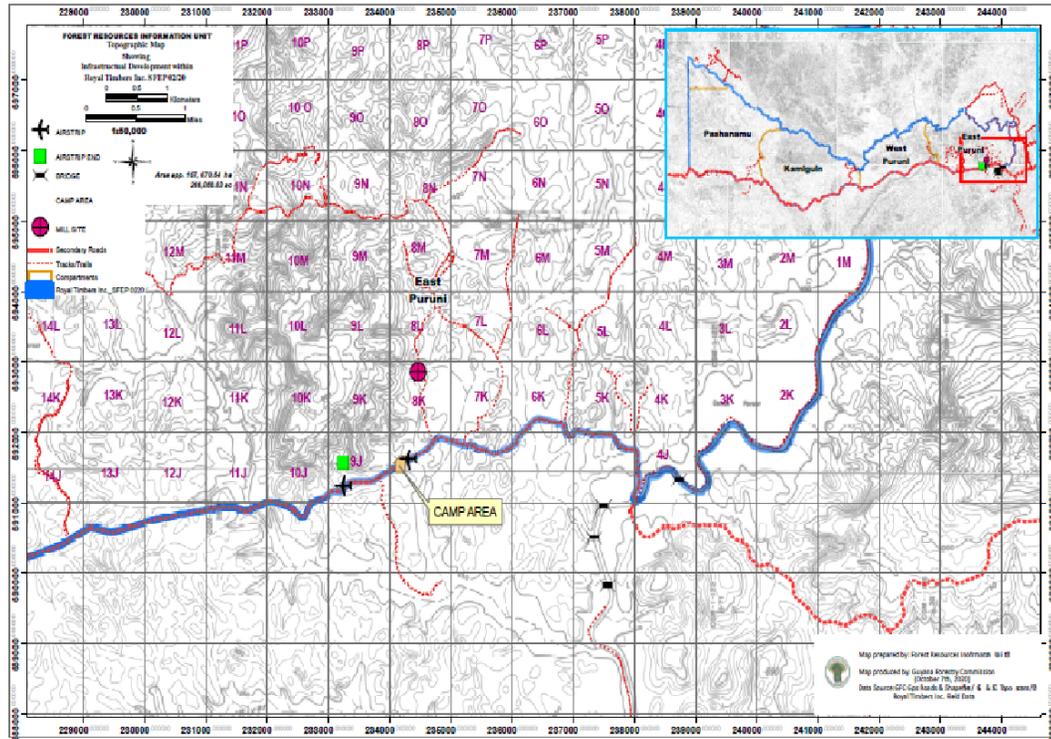


Figure 16: Map of SFEP 2/2020 showing location for its main base camp and airstrip respectively

b) Primary Road Network.

RTI will use topographic maps and prescriptions of the COP to determine the most cost-effective routes for its primary and secondary road network. Advantage will be taken of existing roads where feasible. The pre - plan road network (main, secondary, feeder and skid trail) will be used (natural contours) at all times in order to protect the natural environment. RTI will avoid bridges, culverts wherever possible to reduce interference with stream banks, stream flow and water quality. (See Figure 17 below)

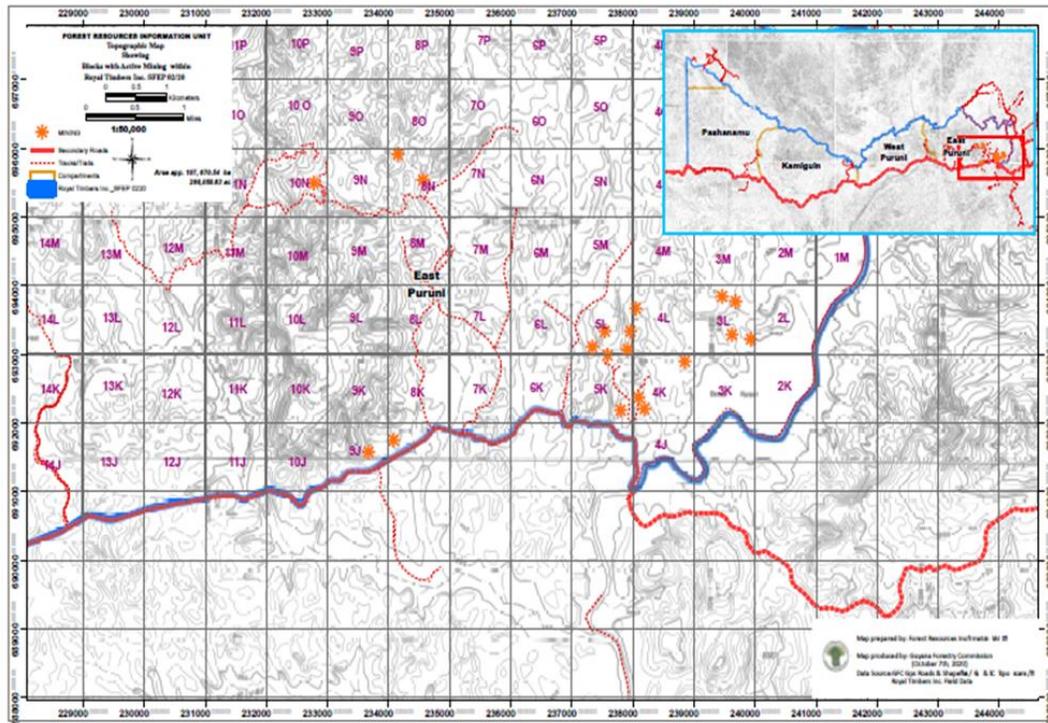


Figure 17: Drainage and current Road Network in East Puruni Compartment, Royal Timbers Incorporated (RTI) Concession

c) Forward Camps

No decision has been taken yet on the location of forward camps. For period 2022-2023 all operation will be conducted from the base camp.

6.8 Production parameters

6.7.1 Yield regulation and organization of production

6.7.1.1 Yield regulation

Yield regulation, or allocation, involves making decisions that lead to clear specifications of where and under what conditions a harvest may be cut using AAC and technical information about a forest. It is a critically important part of sustainable tropical forest management. The GFC SFM guidelines set out the parameters for yield regulation. Generally, yield regulation is determined by:

- Available volume/ha or per block for merchantable species based on pre-harvest inventories
- Restrictions at the level of species-minimum diameter limits, protected species,
- Site restrictions - based on degree of slope, the occurrence of buffer zones, proximity trees protected trees, and in some cases whether there are nests of certain species of fauna on a tree targeted for felling
- Agreed cutting cycles and annual allowable cut
- Distribution of trees on the ground in relation to topography and practical road access,

- f) Site types and the characteristics of the silvicultural system, or systems, specified in a management plan that are being applied in the forest,
- g) Technical information for unlogged, previously logged and secondary forests on each compartment should be considered separately because of differences in tree species, stem diameters and tree distribution that almost always occur. Yield allocation will inevitably be different for each of these classes of forest.
- h) Clearly define on maps and on the ground those areas of forest which are to be excluded, through zoning, from logging for environmental or social reasons. Harvest planning maps can either be manually drawn or GIS generated.
- i) It is desirable that yield allocation plans be prepared two and preferably three years in advance of logging to enable roadline logging and road construction to take place, for roads to settle before use and, where necessary, for climber cutting to be completed.
- j) Wood harvested from roadlines should be allocated as a part of the annual allocation for the year; it should not be an additional allocation of yield.
- k) Cutting cycles and annual allowable cut are predictable and are dealt with in Section 10.1.2. Items a) through c) are determined from tree marking operations that precede timber harvesting operations.

6.7.1.2 Calculation of cutting cycle and annual allowable cut

In this regard, based on discussions with the GFC and reconnaissance data and ground verification, RTI has agreed to the following parameters (see Table 14) to guide the development of timber harvesting operations:

Table 14: Core forest management parameters for SFEP 2/2020

General parameters	
A. Concession size (ha)	107,670.54
B. Felling Cycle (yrs.).	60
C. Sustained yield re 40yr. cycle (m ³ /ha)	20
Operational parameters:	
D. Total sustained yield (m ³)	1,334,967.60
E. Annual Allowable area (AAA) (ha)	1112.47~(11 blocks)
F. Annual allowable cut (AAC) (m ³)	22,249.46

6.7.2 Schedule of timber production

In line with forest management parameters agreed with GFC, RTI will submit a schedule of blocks to be harvested for the approval of the GFC.

6.7.3 Other products to be harvested

The primary focus of RTI operation is merchantable timber. No other forest product or forest use is contemplated at this time.

Importantly, RTI respects the rights of indigenous peoples and therefore will not restrict indigenous peoples or other duly authorized persons from traversing the concession area or from utilizing any forest resources.

6.9 Forest Planning Operations

6.8.1 Forest Inventory

Planning of timber harvests is one part of overall forest management planning, which is itself a component of comprehensive land-use planning.⁸¹ To be effective, harvest planning must be based on a general forest inventory for the concession area and a comprehensive pre-harvest survey including terrain reconnaissance of each cutting unit prior to harvesting. This permits the development of accurate plans, which in turn will permit operators to improve operational control, optimise harvesting production rates, and reduce environmental impacts. All planning of harvesting operations should be guided by the consideration that unless the forest is left in a condition that will permit the attainment of a desired future condition, sustainability cannot be assured.

In order to conduct timber harvesting operations in local forests RTI must deal with variables such as forest type diversity, the proportion and spatial distribution of the merchantable trees across the concession, and the distribution of diameter classes. RTI will undertake two kinds of forest inventory prior to logging: management (reconnaissance) level, and pre-harvest (100%) level.

In addition, after logging, a post-harvest inventory is conducted to garner information on the efficiency of the logging process, compliance with timber harvesting standards and the nature of the condition of residual merchantable trees.⁸²

6.8.2 Management Level Inventory

Given the history of the forest concession, RTI has conducted a management level inventory in the concession. That information has guided RTI' initial interest and investment decisions. The Management Level Inventory for SFEP was conducted by Ewart Forest Service and Consultancy in August 2020. It was conducted at a sample intensity of close to 2.5%.⁸³ (See Table 15 below)

To date, RTI has been studying the condition of the vegetation in Compartment 1, and the enterprise

⁸¹ Dykstra, D.P. & Heinrich, R. 1996. FAO Model Code of Forest Harvesting Practice. Food and Agriculture Organisation of the United Nations, Rome. ISBN 92-5-103690-X. 85 pp.

⁸² <https://www.fao.org/sustainable-forest-management/toolbox/modules/forest-inventory/basic-knowledge/en/%3Ftype%3D111>

⁸³ EFS Consultancy, 2020, Management Level Forest Inventory Proposal for ROYAL TIMBERS INC.

expects to garner information on the broader condition of the vegetation in other compartments after it acquires a TSA.

Table 15: Showing the number of sample plots concerning the distance and number of transect lines per vegetative stand

No.	Description	Compartment Code	Area in Hectares	Distance in KM	# of Transects
1	East Puruni Compartment	PUCO	21,641.30	30	6
2	West Puruni Compartment	WECO	15,894.40	20	4
3	Kamiguin Compartment	KACO	30,381	30	6
4	Pashanamu Compartment	PACO	39,754.10	50	10
Total	Four (4) Compartment		107,670.50	130	26

The Management Level Inventory includes a cruise to collect data on all marketable merchantable species and potential species in classes 35 cm in diameter and up (DBH) within a radius of 18 metres. The 8-meter radius subplot will collect data for all species ranging from 10 cm to 34 cm in diameter.

Based on the pre-planned map prepared by the Ewart Forest Service and Consultancy office showing the location of the transects lines, the cruiser establishes these line by cutting 2 meters wide X 4 – 9 kilometres environmental reference transects at every 25 meters interval with flagging tapes. In case the transect line starts near a road or river the cruiser must ensure that the transect lines must be established at least 100 meters from these ground features. Each circular plot was established at 500 meters apart.

Every 0.1-hectare circular plot consists of a 0.02-hectare circular subplot intended to quantify regeneration and mortality during post-harvest inventory, as the case may be. The 0.1-hectare main plot will have a radius of 18 meters and the 0.02-hectare nested subplot will have a radius of 8 meters.

The broad elements of plot establishment and measurement are as follows:

- a. A circular main plot of 0.1ha is established (17.84m radius on flat ground), within which all live trees 35cm dbh and above are recorded in section 2a of the form (species, dbh and risk class). Slope correction is applied to the radius if the slope is greater than 5%. The GPS unit is activated as soon as the crew arrives at the plot location and is set in averaging mode.
- b. Any trees located on the boundary of the plot (“borderline trees”) are carefully assessed by the PEP and enumeration personnel. The tape is stretched from the plot center to the side of the tree. If more than half of the tree stem is within the plot it is included in the sample; if less than half, it is excluded.
- c. Within this plot stumps and NTFPs are also recorded (sections 2b and 2c respectively).
- d. Plot observations are made in section 1 of the field form. This includes plot location, provided a GPS reading can be obtained within the time available.
- e. A sub-plot of 0.02ha is established (7.98m on flat ground), using the same method as above, within which all live trees 10cm and over are recorded in section 3 of the form (species, dbh and risk class) . Slope correction is applied to the radius if the slope is >5%.

6.8.3 Pre-harvest inventory

6.8.3.1 Objective of a Pre-harvest Forest Inventory

Forest Pre-harvest Inventory (PHI) has long been a key part of the tactical planning phase that enables optimisation of harvesting systems and grades for maximum value recovery. Thus, pre-harvest inventory is vital for planning timber harvests due to the following:

- a) Diversity in forest types and terrain
- b) The number, spatial distribution, and diameter classes for merchantable species
- c) Assessment of ground conditions for felling trees including proximity trees, buffer zones, slope values
- d) Assessment of locations for roads, skid trails and log markets
- e) Identify and map crop trees and potential crop trees
- f) Map tree locations, topography and watercourses

In this regard, FTCI, in collaboration with the GFC, has published procedures for pre-harvest forest inventory.⁸⁴ GFC requires ‘a schedule for the planning and implementation of harvesting operations’ and includes pre-harvest inventory as a major planning requirement (GFC, 2018 (a)). GFC also prescribes the standard for reporting on pre-harvest forest inventory (GFC, 2018 (b))

Pre-harvest inventory methods may be summarized as follows:

Productive areas of compartments are organized into blocks 1,000m x 1,000m (100hectares) and each block is divided into 20 strips, 50 meters wide in a north –south orientation, and each strip numbered, starting from the western boundary of the block.

A reconnaissance of each bloc targeted will be conducted to:

- a) Determine operable ground conditions in terms of prevailing gradients, surface conditions- whether rocky or swampy or the extent of degradation by mining activity.
- b) Establish whether, for areas already mined, whether there is sufficient residual merchantable timber (standing or felled trees) worth harvesting or salvaging
- c) Establish whether logging near any ex-mining sites will lead to further soil degradation through accelerated erosion.
- d) 100% enumeration of the trees within each strip (and then each block) is carried out using a specific set of equipment or tools (see Figure 18); the 100% enumeration requires that at the minimum that each potential merchantable tree be identified by species, the tree is given a number (a tag) is placed on the tree, and the strip #, diameter, estimated merchantable height and the x, y coordinates recorded.

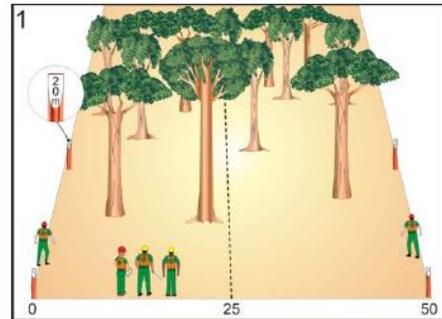
The data is subsequently processed in a manner that a stock map (or tree location map) showing the location of each merchantable tree, along with topographic data and buffer zones are represented. The stock map is then used to plan access roads, skid trails and log markets.

6.8.3.2 Methodology for Conducting Pre-harvest Forest Inventory

⁸⁴http://www.itto.int/files/itto_project_db_input/2350/Technical/FTCI%20Training%20Manual%20Reduced%20Impact%20Logging.pdf

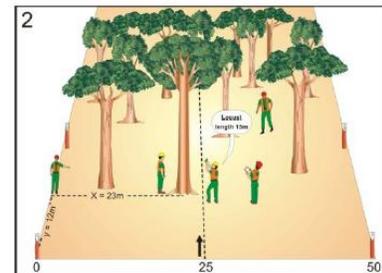
The timber cruising team establishes the 20 strip lines running parallel to each other for 1,000 m along the North-South block boundaries that is:

- The tree spotter and the lines men find the first tree along the strip line;
- The tree spotter identifies the species and the lines men take its X and Y coordinates;
- The tree spotter measures diameter (at breast height) the booker records the information on the field sheet
- The tree receives a numbered tag
- Terrain (ridges, slopes, swamp), drainage (creeks, gullies) and other features (old skid trails, forest type) should be observed and mapped at the same time by assistants and booker.⁸⁵



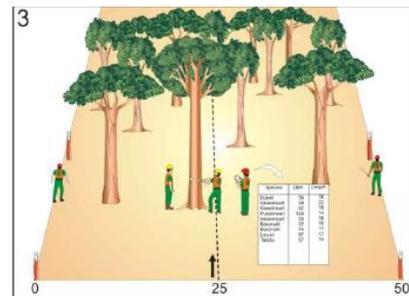
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The enumeration team consists of 4 tree-spotters and 2 checkers are responsible for directing the team and recording all the relevant information. It is composed of two groups with 3 men for group. The checkers walk between the strip lines directing the spotters to enumerate all the mature trees within the strip. Harvestable trees above 35 cm dbh are enumerated and recorded trees marked for felling.



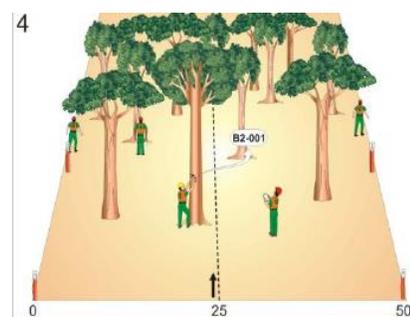
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Tree diameters are measured at 1.3 meters above the highest level (up-hillside of the tree) for trees without buttress, and immediately above the highest buttress for trees with buttresses. Merchantable trees enumerated and marked for felling are identified with a tag stating the strip line number, tree number block number.



ground
and

The tree-spotters traversing between the two strip lines are also responsible for locating the markers along the lines and informing others in the team about the distance and station numbers of the strip lines. They are also responsible for checking between the strip lines to verify if any merchantable free from prohibitive constraints are left behind. The checkers recorders also make a visual assessment in respect of forest

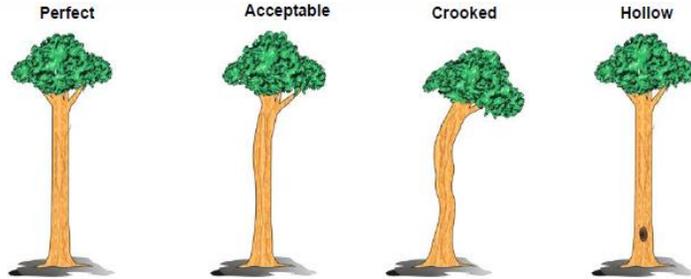


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6.8.3.3 Assessing Stem Quality

⁸⁵ Forestry Training Center – Reduced Impact Logging Training Manual

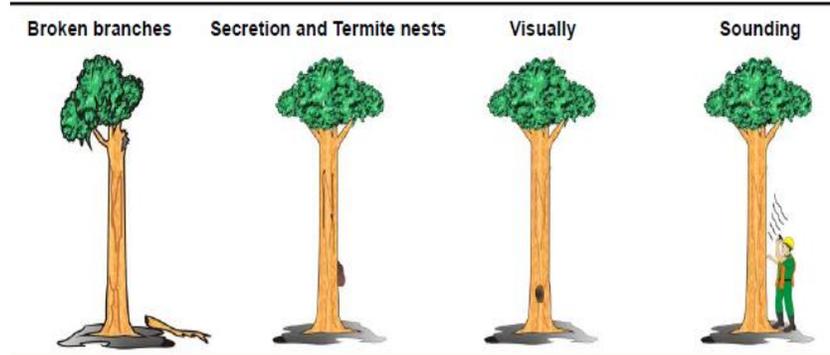
The tree-spotters check whether the trees have any internal defects by sounding the trees with a cutlass looking for natural external defects. trees are defective to the extent that commercial log of minimum five meter length can be obtained, these are included among the trees marked for felling but recorded under retention



trees and If the no (5) are not for trees.

However, only sound trees are enumerated, whereby the minimum commercial bole length is considered. A commercial bole should be free from decay and straight.

Presence of hidden defect (internal rot) cannot always be determined, but there are a number of telltale signs that can be used in case of doubt, enumerate the tree still. The tree will be checked again during marking and just before felling.



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6.8.3.4 Advantage of Conducting a Pre-harvest Forest Inventory

- Previous knowledge of timber stock
- Allow timely marketing of timber
- Location of trees facilitates planning of subsequent activities
- Location of creeks and topographic information facilitates the planning of infrastructure

6.8.3.5 Disadvantages

- Additional activity compared to conventional logging.
- Costs recuperated one year later (or when logs are harvested).

6.8.3.1 Variations

- 100% inventory of commercial and potentially commercial trees dbh \geq 35 cm
- 100% inventory of commercial trees dbh \geq 45 cm
- Diameter limits differ per species (group)

Diameter Measurement

A Diameter Tape is a measuring tape with normal metric increments printed on the one side and diameter increments on the other. The Diameter Tape is used by Foresters to estimate diameter of trees. Measurements are made at 1.3m (4.5 ft; designated 'breast height') above the ground. It gives a direct estimate of diameter, though one measures the circumference of the bole, without the need for any further calculation. If a tree's cross section would be a perfect circle, the circumference (or girth) of a tree is e.g. 150 cm, then the equivalent diameter will be equal to 150 cm divided by the π (pronounced *pi* which equals approximately 3.1416) = 47.7 cm. Therefore, the side of the tape with diameter increments would read 47.7 cm.

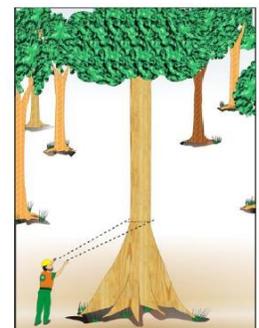


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Methodology when using the Diameter tape

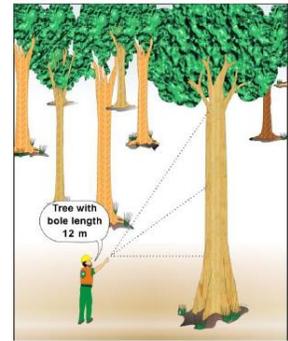
- The tape is wrapped around the tree stem and pulled tight.
- The tape should not be kinked, twisted, or influenced by bark or branches.
- The diameter scale should be facing out and the tape held at right angles to the plane of the stem.
- The zero mark on the tape should be held firmly against the tree.
- As the tape is wrapped around the tree, the other end should be overlaid such that the diameter scale can be seen.
- The diameter scale opposite the zero mark on the tape is read off as the diameter of the tree.



Measuring Tree Diameter

During stock survey, measurements are usually rounded to the nearest cm. For trees with buttress, the diameter is measured 30 cm (1 ft.) above the buttress. In case of high buttresses, the bole cannot be measured directly, but has to be estimated. This is best done with

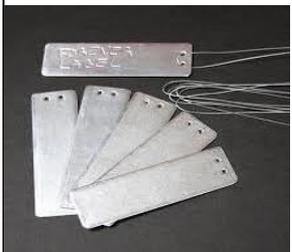
the aid of a stick or with two persons using the other side of the tape. Estimating bole length needs some practice and regular checks by estimating lengths measured with the aid of a 30-m tape and a clinometer.



bole

The data is subsequently processed in a manner that a stock map (or tree location map) showing the location of each merchantable tree, along with topographic data and buffer zones are represented. The stock map is then used to plan access roads, skid trails and log markets.

Figure 18: Typical tools /equipment used for pre-harvest inventory

			
Clinometer	Diameter Tape	Compass	Chain/tape 50m
			
GPS Device	Flagging Tapes	Aluminium tags	Hatchet
			
Clip board	First Aid Kit		

6.8.3.2 Blocks targeted for pre-harvest inventory

Each calendar year, RTI submits a list of blocks to the GFC that it plans to enumerate.

6.8.5 Post-harvest inventory

RTI' post-harvest inventory is an internal audit exercise to establish whether internal SOPs are being followed. For example, RTI block inspector must complete a written inspection report before the block is closed. The block inspector evaluates the harvesting against the GFC code of practice using

the checklist. The block is closed only if the block inspector is satisfied with the state of the block, i.e. all logs have been collected and the creeks cleared. If the block inspector determines that additional work is needed before the block can be closed, the harvesting team shall ensure that the block is completed satisfactorily. If the block inspector determines that other issues cannot be corrected immediately, e.g. inadequate felling technique, this shall be reported to the skidding superintendent. Block inspectors shall report to the skidding supervisor and the production manager within the production department. Every 3 months, the research team will audit a sample of the field report of the block inspectors. The RTI shall convene an environmental committee to access the reports of the block inspectors and the research team and to track the harvesting process in this way.

6.8.6 Growth yield and defect data

RTI is aware of data available on growth, yield, and defect data for local timber species. It is RTI's understanding that data has informed GFC's protocols to produce options for felling cycles and the corresponding annual allowable parameters used by GFC. The findings are based on data from Permanent Sample Plots (PSP) collected by the research team at Barama SFEP and Iwokrama Forest Reserve, in collaboration with Forestry Training Center (FTCI) and Environmental Solution (ES). Valuable information from the Tropenbos Guyana Program analysis of the data obtained from sample plots and research blocks in the Central Demerara Pibiri (DTL) concession area within the forest belt.⁸⁶

6.8.7 Population Dynamics of Greenheart

Sample plots were used to build a growth model to research the effect of logging at different intensity levels on the recovery of the Greenheart population. The purpose of this study was to determine the optimum harvesting schedule for the mixed forest, which answers the following questions:

- What are the vital rates of growth, survival and in – the growth of Greenheart and other species in a logged-over forest?
- What are the sizes and composition of the residual stand?
- Are depleted stands of Greenheart and Wamaradan replenished by the natural recovery of the merchantable population and if so, how many years does it takes?
- What possibilities exist to optimize the harvesting of “high density species” to ensure long – term maintenance of commercial stand of timber in the RTI concession?

The assessment of the primary data and the subsequent development of the population matrix model was carried out by the Tropenbos Guyana Program in the Central Demerara Pibiri (DTL) concession. These findings, which have been drawn from the study of the data-set and population matrix model, are as follows:

- a. The measured growth, survival and in- growth rates suggest that undisturbed population of Greenheart are stable and slightly increasing.
- b. The natural lifespan of the species is in order of 300 years

⁸⁶ Singh, J.; Nicol, G.; Khan, T. Methods of Yield Regulation in Tropical Mixed Forests: Pilot Studies Using MYRLIN and SYMFOR in Guyana: Pilot Study 1. Ituni Small Loggers Association: Pilot Study 2. Barama Company Limited; Oxford Forestry Institute (OFI): Oxford, UK, 2002; pp. 1–95

- c. The average diameter increment of Greenheart in the plots was 3mm per year and other species at 4mm per year, with a very large variation in growth rate depending on site, light availability and the genetic background of the individual.
- d. Mortality rates are not related to tree size.
- e. Management directed at reducing mortality or increasing growth of individuals less than 40 cm DBH would have a large positive effect on population growth, particularly in diameter classes where a large natural variation in growth rates is already present.
- f. A 30 – 50-year reduction period appears to be realistic but is highly dependent on the extent of harm sustained to the residual stand and the rate at which the mortality rate returns to the baseline level
- g. Continued logging is likely to lead to a gradual decrease in the population and, as a result, to a longer harvesting period.

6.10 Harvesting Operations

6.9.1 Overview

RTI timber harvesting operations are summarized in Table 16.

6.9.2 Briefing sessions

Planning is an active process requiring careful thought about what could or should happen in the future and involves the coordination of all relevant activities for the purpose of achieving specified goals and objectives. Planning is an integral component of forest management; is about determining and expressing the goals and objectives which government, rural communities or companies have, and for deciding the targets and steps that should be taken in order to achieve those objectives.⁸⁷

RTI will formalize regular (monthly) briefing sessions with all field operatives to ensure that the various phases of the logging operation are well coordinated and that logs are removed from the forest floor as quickly as possible. Briefing sessions are also intended to get every operative to share responsibility for OSH practices and for environmental management. Briefing sessions will also cover adherence to checklists for preventative maintenance of all equipment and measures designed to control noise and vibration. Special attention will be paid to training needs for operators and to record keeping. Briefing sessions for other operatives will be held monthly. These will address mostly production schedules in line with market demand, compliance with prescriptions of the COP, environmental management, feedback from monitoring reports, and documentation.

6.9.3 Planning teams

RTI will put together a Planning Team the main purpose of the team is to conduct RTI' preparatory tasks before undertaking work major interventions in the forest resources. Specific tasks for the Planning Team include:

- a) plotting road alignment on maps and on the ground;
- b) Designing bridges and culverts;

⁸⁷ <https://www.fao.org/3/w8212e/w8212e07.htm>

- c) Plotting skid trail alignment and log market surveys on the map and on the ground;
- d) Tree marking.
- e) Preparing maps for persons engaged in field operations-for example, each feller will have a tree location map showing the trees to be felled per block or other designated work area, along with the location of the skid trail.

The work of planning teams allow machine operators to focus on their specific tasks and not to spend time (and fuel) looking for alternatives or options. The minimal or controlled use of machines will lead to cost savings.

Table 16: Summary of the various tasks associated with RTI operations.

#	TASK/ACTIVITY	CORE ELEMENTS	RESPONSIBILITY
1	Forest Management Plan (FMP): A document that translates forest policies into a coordinated programme for a forest management unit and for regulating production, environmental and social activities for a set period of time through the use of prescriptions specifying targets, action and control arrangements.	Forest organization 5 yr. projections for: <ul style="list-style-type: none"> ● inventory, ● road construction works ● production by block and compartment ● staff recruitment and training 	Operations Manager
2	APO - Plan of Operations: A tabular statement showing the order and extent of forest work to be carried out during one year and is based upon the prescriptions of a Forest Management Plan. The term is synonymous with Annual Work Plan.	Annual projections for <ul style="list-style-type: none"> ● 100% inventory ● Road construction and maintenance works ● Base camp, forward camp works ● Forest inventory ● Production by block and compartment ● Staff recruitment and staff training 	Forest manager
3	Forest reconnaissance, general forest surveys	General forest reconnaissance looking at: <ul style="list-style-type: none"> ● topography, ● forest type area and distribution, ● proportion of merchantable species and their diameter classes, ● existing road infrastructure, and existing land use 	Supervisor-Forest Planning
4	Primary and secondary road alignment	Forest surveys to identify options for road location considering: terrain, soil, stream network, and the location of merchantable stocks of timber.	Supervisor-Forest Planning

5	Primary and secondary road construction	Forest mensuration and forest surveys, identification of sites for borrow pits, culverts, and bridges Under-bushing and flagging of road alignment Road works, including bridge and culvert construction, using chainsaws, bulldozers, excavators, front end loaders, dump trucks, and motor- graders	Road/skid trail construction crew
6	Block demarcation and forest inventory	Surveying and cutting lines to create 1000m x 1000m blocks- block lines are aligned to selected UTM Coordinates assigning an alpha-numerical code to each block dividing each block into 50m strips, by cutting lines in a vertical (North-south) direction	Supervisor-Forest Planning
7	100% forest inventory	Enumerating trees as per GFC guidelines	Supervisor-Forest Planning
8	Skid trail planning, alignment in the field.	Preparation of tree location maps Selection of harvesting stock Skid trail alignment on maps	Supervisor-Forest Planning
9	Tree marking	Validation of merchantable stocks after consideration of tree form and vigour, and evaluation of site conditions marking felling direction	Supervisor-Forest Planning
10	Skid trail construction	Grubbing and light dozing along marked skid trail	Supervisor-Forest Operations
11	Felling	Directional felling of trees Bucking of trees	Supervisor-Forest Operations/Felling team
12	Skidding	Extracting logs from stump to log market	Supervisor-Forest Operations Skidding team
13	Tagging & documentation	Ensuring all stumps are tagged Ensuring all logs are tagged GFC documentation	Supervisor-Forest Operations
14	Log market operations	Grading logs Sorting logs Loading logs on to logging trucks	Supervisor-Forest Operations
#	TASK/ACTIVITY	CORE ELEMENTS	RESPONSIBILITY
15	Forest monitoring	Ensuring compliance with national standards and guidelines Reviewing performance in terms of forest inventory, road construction and production	Forest Manager
16	Stakeholder liaison	Engaging with stakeholders for the resolution of any emerging conflicts	Operations Officer

6.9.4 Machinery

RTI will invest in an assortment of heavy-duty equipment to boost its productivity and profitability (See Table 17). Royal Timber Inc. has been committed to ensuring that all purchased and current equipment are in full working order in compliance with the specifications of the Code of Practice for Harvesting Activities. As such, all errors, including oil and fuel leakage, will be immediately prevented in order to better protect the ecosystem from the spillage of such fuels and lubricants. Below is a table of devices that will be included in our operations. RTI believes that its current assets will give it a competitive edge.

Table 17: Showing the List of machinery

Department	Type of Machinery	Make/ Model	Number of Units	Expected use date	Remarks & expected life
Road Construction and Maintenance	Bulldozer	CAT D6R	2	01/ 01 / 2021	2030
	Excavator	CAT 320C	1	01/ 01 / 2021	2030
	Motor Grader	CAT 140H	1	01/ 01 / 2021	2030
	Dump Truck	Bedford TM 6X6	2	01/ 01 / 2021	2030
	Chainsaws	Stihl 066	1	01/ 01 / 2021	2025
Felling and Extraction	Tracked Skidder	CAT 527	1	01/ 01 / 2021	2040
	Ranger Skidder	F68	1	01/ 01 / 2021	2045
	Chainsaws	Stihl 066	6	01/ 01 / 2021	2025
Trucking	Log Loader Series 1	CAT 966F	1	01/ 01 / 2021	2055
	Log Truck	Mack RD 888 SX	6	01/ 01 / 2021	2030
	Tugs (Ocean Going)	Caterpillar	1	01/ 01 / 2021	2050

	Barge (Ocean Going)	Steel Hull	1	01/01/2021	2050
	Log Loader Series 1	CAT 966F	1	01/01/2021	2040
	Chainsaw	Stihl 066	1	01/01/2021	2025
	Transport Vehicle	Land Cruiser	3	01/01/2021	2030
	Speed Boats	48 hp	1	01/01/2021	2030
Workshop	Generator	Lister	2	01/01/2021	2030
	Welding Plant	Miller	2	01/01/2021	2025

Beyond basic preoccupation with increased profitability through intensive operator training, attention to OSH practices and adequate preventative maintenance, RTI intends to manage environmental impacts generated by such equipment. A pre-service check or machine walk around to check for safety and maintenance issues will be conducted during the period 06:00-06:30: operators' primary focus will be the detection and correction of any oil or fuel leaks. For machines stationed away from the base camp, a 'travelling mechanic' will assist the operator with the routine preventative maintenance steps. Under normal circumstances, no equipment except generators would be in use after 18:00 hrs. RTI will use solar units for security lights between 22:00 hrs. and 04:30 hrs.

RTI will develop extensive SOPs covering the use of heavy equipment, including the following:

- a) Operators' codes, including the use of seat belts and personal safety gear
- b) The use of chocks for all parked machines
- c) The use of headlights and rotating beacons on all heavy-duty vehicles in active use
- d) Checklists for preventative maintenance.
- e) Reporting on defects
- f) Logbook and documentation
- g) Designated locations for refueling, servicing, and cleaning heavy-duty vehicles
- h) Operators' behavior when confronting fauna traversing roadways

The core heavy-duty equipment that RTI will use specifically for timber harvesting operations are set out in Table 18.

Table 18: Heavy-duty equipment deployed for timber harvesting operations.

#	Machine type	Core function
Road construction		
1	Bulldozer	Dozing trees, grubbing of roadway, light scarification of the soil surface; skid trail construction
2	Front-end loader	To collect earths from borrow pits and carry it to points on the road requiring earth fills or capping with lateritic earths
3	Excavator	Used for borrow-pit construction and excavation, preparatory earth works for bridge and culvert construction, placing logs or beams in position during bridge construction, a limited amount of pile driving
4	Motor-grader	Road levelling, profiling, roadside drainage.
Tree felling & bucking		
5	Chainsaws	Directional felling of trees, bucking logs, ripping logs for bridge and culvert construction
Skidding operations		
6	Skidder	Limited skid trail construction; extracting logs from stump to log market; sorting logs at log market
Loading trucks with logs and cants		
7	Front-End (Log) Loader	Loading, unloading logging trucks; sorting logs.
Hauling logs		
8	Logging trucks (6 x 6) or (6 x 4) with pole trailers.	Haul about 42m ³ of logs per trip.

6.9.5 Logging procedures

6.9.5.1 Overview

RTI' defines its logging protocols in eight phases:

- a) Base camp set up
- b) Primary and secondary road construction
- c) Tree marking & skid trail alignment
- d) Skid trail construction and log market construction
- e) Felling and bucking of trees
- f) Skidding ,
- g) Log market operations
- h) Short haul to a central log depot

6.7.5.2 Base Camp set up

RTI has established its primary base camp within Block 8K, Compartment 1. The UTM Coordinates for the Camp are 21N 0237840, 0691640.

The completed base camp will occupy an average area of about 9 hectares and would include a

sawmill facility, timber depot, forest station and fuel bond. RTI has made no decision has yet on the location of any forward camps.

6.9.5.3 Primary and secondary road construction

a) Overview

RTI will be guided by the following items in the development of its road network:

- a. GFC’s COP (Section 5)
- b. GFC’s GFFO (Section 5 Construction of Road Network, Drainage Structures and Water Course Crossings).
- c. FTCI’s Manual on Forest Roads (FTCI, 2007).
- d. RTI’ experience with constructing roads and bridges
- e. Existing road networks formerly used by miners in the area

b) Road alignment

Based on the hilly nature of the terrain, topography will play a more significant role in road alignment than the spatial distribution of merchantable timber. To the maximum extent possible, RTI will take advantage of any existing road networks to reduce road density on the concession area.

RTI will use GFC’s recommended standards for road design (see Tables 19 and 20 below) as references for its road construction works. Those standards are set out in Section 5.1 Road Standards in GFC’s Guidelines for Forest Operations for State Forest Authorizations for Timber Sales Agreements (GFC, 2018 (b)). The necessity for roadway drainage and drying after a rainstorm, road construction costs and safety issues are also major considerations.⁸⁸

Table 19: RTI road classification categories

Class	Description
Primary road	A road designed for permanent all weather use, permanent side drains, with bridges and culverts duly designed for continuous use by heavy-duty equipment over many years
Secondary road	All weather roads spur roads to primary roads
Spur road	Temporary roads linking one or more log markets to a secondary road

The alignment of primary and secondary roads respectively depends primarily on topography while the alignment of spur road is heavily influenced by the stocking available at any location. RTI intends to close spur roads after use.

Table 20: Maximum road widths (meters) for each class of road.

Class	Maximum width (m) by category			RTI Max Speed

⁸⁸ <http://www.nrs.fs.fed.us/fmg/nfmg/docs/mn/roads.pdf>

	Canopy clearance	Earthworks	Roadbed	Main carriageway	
Primary road	30	12	9	5	64 km/hr
Secondary road	20	10	8	4	40 km/hr
Spur road	15	8	6	3	24 km/hr

c) Road Construction schedule

At this point in time, RTI is still conducting reconnaissance work to determine its primary road network. One critical consideration is to what extent, RTI will be able to use any existing mining roads or trails.

d) Road signage

RTI will use signage to reinforce briefing sessions on responsible road use.

e) Road Closure

RTI plans to remove the optimum merchantable volume from blocks harvested. Once this is accomplished RTI will not re-enter blocks for harvesting purposes. Spurs roads not intended for further use will be closed or decommissioned after post-harvest activities are conducted.

Roads will be formally closed six months after harvesting, unless other stakeholders-such as miners, start using the road.

Road closure practices include the following:

- a) Posting road 'Closed' signs
- b) Remove culverts if any
- c) Removing flagging tapes and all other debris such that the only items left in the area would be tags on the stumps of trees harvested
- d) Drains any post harvesting ponds created from skidding or log hauling activity.

6.9.5.4 Tree marking and skid trail alignment

a) Tree marking

Following the preparation of tree location maps per block with provisional skid trail alignment, the next step is to choose the trees that will be harvested. The 'harvesting stock' would depend on market demand for certain species and the outcome from tree marking activities.

RTI will adopt the following approach to tree marking:

- a. In the first instance, tree marking serves to validate some aspects of the inventory data, especially as tree marking is done a couple of weeks before actual harvesting starts. In validating inventory data, tree marking operatives will check that the correct species and its dbh have been recorded and the quality of the bole is acceptable-good form and free from major defects such as heart rot.
- b. Establishing that site conditions are acceptable-the tree is not on a steep slope, it is not within a buffer zone, and that it meets spatial distance criteria relative to other (protected or merchantable trees). The evaluation of site conditions also includes the verification on whether the tree harbours any fauna, for example nests of harpy eagles or sloths, in which case the tree would not be felled.
- c. Once there is no impediment to felling the tree the next step is to cut any live lianas that may be ‘tying its crown with other tree crowns’ to the extent that felling the tree may lead to accidental, uncontrolled or sympathetic felling of other trees.
- d. Finally, the tree marking staff will place an X on the bole of the tree, indicating (for the feller) that the tree should be felled as part of the felling plan. In addition, a white vertical strip about 50cm is painted on the bole at dbh that indicates the direction in which the tree should be felled. The safety and productivity of skidding teams is highly dependent on how logs are positioned relative to the direction of extraction.⁸⁹
- e. Tree marking is usually done between 2-6 weeks from the planned felling schedule for the block.

b) Skid trail alignment

For compartment 1, characterised by very hilly terrain, and thus few alignment options, skid trails will be conducted before felling. On flat terrain, skid trails will be constructed after felling so that there is more economy in skid trail layout, in fact on flat terrain, skidding distances are likely to be shorter.

The same team that does the tree marking will also do the skid trail alignment on the ground based primarily on Section 4.7 of the COP ‘Layout of skid trail network’ (GFC , 2018 (a)) as well as Section 4.7 of GFFO ‘Layout of skid trail network’ (GFC, 2018 (b)).

For RTI, the key considerations that inform skid trail alignment are:

- a. The spatial distribution of trees to be harvested-it is more cost effective to harvest many trees per unity area
- b. Ground conditions along the provisional alignment, particularly slope grade, rock outcrops, or swampy terrain not captured or mapped in sufficient detail on tree stock maps
- c. The avoidance of large trees along the provisional alignment (such as large defective trees not recorded in the inventory data)
- d. The avoidance of too many curves-curves create conditions for damaging logs during skidding
- e. Soil type-for main skid trails, sand loams or lateritic earths are preferred)

⁸⁹ <https://www.ilo.org/declaration/lang--en/index.htm>

- f. Skidding distance-the shorter haul distances lead to less environmental impact

The tree marking team will use a combination of cut lines and flagging tape to demarcate the skid trail for the convenience of the skid trail construction team.

6.9.5.5 Skid alignment and log market construction

a) Skid trail construction

Skid trail construction is done a few days before actual felling and skidding operations. Since skid trail construction, felling and skidding are all noisy activities that may scare fauna, RTI wants all these activities accomplished within a three-week period.

Provisional skid trail alignment is made on the tree stock map shortly after the tree location map is generated, based on topographical parameters, the spatial distribution of merchantable species, the proposed location of log markets and buffer zones based on the stream network within the block. A few weeks prior to the felling of trees, the tree marking team will align skid trails on the ground.

The modalities for skid trail construction are laid out in Section 6.3 ‘Skid trail construction’ of GFC’s COP (GFC, 2018 (a)) Section 6.3 ‘Skid trail construction’ of GFC’s GFFO (GFC, 2018 (b)).

RTI essential skid trail construction activities will constitute the following:

- A chainsaw will be used to buck any ‘takuba’ (old log) lying along the skid trail alignment
- A bulldozer will be used to bulldoze trees and tree sections along the skid trail alignment with the aim of facilitating skidding of logs with rubber-tyred skidders. Primary skid trails will receive more attention than secondary skid trails.

b) Log market construction

Log markets represent the initial destination for logs skidded from stump. The location of log markets is first indicated on tree stock maps at the level of blocks based on:

- a. the alignment of secondary and spur roads respectively within the forest concession
- b. the terrain within the area of interest
- c. question of whether the log market will accommodate logs from more than one blocks

Tree marking teams then select the final location of the log market based on:

- d. the skid trail alignment set out on the ground based on the tree location map
- e. site conditions at the location indicated: well drained sites, with sandy soils or lateritic earths are preferred; areas devoid of large trees are also preferred.
- f. The area should be big enough to allow for the sorting of logs by species or intended use and to loading of logging trucks. Front-end log loaders will be used for sorting logs and for loading logging trucks.

6.9.5.6 Felling and bucking of trees

RTI has committed to utilise directional felling techniques in keeping with SFM principles because it is safer for the chainsaw team. RIL helps protect the tree bole from damage during tree fall and helps reduce damage to other merchantable trees during tree fall.

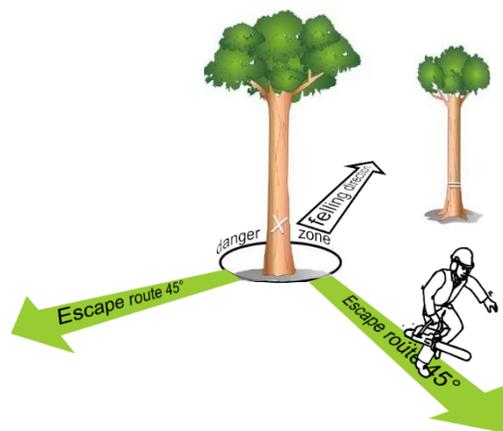
Tree felling operations are set out in Sections 6.1 of the GFC’s COP (2018)⁹⁰ and FTCI’s Manual Course in Reduced Impact Logging: Chainsaw Use, Safety Practices and Directional Tree Felling Techniques (FTCI, 2010).^{91,92}

Tree felling is one of the most hazardous activities for loggers and is a common cause of fatalities in Guyana.⁹³ Moreover, chainsaw operators are subject to exhaust gases, noise and vibration⁹⁴ and RTI will ensure that its felling teams use adequate personal safety equipment as well as the proper tools (see Figure 19).



Figure 19: Tools and PPE to be used by RTI’ felling teams

RTI will ensure that all tree fellers undergo Reduced Impact Logging (Decision Makers’ Course) at the FTCI in all aspects of chainsaw use and preventative maintenance. All fellers will be trained in the basics of directional felling and generic considerations influencing the tree felling process and preparatory tree felling activity (Figure 20).



⁹⁰ <https://www.forestry.gov.gy/wp-content/uploads/2018/07/CoP-for-Forest-Operations-2018.pdf>

⁹¹ http://www.itto.int/files/itto_project_db_input/2350/Technical/FTCI%20Training%20Manual%20Reduced%20Impact%20Logging.pdf

⁹² <https://www.stabroeknews.com/2021/03/16/news/guyana/kwakwani-logger-crushed-to-death-by-falling-tree/>

⁹³ <https://guyanatimesgy.com/logger-killed-by-falling-tree-branch/>

⁹⁴ <https://www.ilo.org/declaration/lang--en/index.htm>

Figure 20: Basic preparatory safety practice for felling trees ©FTCI

The following basic procedures will be adopted and followed by RTI' chainsaw operators/felling teams:

- a) Each feller will be assigned a felling area delineated by strip lines.
- b) Each feller will at all times be accompanied by an assistant who will assist with carrying tools, help locate trees and assess and advise on felling hazards missed by the feller.
- c) The team will first cut lianas and underbrush in the vicinity of the trees to be felled to ensure safety and reduce the incidences of trees being pulled or pushed over in the felling
- d) Fellers will only cuts trees based on the tree location map provided by the planning team
- e) Trees will be felled in predefined sequences and angled to the skid trails in line with markings placed by the planning team.
- f) The felling team will ensure that the stem is cut completely through so that extraction is facilitated during the bucking phase
- g) The chainsaw operator will ensure that the stump of any tree felled is duly tagged and that the tagging information is available to the skidding team.

6.9.5.7 Skidding

RTI will ensure that skidder operators are duly trained in the use and preventative maintenance of skidders. Skidder operators and their assistant (choker-man) will conduct a thorough inspection of the skidder at the start of the workday focusing particularly on tire pressure, engine oil level, transmission and hydraulic fluid levels, brakes, and evidence of oil leaks. The operator will also ensure that lights, horn, and the rotating beacon are functional. Skidding teams will be provided with maps showing where felled trees are lying on the forest floor. These maps will include the skid trail alignment. The choker-man will verify that all stumps from which logs are extracted carry a tag before removing the log. As far as practicable, logs will be winched from stump, using the choker rig on the skidder.

6.9.5.8 Log market operations

Log market operations include the following:

- a) Ensuring that tag information for all logs arriving at the log market is available and recorded in Registers provided for the purpose
- b) Establishing whether there is need for the cross-cutting of any log due to its size or damage sustained during skidding operations
- c) Sorting logs by species and/or dimensions-using the skidder and/or log loader
- d) Grading the logs
- e) Organize log for transportation
- f) Organize GFC documentation for logs being extracted
- g) Loading trucks using a log loader

6.11 Table 21 below sets out a summary of developments to date.

Table 21: Summary of developments to date

	OBJECTIVE	ACTIVITIES	STATUS AT NOV, 2021
1.0	PREPARATORY TASKS		
1.1	Establish concession boundaries: Determine/demarcate borders	Line cutting activities, posting of signboards	95% of the boundary is formed by waterways. Line cutting awaiting issue of TSA
1.2	Determine existing land use	Traverse of the forest area on foot/boat/ATV	20% of area traversed to date by Company & Consultants. GFC produced updated maps summarizing land use activities and location.
1.3	Determine Productive vs. non-productive forests	Map based activity + recce information based on MLI.	Completed, but due to ongoing mining activities within the forest concession area require that this exercise be repeated on receipt of the TSA
1.4	Identify primary biodiversity reserve	Traverse of area identified, posting of sign boards, line cutting activities.	To be completed
1.5	Identify compartment boundaries	Surveying/Line cutting activities	Review work completed by Puruni Wood Products Inc.
1.6	Identify primary road layout	Office base using GIS/satellite Maps	Review work completed by Puruni Wood Products Inc. and GFC
1.7	Identify possible sites for forward camps	Office/map based	Area for primary base camp for 10yr period identified
2.0	PLANNING OPERATIONS		
2.1	Alignment of Primary Road	Surveying works; traverse of road alignment, identification of points for bridges, culverts, mining pits, earth works	To be completed
2.2	Selection of area for setting up base camp, forward camps	Surveying works, site assessment (soil, vegetation and drainage conditions, etc.).	Completed
2.3	Secondary road alignment	Surveying works (including grades and angle of curvature for road alignment, identification of points for bridges, culverts, mining pits, earth works	To be completed
2.4	Setting up of temporary camps for road crews, inventory crews	Minimal clearing for tarpaulin covered camps, vehicle park, etc.	To be completed
2.5	Block Demarcation	Surveying, line cutting	Compartment prioritized. Review work completed by Puruni Wood Products Inc. and GFC.
2.6	Forest Inventory	Forest enumeration	Review work completed by Puruni Wood Products Inc. and GFC. Blocks identified for enumeration identified.

2.7	Stock map preparation	Desk task	Review work completed by Puruni Wood Products Inc. and GFC
2.8	Selection of merchantable stock to be harvested	Desk task	Review work completed by Puruni Wood Products Inc. and GFC
2.9	Skid trail alignment	Surveying, line cutting, cutting of trees, and takubas along skid trails	Not started. Review work completed by Puruni Wood Products Inc. and GFC.
2.10	Log market location	Site assessment and site surveys	Not started
3.0	FIELD OPERATIONS-FOREST CONCESSION		
3.1	Deployment of machinery	Transporting all equipment to the project site	Not started
3.2	Primary, secondary road construction.	Tree removal, earthworks	Not started
3.3	Log market construction.	Tree removal, earthworks	Not started
3.4	Skid trail construction	Tree removal, earthworks	Not started
3.5	Felling & bucking of trees.	Mechanical felling, bucking of trees	Not started
3.6	Skidding logs to log markets.	Dragging/hauling logs along skid trails	Not started
	OBJECTIVE	ACTIVITIES	STATUS AT MAY 31, 2018
3.7	Log market operations (sorting and grading of logs).	Sorting, stacking logs, loading logs onto lorries	Not started
3.8	Hauling logs	Transporting 35-40m ³ logs via heavy duty trucks	Not started
4.0	FIELD OPERATIONS-THE KARTABO-PURUNI ROAD		
4.1	Logs transiting the Kartabu-Puruni Road	Transporting 35-40m ³ logs via heavy duty trucks	Not started
4.2	Managing stakeholder issues	Engagement with stakeholders to address complaints	Not started
5.0	FIELD OPERATIONS: THE ITEBALLI COMMUNITY		
5.1	Logs transiting the Iteballi Community	Transporting 35-40m ³ logs via heavy duty trucks	Not started
5.2	Riverside log depot operations	Transferring logs to a barge at Iteballi waterfront	Not started
6.0	CORPORATE SOCIAL RESPONSIBILITY		
6.1	Support preventive maintenance of Kartabu-Puruni Road	Deploy machines for earth fills, road grading, road compaction and drainage works	Not started
6.2	Support the development of Iteballi Community	Support simple community events as requested by NDC.	Not started
6.3	Manage stakeholder issues	Engagement with community representatives to address complaints.	Not started

7.1 WATER RESOURCES

7.2 Introduction

Guyana, meaning “land of many waters,” is rich in hydrologic resources. ” It has four main rivers - the Berbice, Corentyne, Demerara, and Essequibo - and a host of smaller rivers, creeks and streams. The Essequibo River drains over half the country and is a major river by international standards. Average annual rainfall in Guyana is about 2300mm. It varies from about 1800mm in the savannahs to over 4300mm in parts of the rainforest. In the savannahs there is one rainy season from May to August. The rest of country has two distinct rainy seasons: November to February and May to August. However the actual rainfall in any month can vary significantly. The amount of surface water resources in Guyana compares favourably with the level of consumption but because of the uneven distribution of rainfall over the year Guyana has some problems with droughts (and floods). In the southern part of the country, heavy rainfall during the rainy season from April to August results in widespread flooding. In February and March, however, before the rains start, some creeks can dry up.⁹⁵

Groundwater is the main source of public water supply in the coastal zone. Lying beneath the coastal zone are three significant layers of sand known as the Upper Sands, A sands and B sands. The A and B sands are separated by clay. Under these sands lie the aquifers that supply water for domestic use and some water for industrial use. Along this part of the country, once a well is dug the water rises above ground level without pumping.

Ground water is also being increasingly used in Amerindian Communities in the hinterland but the extent of groundwater supplies is not known and it is unclear whether this use is sustainable.

Guyana has an extensive network of rivers and streams that have many rapids and waterfalls, with an absence of naturally occurring lakes. Water is important ecologically for it is the medium in which many organisms live (Boyd, 2015). The concession area is within the national **Physiographic Region Zone II, Interior Plains** which occupies about 25 percent of the region and is found along the Cuyuni, Mazaruni, and the Essequibo Rivers, where enormous quantities of fresh water are available year-round. Tiboku Falls, as well as several water quality and gaging stations, are located on the Mazaruni River. There are also a few gaging stations on the Cuyuni River. Enormous quantities of fresh water are available from April through August and November through January with large to very large quantities of fresh water available the rest of the year. Figure 21 shows the main surface drainage network and its main tributaries, within the concession area.⁹⁶

7.3 Definitions and scope.

Forests play an essential role in the stable provision of clean, fresh water and many other water-related ecosystem services, such as flood and erosion protection and climate regulation.⁹⁷

Forests are an integral part of the hydrological cycle that generate water resources. Rain forest canopies redistributes rainfall: ‘Interception’ refers to that fraction of rainfall reaching a forest canopy which is intercepted and evaporated; ‘throughfall’ refers to rainfall that goes through the

⁹⁵ https://www.fao.org/fileadmin/templates/legal/docs/CaseStudy_Guyana.pdf

⁹⁶ <https://www.sam.usace.army.mil/Portals/46/docs/military/engineering/docs/WRA/Guyana/Guyana%20WRA.pdf>

⁹⁷ <https://www.fao.org/3/i0410e/i0410e.pdf>

canopy and falls onto the forest floor; and ‘stemflow’ refers to the fraction of rainfall that reaches the forest floor by flowing down the trunks of trees or the stems of other plants (Richards, 1998).

The following definitions are also useful:

- a. **Quantitative terms** (GLASC, 2013).
 - i. Enormous quantities of water refer to discharge rates of >400,000 litres /min.
 - ii. Very large quantities refer to discharge rates of 40,000 to 400,000 l/m.
 - iii. Large quantities: refer to rates of 10,000-40,000 l/m.
- b. **Qualitative terms** (GLASC, 2013)
 - i. Fresh water: maximum of totally dissolved solids <1,000 mg/l.
 - ii. Brackish water: maximum >1,000mg/l but less than 15,000mg/l.
 - iii. Saline water: TDS>15,000 mg/l
- c. **Water hardness** (GLASC, 2013).
 - i. Soft water: 0-60mg/l
Moderately hard water: 61-120mg/l
Hard water: 121-180mg/l
 - ii. Very hard water: >180mg/l C
- d. **‘Soil Water balance’** refers to the amount of water available at any given time in the soil: it is a function of primarily of precipitation, evapotranspiration, soil water storage and water surplus (Strahler & Strahler, 1997)
- e. **Water Quality Standards.** ‘Water quality standards are the quantitative values for acceptable ranges of physical, chemical, biological, and aesthetic characteristics of water (or criteria in stream classification standards, and other water quality standards’ (Boyd, 2015).

7.4 Statutory water rights/Legislation

Water rights in Guyana are generally regarded as the property of the State which then authorises use. Section 36 of the Constitution provides that the State will protect and make rational use of its water resources, the clear assumption being that all water belongs to the State. The State Lands Act (Cap 62:01) also assumes that the State is the owner of all water. In keeping with this the Hydro-electric Power Act (Cap 56:03) provides that, “Subject to any rights lawfully held, the property in and the sole right to the use of all State water powers are hereby declared to be vested in and shall remain the property of the State.”

In 2002, as part of a major reform of the water sector in Guyana the Government brought in new legislation, the Water and Sewerage Act 2002 (the Act), “to provide for the ownership, management, control, protection and conservation of water resources, the provision of safe water...” This Act is the key piece of legislation and must be looked at in some detail to understand how water is now dealt with. All water rights are now governed by this Act which establishes a new regime for water use and management in Guyana.

Under Section 18 of the Act “the ownership of all water resources and the rights to use, abstract, manage and control the flow of water are vested in the State.”

The Act creates rights in water through a licensing scheme. It also recognises existing rights and attempts to incorporate these into the new regime. Ground water and surface water are dealt with in slightly different ways.

The Water and Sewerage Act, 2002 provides the following definitions:

- a) 'Surface water systems' includes creeks and rivers.
- b) 'Water resources' mean water systems, conservancies, canals and all other water arising from rainfall or run off from the land that has been stored or captured within Guyana.

The Water and Sewerage Act, 2002 provides for the setting up of the Hydro Meteorological Department whose functions include 'to establish, manage, and operate national systems to monitor the availability, quality and use of surface water and ground water'. The Act also makes provision for the establishment of the National Water Council, the creation of Guyana Water Inc., the public supply of water, the conservation of water resources, sewerage and related matters.

The Environmental Protection (Water Quality) Regulations (Reg.6/2000) - The Environmental Protection Water Quality Regulations focuses on setting effluent standards, reporting requirements, penalties for violations of standards, and permitting requirements for discharges. It regulates discharges of listed substances.

While Guyana is known as the land of many waters, many activities threaten the quality of water that is in its rivers, lakes and streams. Water pollution is indeed a growing problem in Guyana and this regulation attempts to curb the problem. Some common causes of water pollution in Guyana are domestic waste, agriculture and industries. Some examples include industrial waste, sewage, mining activities, marine dumping, accidental oil leakage, chemical fertilizers and pesticides, leakage from sewer line, urban development, leakage from landfills, and animal waste.

The EPA is tasked with the role as regulator under the regulations to ensure that pollutants released from human activities are within allowable levels that will not adversely affect the health of humans, or other life forms. The regulations requires that any person who discharges or permits the discharge of waste be registered with the EPA.

As such, persons involved in construction, installation, operation, modification or extension of any facility which discharges waste must register with the EPA to discharge waste into waterways. No one is allowed to discharge any effluent without being the holder of an Environmental Authorisation. Failure to comply with this requirement will result in the penalty of a fine of up to five hundred thousand dollars (\$500,000) and imprisonment for 6 months.

According to the Regulations, discharges of the following wastes are prohibited: any waste in toxic amounts, radiological or chemical wastes, any discharge that prevents navigation and anchoring, sewage discharge from water vessels, any other discharge that the EPA identifies as having a negative impact on human health and the environment.

The EPA sets parameter limits of waste which can be discharged into any coastal or inland waters. These are the limits the water body can maintain without reaching unacceptable pollution levels. No facility is allowed to discharge any substance in concentrations greater than those set by EPA. The

EPA also decides the point or source of discharge of effluent from any facility.⁹⁸

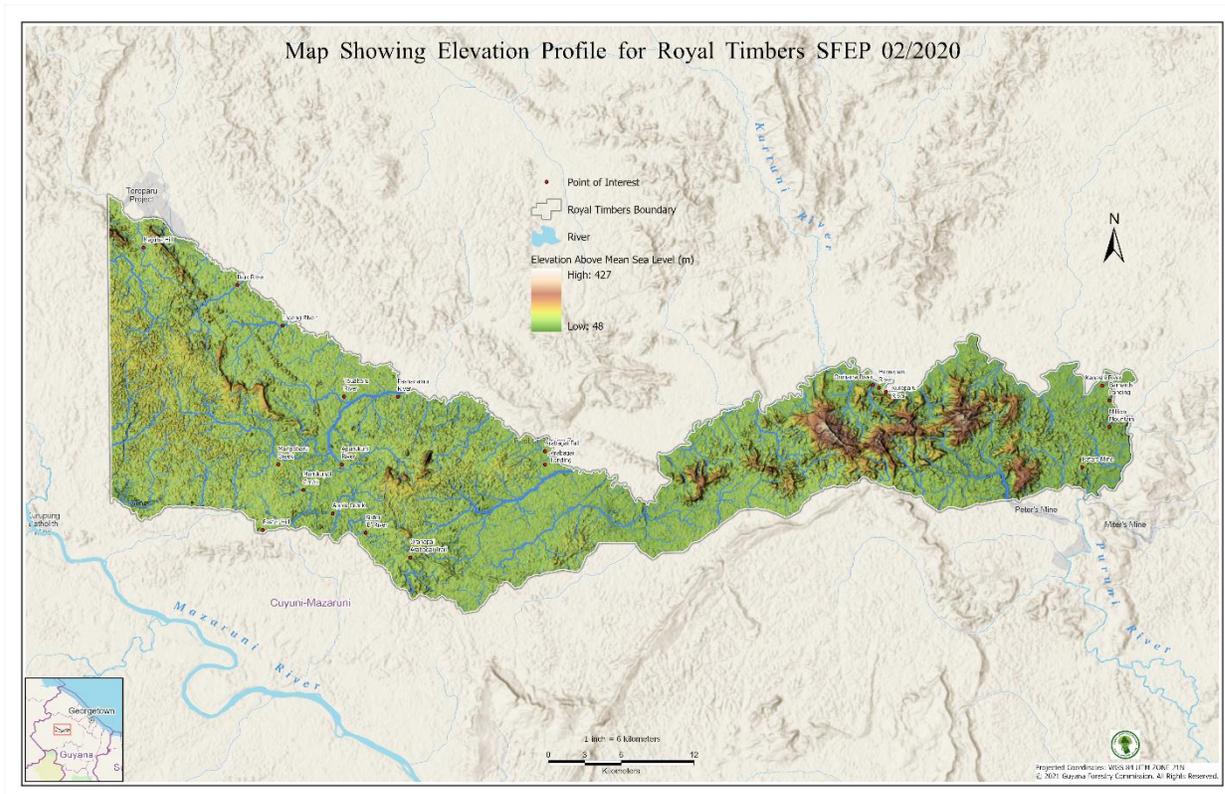


Figure 21: Map showing elevation and core stream pattern-SFEP 2/2020

7.5 Methodology for base line studies undertaken by RTI.

7.5.1 Water sample collection

Water samples were collected and analysed to determine the quality of surface water within the RTI's forest concession. Four (4) water samples were collected and analysed on September 11-17, 2021, within the concession (See Figure 22 below). The samples were taken around and within the boundaries of the concessions to investigate the environmental conditions. The test results represent the effluent or discharge points that may have pollution.

⁹⁸ https://wwflac.awsassets.panda.org/downloads/legislative_review_and_gap_analysis_guyana_draft_pdf



Figure 22: Photograph showing consultants engaged in data collection.

The locations where the samples were collected are identified on the map at Figures 24 as the WQ locations and described in the Table 22 below. RTI plans to convert these WQ sample locations into permanent monitoring stations, since, if there are any impacts on water quality by the operation, the impacts can be detected by testing water quality at these locations.

Analyses were conducted by Environmental Engineering Solutions (EES). Detailed results of the water samples by locations are outlined in Table 22. (See Figure 24 below)



Figure 23: Photographs showing consultants engaged in data collection.

The samples collected were analysed for several parameters which are important and generally used to determine the quality of water, i.e. measurements of pH, Temperature, Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), Oil and Grease, Turbidity, Electrical Conductivity, Total Nitrogen, Nitrate and Phosphate Ions were taken to assess the spatial changes of the quality of water.

In the absence of a specific national standard on surface water quality, comparison was made with

the Guyana National Bureau of Standards (GNBS) for Industrial Effluent Discharge (Table 23 and 24) as well as internationally acceptable limits from the US-EPA, 1986 standards for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife, the World Bank Group International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines for Wastewater and Ambient Water Quality (Table 25), and European Union (EU) 1998 Drinking Water Standards (Table 26).

Table 22: Water sampling-field data report: September 11-17, 2021,

Test Results														
Water Parameters/ Data Results														
Sample ID	Date	Location	BOD mg/L	COD mg/L	DO mg/L	Oil & Grease mg/L	Temp °C	pH	Conductivity [S/cm 0-2000]	Turbidity FAU	TSS mg/L	Total Nitrogen mg/L	Ammonia NH ₃ mg/L	Stream FLOW RATE m/s
RT1	15/09/2021	21N 0200937 UTM 0686723	3.01	7.6	5.3	x	25.4	6.51	35	52	9	27.2	0.5	0.24
RT2	15/09/2021	21N 0201468 UTM 0689778	3.08	8.9	4.5	0.25	26.2	6.31	30	26	40	31.0	2.2	0.052
RT3	15/09/2021	20N 0831823 UTM 0689629	3.17	11.3	10.5	0.15	26.7	6.30	36	16	10	Under range	0.8	0.056
RT4	17/09/2021	21N 0224302 UTM 0690918	2.98	18.8	6.91	0.06	25.0	6.20	68	74	10	6.2	1.2	0.007

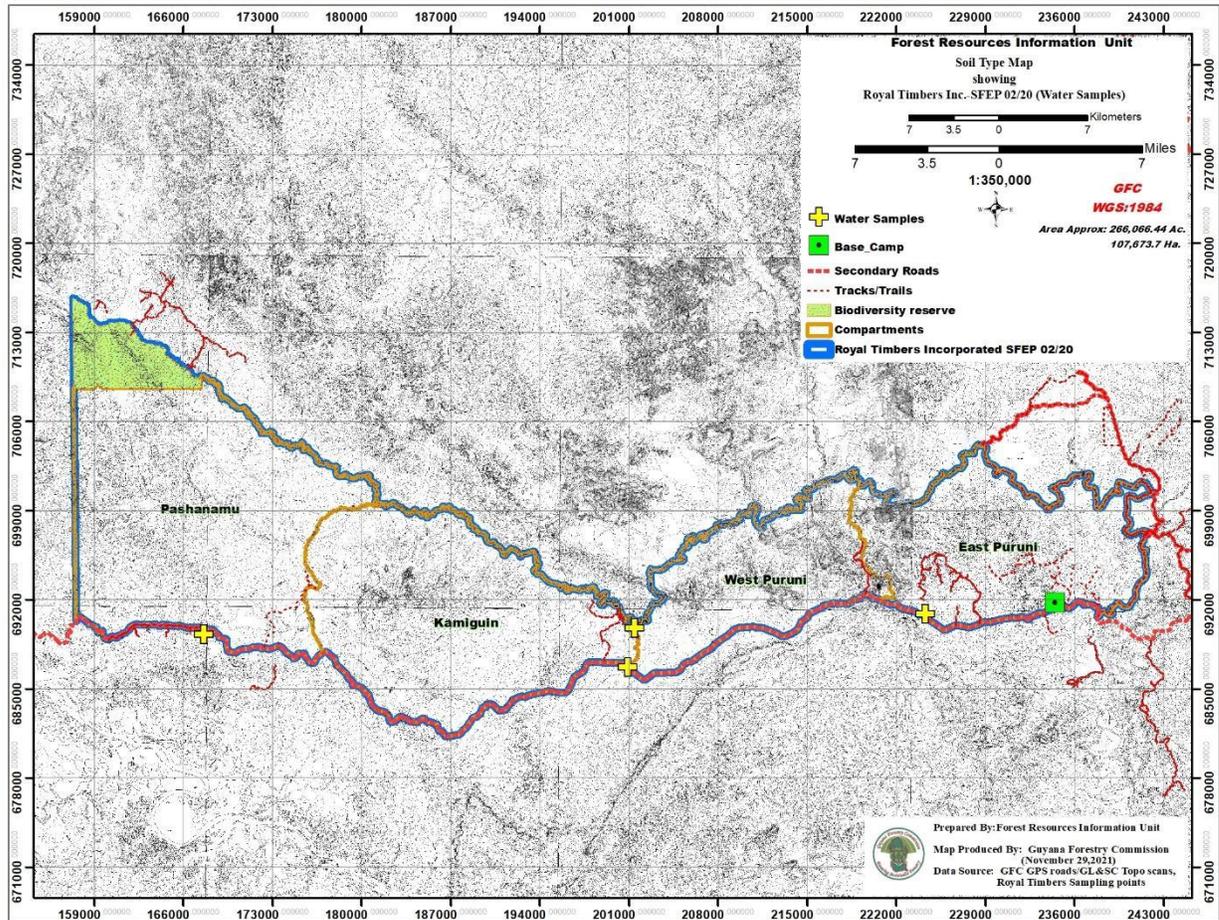


Figure 24: Map showing points where water samples were collected.

Table 23: GNBS Standards for Industrial Effluent Discharge

Point source discharge Limits for Industrial Effluent for Operations other than Mining, Forestry and Agriculture

Parameter and Maximum Allowable Limits (All values expressed as mg/L except pH, temperature and as otherwise noted)

Sector	pH	Temp.	BOD5	CO D	DO	TSS	N as NH3	Total N	P	CN (Tol.)	P04	C1	Surfactant	Phenols	Coliform	O & G	Other and/or Comments
Breweries	5.0-9.0	<40	<100 (t.v.<50)	<250		<100 (t.v.<50)	<50	N as NH3								10	
Cement bagging, manufacturing	5.0-9.0	<40			>4.0	50											WHO Standards for Industries Manufacturing Operations. Turbidity NTU: Max. dy: <150
Citrus processing plants	5.0-9.0	<40	<50	<250		<50	<50									<10	
Distilleries-(a) Blending halls and wineries	5.0-9.0	<40	<50			<50	<50										
Distilleries – (b) Fermentation/ Distillation units	5.0-9.0	<40	<500 (t.v. 100)														
Edible oils	5.0-9.0	<40	<50	<250		50	<10									<10	
Meat and seafood processing	5.0-9.0		<100 (t.v.<50)	<250		<100 (t.v.<50)	<50									<30 (t.v.<10)	
Metal finishers	5.0-9.0	<40				<100 as settle-				<0.5	<10						CD:2.0; Cr(tot):2.0; Hg: 1.0; Cu: 3.0; Pb: 0.1; Zn:3.0; Ni:3.0;

						able solids													Fe:5.0; Ba:10; Cr VI: 0.5
Milk based industries	5.0-9.0	<40	<100 (t.v.<50)	<250		<100 (t.v.<50)	<50											<30 (t.v.<10)	
Paint and ink manufacturing	5.0-9.0		<100			<100									<1.0			<30 (t.v.<10)	Cu:<3.0; PH:<1.0; Cr:<2.0; Cr VI: 0.5; Ni:<3.0; Zn: <3.0; Hg:<1.0
Pharmaceutical/chemical production	5.0-9.0			<150	>4.0									<0.2	<0.5			<10	Secondary parameters: No3: 40; SO4 2: 1000; Cl: 300; NH4 as N:1.0
Sector	pH	Temp	BOD5	COD	DO	TSS	N as NH3	Total N	P	CN (Tol.)	PO4	Cl	Surfactants	Phenols	Coliform	O & G	Other and/or Comments		
Petroleum bulk terminal	5.0-9.0	<40	<50	<250		<100												TPH: <40	Pb: 0.1, Cr GT 0.1, Cr (+A) 0.5
Printers and photo-processing establishments	5.0-9.0	<40	<30	<150		<50												<10	Ag:0.5; Cd:0.1; Cr VI: 0.1; Cr (tot): 0.5; Cu: 0.5; Zn: 2.0
Soft drinks plants	5.0-9.0	<40	<100 (t.v.<50)	<250		<100 (t.v.<50)	<50												
Breweries	5.0-9.0	<40	<100 (t.v.<50)	<250		<100 (t.v.<50)	<50	N as NH3									10		
Sugar factories	5.0-9.0	<40	<250 t.v.<100	<250	>40	<250 (t.v.<100)	<250 t.v.<100												
Textiles	5.0-9.0			<250	>40	<500 (t.v. 100)						300	<0.2 detergents	<0.5	400 MPN Per 100 mls	<10		Cr(tot): 0.5; Cu:0.5; Ni: 0.5; Zn: 2.0; Co: 0.5	

Thermal power	5.0-9.0	<40							5	<fr e e Cl: 0.5				<20	WB Stds for metals: Cr (tot): 0.2; Fe: 1.0; Zn: 1.0; Cu: 1.0; New units are to meet these stds. Old units will be phased out within 3 yrs. or pollution equipment will be installed. New WB stds available. No WB std for phosphate, limit taken from India and Lanka. Sir	
General environmental guidelines	5.0-9.0	<40	<50	<250		<50 as TS S	<10		<2	<1 Free: 0.1		<C I: 0.2	<0.5	<400 MPN per 100 mls	<10	WB Std: Fluorine: 20; No limits given for metals.

Table 24: US EPA Standards for Recreation, propagation and maintenance of a healthy, Well- balanced population of fish and wildlife.

(a) Florida USEPA standards for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife

Florida USEPA standards for Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife		
Parameter	Fresh	Marine
Phosphorous (mg/L)		≤ 0.1
pH	6.5-8.5	6.5
Faecal Coliform (CFU/100ml/day)	800	800
Dissolve Oxygen (mg/L)	< 5	<5

Table 25: World Bank Group International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines for Wastewater and Ambient Water Quality

Pollutants	Units	Guideline Value
pH	pH	6 - 9
BOD	mg/l	30
COD	mg/l	125
Total Nitrogen	mg/l	10
Total Phosphorus	mg/l	2
Oil and Grease	mg/l	10
Total Suspended Solids	mg/l	50
Total Coliform Bacteria	MPN / 100 ml	400

Table 26: European Union (EU) 1998 Water Standards

Pollutants	Units	Guideline Value
Electrical Conductivity	□ S/cm	2500

7.6 Results and Discussion

7.6.1 Overview

Four samples taken over a wide geographic area gives a fair assessment of the parameters of the surface water on the concession area. For the results of the surface water quality analysis conducted for RTI's forest concession (see Table 27), some of the parameters analysed were within the acceptable standards set out in Tables 23, 24, 25 and 26.

Table 27: Results of surface water quality analysis for RTI's SFEP 2/2020

Test Results														
Sample ID	Date	Location	Water Parameters/ Data Results											
			BOD mg/L	COD mg/L	DO mg/L	Oil & Grease mg/L	Temp °C	pH	Conductivity µS/cm 0-2000	Turbidity FAU	TSS mg/L	Total Nitrogen mg/L	Ammonia NH ₃ mg/L	Stream FLOW RATE m/s
QS1	11/09/2021	21N 0259454 UTM 0745809	3.57	32.3	6.0	0.12	26.8	8.41	59	67	63	39	1.9	0.001
QS2	11/09/2021	21N 0253184 UTM 0749012	3.50	46.7	5.5	0.12	26.8	7.70	39	76	62	37	1.6	0.005
QS3	11/09/2021	21N 0246963 UTM 0744471	3.23	27.1	3.5	0.12	26.5	6.82	45	85	45	41	2.4	0.007
QS4	11/09/2021	21N 0241182 UTM 0737351	3.05	22.8	7.2	0.14	26.8	6.64	68	782	39	26	4.4	0.006
QS5	11/09/2021	21N 0233792 UTM 0734672	3.16	12.7	13.1	0.10	27.3	6.75	40	58	49	46	1.7	0.003
QS6	14/09/2021	21N 0270333 UTM 0727099	3.24	10.4	6.6	0.08	34.3	6.61	36	37	15	88	2.8	0.356
RT1	15/09/2021	21N 0200937 UTM 0686723	3.01	7.6	5.3	0.08	25.4	6.51	35	52	9	27.2	0.5	0.24
RT2	15/09/2021	21N 0201468 UTM 0689778	3.08	8.9	4.5	0.25	26.2	6.31	30	26	40	31.0	2.2	0.052
RT3	15/09/2021	21N 0831823 UTM 0689629	3.17	11.3	10.5	0.15	26.7	6.30	36	16	10	Under range	0.8	0.056
RT4	17/09/2021	21N 0224302 UTM 0690918	2.98	18.8	6.91	0.06	25.0	6.20	68	74	10	6.2	1.2	0.007

3. Standards and Guidelines

Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.

Parameter	Guideline	Guideline Color Identification
Temperature (T)	<40 °C	Below Guideline Value
pH	6.0-9.0	
Total Suspended Solids (TSS)	<50 mg/L	Boundary Guideline Value
Chemical Oxygen Demand (COD)	<250 mg/L	
Biological Oxygen Demand (BOD)	<50 mg/L	
Ammonia (NH ₃)	< 5 mg/L	Above Guideline Value
Total Nitrogen (TN)	< 50 mg/L	
Oil and Grease	< 10 mg/L	

4. Test Methods

Biological Oxygen Demand (BOD): SMEWW 5210 B
 Chemical Oxygen Demand
 Oil & Grease: USEPA 1664
 Total Suspended Solid (TSS): Photometric
 Total Nitrogen: Persulfate Digestion Method
 Ammonia: Chromotropic Acid
 pH, Conductivity, Turbidity, Temperature, TDS: Optical Sensor

5. Comments and Recommendations

- No constraints during the survey.
- The values represent the current state of surface water quality of the effluents in compare with the Standards (Guidelines). Total Nitrogen for sample QS5 shows value of 46 mg/L close to boundary (guideline value of 50 mg/L), Total Nitrogen for sample QS6 shows value of 88 mg/L above boundary value (guideline value of 50 mg/L) and for the sample QS4 the lab result shows ammonia concentration of 4.4 mg/L close to guideline value of 5 mg/L. These values reflect in general excess of nitrogen within the Nitrogen cycle, the result may reflect with this values and excess of nutrients within the water body where the samples were taken. No indication of pollution were found due to anthropogenic activities.

7.6.2 Significance of values

- PH** - The pH analysis done for the surface water samples collected within and around RTI's concession in September ranged from 6.2 to 9.81, all outside the pH parameters for the limits (6.0 - 9.0 pH) GNBS Guidelines for Industrial effluent into the Environment as well as the US-EPA and World Bank Group IFC EHS Guidelines. However, the values obtained from the laboratory tests for the same samples were not only more uniform, ranging from 6.15 to 6.64, and were all within the GNBS guidelines (5-9) as well as the US EPA (6.5-8.5) and World Bank group IFC EHS Guidelines (6-9).
- Water Temperature**– The surface water temperature reading ranged from 25. to 26.7 °C during time of collection in the field. All values are within the GNBS accepted range of <40 °C, which is

considered healthy for living organisms.

- **Total Suspended Solids** - TSS results of the surface water samples collected were within a range of 9.00mg/l to 40mg/l.

Samples RT1, RT2, RT3 and RT4 yielded TSS values of 9.00, 40.00 10.00 and 10 mg/l respectively. Therefore four samples are within the GNBS range of <50m/l and under the World Bank group IFC EHS Guidelines of 50mg/l. The suspended particles may be related with organic matter decomposition and high content of sediment driven by the water flow.

- **COD (Chemical Oxygen Demand)** COD levels of the water samples ranged from 7.6mg/l to 18.8mg/l. and were all within the GNBS accepted range of <250 mg/l and the World Bank Group IFC EHS Guidelines of 125 mg/l.
- **Oil and Grease (OG)** - OG levels of the water samples ranged from 0.06 mg/l – 0.25 mg/l and were well above the GNBS and World Bank Group IFC EHS limits of <10 mg/l.
- **Turbidity**- The turbidity level of the water samples ranged from 16.0 to 74.0 ntu. Therefore, the turbidity levels of the water samples were all above the accepted 10 ntu GNBS standards, due to the soil being rich in organic matter-the normal forest conditions, as well as the particulate matter in streams near to mining operations. High turbidity levels were expected because of particulate matter that is usually prevalent in streams near mining operations. Turbidity generally increases with distance closer to the bank of a stream or flowing canal.
- **Electrical Conductivity**- Electrical Conductivity of the surface water samples within the RTI area ranged from 30 - 68 μ S /cm and were all within the European Union (EU) standards for drinking water i.e., 0 - 2500 \square S/cm. Most streams range between 50 to 1500 μ S/cm. Freshwater streams ideally should have electrical conductivity ranging from 150 - 500 μ S/cm to support aquatic life.
- **Total Nitrogen**- Total Nitrogen ranged from 6.2mg/l to 31.mg/l. Therefore all values were well below the World Bank Group IFC EHS Guidelines of 50 mg/l.
- **Nitrates**- Nitrate levels of surface water samples ranged from 0.50mg/l to 2.2mg/l and were all within the accepted range of 10 mg/l.

7.7 Impact prediction and assessment

7.7.1 Overview

Forests act as giant sponges, soaking up rainfall during wet seasons and slowly releasing it during times of drought. Forests provide natural filtration and storage systems that supply an estimated 75 percent of usable water globally. Tree roots and leaf litter create conditions that promote the infiltration of rainwater into the soil and then into the groundwater, providing supplies during dry periods.⁹⁹

Generally, within forest operations, most impacts on water resources are likely to emerge from three situations: soil erosion during earth works, soil compaction - due to road construction and skidding activity- that forces more surface flow of water rather than its infiltration after rainstorms and the (accidental) discharge of pollutants such as oil and grease on the forest floor.

⁹⁹ Center for Watershed Protection and US Forestry Service. Watershed Forestry Research Guide. 2008. <http://www.forestsforwatersheds.org/reduce-stormwater/>

7.7.2 Impacts from earthworks.

In forest conditions, surface runoff and soil erosion are generally low because of the surface litter cover. If the litter layer is disturbed, then runoff and erosion rates can increase by several magnitudes. A road network in forest lands provides easy access to forest resources for extraction, regeneration, protection and recreation activities. Erosion from forest roads and skid trails is a major concern in forest management due to the capability to cause adverse environmental effects. The planning and construction of forest harvesting roads is a major and expensive operation that is critical to the orderly flow of logs. In tropical environments, road development has to contend with difficult terrain and high and protracted rainfall.

Traditionally, logging roads have tended to use high-impact construction methods featuring wide clearing widths, major earthworks and relatively crude construction standards. The justification for such practices has commonly been on the basis of economic and operational needs. Poorly located, constructed or maintained roads are inefficient and can cause major soil and water hazards with serious and long-term social implications to affected communities, which may be distant from the site of the actual road.

In this regard, the GFC Code of practice for forest operation aimed at setting basic standards to reduce these adverse impacts whilst still meeting operational and other needs. RTI will endeavour at all times adhere to the CoP in every aspect of its operation.

Changes in the forest ecosystem is caused by interventions, such as earthworks. Earthworks include grubbing roadways-felling trees then bulldozing stumps, scarification of the soil surface to remove the root mat, cut and fills on sloping terrain, and compaction. Other impacts come from excavation works for side drains, culverts, bridges and borrow pits.

Timber harvest units represent the largest areas of anthropogenic disturbance and can increase erosion rates by one to five times relative to undisturbed areas. Roads contribute to sedimentation caused by erosion on cut and fill slopes, on the road surface and by stream diversion. Skid trails, like forest roads, can be sources of sedimentation of surface waters. Skid trails are used by conventional systems when rubber-tire skidders can cause rutting and puddling of soils.

The hydrological balance in watersheds depend on the nature of the vegetative cover and capacity of the soil to retain water. Watersheds provide a useful context for managing aquatic ecosystems. Rivers, lakes, wetlands, and ground water are sinks into which water and materials from the surrounding landscape drain. Thus, according to ter Steege et al (1996) the removal of trees during road construction disrupts both the interception of rainfall and the opportunity for plant debris on the soil surface to trap moisture; further grading soil removes root masses and soil fauna which are generally responsible for soil porosity. Ter Steege et al argue that in respect of changes to the hydrological balance, both interception and uptake are reduced to zero. Soil porosity is further reduced by compaction which in turn is due to deforestation.¹⁰⁰ On sloping terrain, soil particles not protected by leaf litter, may be eroded by rainfall (and even wind) and these particles may enter streams where they modify the physical and chemical properties of the water.

¹⁰⁰ Ter Steege, H., V.G. Jetten, M. Polak & M.J.A. Werger. 1993. Tropical rain forest types and soils of a watershed in Guyana.]. *Veg. Sci.* 4: 705-716.

7.7.3 Impacts from Skidding

Skid trails are used in ground skidding systems and are recognized as the source of erosion. Log extraction by skidders can lead to soil compaction, increase runoff, and cause deep rills and erosion. Anthropogenic sediment sources on forest hill slopes include roads, skid trails and timber harvest units. Forests' most significant contribution to water for all living things is in maintaining high water quality. They achieve this through minimizing soil erosion on site, thus reducing sediment in water bodies (wetlands, ponds and lakes, streams and rivers), and through trapping or filtering other water pollutants. The conversion of precipitation to groundwater and streamflow is reduced by the interception of forests and by evaporation from the tree canopy. It is reduced further through transpiration of soil moisture from foliage. It is confirmed that partial or complete removal of the tree cover increases the total amount of water in streams flowing from the catchment area. This is largely because of decreased evapotranspiration by trees, which act as deep-rooted "water pumps" (Hamilton and King, 1983; Bruijnzeel, 1990). Skidding is responsible for residual stand damage which impacts forest degradation, soil scouring and soil compaction and therefore the hydrological cycle; less skidding will lead to less compaction (ter Steege, Hans et al 1996) (van der Hout 1999).

7.7.4 Impacts from oil spills, other pollutants

In the use of heavy-duty machines in logging, it is possible to inadvertently spill oils, fuel, and grease. During logging, the accumulation of small spills during routine operations, may seriously contaminate soils and drainage water; all oils, especially diesel migrate quickly through the soil.

7.8 Mitigation and monitoring

RTI is committed to conserving water resources within the concession area, and conservation measures will be mentioned at every briefing session for field operators. The Forest Monitoring Officer will be tasked to provide briefing sessions to all employees to instil in them the need to think about conservation of the environment generally and the conservation of water resources.

The company plans five key initiatives to translate its concerns into action.

- a) **Adherence to the COP:** Guidelines of the COP will be followed to the letter: specifically, Sections 4.4.1-4.4.4 which refers to prescribed buffer zones along waterways; Section 5- 'Construction of road network, drainage structures, and water course crossings', Section 8- 'Operational Hygiene', and Section 9 'Camp Hygiene' will be followed to the letter. At no time whatsoever will vehicles be washed in natural waterways.
- b) **Planning versus weather sensitive events:** All earthworks and skidding operations will be planned with great care to reduce the deployment of machines. Road construction and road maintenance works will be avoided during the rainy season.
- c) **Side drains:** RTI will take measures to avoid water running from roadside drains directly into streams; the storm water will be channeled to pits ('dead sumps') at roadside to allow the storm water to infiltrate into the soil rather than flow over land. Another option is to lead the run-off to masses of vegetation, leaf litter or rocks which would help filter out the sediment.
- d) **Permanent Monitoring Stations:** Initial plans targeted sites close to the mouth of the main rivers. However, now that the company has been able to assess water levels in the rainy season, RTI will identify inland points on streams. Water samples will be taken quarterly, guaranteeing samples during dry spells and also during the rainy season.

- e) **Extension works with other land-users (miners):** RTI will encourage the mining community to respect its earth work practices and to follow its own practices as far as practicable. RTI will post advisory signs within selected buffer zones targeting its own operatives, as well as miners.

8.1 SOILS, LAND & GEOLOGY

8.2 Overview

Forests and forest soils play a broad, complex and interactive role within the environment. Soils have provided the foundation for trees and entire forests over millions of years. Soil is an important component of forest and woodland ecosystems as it helps regulate important ecosystem processes, such as nutrient uptake, decomposition, and water availability. Soils provide trees with anchorage, water and nutrients. In turn, trees as well as other plants and vegetation, are an important factor in the creation of new soil as leaves and other vegetation rot and decompose.

The aim of sustainable forest management (SFM) is to ensure that forests supply goods and services to meet both present-day and future needs and contribute to the sustainable development of communities. The prevailing geological patterns and soil types influence forest species composition. Thus, the prevailing geology, soil type and landform are critical considerations in planning logging activities.¹⁰¹ Variations in forest formations are linked to geology which manifests itself in various ways relating to topography and to the chemical and physical properties of the soil.¹⁰²

The role of soil biodiversity in addressing global climate change cannot be understated: the soil community's activities can contribute either to the emission of greenhouse gases or to absorbing carbon into soils from the atmosphere. As part of the natural functions and ecosystem services provided by soils, a healthy soil stores more carbon than that stored in the atmosphere and vegetation combined. Soils are a key reservoir of global biodiversity which ranges from microorganisms to flora and fauna. This biodiversity has a fundamental role in supporting soil functions and therefore ecosystems goods and services associated with soil. Therefore it is necessary to safeguard soil biodiversity to safeguard these functions' (FAO, 2020).

The earthworks necessary to construct forest roads for timber harvesting operations coupled with log skidding operations produce considerable impacts on soil, perhaps the major impact being soil compaction. Soil compaction decreases the volume of macropores and consequently alters soil structure, penetration resistance, soil pore distribution and bulk density.¹⁰³ John Hendrison on researching problems with soil compaction on a logging concession in Suriname, reported that after four passes of a skidder on a particular parcel of soil, its bulk density changed from 1.25 g m⁻³ to 1.60

¹⁰¹ <http://www.mekonginfo.org/assets/midocs/0001776-environment-sustainable-forest-management-a-review-of-conventional-wisdom.pdf>

¹⁰² <https://www.fao.org/soils-2015/news/news-detail/en/c/285569/>

¹⁰³ <https://www.fao.org/3/cb1929en/cb1929en.pdf>

g m⁻³ (ter Steege, Hans et al 1996). Soil microbial activity and biomass are affected by soil compaction: for example, changes in soil bulk density due to compaction affect the burrowing action of macrofauna such as earthworms (FAO, 2020).

Soil conservation practices inform many of the prescriptions in GFC's COP: for example, Section 5.4 Road Construction and Section 9.3 Water ponding. Similarly measures such as those prescribed in Section 8.0: 'Operational Hygiene' of the GFFO, speak to the conservation of water resources through proper soil protection and soil conservation practices.

8.2 Definitions and scope

Soil may be defined as a natural terrestrial surface layer containing living matter and supporting or capable of supporting plants; and Geology refers to 'the science of the solid earth, including the earth's origin and history, materials comprising the earth, and the processes acting within the earth and upon its surface'.¹⁰⁴

Soil type and hydrology are major determinants of forest composition.¹⁰⁵ Soil types and their respective properties are generally based on the mineral composition of the original parent material, water table dynamics, acid chemistry, biological action and the extent of weathering.¹⁰⁶ Land form or terrain influences vegetation type to the extent that several kinds of mixed forests are available.

8.3 Baseline information

Concession soils are generally weathered and relatively low in nutrients and organic matter. Usually, these soils are moderate to low in permeability. The dominant soil type Kanhapludults (< 85 per cent) divided into approximately equal sections of the corresponding subsoil classes Hapludoxs / Dystrochrepts and Dystrochrepts / Endoaquults. Typically, the latter type may hold water close to the surface most of the year. (See Table 28).

The national land use plan of Guyana 2013 and Food and Agriculture soil Map of North British Guyana (1964) have shown similarities in the description and topography of the soils found with RTI forest concession.

The Southern side of the concession comprises of soils that originated from sedimentary loam and red clay. However, some parts along the Kartabu – Puruni Road consist of sandy loam and gravelly soils. This type is found widely and plenty over the units' hillsides and the hilltops where there is no white sand. Commonly, this deep loamy soil is intermediate in texture between the heavy clay of mixed forest and brown sand and gravelly soil of the Greenheart association.

The soil is strongly acidic, includes a small amount of organic material and is a yellow - brown color, not suitable for agricultural purposes. This form is likely to occupy the optimal forest habitat, as shown by the lack of a single dominant species. The soil is quite black on the forest floor and muddy, but not

¹⁰⁴ Strahler, Alan & Strahler, Arthur. 1997. Physical geography. Science and Systems of the Human Environment. John Wiley & Sons Inc. New York, USA. 640pp.

¹⁰⁵ Ter Steege, Hans et al. 1996. Ecology and Logging in a tropical Rain Forest in Guyana, with recommendations for improvement. Tropenbos Series 14. The Tropenbos Foundation, Wageningen, the Netherlands. 123pp

¹⁰⁶ Hammond, David. 2005. Tropical Forests of the Guiana Shield, Ancient Forests in a Modern World. CABI Publishing. UK. 528pp.

as dark and damp as the vegetation of Mora and Morabukea. Liana flora is present in some places in all compartments, suggesting a certain amount of disturbance the understory structure of the forest is occupied by seedlings. However, no Greenheart has been detected or reported in compartment 3&4. Similar observations were made by the previous owners of the concession. However, the two compartments consist of Wamaradan, a prime commercial species in Guyana, and also found in the Iwokrama Forest Reserve.

#	Soil Description	Area (hectares)	%	Key properties	Management implications
1	Dystrochrepts, Endoaquults	48,052	44.8	Coarse textured, strongly leached soils; relatively low in nutrients, either without any distinctive properties; low in permeability, subsurface horizons with strong reddish or yellowish colours; in some cases, water lies near the surface for much of the year	Soils suitable for land fills
2	Dystrochrepts, Kanhaplustults	10,301	9.6	Coarse textured soils, strongly leached soils, low native fertility, acidic, high clay content	Not suitable for road construction
3	Hapudoxs, Dystrochrepts	45,055	42.0	Highly weathered soils, low native fertility, rich in iron and aluminum oxides, moderate permeability, without distinctive subsurface properties	Moderate use for road fills
4	Ustorthents, Kanhaplustults	3,928	3.7	Medium textured soils, retains water in superficial layers, fairly moderate in nutrient level	Not suitable for road construction
		107,334			

Table 28: Soil types within RTI's Concession area.

8.4 Methodology

Four (4) Samples of soil and measurement of moisture content were taken and analysed within the Royal Timbers Inc. Logging Concession by Environmental Engineering Solutions (EES) during September 11-17, 2021. Soil samples were taken based on the changes in vegetation observed while in the Concession (see Table 29, Figure 16).

Table 29: Results of soil analysis conducted at RTI's forest concession

3. Measurements (Data)							
<i>Initial Soil Type Classification</i>							
SOIL Description							
Sample ID	Collection Date	Location	Moisture Content %	Texture	Consistence	Colour	Picture of soil samples collected within logging concession
RT1	15/09/2021	21N 0200937 UTM 0686723	42.3	Loamy/Sandy	Loose/Weak	Red: presence of iron oxides	

RT2	15/09/2021	21N 0201468 UTM 0689778	68.5	Clayey/Organic material	Friable/firm	Dark brown/Red: organic soil	
RT3	15/09/2021	20N 0831823 UTM 0689629	84.3	Clayey/Organic material	Soft/loose	Red: presence of iron oxides	
RT4	17/09/2021	21N 0224302 UTM 0690918	71.3	Clayey/Organic material	Friable/firm	Dark brown/Red: organic soil	

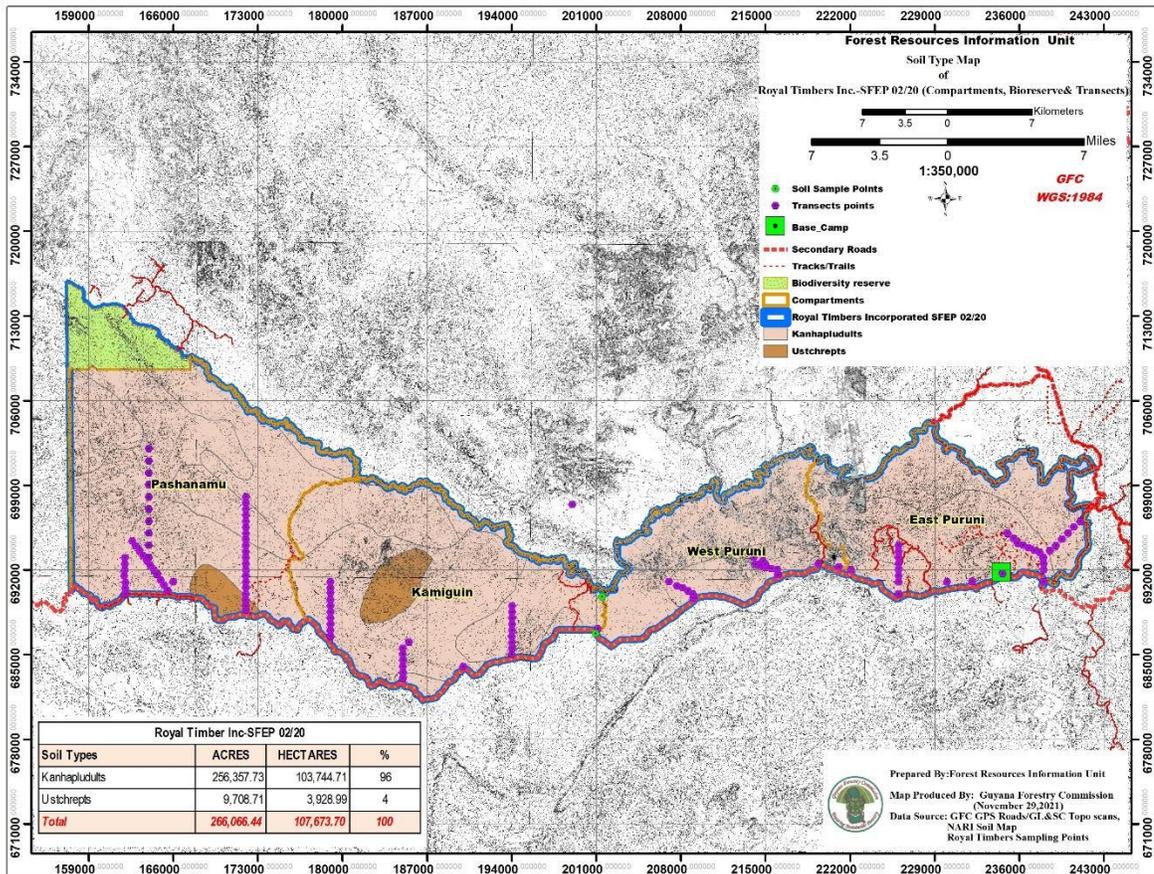


Figure 25: Soil Sample Points within RTI Forest Concession

8.5 Results

Of the four (4) soil samples taken within the RTI forest concession, the general soil type was found to be predominantly clay composed of organic materials and sandy loam. The colour of the soils ranged from light/dark brown to brown, either showing some indication of light weathering or oxidation. This

is considered common for sandy and clay soils or soils rich in humus.

8.6 Impact Statement and Assessment

Ground-based logging operation is potentially one of the major soil-disturbing activities that cause soil displacement, rutting depth and soil compaction.¹⁰⁷ Forest harvesting operations have high potentials for soil disturbances since heavy forestry machines cause soil compaction due to exerted normal pressure, shear stress and vibrations. Further, physical damage and erosion hazards are very intense where major earth movement occurs such as cuttings on slopes.¹⁰⁸ Thus, logging operations should be carefully planned considering the factors that influence soil disturbance.¹⁰⁹ Therefore, RTI will endeavour to be careful because of the nature of the terrain and the soil. RTI also foresees a major challenge is expected to come from managing ex-mining sites deemed worthy of rehabilitation.

8.7 Mitigation measures

RTI's forest monitoring officer will be responsible for all matters relating to soil conservation and management, including water and waterways. The company will seek technical inputs from qualified consultants and experts to collect and interpret soil quality data.

Other specific actions to be implemented are as follows:

- a.** All interventions that will impact the soil will be done in a manner so that heavy-duty machines will impact the minimal distance possible and for the minimal time possible. As such, no interventions will be planned during the rainy season.
- b.** RTI will endeavor to implement all elements of Section 5 of the COP.
- c.** RTI will hold quarterly briefings with employees to ensure that protocols and guidelines for road use and waste management are followed at all times.
- d.** Finally, soil and water samples will simultaneously be collected, tested and analysed at the permanent monitoring stations.

¹⁰⁷ Akay AE, A Yuksel, M Reis, A Tutus. 2007. The impacts of ground-based logging equipment on forest soil. Polish Journal of Environmental Studies 16 3): 371-376.

¹⁰⁸ Richards, P.W. 1998. The Tropical rain forest, an ecological study. 2nd Ed. Cambridge University Press, UK. 575pp.

¹⁰⁹ Ampoorter E, R Goris, WM Cornelis, K Verheyen. 2007. Impact of mechanized logging on compaction status of sandy forest soils. Forest Ecology and Management 241: 162-174

9.1 AIR QUALITY

9.2 Introduction-Air quality

Air pollution is defined as the presence of toxic chemicals or compounds (including those of biological origin) in the air, at levels that pose a health risk.¹¹⁰ Therefore, in the pursuit of its general logging operations it is expected that RTI's vehicles will be emitting exhaust fumes and creating dust clouds while traversing roads within and beyond the concession area. Thus, air quality is a major concern for RTI as it addresses potential air pollution hazards confronted by its employees and other persons and fauna in the vicinity of its operations.

9.3 Definition and scope

Air pollution is defined as the contamination of atmosphere by gas-phase and particulate phase that results in adverse or undesirable environmental effects.¹¹¹ The term 'air pollution' covers all air contaminated by substances, whatever their physical state, which are harmful to health or otherwise dangerous.¹¹²

According to the Encyclopedia Britannica, air pollution may be divided into natural air pollution and

¹¹⁰ <https://www.britannica.com/science/air-pollution>

¹¹¹ *ibid*

¹¹² <https://www.ilo.org/legacy/english/lib/century/sources/sources1977.htm>

anthropogenic air pollution.¹¹³ Natural air pollution may arise from wild fires, plant and animal decomposition, pollen and spores and even soil erosion. Anthropogenic air pollution arise from human activity such as burning wood, gaseous pollutants from internal combustion engines and waste disposal, and noise.¹¹⁴

Particulate Matter (PM) – are particles suspended in air, also called aerosols, that are capable of entering and being deposited in the human respiratory system, and chronic studies have shown that long term exposure to particulate matter is associated with various cardiac and pulmonary health effects.¹¹⁵ **Smaller aerosols travel farther into the respiratory system and generally cause more health effects than larger particles: for this reason, the US EPA has divided airborne particles into two size particles, PM10 which refers to particles $\leq 2.5\mu\text{m}$.**¹¹⁶

Total Suspended Particulates (TSP) - This refers to all particles in the atmosphere that are less than 100 micrometres per cubic meter. The amount of PM10 and PM2.5 are related to the amount of total suspended particulates (TSP) in the air.¹¹⁷ Particulate Matter guidelines and standards are instituted (Table 4) due to short term and long- term health effects including premature mortality, chronic respiratory disease, acute respiratory systems, decreased lung functions and aggravated asthma, persistent cough, phlegm, wheezing and physical discomfort.¹¹⁸ These health effects are especially associated with PM10 and PM2.5. The PM10 fraction from TSP can reach the lower regions of the respiratory tract. On the other hand, PM2.5 can absorb more toxic and carcinogenic compounds than larger particles and penetrate more easily deep into the lungs. Additionally, there is increased harm to the environment as PM is a major source of haze that reduces visibility, causes changes to nutrient and chemical balance of the soil and aquatic environment, erosions and staining of structures.¹¹⁹

9.4 Air Quality Standards/Guidelines

The purpose of the ambient air quality standards are to establish maximum limits on parameters of air quality considered desirable for the preservation and enhancement of the quality of air resources and health.¹²⁰ Air quality standards are set by each country to protect the public health of their citizens and as such are an important component of national risk management and environmental policies. National standards will vary according to the approach adopted for balancing health risks, technological feasibility, economic considerations and various other political and social factors, which in turn will depend on, among other things, the level of development and national capability in air quality management.¹²¹

¹¹³ <https://www.britannica.com/science/air-pollution>

¹¹⁴ Godish, T. (2003). Air Quality. 4th Edition. Lewis Publishers. INC.

¹¹⁵ *ibid*

¹¹⁶ Artiola, J. F., I. L. Pepper & M.L. Brusseau (2004). Environmental Monitoring and Characterization. Elsevier Inc.

¹¹⁷ Patnaik, P. (2010). Handbook of Environmental Analysis: Chemical Pollutants in Air, Water, Soil .2nd edition. CRC press, New York.

¹¹⁸ Alias, M., Hamzah, Z. & Kenn. T. (2007). Total suspended particulates (TSP) Measurements in various Power Stations. The Malaysian Journal of Analytical Sciences, 11(1): 255-261.

¹¹⁹ *ibid*

¹²⁰ <https://www.mecknc.gov/LUESA/SOER2012/Pages/HHW.aspx>

¹²¹ https://www.who.int/whr/2006/whr06_en.pdf

The measured parameters recorded are some of the key indicators generally used to determine air quality. These parameters of primary focus for this assessment are mainly that of Total Suspended Particulate (TSP), Particulate Matter (PM2.5 and PM10), Formaldehyde (HCHO) and Total Volatile Organic Compounds (TVOC). High occurrences and changes in these parameters will aid in providing a good indication or assessment of possible air pollution that can affect the atmosphere and human health. Consequently, the parameter measurements recorded were assessed in comparison with the USA National Ambient Air Quality Standards (NAAQS) (Table 28), the World Health Organization and EAS Inc. Indoor Air Quality Guidelines (Table 29).¹²²

Air quality data in Guyana is extremely limited given the constraints relating to the unavailability of equipment and cost associated with this type of data collection. There was no historical air quality data for RTI SFEP 2/2020.

9.5 Methodology/Monitoring Procedure

The measurements of air quality were taken around and within the concessions boundaries to investigate the environmental baseline conditions (see Figure 26 below). The test results represent the initial environmental examination related to Air Quality. The test results are show in Table 32 below.

The results were then compared to the United States Environmental Protection Agency (USEPA) 1971 National Ambient Air Quality Standards (NAAQS) for Particulate Matter, as a current TSP limit permissible utilized (See Table 30). Quality assurance and quality control (QA/QC) was practiced, as well as routine parts of the air quality monitoring during the calibration, operation, and maintenance of the monitoring equipment.

The Air was measure to have an initial environmental examination of the weather conditions and the Air Quality in the areas of assessment. The data presented in during this survey reflect the quality of the air present conditions. No Total Suspended Particulates (TSP), PM2.5 and PM10 results were above guidelines values. Noise values were below 90 dB according to Guyana national Bureau Standards (GNBS, 2002). The data assessment reflects an overall good quality of Air at Royal Timbers Inc.

¹²² https://parliament.gov.gy/documents/documents-laid/5473-annual_report_of_the_enivornmental_protection_agency_2013.pdf

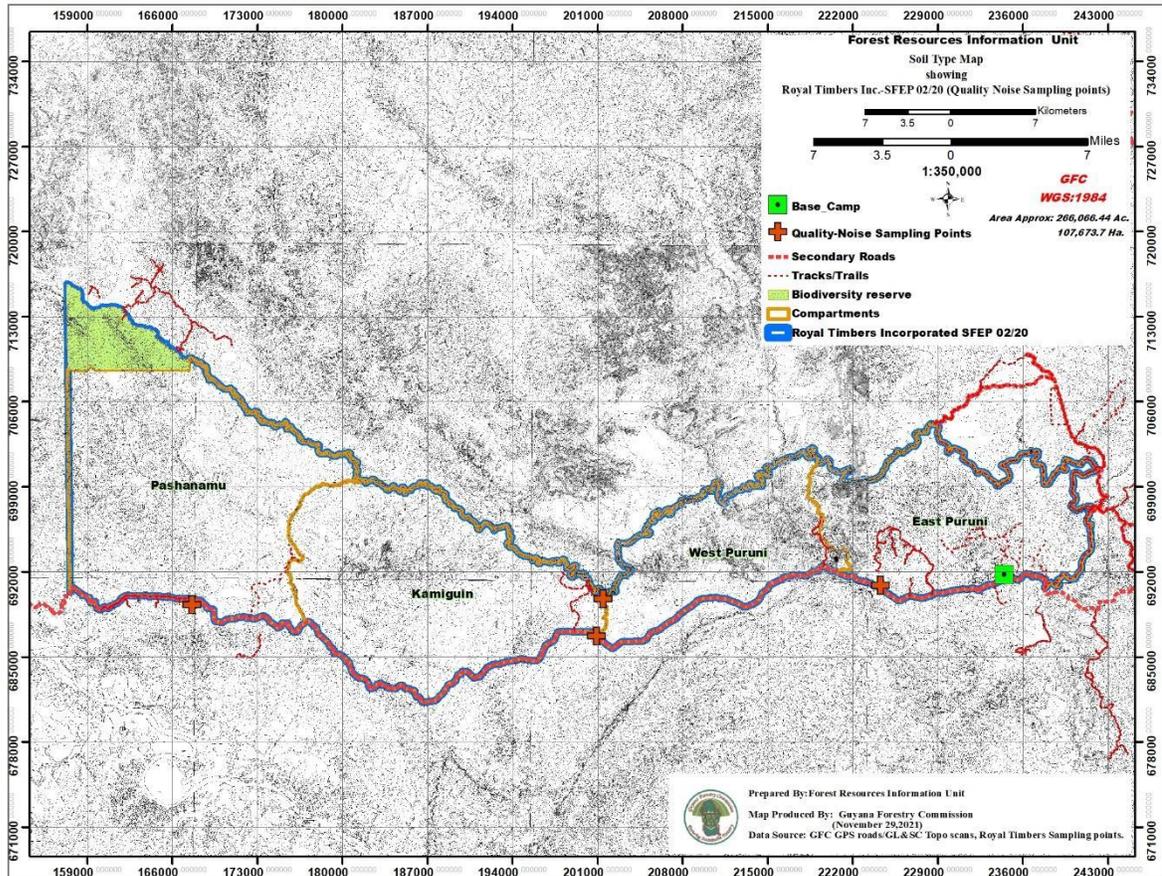
Table 30: National ambient air quality standards (US EPA, 2016).

Parameter	Type	Averaging Time	Level	Form
PM _{2.5}	Primary	Annual	12.0 µg/m ³	Annual arithmetic mean, averaged over 3 years.
	Secondary	Annual	15.0 µg/m ³	Annual arithmetic mean, averaged over 3 years.
	Primary and Secondary	24-hour	35 µg/m ³	98 th percentile, averaged over 3 years.
PM ₁₀	Primary and Secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year on average over a 3-year period.
Total Suspended Particles (TSP)	Primary	24-hour	260 µg/m ³	Not to be exceeded more than once per year.
		Annual	75 µg/m ³	Annual geometric mean.
	Secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year.
		Annual	60 µg/m ³	Annual geometric mean.

Table 31: Indoor air guidelines for TVOC and HCHO (EAS Inc., 2015; WHO, 2010).

Parameter	Guideline		Notes
TVOC	0.3 mg/m ³	300 µg/m ³	Low Level of Concern
	0.5 mg/m ³	500 µg/m ³	Acceptable Level
HCHO	0.1 mg/m ³	100 µg/m ³	Short-term (30 min)

Figure 26: Air Quality Sample Locations –RTI’s Concession



9.6 Results and Discussion

9.6.1 Overview

The Tables 32 shows the results of Total Suspended Particulates (TSP) concentration, taken within and around SFEP 2/2020. The samples were collected and analysed by Environmental Engineering Solutions (EES). In addition, values for the Average Concentration, Time Weighted Average (TWA) and Maximum Concentration of the air quality during the monitoring period are presented.

Table 32: Results of Air Quality and TSP Measurement within and around the RTI's Forest Concession

3. Measurements (Data)																	
Air Quality and Total Suspended Particulate (TSP) $\mu\text{g}/\text{m}^3$																	
Sample ID	Collection Date	Coordinates UTM		Time		Data RAM mg/m^3			TEMPO		HCHO	TVOC	Direction	Speed (m/s)	Noise dB Low	Temp. Celsius	Elev. meter
				Start	%RH	TWA	Max.	Ave.	PM2.5	PM10							
RT1	15/09/2021	21N 0200937	0686723	9:54	50.3	0.02	0.03	0.01	7.0	9.8	0.000	0.764	Nil	-	46.2	38.0	98
RT2	15/09/2021	21N 0201468	0689778	11:50	53.6	0.02	0.04	0.01	8.6	12.0	0.000	0.096	SW	0.9	47.3	33.6	90
RT3	15/09/2021	20N 0831823	0689629	15:10	35.8	0.01	0.03	0.00	14.1	19.7	0.000	0.773	Nil	-	42.2	42.2	111
RT4	15/09/2021	21N 0224302	0690918	10:55	72.1	0.02	0.05	0.01	17.1	25.3	0.000	0.193	Nil	-	44.9	28.9	86

4. Standards and Guidelines						
Parameter	Type	Averaging Time	Level	Form	References/ Colour Code Results	
PM _{2.5}	Primary	Annual	12.0 $\mu\text{g}/\text{m}^3$	Annual arithmetic mean, averaged over 3 years.	USA EPA, 2016	
PM ₁₀	Secondary	Annual	15.0 $\mu\text{g}/\text{m}^3$	Annual arithmetic mean, averaged over 3 years.	GNBS, 2002	
	Primary and Secondary	24-hour	35 $\mu\text{g}/\text{m}^3$	98 th percentile, averaged over 3 years.	Below Guideline Value	
Total Suspended Particles (TSP)	Primary and Secondary	24-hour	150 $\mu\text{g}/\text{m}^3$	Not to be exceeded more than once per year on average over a 3-year period.	Boundary Guideline Value	
	Secondary	24-hour	260 $\mu\text{g}/\text{m}^3$	Not to be exceeded more than once per year.		
Annual		75 $\mu\text{g}/\text{m}^3$	Annual geometric mean.			
Annual		60 $\mu\text{g}/\text{m}^3$	Annual geometric mean.			
Noise	Categories		Daytime Limits in dB (06:00 – 18:00h)		Night time Limits in dB (18:00 – 06:00h)	
	Industrial		100		80	Above Guideline Value
	Construction		90		75	

5. Comments and Recommendations
The Air was measure to have an initial environmental examination of the weather conditions and the Air Quality in the areas of assessment. The data presented in during this survey reflect the quality of the air present conditions. No Total Suspended Particulates (TSP), PM _{2.5} and PM ₁₀ results were above guidelines values. Noise values were below 90 dB according to Guyana national Bureau Standards (GNBS, 2002). The data assessment reflects an overall good quality of Air at Royal Timbers Inc.

9.6.2 Total Suspended Particles

Monitoring showed the TSP levels of TWA and Maximum Concentration (Max. Conc.). TWA of the monitored area ranged from 0.01 to 0.02 $\mu\text{g}/\text{m}^3$, while maximum concentration ranged from 0.03 to 0.05 $\mu\text{g}/\text{m}^3$ respectively, during the monitoring period. The values recorded were all below the TSP Air Quality Standard during the monitoring period. It should also be noted that not all of TSP consist of particulate matter harmful to human health then an analysis of PM_{2.5} and PM₁₀ will describe the air quality and the risk during working conditions.

9.6.3 PM_{2.5} and PM₁₀

The material particulate in the air with a nominal diameter of 10 micrometres (PM₁₀) and a nominal diameter of 2.5 micrometres (PM_{2.5}) were monitored during the survey exercise (See Tables 20). The range values are from 7.0 to 17.1 $\mu\text{g}/\text{m}^3$ in comparison with the standard of 24

hours exposure that is 150 µg/m³. The study indicate that the air is safe and healthy for life within the concession. PM10 density can be higher in comparison with PM2.5 this make them safer to the environment because are more likely to settle to the ground in less time, avoiding or reducing the exposure time.

9.6.4 Formaldehyde (HCHO)

The concentration of the HCHO hydrocarbon at the sample points were below the WHO Guidelines of 100 µg/m³ short-term. Formaldehyde is also released to the environment because of natural processes, such as forest fires and natural decomposition of vegetation.

9.6.5 Total Volatile Organic Compounds (TVOC)

Concentration of TVOC at the sample points ranged from 0.96 µg/m³ to 0.773 µg/m³, during the monitoring period. Based on the results obtained, it was observed that TVOC readings were below the Guideline of 300 µg/m³ which is the ideal target for a low level of human health impact.

Generally, in intact forests or monitoring in forest concession before the logging operations, the VOCs come from three main sources, these source indicators by source type are anthropogenic, biogenic, or natural forest wildfire. The anthropogenic activity is low, no forest wild fires were found during the survey, then the data obtained for VOCs came from biogenic source type, meaning produced or brought about by living organisms that populate the forest system.

9.6.6 Noise

Noise pollution is the regular exposure to elevated sound levels that can possibly lead to adverse effects in humans or other living organisms.¹²³ As such, the intensity of the sound generated by various activities is of key concern to health. Prolonged exposure to sounds louder than 80dB is considered hazardous to hearing.¹²⁴ Therefore, as human hearing is only receptive to certain sound levels, an A- weighting noise assessment would provide data on existing noise levels.¹²⁵

Measurement Site: The measurement site must be located at least 3.5m from an acoustically reflective surface other than the ground. If conditions limit the available measurement location to positions within 3.5m of such a surface then the measurement location should be positioned 1 meter from the surface.

Calibration: Collection of data and calibration protocols respectively were conducted according to the Instruction Manual. Calibration exercises are recommended at least once per year. The calibration of a sound level meter is checked at about 94dB (A) using a 100oHz acoustic calibrator. Any variation from the calibration method should be noted. Environmental noise levels are often significantly lower than 94 dB (A).

Noise Level readings: The meter must be set to fast time response and A-weighted frequency response. The results are read directly from the meter's display screen. All measurements should be accompanied by a written record of the measurement conditions.

¹²³ <https://www.environmentalpollutioncenters.org/?a=1&y=2017>

¹²⁴ Hill, M. K. (1997). *Understanding Environmental Pollution*. Cambridge University Press, Cambridge.

¹²⁵ Harrison, R. M. (1996). *Pollution, Causes, Effects and Control*. 3rd Edition. The Royal Society of Chemistry, Thomas Graham House, Science Park, Cambridge.

Time measurements. The time of day of any measurement must be noted to an accuracy of ± 5 minutes. The duration of any measurement periods for statistical and/or integration measurements must be measured and noted to an accuracy of $\pm 5\%$ of the duration.

The noise levels founded during the survey have the range of 42.2 dB to a maximum of 47.3 dB for industrial activities (80 dB night-time and 100 dB daytime) the limits are between the ranges for safety operations.

9.7 Mitigation measures

9.7.1 Overview

The responsibility for responsible for mitigation measures targeting air quality and its elements will be assigned to RTI forest monitoring officer. RTI is committed to taking whatever measures are feasible to ensure that air quality remains at tolerable levels, and always within the established ranges.

9.7.2 Concession area

The forest monitoring officer will be responsible for air quality management including addressing complaints from stakeholders and for preparing reports in this regard to the EPA and GFC. Technical inputs will be sought from technical experts and consultants to take and interpret air quality data. At the concession level, dust may not be much of a problem because trucks will make one trip per day and will not travel more than 50km/hr. Every effort will be made to maintain vehicles in a fully functional state so that exhaust emissions are within the projected parameters for the machine.

9.7.3 Permanent Monitoring Stations

Air quality will be monitored initially at the permanent monitoring stations to be implemented by RTI while water quality and soil quality parameters are taken.

9.7.4 The Kartabu-Puruni Road (KPR)

On the KPR, the following measures will apply (see also Table 33):

- a) Trucks will always travel at speeds < 65 km/hr. by day only and will always be using rotating orange beacons on the top of the cab or travel with its main headlights in the ‘on’ position.
- b) Trucks will always slow down to 25 km/hr. near communities, camps or other human dwelling, unless there are humps on the road, in which case when trucks will come to a stop before crossing the humps.

Table 33: Summary of mitigation measures for air quality monitoring, SFEP 2/2020

ACTIVITY	PARTY RESPONSIBLE	FREQUENCY OF MONITORING	LOCATION
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Data Collection at Permanent Monitoring Stations	RTI	Quarterly	PMS
Ensure all vehicles are in a fully functional state	RTI	Quarterly	RTI B/Camp
Engagement with the mining community, other stakeholders	RTI	Quarterly	KPR
Requirements <ul style="list-style-type: none"> ● Transportation (ATV) ● GPS Device ● Thermo pDR-1000AN personalDataRAMTM Particulate Monitor ● Laboratory Services 			
BUDGET G\$2,500,000.00 per annum (including costs for laboratory analysis)			

10.1 CLIMATE AND CLIMATE CHANGE

10.2 Overview-definitions, concepts

Climate may be defined as ‘the long-term pattern of weather conditions prevailing in an area in general or over a long period.’¹²⁶ More rigorously, it is the mean and variability of meteorological variables over a time spanning from months to millions of years. Some of the meteorological variables that are commonly measured are temperature, humidity, atmospheric pressure, wind, and precipitation. In a broader sense, climate is the state of the components of the climate system, which includes the ocean, land, and ice on Earth. The climate of a location is affected by its latitude/longitude, terrain, and altitude, as well as nearby water bodies and their currents.

Climates can be classified according to the average and the typical ranges of different variables, most commonly temperature and precipitation. The most commonly used classification scheme was the Köppen climate classification. The Thornthwaite system, in use since 1948, incorporates evapotranspiration along with temperature and precipitation information and is used in studying biological diversity and how climate change affects it. The Bergeron and Spatial Synoptic Classification systems focus on the origin of air masses that define the climate of a region.¹²⁷

Basics of Climate Change. Climate change is the variation in global or regional climates over time. It reflects changes in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. These changes can be caused by processes internal to the Earth, external forces (e.g. variations in sunlight intensity) or, more recently, human activities. In recent usage, especially in the context of environmental policy, the term "climate change" often refers only to changes in modern climate, including the rise in average surface temperature known as global warming. In some cases, the term is also used with a presumption of human causation, as in the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC uses "climate variability" for non-human caused variations.¹²⁸

A frequently mentioned feature of climate change is global warming – a sustained increase in the Earth’s average surface temperature, which is predicted to continue rising during the 21st century. However, climate change has other important features, including changes in ocean currents, sea surface temperature, wind strength and direction, and the distribution and extent of rainfall.¹²⁹

"Adverse effects of climate change" means changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare.

"Climate system" means the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions.

"Emissions" means the release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time.

¹²⁶ https://gml.noaa.gov/education/info_activities/pdfs/TBI_what_is_climate.pdf

¹²⁷ <https://www.climateurope.eu/what-is-climate-and-climate-change/>

¹²⁸ https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf

¹²⁹ <https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/>

"Greenhouse gases" means those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation.

"Regional economic integration organization" means an organization constituted by sovereign States of a given region which has competence in respect of matters governed by this Convention or its protocols and has been duly authorized, in accordance with its internal procedures, to sign, ratify, accept, approve or accede to the instruments concerned.

"Reservoir" means a component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is stored.

"Sink" means any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.

"Source" means any process or activity which releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas into the atmosphere.

Forests play a critical role in the Earth's climate system, in a number of different ways. Most importantly for global climate change, they capture carbon dioxide from the atmosphere and convert it, through photosynthesis, into living biomass: tree trunks, roots, branches and leaves. Forests also store carbon in forest soils, absorbed through leaf litter, woody debris and roots; whether these inputs are sequestered in the soil matrix or biodegraded and returned to the atmosphere as carbon dioxide, and if so at what rate, depends on complex interactions involving soil minerals, plants and soil organisms, and organic components, all influenced by factors such as local climatic conditions and forest management.¹³⁰

10.3 Introduction-Guyana's climate

Guyana lies on the north-eastern part of South America, between 56°20'W and 61°23'W and 1°10'N and 8°35'N. The climate of Guyana is strongly influenced by the movement of the Intertropical Convergence Zone, and therefore most climatic variables show a bi modality through the year; there are two wet and two dry seasons per year.¹³¹

On the coastal plain there is precipitation for 200 days per year: 50% of the annual rainfall occurs from mid-April to mid-August, and there is a second wet season December through February. Annual rainfall varies from about 2,200 mm on the coastal plain to 2800mm inland, although it rises to over 4000mm in the upper Mazaruni/Pakaraima Mountains Area; October is generally the driest month of the year (ter Steege et al, 1996). In the drier savannahs there is only one wet season from April to August when annual rainfall ranges from 1400 to 1800mm, most of it occurring from April to May.¹³²

Mean air temperature ranges from 25°C through 27°C throughout the year in most regions except the upland regions on the western edge of the country where mean temperatures range from 20°C

¹³⁰ <https://www.un.org/esa/forests/wp-content/uploads/2019/03/UNFF14-BkgdStudy-SDG13-March2019.pdf>

¹³¹ ter Steege, H., and D. S. Hammond . 1996. Forest management in the Guianas: ecological and evolutionary constraints on timber production. BOS NiEuWSLETTER

¹³² <https://glsc.gov.gy/wp-content/uploads/2017/05/National-Land-Use-Plan-Final-Oct-2013.pdf>

through 23°C.

High temperatures, heavy rainfall with small seasonal differences, high humidity, and high average cloud cover provide climatic characteristics of an equatorial lowland. Temperatures are remarkably uniform. At Georgetown the daily temperature varies from the mid-70s to the mid-80s °F (mid-20s to the upper 20s °C). The constant heat and high humidity are mitigated near the coast by the trade winds.

Rainfall derives mainly from the movement of the intertropical front, or doldrums. It is heavy everywhere on the plateau and the coast. The annual average at Georgetown is about 90 inches (2,290 mm), and on the interior Rupununi Savanna it is about 70 inches (1,800 mm). On the coast a long wet season, from April to August, and a short wet season, from December to early February, are sufficiently well marked on the average, but in the southern savannas the short wet season does not occur. Total annual rainfall is variable, and seasonal drought can occur in July and August when the southeast trade winds parallel the coast. Variations in Guyana's climatic patterns have a determining effect on tropical crop production.¹³³

Climate data for Georgetown and for Dukwarri are presented below (see Figures 27, 28, 29 & 30). A temperature graphs for Dukwarri is shown in Figure 30.

Georgetown's climate is classified as tropical. There is a great deal of rainfall in Georgetown, even in the driest month. This climate is Af according to the Köppen-Geiger climate classification. The average annual temperature is 26.8 °C in Georgetown. About 2363 mm of precipitation falls annually. Precipitation is the lowest in September, with an average of 84 mm. The greatest amount of precipitation occurs in June, with an average of 330 mm. At an average temperature of 27.6 °C, September is the hottest month of the year. The lowest average temperatures in the year occur in January, when it is around 26.1 °C. Between the driest and wettest months, the difference in precipitation is 246 mm. The variation in temperatures throughout the year is 1.5 °C.

Dukwarri's climate is classified as tropical, with significant rainfall. Even in the driest month there is a lot of rain. The Köppen-Geiger climate classification is Af. In Dukwarri, the average annual temperature is 26.0 °C. The average annual rainfall is 2183 mm. Precipitation is the lowest in September, with an average of 111 mm. Most of the precipitation here falls in June, averaging 290 mm. At an average temperature of 27.0 °C, September is the hottest month of the year. January is the coldest month, with temperatures averaging 25.2 °C. Between the driest and wettest months, the difference in precipitation is 179 mm. Temperatures vary by 1.8 °C throughout the year.¹³⁴

¹³³ <https://www.britannica.com/place/Guyana/Climate>

¹³⁴ <https://en.climate-data.org/south-america/guyana/dukwarri/dukwarri-691343/>

Figure 27: Climate graphs depict monthly average temperatures, precipitation, wet days, sunlight hours, relative humidity and wind speed.

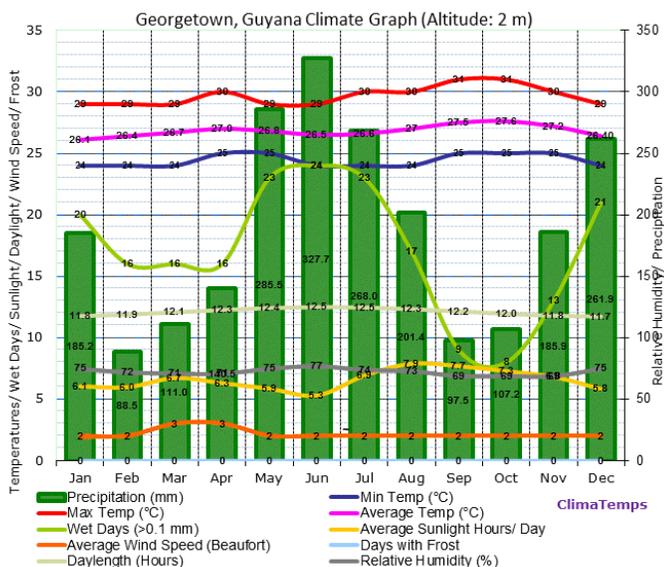
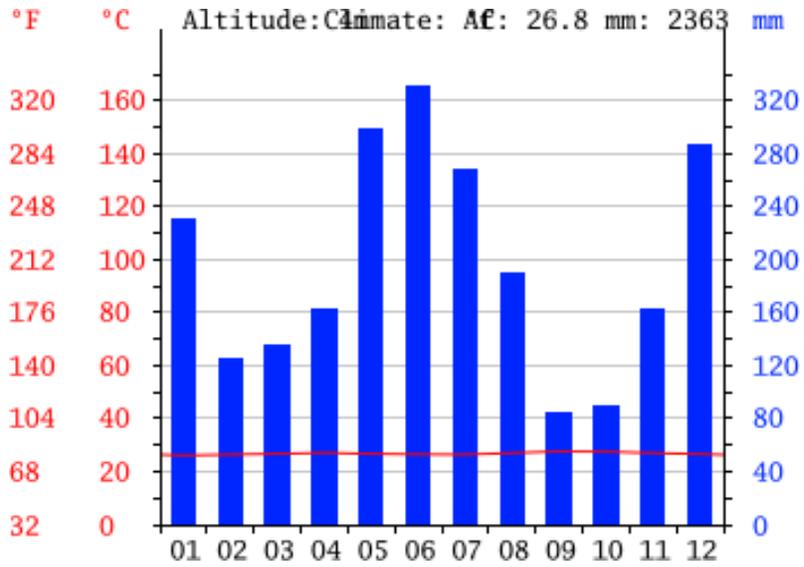


Figure 28: Climograph for Georgetown, Guyana



A Climograph for Dukwarri is presented in Figures 26 and a temperature graph is set out in Figure 27.

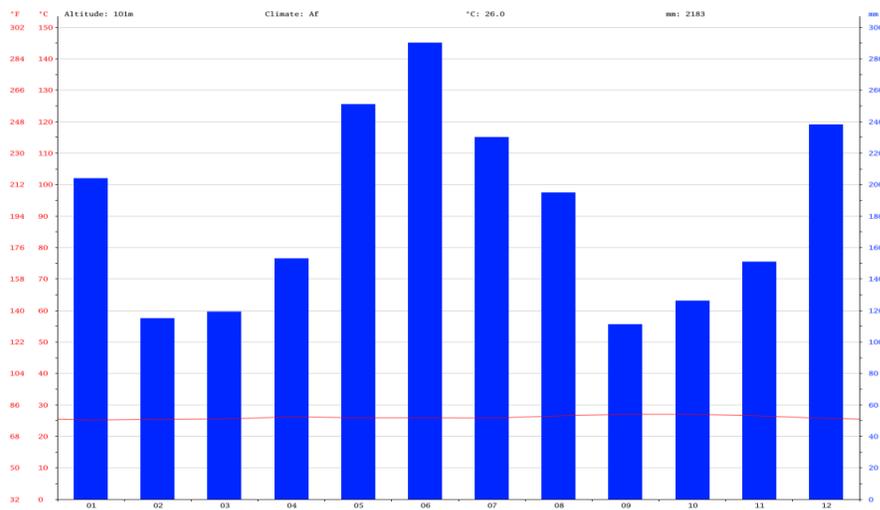


Figure 29: Climograph for Dukwarri, LB Cuyuni River

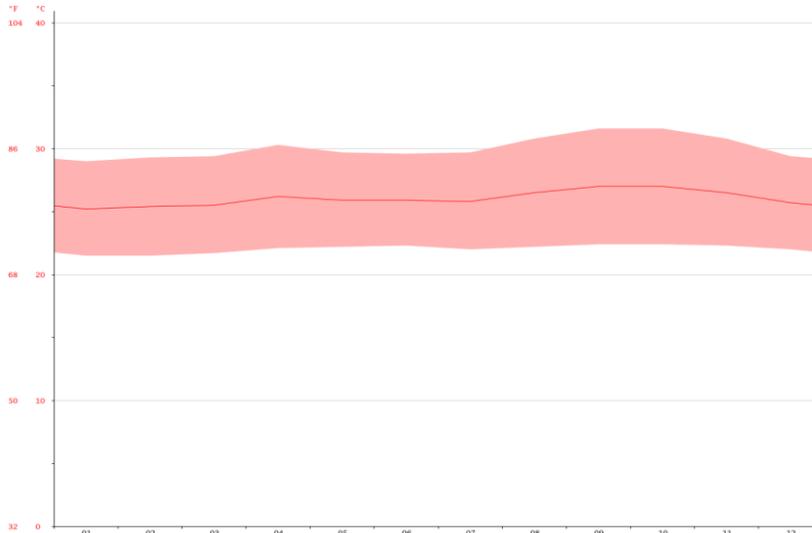


Figure 30: Temperature graph for Dukwarri, LB Cuyuni River.

Generally, in Guyana climate data dictate operational activities. There is a reduction of most field operations such as tree felling, and road construction and maintenance during the rainy season. The trucking of logs may also be reduced in the rainy season due to visibility hazards during rainfall or due to slippery road surfaces.

10.4 Key relevant policy, legislation, guidelines, standards etc.

Guyana has made significant progress in terms of development of legislation as a ‘command and control’ mechanism for promoting effective environmental management and protection and the sustainable use of Guyana's natural resources. Chief among national legislation are: the Environment Protection Act (1996) and accompanying regulations including the Species protection Regulations (1999), (Hazardous Wastes Management) Regulations (2000), Noise Management Regulations (2000), Air Quality Regulations (2000), Water Quality Regulations (2000), Authorisation Regulations (2000); the Guyana Revised Constitution (2003), the Wildlife Conservation and Management Regulations (2008); the Amerindian Act (2006); the Mining Amendment Regulations (2005); the Guyana Forestry Commission Act (2007) and the Forest Bill, (2009), and the Protected Areas Act (2011), among others. Moreover, a number of guidelines have been prepared for Reviewing and Conducting Environmental Impact Assessments, Mining, Sand Blasting, Water Sampling; and for Conducting Biodiversity Research, among others, while Codes of Practice have been prepared for specific sector activities, including mining and forestry. The success of national legislation to promote environmental sustainability has been constrained mainly by institutional capacity (financial, technical and human resource) for continual monitoring and enforcement.¹³⁵

¹³⁵ <https://unfccc.int/resource/docs/natc/guync2.pdf>

Section 24 (h) of the Protected Areas Act, 2011 sets out that Objectives of the National protected Areas System includes ‘assist in combatting climate change by

- a) Ensuring that Guyana’s existing forests are maintained, and protected degradation and their ecosystem functions are safeguarded;
- b) Promoting the restoration and expansion of Guyana’s natural forest cover
- c) Protecting marine ecosystems
- d) Protecting freshwater ecosystems and important watersheds.

The Water and Sewerage Act, 2002 provides for the setting up of the Hydro-Meteorological Department whose functions include ‘to establish, manage, and operate national systems to monitor atmospheric conditions, climate change and water resources’.

10.5 Global Initiatives to safeguard forests.

More than 100 world leaders have promised to end and reverse deforestation by 2030 at the COP26 UN Climate Change Conference. The pledge, which includes almost \$19.2 billion of public and private funds, is a landmark move for nature.¹³⁶

The Glasgow Leaders’ Declaration on Forest and Land Use will cover forests totalling more than 33 million square kilometres (13 million square miles), according to a statement from the British prime minister’s office on behalf of the leaders.¹³⁷

Deforestation and forest degradation continue to take place at alarming rates, which contributes significantly to the ongoing loss of biodiversity. It warned that the Sustainable Development Goals would not be met by 2030 unless dramatic changes occurred in the agroforestry, agribusiness and agriculture sectors.¹³⁸

Over the years the international community have developed initiatives to help countries with major forest resources to safeguard them on the one hand and on the other to encourage countries with massive industrial bases to put limits on their gas emissions.

Generally, the major international and bilateral initiatives to conserve forests are:

- a) **Emphasis on conservation areas:** protected area systems, indigenous and extractive reserves, conservation concessions and debt for nature swaps;
- b) **Forest conservation and livelihoods:** sustainable forest management, reduced impact logging, forest certification, ecotourism, payment for environmental services (PES), bioprospecting, wildlife management, ecotourism and enterprises based on NTFPS. Certification is widely advocated as a strategy to conserve the world’s forests and the biodiversity which they contain.
- c) **Governance:** combat on corruption, the Kyoto Protocol and REDD+¹³⁹

¹³⁶ <https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/>

¹³⁷ <https://news.mongabay.com/2021/11/cop26-glasgow-declaration-salvation-or-threat-to-earths-forests/>

¹³⁸ <https://www.unep.org/news-and-stories/story/inside-global-effort-save-worlds-forests>

¹³⁹ Ghazoul, J. and Sheil, D., 2010. Tropical rain forest ecology, diversity and conservation. Oxford and New York: Oxford University Press

The UNFCCC was established at the Earth Summit in Rio-de-Janeiro in 1992, followed in 1997 by the more powerful and legally binding Kyoto Protocol.

10.6 Initiatives in Guyana

The Guyana Government has demonstrated unequivocal commitment to global efforts in climate change mitigation and adaptation. Notable initiatives include the Low Carbon Development Strategy in 2009 (3), the Green State Development Strategy (2017), the Guyana Climate Change Policy and Action Plan (Draft) 2019 (4), and the National Adaptation Plan (Draft, 2019) – all of which will provide the point of reference for Guyana to build resilience to climate change, adapt to the health effects of climate change, and maximize the health co-benefits available through climate mitigation and adaptation.¹⁴⁰

Guyana has recently launched the revised LCDS 2030 which seeks to create a new -low-carbon economy in Guyana by establishing incentives that value the world’s ecosystem services and promotes these as an essential component of a new model of global development.

In Guyana, the Office of Climate Change (OCC) works across the Government of Guyana to support work on climate adaptation, mitigation, and forest conservation; it drives the development of the LCDS 2030 the advancement of the Government’s green agenda; it also and coordinates the Government of Guyana’s engagement with international forestry programmes such as the Forest Carbon Partnership Facility, the Forestry Investment Programme and UN-REDD.

A major initiative of the OCC is its engagement with UNDP-which has pledge support for Guyana’s ‘green’ endeavours-to finalize official guidelines for the reduction of Green House Gases (GHG) of municipalities across Guyana.

Generally, Guyana-collaboration with international agencies and environmental NGOs, has been very proactive in putting measures in place to contribute to climate mitigation initiatives.

Initiatives include:

- a) The establishment of the Iwokrama International Centre, 1996;
- b) The establishment of the Environmental Protection Agency (1997);
- c) The requirement for ESIA’s and/or Environmental Management Plans for large land based or industrial projects;
- d) The development of a protected areas system;
- e) The development of Codes of Practices for the forestry sectors and the mining sectors respectively;
- f) The adoption of reduced impact logging as the basic standard for commercial timber operations;
- g) The establishment of a Faculty of Earth and Environmental Sciences, University of Guyana, 2017;

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https://cdn.who.int/media/docs/default-source/climate-change/who-unfccc-cch-country-profile-guyana.pdf?sfvrsn=7fd8e6db_2&download=true#:~:text=Notable%20initiatives%20include%20the%20Low,Guyana%20to%20build%20resilience%20to

- h) The establishment of a PES project with Norway;
- i) The development of a VPA with the EU (2018)
- j) Revised forest policy and forestry legislation that address broader forest values (rather than timber production), 2018.
- k) The signing onto many international agreements and conventions (see Table 3);
- l) The development of a Low Carbon Development Strategy;
- m) The development of a Green State Development Strategy, 2017.
- n) The development of the revised Low Carbon Development Strategy (2021)

10.7 Initiatives by RTI

It is an accepted fact that climate change mitigation requires a shared understanding of the issues and a collective approach to generating solutions for problems as they emerge. A major issue is the availability of data to guide decision makers in adopting prescribed practices. In this regard, RTI will adapt five approaches to local initiatives to manage climate change:

- a) Keep abreast of national policy positions and discussions initiated mainly by the MNR;
- b) Follow the guidelines, standards and practices recommended by the GFC and the EPA: RTI will engage directly with the GFC in development of its logging operations and engage with the EPA in reporting on environmental matters.
- c) Participate in discussions on sectoral initiatives on issues of sustainable forest management climate such as those embodied in formal initiatives like the VPA between GOG and the EU; and
- d) Participate in initiatives on waste management, noise abatement or dust nuisances.

RTI's forest monitoring officer will be responsible for managing the company's efforts at climate change mitigation. RTI's climate change-based initiatives will be linked to data collected on water quality and air quality, respectively.

11.1 BIOLOGICAL RESOURCES

11.2 Overview

Royal Timbers Inc. (RTI) acquired SFEP 2/2020, over an area of 107,670.54 ha on right bank Puruni River, west of Puruni Landing, for the purpose of developing an integrated logging and sawmilling business.. It is therefore critical that interventions made to the forest to extract merchantable timber do not contribute to deforestation, forest degradation or forest fragmentation. In addition, in the course of its logging operations, it is necessary that RTI works to conserve fauna. Flora and fauna are integral parts of the ecosystem and they are both necessary for its existence. Plant and products are vital for the sustenance of fauna, while fauna is necessary for ecological processes such as pollination and seed dispersal.

11.3 Flora

11.3.1 Desk review-the forest resources

Previously, the concession was managed by Puruni Woods during the period 2012-2015, where a total of 29 blocks were enumerated and harvested, with a total of 4987 stems removed. The key species extracted are Greenheart, Wamaradan, Wamara, Baromalli, Shibadan, Purpleheart, Kabukalli and a few Crabwood and Korokororo.

The forest concession is of traditional origin and involves natural associations and species that are native to the region. To date, there have been no reports of either climatic or fire natural disasters. Current land uses within the concession are mainly natural forest and mining. There is some evidence of independent and small - scale logging operations for specific tree species, but there is no proof of any sort of larger - scale logging activity within the concession. However, the potential for conflict is high given that there are a variety of gold miners in the area and the Executive Director of the Guyana Gold and Diamond Miners Association (GGDMA) has made it known that "they have the right to mine the area."

Downstream of the Mazaruni River, where indigenous groups have been living in the area for hundreds of years and have established their traditional system of farming and settlement. The Dutch founded a trading port in the 1600s on the small island of Kartabu, where the rivers Essequibo, Mazaruni and Cuyuni converge, known as Kyk-Over-Al. Later, few permanent settlers settled property on the left bank of the Mazaruni River and on the right bank of the Cuyuni River. St. Edwards, an Indigenous mission was established on the left bank of the Mazaruni River at the beginning of the 19th century. A research station was set up at the Kartabu point by a U.S. research team during World War 11.

In the early fifties, the interior of the concession was first penetrated by workers, pork-knockers through the Mazaruni and Puruni Rivers by boat to reach the gold and diamond mine. However, the opening of the peters mine in the 1950s and the Kartabu–Puruni trail were built. Later, the Kartabu–Puruni road network was constructed for the purpose of the failed Hydro–Electric scheme, which was expanded all the way to the Kurupong River, where the diamond and gold mining operations

are currently active.

However, the Peters Mines were abandoned in 1909 as well as the Arimu Mines, which worked on a small scale in 1910 and were commercialized until 1948. Kartabu–Puruni Road to Kartabu Point from the junction of the UMMR Road (Iteballi) was built in the early 1970s by the abandoned Mazaruni Hydro Electric Project. The Kartabu point, too, was utilised by logging companies such as WTT and AMS did in the 80's and 90's, but, due to heavy road maintenance, this part of the road was abandoned (logging companies moved their landings to Iteballi on the west bank of the Mazaruni River. Since there was no clear road maintenance plan, some parts of the Kartabu–Puruni Road became deplorable and other areas, such as Takutu and Peter Mines, were completely abandoned.

The region of birth light with the reopening and development of the Kartabu–Puruni Road to the Kurupong River by ETK Mining Inc during 2000 –2004 established a road for the previous owners of the concession, currently under the control of RTI. Other than providing access to the mining sector, several logging companies such as Jettoo Lumber Yard and Sawmill, Willems Timber and Traders Partnership, Mazaharally and Sons, Sukhram and Sons, Lumber Master Guyana Inc., Hi Tech Construction Inc and Toolsie Persaud Limited have crossed the same route.

The forests of Guyana have very high species diversity; about 30 – 60 tree species may be found within one (1) hectare of forest, while a square kilometer can contain 100 – 200 different species or more. However, one or few species often dominate resulting in clearly identifiable forest types. These forest types are named by their dominant species. Based on a general report by Hans ter Steege (ter Steege, 2000) on species densities -number of trees per 100ha) for the Cuyuni -Mazaruni District, the most abundant species per 100 ha in the concession area are:

- a) Mora (*Mora excelsa*): 593 trees/100ha
- b) Wallaba (*Eperua spp*) 545 trees/100ha
- c) Greenheart (*Chlorocardium rodiei*) 380 trees/100ha
- d) Wamara (*Swartzia spp*) 272 trees/100ha
- e) Black Kakaralli (*Eschweilera spp*) 392 trees/ha
- f) Kautaballi (*Licania spp.*) 147 trees/ha
- g) Baromalli (*Catostemma commune*) 121trees/ha

The concession area embraces the transition between two forest types cited by ter Steege: **Northwest Wet Forests** and **Central Guyana Wet Forests**. For this reason, RTI will rely on more detailed forest type information available at the GFC. A detailed description of the vegetation types recorded for SFEP 02/2020 in shown below (source GFC, 2021).

Major vegetation Types prevailing in RTI's concession area

Mixed Forests (Mainly type 1,1h, 1b, 1c and 3): The term 'mixed forest' covers a variety of subtypes, and is mainly found on well drained soils without stagnating water even in the rainy season. The soils can be brown sands, laterite or loam. Among others the following subtypes can be identified within the mixed forest. Typical species are Black Kakaralli (*Eschweilera spp.*) Kauta (*Licania spp.*) and Kabukalli (*Goupia glabra*)

Greenheart Forests can be found on brown sand, as well as on laterite, often on slopes and ridges. The canopy, reaches a height of 20-35 m. Typical species are Greenheart (*Chlorocardium rodiaei*), Yarula (*Aspidosperma spp.*) and Monkey Pot (*Lecythis davisii*)

Morabukea Forest grows on laterite. Less frequently it is encountered on sandy loam or on brown sand. It occurs on undulating terrain with steep slopes. Morabukea (*Mora gonggripii*) dominates the canopy layer that reaches a height of 20-30 M. Often Baromalli (*Catostemma spp.*), Greenheart (*Chlorocardium sp.*), Aromata, (*Clathrotropis brachypetala*) Black Kakaralli (*Eschweilera spp.*) are found in the Morabukea forest.

Swamp Forest (3): In the common forest type on wet sites, a mixture of Turu Palms (*Jessenia sp.*), Manni (*Symphonia globulifera*) and White Cedar (*Tabebuia insignis*) is the dominant combination on these wet sites.

Mora Forest (3b): Occurs on silt clay or loam along rivers and flats throughout the low land regions. The sites are inundated during rainy season. Mora (*Mora excelsa*) is the dominant specie among other species, such as: Crabwood (*Carapa guianensis*), Baromalli (*Catostemma spp.*), and Dalli (*Virola surinamensis*).

11.3.2 Desk review of inventory data

As part of the procedure to derive a yield factor that is applicable to the RTI concession, RTI contracted Ewart Forest Service and Consulting (EFSC) in August 2020 to develop a forest management plan. In this regard, EFSC conducted a desktop review and field survey regarding cycle cutting, Annual Allowable Cutting (ACC), volume per hectare, resource, forest stand (timber stock) and accessibility to the same resources. EFSC also investigated data from the Barama forest concession, Takatu forest concession and Iwokrama Rain Forest management level inventories were examination and analysis to determine a suitable cutting cycle for Royal Timbers concession. A comparison of the volume/ ha for the various species using 100% inventory data from the TPL concession and management level inventory data from Barama Housing concession; reveals no significant correlation in the species composition between the two concession. A comparison of volume/ha for the different species using 100% TPL concession and management level inventory data from the Barama Housing concession and Iwokrama International Centre for Rainforest Conservation and Development forest; does not show any important similarity in the composition of the species between the four concessions. However, several factors can be attributed to such contrasting findings:

- Different inventory methodology
- Variation in forest type

- Species variation due to location
- Location of actual inventory

Despite the above, it is still wise to operate the concession on a 60-year cutting schedule, because the inventory data for both locations indicates that the removal of 20m³/ha will still result in sufficient standing timber resources to enable viable next harvesting. In addition to this hypothesis, recent market developments also show demand for sizes of 60 cm and above, which further decreases the amount extracted from each hectare by approximately 50%.

11.3.3 Desk review of inventory data from Iwokrama International Center for Rain Forest Conservation and Development

The outcome of the Iwokrama Environmental and Forest Management Plan for the Management Level Inventory has shown that 42.2 M³ / ha can be achieved in Central Guyana. The data was analyzed using the GEMFORM Growth and Yield Management Method to measure the annual Allowable Cut (ACC). The GEMFORM program provides sustainable harvest levels based on selected input parameters such as cutting period, diameter, risk of the defect and commercial species. The estimated adjusted standing volume measured based on the GEMFORM inventory is 22.37 M3 / ha. However, after much debate, Iwokrama decided to use 12M³ / ha as a usable number. Factors that contributed to this analysis are as follows:

- the experience in Guyana suggests that a realistic sustainable net production is lower than the apparent standing volume.
- The market requirement will most likely mean that not all species included in the original ACC calculation will be merchantable at any given time.
- Through the original ACC, calculations were conducted on Risk Class 1 tress only, it is inevitable that some trees, or part of some trees, will have hidden defects.

11.3.4 Desk review of inventory data from Barama Housing Concession

The Barama concession presented details on yield and cutting cycle information in the public review of its five-year management plan where it stated the compartment four (4) 8.4 M3 / ha of available volume target over a 40-year cutting period. While in compartment 5 (5) 8.0 M3 / ha available volume target over 40 – year cutting period. During the active harvesting process, the company indicated that 'the planned low cutting intensity is mainly due to the current operational needs of only 35 commercial species of a total of 127 commercial species found in the similar area of the BCL concession. It continues to be anticipated that the current uptrend in the timber and timber products markets will likely increase the number of commercial species from the present 35 to 45 plus species. However, in comparison to the details set out above, the BCL target of 25 M³ / ha was only able to hit between 12 M³ / ha and 14 M³ / ha. A similar result was published in the same publication for Demerara Timbers Limited (DTL), which was also targeting 25 M³ / ha but managed to hit 15m³ / ha. (see Table 34 and 35 below).

Table 34: Summary of GEMFORM generated data for Barama Housing Concession:

Net volume (m ³ /ha) above diameter (cm)

Species	10+	35+	45+	55+	65+	75+	80+	Total
Forest Total of plots								780
Major Commercial Species								
Mora	17.816	15.437	13.410	11.757	8.893	6.384	5.438	17.816
Kereti Silverballi	10.201	3.388	1.781	.797	.426	.190	.127	10.201
Silverballi	2.316	1.351	.976	.684	.599	.421	.302	2.316
Shibadan	1.735	1.584	1.409	1.158	.979	.424	.259	1.735
Locust	1.476	1.427	1.389	1.357	1.298	1.147	1.147	1.476
Kabukalli	1.154	.947	.871	.737	.579	.468	.429	1.154
Purpleheart	.849	.788	.768	.723	.723	.508	.339	.849
Crabwood	.834	.701	.599	.411	.319	.234	.159	.834
Burada	.507	.495	.463	.394	.394	.173	.173	.507
Tatabu	.408	.408	.323	.323	.323	.092	.092	.408
Greenheart	.342	.342	.302	.206	.134	.064	-	.342
Simarupa	.160	.098	.081	.081	-	-	-	.160
Cedar red	.121	.105	.079	.054	-	-	-	.121
Itikiboroballi	.080	.044	.014	-	-	-	-	.080
Darina	.052	.052	.041	.041	-	-	-	.052
Bulletwood	.039	-	-	-	-	-	-	.039
Balataballi	.026	.026	.026	-	-	-	-	.026
Subtotal for species group	38.115	27.192	22.531	18.723	14.666	10.105	8.465	38.115
Others								
Haiariballi	12.676	6.724	4.496	2.542	1.437	.288	.151	12.676
Kakaralli Wina	9.416	5.529	3.135	2.233	1.113	.551	.379	9.416
Kauta	8.347	3.602	1.726	.829	.367	-	-	8.347

Trysil	7.957	2.189	.813	.374	.103	.063	.063	7.957
Whity	6.842	3.564	2.293	1.469	1.193	.538	.360	6.842
Parakusan	2.773	2.453	2.240	2.062	1.927	1.252	.963	2.773
Yarri Yarri Black	2.261	.012	-	-	-	-	-	2.261
Corkwood	1.951	1.405	1.089	.902	.671	.451	.311	1.951
Monkey pot	1.792	1.161	.930	.591	.350	.075	.039	1.792
Asepoko	1.671	.968	.689	.549	.321	.254	.254	1.671
Unknown	1.427	.600	.411	.293	.222	.179	.179	1.427
Wild Calabas	1.382	.128	.100	.048	.048	-	-	1.382
Wild Guava	1.297	.356	.038	.038	-	-	-	1.297
Futui	1.141	.923	.821	.671	.529	.429	.429	1.141
Wild Fig	1.094	.134	.098	.077	.052	-	-	1.094
Iron Mary	1.067	.480	.236	.073	.040	.040	-	1.067
Awasokule	.955	.070	-	-	-	-	-	.955
Swizzle stick	.869	.094	.038	.038	-	-	-	.869
Congo pump	.775	.337	.169	.097	-	-	-	.775

Table 35: Comparison of forest type by area for the Takatu concession and the Barama Housing Concession and Royal Timbers Incorporated (RTI)

Takatu Concession		Barama Housing	
Forest Type	Size in Ha	Forest Type	Size in Ha
1 Mixed forest, undulating to hilly	23,686.00	1 c Mixed forest deeply dissected	3,293.00
1b Mixed forest, flat to undulating	5,545.00	1b Mixed forest, flat to undulating	22,641
1d Liana forest	2,226.00	1 Mixed forest, undulating to hilly	16,638
1h high hills	6,855.00	1h high hills	4,739
2a Wallaba	615	3 Low Swamp	3
3b Mora	7		

Table 36: Royal Timbers Incorporated – Forest Concession

No	Vegetation Types	Acres	Hectares	%
1	1h High hills - Non-Productive	64,916.23	18,986.40	17.8
2	1c Mixed Forest, deeply dissected	5,52.08	2,206.39	2
3	1b Mixed Forest flat to undulating	57,550.50	23,289.95	21.6
4	1 Mixed Forest, Undulating to hilly	152,885.09	61,870.65	57.5
5	3 Low swamp - Non-Productive	3,232.30	1,308.07	1.2
6	No Data	22.30	9.08	0

From the tables (including 36) above, it can be seen that there is a similarity in some forest types. The dominant forest types among the three concessions are Mixed Forest, Undulating to Hilly. Contrast to the data in the above, the dominant vegetation may have variations in species density and compositions. However, forest type may indicate the type of species existing in such a habitat. For instance, the Mixed

Forest, Deeply Dissected forest type which found in all three concession will indicate the presence of a large number of waterways that will support species such as Mora, Trysil and Crabwood.

11.3.5 Field work

As part of the preparatory planning for the proposed logging operation, RTI conducted a management level inventory (MLI) in the concession. The MLI was conducted by Ewart Forest Service and Consultancy in August 2020. It was conducted at a sample intensity of close to 2.5%. The results obtained were very similar to data published by ter Steege (ter Steege, 2000). Taking into account the strong prevalence of mining in the area, the priority was to determine the condition of the vegetation, to determine to what extent mining might have impacted on extensive areas of forest (see tables 37 & 38 below).

Table 37: Showing the number of sample plots concerning the distance and number of transect lines per vegetative stand

No.	Description	Compartment Code	Area in Hectares	Distance in KM	# of Transects
1	East Puruni Compartment	PUCO	21,641.3	30	6
2	West Puruni Compartment	WECO	15,894.4	20	4
3	Kamiguin Compartment	KACO	30,381	30	6
4	Pashanamu Compartment	PACO	39,754.1	50	10
Total	Four (4) Compartment		107,670.5	130	26

Table 38: Showing a Calculated Forest Resource by Volume and Species (Interpolation for the whole SFEP Area

Compartment Name	Common Name	Species	Volume in Cubic Meters	Percentage (%)
	Greenheart ¹⁴¹	<i>Chlorocardium rodiei</i>	304,179	13.01
	Mora	<i>Mora excelsa</i>	700,923	29.98
	Purpleheart	<i>Peltogyne venosa</i>	30,821	1.32
	Baromalli	<i>Catostemma commune</i>	150,179	6.42
	Kabukalli	<i>Goupia glabra</i>	90,102	3.85
	Locust	<i>Hymenaea courbaril</i>	60,564	2.59
	Crabwood	<i>Carapa guianensis</i>	70,088	3.00
	Bulletwood	<i>Manilkara bidentata</i>	25,769	1.10
	Wamara	<i>Swartzia leiocalycina</i>	50,067	2.14
	Monkey Pot	<i>Lecythis zabucajo</i>	29,646	1.27

	Simarupa	<i>Simarouba amara</i>	8,620	0.37
	Shibadan	<i>Aspidosperma album</i>	32,987	1.41
	Soft wallaba	<i>Eperua falcata</i>	160,281	6.86
	washiba	<i>tabebuia serratifolia</i>	16,538	0.71
	Silverballi	<i>Ocotea puberula</i>	6,677	0.29
	Maho	<i>Sterculia rugosa</i>	4,019	0.17
	Hiairiballi	<i>Alexa imperatricis</i>	255,369	10.92
	Wamaradan	<i>Dicorynia guyenensis</i>	250,468	10.71
	Others		90,548	3.87
<i>Grand Total</i>			2,337,845 M³	100.00

11.3.6 Main observations

The exploratory activities have shown that only the East and West Puruni Compartments contains Greenheart. There was no Greenheart was recorded / identified in the Kamiguin and Pashanamu compartment. The data set generated from RTI' MLI data validates the data published by Ter Steege (ter Steege 2000). There are no indigenous communities within (the vicinity) of the concession area. Mining represents the primary land use within the concession area.

The concession area falls within the Mazaruni Mining District (District # 3) and the entire area has been allocated under some form of mining claim. There has been a history of mining in the area since the late 1920s, with a particular surge in scale of mining the past 30 years with a significant increase in the use of excavators and 'dragas'. RTI's projections are that about 1000 persons occupy the concession area: these comprise artisanal, small and medium scale miners as well as merchants trading mainly in fuel and rations.

Ongoing and past gold mining on right bank Puruni River, especially in the north-eastern part of concession area has left extensive forest resources along the river bank, to a depth of up to one kilometer, in a degraded or fragmented state. A typical example is the Million Dollar Mountain District. Also there are numerous 'deforested' landings on right bank Puruni River, for example Kumong-Kumong and Bush Cow Landing.

11.3.7 Conclusion

RTI has been able to validate the data published by Ter Steege, 2000 (ter Steege 2000). RTI is satisfied with the species distribution and the opportunity to expand its operations by engaging in the extraction of lesser used species.

There was no evidence of commercial scale logging. Current indications point to an expansion of the gold mining industry and gold output, particularly as the current price of gold is attractive and there is strong policy support for the industry. Wherever feasible, RTI will use existing roads to reduce forest fragmentation.

RTI estimates that since 2007, the area of forests in the concession area has declined by 15%.

It is also apparent however that the concessionaire will be able to salvage timber from trees felled and set aside to facilitate mining activity.

11.4 Fauna

11.4.1 Overview

Guyana is a relatively rich country in terms of faunal assets (see Tables 39, 40).

Table 39: Number of vertebrates in Guianan countries (Hammond 2005).

Class	Guyana	Suriname	French Guiana	Guianas
Mammals	221	180	191	234
Birds	752	672	699	812
Fish, skates, and eels	420	318	334	440
Amphibians	81	94	72	118
Reptiles	140	143	162	206
Total ³⁵	1,426	1,365	1,416	1765

*Fresh water only.

Table 40: Number of described mammals, Guianan countries (Hammond 2005).

Order	Guyana	Suriname	French Guiana
Marsupialis	15	11	12
Xenarthra	10	10	10
Chiroptera	126	105	109 ^a
Primates	8	8	8
Carnivores	16	15	15
Perissodactyla	1	1	1
Artiodactyla	5	5	5
Rodentia	40	25	31
Total	221	180	191

^a Including a new species and name revisions in Simmon and Voss (1998) and Voss et al (2001).

Frequent sightings of a variety of fauna have been recorded for the concession area. No hunters, or evidence of hunters were observed within the concession area. Also, at no point did the consultants

encounter anyone selling wild meat.

The concession is rich in faunal species, consisting of a high diversity of terrestrial and arboreal mammals, birds, reptiles and amphibians. During recent reconnaissance surveys, there were several sightings of a diversity of animals and birds; and it appears that fauna benefit from foraging on new shrub growth as well as abandoned vegetable patches in ex-mining sites.

Faunal surveys for PWPI targeting mammals recorded sightings of peccaries (*Tayassu spp.*), deer (*Mazama spp.*) Baboons (*Alouatta sp.*); Capuchin monkey (*Cebus olivaceus*), and red-rumped agouti (*Dasyprocta agouti*). The presence of Capybara (*Hydrochoerus hydrochaeris*) was also detected.

11.4.2 Methodology

The consultants travelled frequently in and around the concession area and were able to observe a large number of fauna. In addition, boat captains, miners and RTI field operatives were consulted about wildlife in the area. Other casual means used to identify fauna were animal tracks and scat.

Faunal wildlife surveys were done during September and October 2020 targeting mammals recorded sightings of peccaries (*Tayassu spp.*), deer (*Mazama spp.*) Baboons (*Alouatta sp.*); Capuchin monkey (*Cebus olivaceus*), and red-rumped agouti (*Dasyprocta agouti*). The presence of Capybara (*Hydrochoerus hydrochaeris*) was also detected from their scat as well as via a photograph captured by a trail camera set up by the consultants.

Several publications were used to support this baseline study: (Eisenberg, 1989); (Braun, Robbins, & Schmidt, 2007) and (Gallo, 1988).

11.4.3 Results

The concession is rich in faunal species, consisting of a high diversity of terrestrial and arboreal mammals, birds, reptiles and amphibians. During recent reconnaissance surveys, there were several sightings of a diversity of animals and birds; and it appears that fauna benefit from foraging on new shrub growth as well as abandoned vegetable patches in ex-mining sites.

Data exist from previous surveys conducted in SFEP 2/2020 previously allocated to Puruni Wood Products Inc. (PWPI). The results are herein set out below.

Mammals

Mammals, especially the smaller species, constitute a primary component of the tropical rainforest. Through pollination, seed dispersal, and control of insect populations and as part of the food chain for carnivorous animals, the smaller mammals such as opossums, rodents and bats assist in the natural functioning of the ecosystem.

The concession area is quite rich in faunal species. The red-rumped agouti *Dasyprocta agouti* and the labba, *Agouti paca* were the most abundant species of mammals recorded within RTI's forest concession.

Marsupial – Opossums

Two species of Marsupials or opossums were recorded in the project area. The common opossum *Didelphis marsupialis* is also hunted for food when other forest game is scarce.

Xenarthra - Anteaters, Sloths and Armadillos

Most members of this order are specialized feeders that eat mainly ants and termites. This interesting group is represented by eight species in Guyana.

Anteaters: two arboreal species, the Tamandua and the Pygmy Anteater, were recorded in the study area.

Sloths: Two species are known and both were reported occurring in the area.

Armadillos are insectivorous, but are known to feed on small animals, eggs and carrion. Local inhabitants confirmed the presence of the nine-banded Armadillo. They are elusive and prized for their flash.

Primates - Monkeys

In the project area, two species of the family Cebidae namely the Howler Monkey, *Alouatta seniculus* and the Wedge-capped Capuchin Monkey, *Cebus olivaceus* were observed. Loud roars were heard of the former in the nearby forests. A family of six of the latter was observed travelling in the forest canopy. The Howler Monkey is hunted for food when forest game is scarce.

Rodentia - Rodents

Rodents occupy a wide range of habitats in the tropical forest ecosystem. Two species the *Dasyprocta agouti* familiarly known as the Accuri, and the *Agouti paca* or labba occur in the project area in fairly large numbers and are hunted for food. The Accuri or Agouti, a diurnal species is the commonest forest mammal well developed to the forest floor environment. Fallen seeds and nuts make up the bulk of its diet. The labba, a nocturnal species, frequents streamside and river bank locations and when disturbed, they seek protection by diving into the water.

Carnivora - Carnivores

Eight of the ten species of species of carnivores or flesh-eating mammals known to occur in Guyana can be found in the concession area. All species are wide-ranging and their presence in a particular area depends on the abundance or scarcity of prey. The family Felidae is classified as endangered by C.I.T.E.S. Jaguar *Panthera onca* tracks were observed within the concession. (See figure 31).



Figure 31: Jaguar tracks within SFEP 2/2020

Perissodactyla: In Guyana the family Tapiridae is represented by a single species.

Tapirus terrestris, tapir or bush cow an odd-toed hoofed mammal, is an ubiquitous inhabitant of the tropical rainforest. Dense vegetation and an abundance of water provide ideal conditions for this free-ranging mammal. The tapir is hunted for food throughout its known range. From information received a few sightings have been recorded.

Artiodactyla. The even-toed hoofed mammals of Guyana are represented by two families, Tayassidae, the Peccaries with two species and Cervidae with three species. In the project area two species of peccaries and two species of deer were recorded. Some rooted area was observed which confirmed the presence of peccaries. Peccaries and Deer are extensively hunted for food.

Chiroptera - Bats: Bats reach their highest densities in tropical and subtropical areas. In certain tropical localities there are more species of bats than all mammals combined. In tropical forest bats occupy a variety of habitats, within the forest canopy, a wide variety of bat species feed on fruits and nectar, while few are insectivorous. Below the canopy, in the middle zone of the tree trunks, insectivorous bats are highly active. The *sanguivorous* and some carnivorous bats feed in the area of the forest floor.

Bats play important roles in ecosystem functioning, they consume large quantities of insects, they aid in pollination of many flowering plant species and serve as seed dispersers by feed on fruits.

Avian Fauna

Birds are probably the most widely studied vertebrate group, primarily because of their great diversity and considerable influence on the environment and their place in human and cultural history. In all communities even those dominated by human, birds are important consumers, predators and prey of other organisms. Birds help to control insect populations, including agricultural pests. In many environment birds are key dispersal agents of plants by spreading seeds after feeding on a variety of fruits while few are exclusive plant pollinators.

The layered canopy at the tropical forest provides a variety of habitats for the avifauna. The family *Psittacidae*, parrots and *Ramphastidae*, toucans dominate the upper canopy. In the middle and lower level of the canopy, gotingas wood creepers, trogons and humming birds were sighted. The noisiest and most

conspicuous bird in the stratum was the Greenheart bird *Lipaugus vociferans*. The forest floor habitat was occupied by two members of the family Cracidae the Powis, *Crax alector* and the Marudi Penelope marail.

A number of bird species are hunted for food by forest dwelling people. These include the Black curassow, *Crax alector* and the Marudi Penelope marail they occur in the project area and are particularly sensitive to human pressure from hunting; every effort should be made to protect these species from over hunting.

There was no evidence of nesting, no trapping was observed.

Avifauna Patterns

The bird community at RTI concession was most similar (homogeneous) to that at Timber Traders. The most notable difference between the two sites was lesser prominence of some canopy species such as toucans, cotingas and parrots.

Reptiles and Amphibians

Reptiles and amphibians comprise an important component of vertebrate fauna in tropical rainforest regions. They exhibit a high diversity and extreme ecological specialization and habitat preferences. All survey on reptiles depends on visual searches, while frogs can be detected by their vocalizations. Amphibians are a diverse group at predatory animals that reach their greatest abundance in tropical regions, most possess complex life cycles an aquatic larval stage and terrestrial adult stage that is unique among vertebrates. They are strongly influenced by the distribution of water, usually in form of rain which influences the breeding of many species. Terrestrial adults typically move to suitable aquatic habitats to breed, especially near riverine habitats, hollow-out pools of water, even in high bromeliads.

11.5 Impact Assessment

11.5.1 Flora

Lowering the impact of forest utilisation on the forest environment is a part of the improvement in sustainable forest management. As part of forest utilisation, timber harvesting can also cause environmental implications. The main impact of forest operations is on the soil, on regeneration and on the residual stand. Furthermore, logging operations are responsible for deforestation; therefore, sustainable logging is ipso facto necessary and desirable to attain SFM.

Severe damage is usually inflicted on the forest ecosystem during logging activities. Some of the major unintended impacts of timber extraction are as follows:

1. Loss of Cultural Diversity
2. Loss of Biodiversity
3. Loss of Carbon Storage Capacity.

The damage includes forest soil compaction, damage to other trees and plants, cutting of seedlings, trampling, wildlife killing or chasing away and encroachment into opened forest by land grabbers. These forms of damage are aggravated through insufficient planning, improper operational techniques, lack of operational skill, loggers' level of competence and lack of serviceable modern felling tools.¹⁴²

Preparatory road building tasks and timber harvesting leads to alteration of forest structure (height class distribution and diameter class distribution). This alteration in structure affects the microclimate (in terms of wind, humidity temperature and light conditions in the understory which in turn influences seed germination and seedling development).¹⁴³

The removal of logs during timber harvesting tasks represent a loss of nutrients for the soil as well as plant genetic material; trees of good form are normally harvested so perhaps the best genetic material may be exported.

Generally, logging robs the forest of the best (quality) trees. To attempt to counter act such creaming in Guyana, a maximum yield per hectare, felling cycles and site restrictions are prescribed (GFC, 2018); for example, in Guyana, a maximum of 20m³/hectare for a felling cycle of 60 years is applied. Logging also removes trees from the forest at a faster rates of natural mortality.

Logging disrupts ecological relationships between plant species by brutally changing understorey conditions within a few minutes, and over a period of the roughly 20 days it takes to harvest a 100ha, major changes in habitats and plant niches occur.

Road building operations and timber harvesting leads to forest degradation and the alteration of microclimate (in terms of wind, humidity temperature and light conditions in the understory. The sudden shock in the understorey influences seed germination and seedling development. The combination of numerous gaps and disrupted soil surface facilitate the establishment of pioneer species (for example *Goupia glabra*³⁶, *Renialmia spp*, *Miconia spp*, and *Trema spp*) which eventually influence the floristic composition of the forest in the long term (ter Steege, Hans et al 1996).

The short term and long term effects of RIL based, sustainable logging is a function of the forest type, the patchiness of species distribution, soil type, slope position, and care taken with directional felling and skidding operations respectively. Forest fragmentation represents the worst scenario wherever sustainable logging is practiced. Forest fragmentation due to logging in Guyana is rare.

11.5.2 Fauna

Logging in forest ecosystems significantly changes biodiversity. The species composition of gaps is an indicator of animal activity: for example, the seeds of Burburu (*Solanum stramonifolium*) are

¹⁴² Eroglu, H, Öztürk, UO, Sönmez, T, Tilki, F and Akkuzu, E. 2009. The impacts of timber harvesting techniques on residual trees, seedlings, and timber products in natural oriental spruce forests. Afr J Agric Res., 4(3): 220–224.

¹⁴³ Fimbel, Robert A, Alexandro Grajal, and John G. Robinson. 2001. "Logging-Wildlife Issues in the Tropics. An Overview." In The Cutting Edge: Conserving Wildlife in Logged Tropical Forests, by Robert A Fimbel, Alexander Grajal and John G. Robinson. New York: Columbia University Press E-Book.

dispersed by bats, birds, and monkeys.¹⁴⁴

One reason that fauna thrives in tropical forests is that forests provide innumerable habitats and niches: for example, many animals dwell only at the ground level (tapir, deer, agouti), others dwell at mid-storey /understorey (squirrels, monkeys) and others dwell in the canopy itself (eagles, sloths) (Whitmore 2012). Some animals are active only by day, some only by night and some are active by day and by night (tapir, jaguars, peccaries) (Whitmore, 2012).

Logging directly impacts forest dependent wildlife through the destruction or degradation of habitats, disruption of faunal movements, and interruption of ecological interactions between organisms....the intensity of impact of these ‘disruptions’ depend a great deal on the species of animals and their capacity to adapt quickly to changes (Fimbel, Grajal and Robinson 2001).

11.6 Mitigation and Monitoring Measures

For flora, RTI will follow strict RIL practices, planning all interventions in the forest resources and paying special attention to directional tree felling and skid trail planning. RTI will make every effort to avoid water ponding in any form which restricts tree growth.

RTI will take measures, for example ‘no hunting policies’, to protect all fauna-animals, including bats- that aid in seed dispersal and ultimately foster the regeneration of trees.

RTI’s employees will be forbidden from lighting fires on the forest floor. Based on RIL, forest degradation may be regarded as ‘commercial degradation’. The residual forests continues to carry out all forest functions and while some ecological relationships are destroyed, new ones emerge.

For fauna, RTI’s field operatives would avoid confrontation with fauna; vehicles will always stop and allow animals crossing the road to do so safely; this applies particularly to snakes, sloths, anteaters, and ground dwelling birds. Strict no hunting and no fishing policies will be enforced by RTI. Signage to this effect will be posted along the primary roads.

Forest gaps stymy the movement of fauna that will not use open spaces.¹⁴⁵ Every effort will be made to avoid gaps and fragmented forests. Prescriptions of the COP regarding logging operations (Chapter 6) operational hygiene (Chapter 8) and Camp Hygiene (Chapter 9) will be followed. Field operatives will be encouraged to take an interest in fauna. Registers will be kept at the base camp where field operatives can record sightings of mammals.

¹⁴⁴ Andel TR van (2000) Non-Timber Forest Products of the North-West District of Guyana. Part I and II. Tropenbos-Guyana Series 8A and 8B. Utrecht University, Utrecht, The Netherlands

¹⁴⁵ Fimbel, R., Robinson, J.G. and Grajal, R. (2001) The Cutting Edge: Conserving Wildlife in Logged Tropical Forests. Columbia University Press, New York.

12.1 ECOSYSTEM SERVICES

12.2 Introduction

A natural ecosystem is the result of interactions between organisms and the environment. A natural ecosystem has a diverse amount of species and plants and are self-sustaining and result from spontaneous natural reaction.

Ecosystems are living elements which interact with each other and their non-living environments. They provide benefits, or services, to the world.

Ecosystem services make human life possible by, for example, providing nutritious food and clean water, regulating disease and climate, supporting the pollination of crops and soil formation, and providing recreational, cultural and spiritual benefits.

Biodiversity includes diversity within and among species and ecosystems. Changes in biodiversity can influence the supply of ecosystem services. Biodiversity, as with ecosystem services, must be protected and sustainably managed.¹⁴⁶

Since forestry benefits from and influence ecosystem services, RTI therefore values the overarching benefits of the forest environment on our livelihoods. In this regard, RTI recognises and fully support the efforts of GoG and international agencies that foster a heightened awareness of the critical need for the conservation of tropical forest resources in the fight against climate change. RTI also notes the Glasgow leaders' declaration on forests and land use at the CoP 26 meeting in Glasgow, Scotland.

RTI recognises that these efforts are critical to meet land use, climate, biodiversity and sustainable development goals, both globally and nationally and will require transformative further action in the interconnected areas of sustainable production and consumption; infrastructure development; trade; finance and investment; and support for smallholders, Indigenous Peoples, and local communities, who depend on forests for their livelihoods and have a key role in their stewardship and to adapt to climate change; and to maintain other ecosystem services.

RTI has studied the value and benefits of non-timber resources and fully supports the efforts of the Guyana Forestry Commission in developing forest policies, forest management standards and guidelines that prescribe forest conservation during timber harvesting. RTI has committed to keep abreast of the national and international discussion on biodiversity, the conservation of natural landscapes and issues of climate change. RTI is passionate about sustainable forest management and its employees pay close attention to local and global developments on sustainable forest resources management. RTI also fully supports the new LCDS 2030 which aim to create a new-low-carbon economy in Guyana by establishing incentives which value the world's ecosystem services, and promoting these as an essential component of a new model of global development with sustainability at its core. In Guyana's case, harnessing the value of the country's ecosystem services can build a

¹⁴⁶ <https://www.fao.org/ecosystem-services-biodiversity/en/>

long-term, low- carbon diversification opportunity.¹⁴⁷

12.3 Definitions and scope

The Convention on Biological Diversity (1992) defines an ecosystem as “a complex of living organisms and the abiotic environment with which they interact in a specified location.”

The Protected Areas Act, Act 14 of 2011, defines an ecosystem as *‘the dynamic complex of animal, plant and microorganism communities and their non-living environment interacting as a functional unit’*.¹⁴⁸

Forest ecosystem services (FES) are those services deriving from forest ecosystems. An ecosystem (or ecological system) consists of all the organisms and the physical environment with which they interact.¹⁴⁹

Ecosystems are controlled by external and internal factors. External factors such as climate, parent material which forms the soil and topography. Internal factors are controlled, for example, by decomposition, root competition, shading, disturbance, succession, and the types of species present.¹⁵⁰

Ecosystems are dynamic entities—they are subject to periodic disturbances and are always in the process of recovering from some past disturbance.¹⁵¹

Ecosystems provide a variety of goods and services upon which people depend. Ecosystem goods include the "tangible, material products" of ecosystem processes such as water, food, fuel, construction material, and medicinal plants. Ecosystem services, on the other hand, are generally "improvements in the condition or location of things of value". These include things like the maintenance of hydrological cycles, cleaning air and water, the maintenance of oxygen in the atmosphere, crop pollination and even things like beauty, inspiration and opportunities for research. Ecosystem restoration is thought to contribute to all 17 Sustainable Development Goals.¹⁵²

One of Guyana’s most valued natural assets is its forests: the national forest cover is approximately 85% with estimated forest land between 18.416 million hectares and 18.695 million hectares and approximately 12% designated as protected areas: Iwokrama Rain forest Reserve, Marudi Mountain allocations to Conservation International and the Kaieteur Falls. Significant acreages (approximately 6%) have also been allocated to Amerindian communities.¹⁵³

¹⁴⁷ <https://lcds.gov.gy/>

¹⁴⁸ <https://doe.gov.gy/published/document/5ae8f345b4d000153ca57a98>

¹⁴⁹ <https://www.fao.org/ecosystem-services-biodiversity/en/>

¹⁵⁰ <https://www.unep.org/resources/report/payments-ecosystem-services-getting-started>

¹⁵¹ <https://www.unep.org/explore-topics/ecosystems-and-biodiversity/about-nature-action>

¹⁵² <https://unece.org/ecosystem-services-0>

¹⁵³ <https://forestry.gov.gy/wp-content/uploads/2021/01/MRVS-Year-2019-Report-Version-1-Final.pdf>

The Guiana Shield- and its abundant ecosystems and ecosystem services- make it one of the most critical global assets¹⁵⁴ and Guyana's entire territory contributes 9.4% of the area of the Guiana Shield¹⁵⁵.

Six types of forests can be identified, namely (see figure 32 below):

Tropical rainforest – which grows on the peneplane and interior lowlands of Guyana. The greenheart and other popular species used in construction are part of the rain forest.

Marsh forests –can be located where the soil is very wet or flooded for part of the year and very dry for part of the year. This type of forest is found extensively on pegasse (peat) swamps and under other wet soil conditions. Usually marsh forests are dominated by palm trees, including the heart of palm.

Swamp Forests occur where the soil is waterlogged and rarely dry. Swamp forest includes the mora forests, found in wet conditions and the mangrove forests growing on the coast and in the brackish waters of the major rivers.

Dry Evergreen Forests – found in areas where the rainfall is high but the soil is excessively well drained. The most common form of this forest, the wallaba forest, grows on the white sand areas. The forest is not as dense as the rain forest and the trees are smaller in diameter though the canopy may be quite high.

Montane Forests that grow on the Pakaraima and Kanuku Mountains and so are affected by both the high altitude and high rainfall, and also the poor soil conditions. Some are luxuriant and similar to the rainforest; others are sparser with stunted growth and gnarled trees on the higher slopes and escarpments.¹⁵⁶

¹⁵⁴ (UNDP, 2012)

¹⁵⁵ (Hammond, 2005)

¹⁵⁶ <https://www.forestry.gov.gy/wp-content/uploads/2015/09/Guyana-MRVS-Interim-Measures-Report-Year-1-V3.pdf>

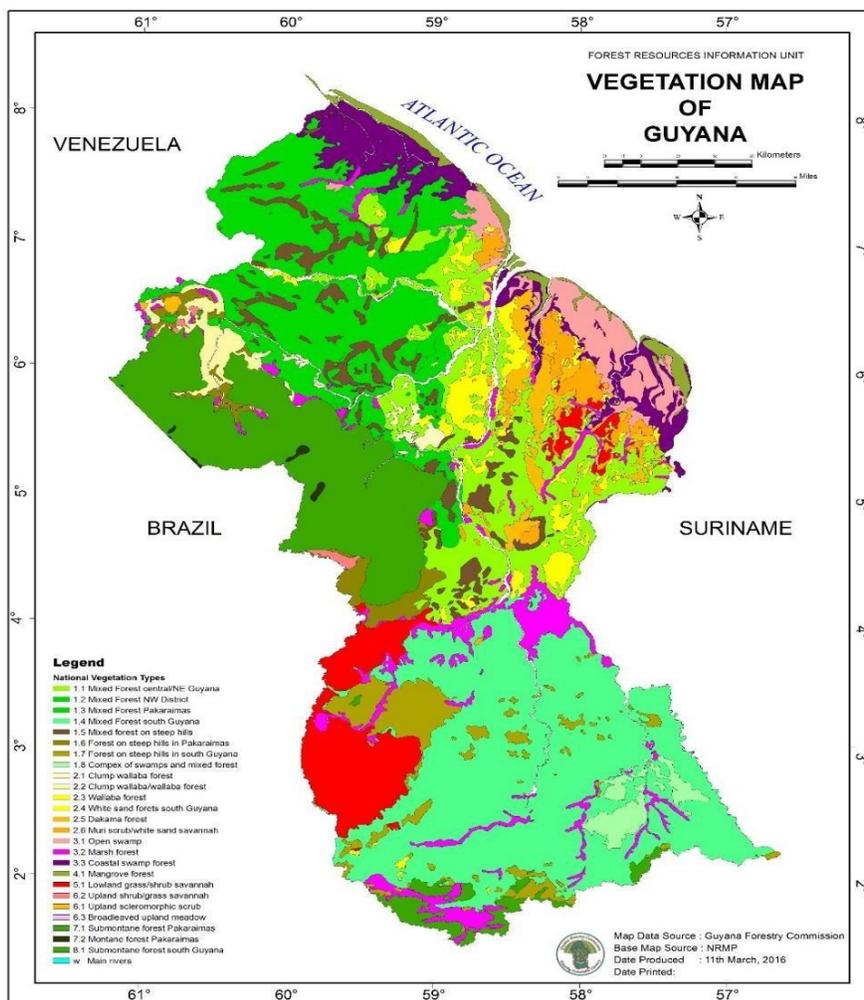


Figure 32: Vegetation map of Guyana

Guyana is centrally positioned within the Guiana shield, containing much of its representative ecosystems and biodiversity, while still featuring many endangered Amazonian species. This biological richness is even more significant considering that the Amazon houses approximately 10% of the world's known biodiversity and is the world's largest remaining tract of tropical rainforest.

Biodiversity plays a very important role to Guyana in maintaining the extensive forest cover of the country, the savannahs, and the various aquatic habitats. The biological resources of the country are important and linked to the future development of the economy and the population.

Guyana has commenced the Guyana REDD+ Monitoring Reporting and Verification System (MRVS) system with support from the Government of Norway.

Previously, in 2009, the Government of Guyana and the Government of the Kingdom of Norway had initiated a programme under the climate and forest partnership. Under the MRVS and Guyana's national REDD+ programme Guyana's forest cover and resultant carbon emissions from Guyana's forests will be measured as an underpinning for results-based REDD+ compensation in the long-term.

Preserving the forest in Guyana will lead towards protection of biodiversity. Biodiversity is valuable to ecosystems functions and is directly related to the livelihood of several communities in Guyana.

Guyana signed the United Nations Convention on Biological Diversity in June 1992 at the Rio Summit in Brazil. Guyana subsequently ratified the Convention in August 1994.

The Biodiversity Convention provides several general obligations for member states. These include a commitment to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity. Member states such as Guyana must also integrate the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Biodiversity is valuable to ecosystems functions and is directly related to the livelihood of several communities in Guyana.¹⁵⁷

12.4 Key relevant policy, legislation, guidelines, standards etc.

The Constitution is the supreme law of Guyana. It outlines the branches and powers of Government, and several important constitutional office holders as well as establishes qualifications and times for elections, lists basic human rights and sets up independent institutions to protect these rights.¹⁵⁸

Several Articles in the 1980 Guyana Constitution expressly provides protection of the environment as well as an obligation that is placed upon citizens to improve the environment. Article 25 provides a duty to improve the environment and states: ‘Every citizen has a duty to improve the environment and protect the health of the nation.’ Article 36 provides for land and the environment and states: ‘The well-being the nation depends upon preserving clean air, fertile soils, pure water and the rich diversity of plants, animals and eco-systems.’ There was an amendment in 2003 in which Article 149J – ‘The environment’ was included and it provides:

- (i) ‘Everyone has the right to an environment that is not harmful to his or her health or well-being.
- (ii) The State shall protect the environment, for the benefit of present and future generations, through reasonable legislative and other measures designed to –
 - i. prevent pollution and ecological degradation;
 - ii. promote conservation; and
 - iii. secure sustainable development and use of natural resources while promoting justifiable economic and social development.

(iii) It shall not be an infringement of a person’s rights under paragraph (i) if, by reason of an allergic condition or the peculiarity, the environment is harmful to that person’s health or well-being.

Environmental Protection Act

¹⁵⁷http://www.itto.int/files/user/pdf/PROJECT_REPORTS/Exploring%20Payments%20for%20Ecosystem%20Services%20in%20Guyana.pdf

¹⁵⁸ Laws of the Cooperative Republic of Guyana, The Constitution, available at <http://parliament.gov.gy/constitution/>, accessed 11 November 2019.

In 1996, the Environmental Protection Act (EP Act) was enacted to implement the environmental provisions of the Constitution. The EP Act establishes the Environmental Protection Agency (EPA), a body corporate, as the lead agency on environmental matters in Guyana.

The EP Act also requires the EPA to take the necessary measures to ensure the prevention and control of pollution, assessment of the impact of economic development on the environment, and the sustainable use of natural resources.

The EP Act outlines the legal requirement for environmental impact assessments for development projects considered to have significant impacts on the environment, inclusive of biodiversity.

The EP Act supports the Aichi Target 1 because it expands and improves awareness, appreciation and communication on biodiversity and ecosystems. It also supports Aichi Target 2 because it consolidates/harmonizes the legal frameworks and provides support to the sustainable use, protection and management of biodiversity resources. The EP Act also supports the Aichi Targets 14 and 15 by improving the status of biodiversity by conserving ecosystems, species and genetic diversity and by restoring biodiversity and ecosystem services in degraded areas.¹⁵⁹

Protected Areas Act

The Protected Areas Act (PA Act) was enacted in July 2011. The Act provides for the protection and conservation of Guyana's natural heritage and natural capital and maintenance of ecosystem services through a national network of protected areas, the National Protected Areas System (NPAS). It provides for the establishment of a Protected Areas Commission to oversee the management of this network; the creation of national protected areas system and the establishment of a protected areas trust fund. Under the NPAS, four areas of extraordinary biological value were designated legally Protected Areas: Kaieteur National Park, Shell Beach, the Kanuku Mountains, and the Iwokrama Centre for Rainforest Conservation. The PA Act highlights the importance of maintaining ecosystem services of national and global importance and public participation in protected areas and conservation, and it establishes the protected areas trust fund to ensure adequate financial support for maintenance of the network.¹⁶⁰

Section 24 of the Protected Areas Act 2011 specifies that the objectives of a national protected areas system, includes:

- a. Conserving Guyana's biological diversity;
- b. Protecting ecologically viable areas representative of all ecosystems and habitats naturally occurring in Guyana, and its natural landscapes and seascapes;
- c. Protecting ecologically significant areas which are vulnerable; and
- d. Safeguarding and maintaining ecosystem services

¹⁵⁹ Laws of the Cooperative Republic of Guyana, Environmental Protection Act, No. 11 of 1996 (Cap. 20:05) section 2(h). See also Laws of the Cooperative Republic of Guyana, Environmental Protection (Amendment) Act, No. 17 of 2005.

¹⁶⁰ Laws of the Cooperative Republic of Guyana, Protected Areas Act, No. 14 of 2011

Forestry Commission Act

The Guyana Forestry Commission Act 2007 (GFC Act) repealed and replaced the Guyana Forestry Commission Act of 1979 and re-established the Guyana Forestry Commission.¹⁶¹ The Act provides specifically for the establishment, organization, mandate and functions and responsibilities of the Guyana Forestry Commission, the forestry authority in Guyana. The functions of the Commission as defined in the Act under Section 5(a) of the Guyana Forestry Commission Act No. 20 of 2007, mandates the GFC to prepare plans, codes of practice and guidelines for the conservation and management of forests; this by implication includes the conservation of ecosystems.

Section 5(b) of the same Act, mandates the GFC to research, collate, analyse, prepare, and disseminate data, statistics and other information about forests and all aspects of forestry including forest ecology and the use of forest produce. The GFC prescribes that a minimum of 4.5% of the productive forests within State forest authorizations $\geq 8,000\text{ha}$ must be preserved (and managed as biodiversity reserves). RTI has already earmarked an area of **3,931.3 ha** for a biodiversity reserve.

12.5 Existing information, Surveys and Baseline studies

The protected areas network (see Figure 33), the forests managed by the Iwokrama International Centre and forest reserves managed directly by the GFC are all part of the attempts at the national level to conserve ecosystems. The total current protected areas comprise those areas that formally constitute the NPAS, in addition to an area of 3716.81km^2 managed by IIC and an area of $6,250\text{ km}^2$ of private property managed by the Konashen Indigenous Community.

¹⁶¹ Laws of the Cooperative Republic of Guyana, Forestry Commission Act, No. 20 of 2007.

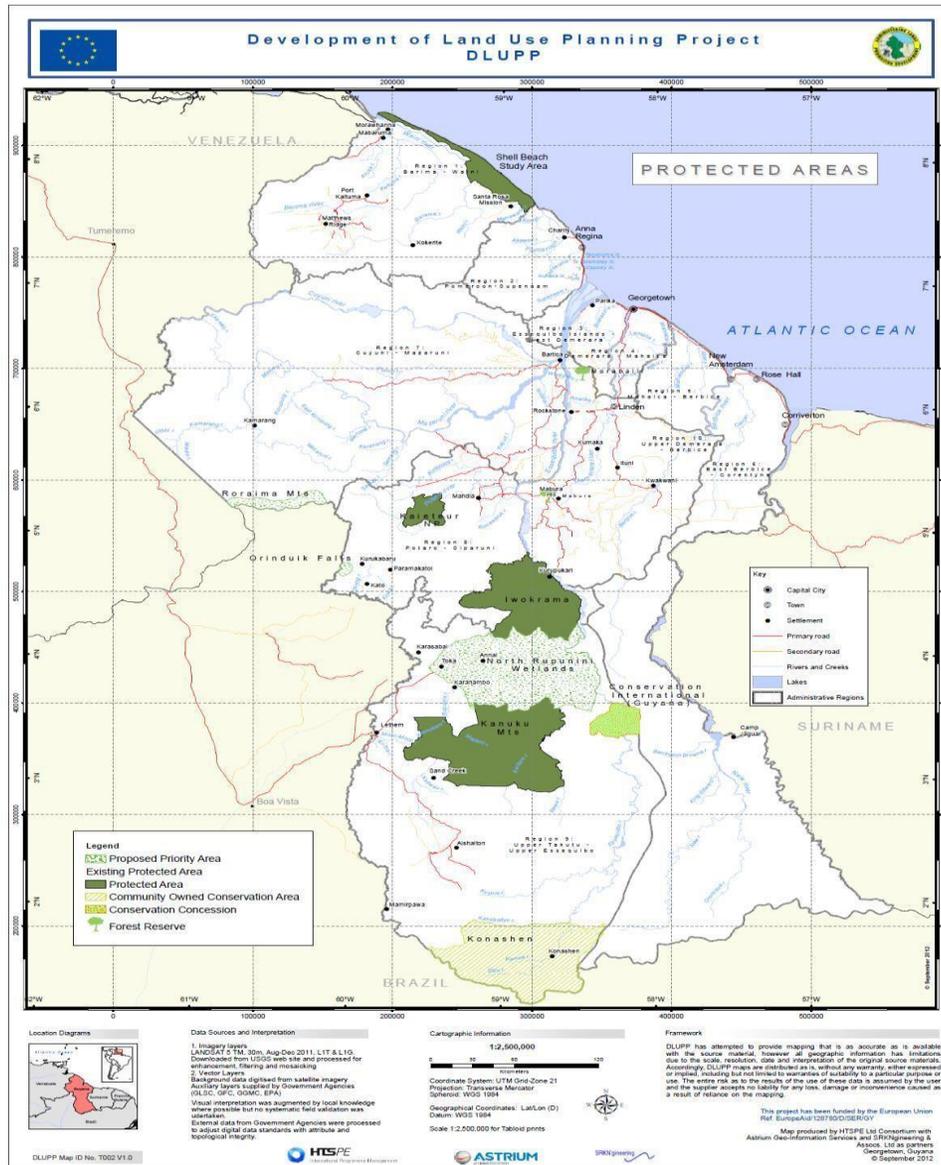


Figure 33: Map of protected areas in Guyana. (GL&SC 2013).

In addition, according to TEEB (2010)¹⁶², ecosystems are critical because they provide humans with four categories of services (see also Table 41):

- (a) Provisioning services-ecosystem services that describe the material or energy outputs from ecosystems, including food and fresh water;
- (b) Regulating services: these are services that ecosystems provide by acting as regulators, for example in regulating the quality of air and soil;
- (c) Habitat or supporting services: for example, habitats provide the means for survival; and

¹⁶² <http://teebweb.org/publications/teeb-for/research-and-academia/>

(d) Cultural services: experiences with aesthetic phenomena.

Table 41: Typical ecosystem services garnered from forest resources (TEEB 2010).

<p>THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY: CATEGORIES OF ECOSYSTEM SERVICES (http://www.teebweb.org/resources/ecosystem-services/)</p>
<p>1.0 Provisioning Services: Provisioning Services are ecosystem services that describe the material or energy outputs from ecosystems. They include food, water, and other resources.</p>
<p>1.1 Food: Ecosystems provide the conditions for growing food. Food comes principally from managed agro- ecosystems, but marine and freshwater systems or forests also provide food for human consumption. Wild foods from forests are often underestimated.</p>
<p>1.2 Raw materials: Ecosystems provide a great diversity of materials for construction and fuel including wood, biofuels and plant oils that are directly derived from wild and cultivated plant species.</p>
<p>1.3 Fresh water: Ecosystems play a vital role in the global hydrological cycle, as they regulate the flow and purification of water. Vegetation and forests influence the quantity of water available locally.</p>
<p>1.4 Medicinal resources: Ecosystems and biodiversity provide many plants used as traditional medicines as well as providing the raw materials for the pharmaceutical industry. All ecosystems are a potential source of medicinal resources.</p>
<p>2.0 Regulating Services: Regulating Services are the services that ecosystems provide by acting as regulators, for example, regulating the quality of air and soil or by providing flood and disease control.</p>
<p>2.1 Local climate and air quality: Trees provide shade whilst forests influence rainfall and water availability both locally and regionally. Trees or other plants also play an important role in regulating air quality by removing pollutants from the atmosphere.</p>
<p>2.2 Carbon sequestration and storage: Ecosystems regulate the global climate by storing and sequestering greenhouse gases. As trees and plants grow, they remove carbon dioxide from the atmosphere and effectively lock it away in their tissues. In this way forest ecosystems are carbon stores. Biodiversity also plays an important role by improving the capacity of ecosystems to adapt to the effects of climate change.</p>
<p>2.3 Moderation of extreme events: Extreme weather events or natural hazards include floods, storms, tsunamis, avalanches, and landslides. Ecosystems and living organisms create buffers against natural disasters, thereby preventing possible damage. For example, wetlands can soak up flood water whilst trees can stabilize slopes. Coral reefs and mangroves help protect coastlines from storm damage</p>
<p>2.4 Waste-water treatment: Ecosystems such as wetlands filter both human and animal waste and act as a natural buffer to the surrounding environment. Through the biological activity of microorganisms in the soil, most waste is broken down. Thereby pathogens (disease causing microbes) are eliminated, and the level of nutrients and pollution is reduced</p>
<p>2.5 Erosion prevention and maintenance of soil fertility: Soil erosion is a key factor in the process of land degradation and desertification. Vegetation cover provides a vital regulating service by preventing soil erosion. Soil fertility is essential for plant growth and agriculture and well-functioning ecosystems supply the soil with nutrients required to support plant growth</p>

2.6 Pollination: Insects and wind pollinate plants and trees which is essential for the development of fruits, vegetables, and seeds. Animal pollination is an ecosystem service mainly provided by insects but also by some birds and bats. Some 87 out of the 115 leading global food crops depend upon animal pollination including important cash crops such as cocoa and coffee (Klein et al. 2007)

<p>THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY: CATEGORIES OF ECOSYSTEM SERVICES (http://www.teebweb.org/resources/ecosystem-services/)</p>
<p>2.7 Biological control: Ecosystems are important for regulating pests and vector borne diseases that attack plants, animals, and people. Ecosystems regulate pests and diseases through the activities of predators and parasites. Birds, bats, flies, wasps, frogs, and fungi all act as natural controls.</p>
<p>3.0 Habitat or Supporting Services</p>
<p>Habitats for species: Habitats provide everything that an individual plant or animal needs to survive food; water; and shelter. Each ecosystem provides different habitats that can be essential for a species' lifecycle. Migratory species including birds, fish, mammals, and insects all depend upon different ecosystems during their movements.</p>
<p>Maintenance of genetic diversity: Genetic diversity is the variety of genes between and within species populations. Genetic diversity distinguishes different breeds or races from each other thus providing the basis for locally well-adapted cultivars and a gene pool for further developing commercial crops and livestock. Some habitats have an exceptionally high number of species which makes them more genetically diverse than others and are known as 'biodiversity hotspots.</p>
<p>4.0 CULTURAL SERVICES</p>
<p>4.1 Recreation and mental and physical health: Walking and playing sports in green space is not only a good form of physical exercise but also lets people relax. The role that green space plays in maintaining mental and physical health is increasingly being recognized, despite difficulties of measurement.</p>
<p>4.2 Tourism: Ecosystems and biodiversity play an important role for many kinds of tourism which in turn provides considerable economic benefits and is a vital source of income for many countries. In 2008 global earnings from tourism summed up to US\$ 944 billion. Cultural and eco-tourism can also educate people about the importance of biological diversity.</p>

12.6 Impact prediction and assessment.

The key matters of interest regarding ecosystem services and biodiversity for forest operators are the functional aspects of forests and the need to ensure that the said processes are not unduly disrupted since they form the basis of forest sustainability.

Thus, the core processes can be summarised as follows:

- a) **Soil conservation:** everything should be done to avoid soil degradation and to avoid soil pollution given the critical role of soil biodiversity in the vigour of ecosystems.
- b) **Pollination:** this refers generally to the transfer of pollen between flowers: birds and insects are the main agents
- c) **Seed dispersal:** seed dispersal and seed predation affect the regeneration potential of forest stands; the higher the quantity of viable seeds, the more robust the regeneration. Most animals that feed on fruit facilitate seed dispersal. Seed predation may have negative effects on forest regeneration; insects that feed on seed and seedlings have the potential to kill their host.
- d) **Nutrient cycling:** nutrient cycling depends on soil moisture, soil ph., soil texture and the nature of the soil itself-whether shallow or deep or whether freely draining or waterlogged,

etc.

- e) **Infiltration of water into the soil:** forest floor conditions such as the presence of a litter layer, soil organisms, soil texture and site conditions help determine the degree to which water infiltrates into the soil and percolate in the subsurface.

12.5 Mitigation and monitoring - Environmental and Social Management Plan

At a time when increasing pressures are being placed on forest managers to adapt management practices to meet changing demands and projected climate change, it is important that policy makers and other stakeholders in the forestry sector have the tools to examine how possible changes in policy and legislation may affect sustainability indicators, .

In this regards, ecosystem conservation considerations have been built into the forestry legislation, the COP and forest management guidelines. The legislation grants power to the GFC to set conditions for timber harvesting, restrictions on felling trees, and restrictions on felling species. The Forest management guidelines include prescribing fell cycles, forest organization- compartments and blocks; annual allowable area, annual allowable cut, maximum yield per hectare.

As such, RTI values the ecosystem services provided by the forests of Guyana and has committed utilise RIL principles and practices in association with the COP and GFFO. RTI will also adopt suitable measures to conserve water resources, soil and air quality will also contribute to ecosystem conservation. RTI will collaborate with MNR, GGMC, GFC and EPA to develop a logging plan targeting areas that are earmarked for mining activities. RTI will target such areas identified in order to extract commercial species before the commencement of mining activities. These measures will be articulated and outlined in FMPs, AOPs and annual reports to the GFC and EPA.

RTI recognises that damage to the shared ecosystems within the area held by SFEP 2/2020 is inevitable. It is an accepted fact that mining leads to the destruction of entire habitats and modification of the geological features underlying them (TEEB 2010). Miners within the concession area will be encouraged to support conservation projects by RTI. The draining and/or filling of exploratory pits and mined sites are areas where miners and RTI can cooperate.

RTI will train all site personnel to have a basic understanding of environmental principles (value of ecosystem services, protection and conservation). RTI operatives will also be trained avoid adverse impacts on ecosystem services which may result in adverse health, safety risks and impacts to affected communities.

13.1 NOISE AND VIBRATION

13.2 Introduction

Forest logging involves the use of various noise-producing equipment, which may be harmful to the hearing capabilities of operators in the immediate area. One of the problems that came up along with the mechanization of forest operations is exposure of machine operators to noise and vibrations.

In most cases, noise is produced as a result of human activities: noise is sound energy that is objectionable because of its physiological and psychological effects on humans.¹⁶³

In logging operation, heavy duty equipment is required for the construction of forest roads, skidding logs and organizing log markets. Such equipment are also used for conveying logs from log markets to log depot. These heavy-duty equipment produce noise and vibration. Other sources of noise and vibration are generators, chainsaws and other mechanical equipment in workshops at base camps.

High level of noise is a disturbance to the human environment. Noise in industries is also an occupational hazard because of its attendant effects on workers' health. Noise presents health and social problems in industrial operations, and the source is related to the machineries used in the industries. One of the unique features of the noise associated with wood machinery is the level of exposure and duration. Equipment used in a factory can be extremely loud. They can produce noise at decibels high enough to cause environmental health and safety concerns. The mechanically driven transport and handling equipment, cutting, milling, shaping and dust extractor installations in the wood industry generate noise. The sources of noise pollution have increased due to non-compliance with basic safety practices. The increased use of locally fabricated machine in the industry has increased the level of noise and vibration.¹⁶⁴

RTI is committed to mitigating noise and vibration in every case where this is achievable. The company will focus on the careful planning of the use of machines and employee sensitization about the issues of noise and vibration and their respective mitigation will be RTI' main thrust in its noise and vibration mitigation practices.

13.3 Definitions and scope

Noise pollution is one of the important issues of pollutant in workplaces and is almost one of the harmful agents. Noise is defined as unpleasant or unwanted sound released into the environment. It disturbs the human being causing adverse effects on the mental and psychological wellbeing. In other words it is simply the rapid fluctuation of air pressure, usually resulting from the vibration of a noise source.¹⁶⁵ It has been scientifically proven that noise more than 85 decibels can cause hearing impairment also accidents.

The term 'vibration' covers any vibration which is transmitted to the human body through solid structures and is harmful to health or otherwise dangerous.¹⁶⁶

The main sources of noise associated with the sawmill operation include: Transportation,

¹⁶³ Godish, T.; Davis, W.T.; Fu, J.S. Air Quality, 5th ed.; CRC Press: Boca Raton, FL, USA, 2015

¹⁶⁴ <http://docplayer.net/43677783-Noise-pollution-and-control-in-mechanical-processing-wood-industries.html>

¹⁶⁵ *ibid*

¹⁶⁶ https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312293

unloading and loading of logs; Chain saw use for off-cuts, and damaged or out of specification timber; Milling and planing operations (including headrig, edger, resaw and planer). For forestry activities, chainsaw operators, operators of skidders, bulldozers excavators and front end loaders and mechanics are particularly exposed to noise for many hours at a time on a regular basis. Manufacturers of heavy-duty machines goes to great lengths to prevent reduce the noise and vibration emanating from their machines.

13.4 Legislation

The relevant legislation that governs noise management in Guyana is the Environmental Protection (Noise Management) Regulations 2000 (see Section 5.2.9.3). It is the primary noise management legislation in Guyana. The EPA and the GNBS have published standards (see Tables 11, 42) to guide developers. Noise decibel levels are not to be greater than the established permissible noise levels/limits of the Guyana National Bureau of Standards (GNBS) Guideline values for noise in specific environment which has been adopted by the Environmental Protection Agency (EPA).

Table 42: GNBS' Guidelines for Noise Emission into the Environment (GNBS: GYS263:2010 First Revision)

Categories	Daytime Limits (dB) (06:00-18:00)	Night-time Limits (dB)
Residential	75	60
Institutional	75	60
Educational	75	60
Industrial	100	80
Commercial	100	80
Construction	90	75
Transportation	100	80
Recreation	100	70

13.5 Baseline information

Clusters of noise measurements were taken in at various locations within and around the concession during September 11-17, 2021 (see Figure 34)

As a benchmark, noise decibel levels are not to be greater than the established permissible noise levels/limits of the Guyana National Bureau of Standards (GNBS) Guideline values for Noise in specific environment which has been adopted by the Environmental Protection Agency (EPA).

RTI's SFEP is characterised by itinerant mining and for all practical purposes the SFEP area may be considered an 'industrial zone'.



Figure 34: Photographs showing consultants engaged in data collection.

13.6 Results and Discussion

Noise levels within RTI’s forest concession ranged from 35.40dB to 52.60 (see Table 43). Noises emanated primarily from motor driven water pumps, generators in the vicinity and passing motorboats.

13.7 Impact Assessment

Employees of RTI will be exposed to noise and vibration across the whole gamut of the company’s field operations almost daily because they are in the frontline of operations.

Mining operatives or persons transiting the forest concession may be affected temporarily if they happen to be in the vicinity-less than 300m - of logging operations.

Logging practices impact wildlife generally by altering habitats and dispersing populations but there is reason to believe that different faunal groups react differently to these practices (Fimbel, Grajal, & Robinson, 2001). For noise emanating from tree felling and skidding operations, nuisances will normally be very temporary, a maximum of about three weeks duration per 100ha block. However, noise and vibration impacts will persist along the main primary roads that are used a regular basis.

Table 43: Noise data recorded at SFEP 2/2020

Sample ID	Date	UTM Coordinates 21N		Time	Noise Data	Wind	
		Easting	Northing			Start	dB
RTI1	15/09/2021	0200937	0686723	10:30	46.20	-	-
RTI2	15/09/2021	0201468	0689778	15.44	47.30	-	-
RTI3	15/09/2021	0831823	0689629	10.55	42.20	-	-
RTI4	15/09/2021	0224302	0690918	14.01	28.90	-	-

13.8 Mitigations Measures

To further reduce worker exposure to hazardous noise and vibration RTI will apply the following basic measures:

- a) All employees will be sensitized about the dangers of exposure to noise and vibration.
- b) Employees will be provided with ear plugs or other appropriate hearing protection apparatus to restrict noise and vibration entering their ear.
- c) The use of all machinery will be planned the extent that engines will always be turned off after use. Machines will be serviced and maintained in a state where they emit only noise in line with their optimum performance. Care will be taken that all machines will carry fully functional exhaust systems.
- d) Timber harvesting operations will be restricted to periods between 7:00hrs and 18:00hrs.
- e) Enclose engines and heavy equipment workstations to contain the noise
- f) Install silencers and mufflers on equipment
- g) Reduce exposure time for workers operating noisy equipment
- h) Perform maintenance of hand tools and vehicle systems
- i) Ensure that workers consistently wear properly-fitted hearing protection every time they are in noisy areas or using noisy equipment
- j) Make sure that employees receive regular monitoring for changes in their hearing, so that additional measures to limit the progression of any detected hearing loss can be taken

14.1 LAND SCAPE AND VISUAL RESOURCE

14.2 Introduction

Guyana's forests form part of the wider Guiana Shield Rainforest that also covers Suriname, French Guiana, Venezuela and Brazil and is one of the largest expanses of untouched tropical rainforest in the world.¹⁶⁷ As such, the landscapes in the concession area is characterised by predominantly fast flowing rivers, densely forested and flat to undulating and hilly terrain. The north-western and the eastern districts are characterized by very hilly terrain. The highest elevation is the East Puruni Peak reaching 427 meters (1,500 feet).

A 175km segment of (right bank) Puruni River forms the northern boundary of the concession area. The central and eastern areas of the concession are drained mainly by right bank tributaries of the Puruni River, including the Kamiguin (Kumong-Kumong) River and the Pashanamu River. The western end of the concession area is drained primarily by the Putareng River, itself a left bank tributary of the Mazaruni River.

GFC's projections are that by mid-2021, active timber harvesting operations will extend from Pappy-Show to Iteballi. There are no indigenous communities within (the vicinity) of the concession area. Mining represents the primary land use within the concession area. RTI estimates that since 2007, the area of forests in the concession area has declined by 15%.

Logging activities leads to interventions in forest canopies that alter the quality of, or degrade landscapes. Logging impacts the environment in two ways, the timber harvest itself, that is, the removal of trees from the forest, and secondly by the disturbance caused by logging operations. The removal of trees alters species composition, the structure of the forest, and can cause nutrient depletion. Harvesting also can lead to habitat loss, prominently in high-value, ecologically sensitive lands. Harvesting adjacent to streams can increase sedimentation and turbidity in streams, lowering water quality and degrading riparian habitat. Poor logging practices could lead to forest fragmentation which further degrade landscapes. It is possible to do logging and still preserve the aesthetic values of landscapes. Poor logging practices may also lead to major transformation of the vegetation types, where grasses, lianas or shrubs may dominate.

Selective logging and thinning can maintain and enhance forest productivity and achieve co-benefits when conducted with due care for the residual stand and at intensity and frequency that does not exceed the rate of regrowth.¹⁶⁸

14.3 Definitions and Scope

Landscape means the natural and physical attributes of land together with air and water which change over time and which is made known by people's evolving perceptions and associations [such as

¹⁶⁷ <https://forestlegality.org/risk-tool/country/guyana#tab-resources>

¹⁶⁸ Romero, C. and F.E. Putz, 2018: Theory-of-change development for the evaluation of forest stewardship council certification of sustained timber yields from natural forests in Indonesia. *Forests*, 9, doi: 10.3390/f9090547.

beliefs, uses, values and relationships].¹⁶⁹

Landscapes are a composite of various ecosystems. Rainforest landscapes are influenced by variables such as weather, drainage and soil.¹⁷⁰ At a regional scale, Hammond (2005) describes ‘a massive landscape designated the Guiana Shield simply as a land of old rock, poor soils, much water, extensive forests and few people’. Some authors also refer to the term landscape ecology—the study of spatial patterns, processes and change across biological and cultural structures within areas encompassing multiple ecosystems.¹⁷¹

14.4 Key relevant policy, legislation, guidelines, and standards.

The key policy, guidelines and standards in Guyana in respect of conservation and protection of landscapes seem oriented towards avoiding forest gaps, forest fragmentation and forest degradation.

The GFC has always characterised forest types by linking species composition with edaphic factor and altitude, for example, the forest concession contains a forest type described as 1. Mixed forests on hilly or undulating terrain.

The GFC, in its forest concession administration protocols determine where logging should occur (Sections 6, 10 of the Forests Act, 2009), the proportion of productive area, the proportion of productive area should be set aside as a biodiversity reserve, annual allowable area (ha) and the annual allowable cut (m³) and the maximum yield per hectare (m³/ha) that should be extracted. There are provisions for forest protection (Section 24, 30 of the Forests Act, 2009). There are prescriptions in the Forests Regulations to avoid clear felling at all costs by limiting the diameter at breast height of trees that should be felled. There are many prescriptions seeking to conserve the forest environment by for example, prescribing standards for roads (see Section 5 of the COP) and log markets, managing skid trail alignment and skid trail density, and the conservation of water courses. Also, there is the effort to limit gaps by prescribing the minimum distance between trees that should be felled. Felling trees is also prohibited on slopes.

14.5 Impact prediction and assessment

Logging in tropical forests could modify landscapes by altering forest structure via the distribution of diameter classes, changing the proportion of each species and by affecting forest architecture via alteration of the height class structure of the forests (van der Hout, 2000; Ghazoul & Sheil, 2010). Forest gaps and forest fragmentation are a major source of concern. Fires and extended flooding are also capable of extensive forest degradation. Accelerated erosion frequently leads to accelerated sediment loads in waterways which degrade the aesthetic values of the landscape.

14.6 Mitigation and monitoring

¹⁶⁹ Mainpower NZ Ltd v Hurunui District Council [2011] NZEnvC 384 at [301]

¹⁷⁰ Ghazoul, J., Sheil, D. 2010. Tropical rain forest ecology, diversity, and conservation. New York, USA, Oxford University Press.

¹⁷¹ Wade, T., & Sommer, S. (2006). A to Z GIS: An illustrated dictionary of geographic information systems. Redlands, Calif: ESRI Press.

In forest operations where reduced impact logging techniques are utilised and applied, significant landscape changes are not anticipated due to logging activity. It is however unfortunate, that many parts of the concession area have been allocated for mining which, in a situation of shared land use and infrastructure, could significantly impact mitigation efforts. Landscape conservation will be a natural consequence of mitigation measures adopted for the conservation of soil and the conservation of water ways.

Consequently, RTI anticipates that its embrace of RIL practices will *prima facie* support its efforts in forest conservation and conservation of landscapes. RTI will spare no effort to avoid forest fires, stream pollution, deforestation, and any other form of forest degradation.

RTI' first priority is to ensure that all employees share responsibility for avoiding forest fires and stream pollution. RTI will hold quarterly briefing sessions with employees to discuss problems associated with fires and stream pollution. The relevant sections of GFC's COP, 2018, specifically:

- a) Chapter 5: sections 5.5 (drainage) & 5.7 (water course crossings),
- b) Chapter 8
- c) Chapter 9
- d) Chapter 10: section 10.4 (fire prevention and suppression) and section 10.11 (water operations).

RAI's employees and contractors will be prohibited from lighting any kind of open fire on the forest floor or around the base camp.

RTI will also conduct the following:

1. Identify outstanding natural landscapes and features, together with areas that have high or specific amenity values within the forest concession
2. Develop objectives, policies and methods to protect landscapes, features and high or specific amenity values
3. Develop rules and consent conditions to control subdivision, use and development

There will be two main measures to avoid stream pollution, as follows:

- a) No major road works will be carried out during the rainy season, and no activity requiring earthworks will be done during a rain storm
- b) No water from side drains or ditches will be allowed to enter directly into water courses. Such water will be led into special pits where it will lodge and allowed to infiltrate into the soil. Alternatively, the water will be channeled through any suitable structure or debris deliberately put in place to trap most of the sediments suspended in the drainage water before it reaches the watercourse.

15.1 CULTURAL HERITAGE

15.2 Introduction

Forests are some of the most biodiversity-rich habitats on Earth. They play a crucial role in climate regulation by absorbing carbon dioxide (CO₂) and are considered as one of the most cost-effective forms of climate action.¹⁷²

The term ‘heritage values’ refers to the meanings and values that individuals or groups of people bestow on heritage (including collections, buildings, archaeological sites, landscapes and intangible expressions of culture, such as traditions).

The Indigenous Peoples were said to be the very first inhabitants of the land. They share a rich and diverse culture and are one of the many ethnic groups that make up the people of Guyana.

The Upper Mazaruni District is located in the west-central part of Guyana, bordering Venezuela and Brazil and is part of the Guiana Shield, recognized as one of the most ancient and vulnerable ecosystems on earth. It encompasses the upper part of the Mazaruni River basin where the Akawaio and Arekuna peoples have been living since ‘time immemorial’ and who maintain a strong collective attachment to their territory up until today.¹⁷³

Archaeological investigation indicates that human presence in the region dates back thousands of years, resulting in a culture that is deeply interconnected with the land: “The social structure, economy, conceptual system and the whole way of life of its present inhabitants are embedded in this landscape, its climate and its biodiversity, flora and fauna.”¹⁷⁴

Akawaio and Arekuna peoples depend on their forests, savannahs, mountains, rivers and wetlands for their sustenance and distinct way of life. They believe that the spirits of their ancestors populate the landscape and that any relocation from their traditional land will bring sickness and misfortune to their communities. There are nine Indigenous Nations that settled across the ten administrative Regions of Guyana.

The Arecunas originated from the Caron, a large tributary of the Orinoco, this tribe is located on the banks of the Kamarang river. In the olden days they grew cotton in commercial quantities, which they traded to the other tribes. Their weapon of choice was the blow-gun and they were experts in

¹⁷² <https://whc.unesco.org/en/forests/>

¹⁷³ Butt Colson, A J (2009) Land: its occupation, management, use and conceptualization – the case of the Akawaio and Arekuna of the Upper Mazaruni District, Guyana. Last Refuge, Panborough

¹⁷⁴ Butt Colson, A J (2013) Dug out, dried out or flooded out? Hydro power and mining threats to the indigenous peoples of the Upper Mazaruni district, Guyana. FPIC: Free, Prior, Informed Consent?

its manufacture.

The Akawaio is a warlike tribe that travelled from village to village, carrying the news and trading with other tribes. They also, love to use the blow-pipe. Members of the tribe are located in the Upper Mazaruni area, on the Barama, Upper Pomeroon, Demerara Wenamu, and the Upper Cuyuni rivers.

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RTI will endeavour to identify, discover, conserve and record any asset of evidence of archaeological importance within the concession.

15.3 Baseline information

The indigenous peoples of Guyana are known locally as 'Amerindians'. It is estimated in the 2012 Census that they number around 78,500 persons - close to double the estimates compared to the 1980 Census. They are the descendants of the first people to inhabit the varied geographical zones in the northern part of South America. Some groups were coastal dwellers while others lived mainly in the rain forest, savannahs and mountains of the interior.

The Amerindians are grouped into nine Indigenous Nations, based on language. The Warao, the Arawak and the Carib (Karinya) live on the coast. The Wapichan, the Arekuna, the Makushi, the Wai Wai, the Patamona and the Akawaio live in villages scattered throughout the interior. Amerindians constitute the majority of the population of the interior, in some regions accounting for as much as 86% of the population. The forest resources/timber on government-titled Indigenous lands (Amerindian Village Lands) are fully under the managerial authority of the Amerindian title holders, while minerals under the same lands remain ultimately under national government authority.

The coastal Amerindians are the Kalihna (Carib-Galibi), Lokono (Arawak-Taino) and Warau, whose names reflect the three indigenous language families.

The interior Amerindians are classified into six groups: Akawaio, Arekuna, Patamona, Waiwai, Makushi and Wapishana. All of these interior groups originally spoke Carib with the exception of the Wapishana, who are within the Taino-Arawak linguistic family.

The Akawaio who live in the lowland and upland forests of the present day Guyana interior, originally called themselves Kapohn and during the colonial era were the next most important warrior group after the Kalihna (Carib-Galibi). The Kapohn like most of the interior tribes are Carib speakers and were found across a wide region from Essequibo to Berbice and especially down the main rivers.

In the early years of colonial presence the British considered the Kapohn (Akawaio) to be the most hostile of all the indigenous peoples in Guyana.

Amerindians have inhabited the lower Mazaruni area for hundreds of years and employed their traditional shifting settlement and agricultural practices. The Dutch colonists established a strategic trading post and fort called Ky-kover-al on an island off Kartabu Point in the eighteenth century. Later, some permanent settler cultivated land on the left bank of the Mazaruni River and the right bank of the Cuyuni Rivers. An Amerindian Mission called St. Edwards was established on the left bank of Mazaruni River –Kartabu Point- in the early 19th century. (Studies of tropical insects were

¹⁷⁵ <https://moaa.gov.gy/amerindian-nations/>

carried out by a United States Research Team, who established a research facility at Kartabu Point just after World War II).

The Arekuna were late migrants into what is now Guyana. They lived originally in upper regions of two large rivers in Venezuela (Caroni and Paragua). After 1770, the Spanish Capuchin missions, with the support of the colonial authorities, began to forcibly resettle the Arekuna and other indigenous communities away from their traditional lands to missions located on the Orinoco River. Groups of Arekuna escaped to Guyana to avoid this process and established villages in the upper areas of the Mazaruni and Cuyuni Rivers.

According to the APA, all Amerindian villages along the Upper Cuyuni were formed relatively recently, considering the developments in other regions: Kartabo-1900; Kaikan-1920; Karrau-1940; Kurutuku- 1967; Batavia- 1970; in contrast villages in the upper Mazaruni such as Kako, Kamarang and Philipai have been around since time immemorial (APA, FPP, & RFF, 2019).

To date, no indigenous assets of archaeological importance have been detected within the concession area.

However based on the fact that several such assets exist within neighbouring concessions, then it is highly likely that there are such assets within the concession area. Any such assets are likely to be discovered during 100% pre-harvest inventories.

RTI' field operatives will be trained to identify and record the presence of any archaeological materials including products made from pottery, ancient tools, old cemeteries, rock paintings during 100% enumeration activities.

15.4 Impact predictions

In the pursuit of its logging operations, RTI will ensure that all interventions in the forest is done in a sustainable manner. RTI field operatives will be trained to be vigilant in order to identify and record assets of indigenous or archaeological importance that may be destroyed during logging activities or by miners.

15.5 RTI' POLICIES

RTI will adopt the following policies in the development of the concession:

- a) RTI will only intervene in the forest resources to push a road or to harvest timber; beyond those activities forest areas of little commercial interest as far as merchantable timber is concerned will be left intact.
- b) RTI will engage the miners with a view to learning about their intentions in the longer term.
- c) RTI will be vigilant in isolating and protecting any asset of archaeological interest on the concession area and then bringing the relative facts to the authorities.
- d) RTI will not encourage the setting up of any 'bush shops' near to its base camp.
- e) RTI will post appropriate signs (see Figure 35) at strategic points within the concession area and along its roadways.

f) RTI will not operate near communities



Figure 35: Specimens of signage to be posted by RTI

16.1 SOCIO-ECONOMIC AND CULTURAL IMPACTS (DIRECT AND INDIRECT)

16.2 Introduction

RTI strongly believes that its logging project will transform the socio-economic environment for Kartabu triangle because of the impacts its operations will have on cash inflows to residents, improved options for road access to untapped mineral and timber resources respectively. RTI' operations will also improve the performance of the forestry sector, since more revenue will enter the state coffers through production and export of timber, more timber will be available timber on the local market to bolster the current building boom.

The core impacts are summarized in Table 44.

#	Issue	Nature of Impact
1	Employment	<ul style="list-style-type: none"> ● Creation of equal opportunities for employment and training ● Expanded businesses and opportunities
2	Concession road network	<ul style="list-style-type: none"> ● Expanded gold mining operations and prospecting ● Restrictions on road use leading to conflict ● Opportunities for expanded services by private and public entities ● Increased opportunity for illegal logging and mining activities
3	Road hazards	<ul style="list-style-type: none"> ● Potential dust hazards due to increase road traffic ● More risk of accidents due to increase traffic congestion

Table 44: Identification of core socio-economic and cultural impacts.

16.3 Definitions and scope

The total size of SFEP 2/2020 is 107,670.54 ha and consist of mostly intact forests. These forests are very important for the protection of watersheds and the conservation of fauna. The National Forest Policy Statement 2018 (GFC, 2018) includes not only provisions for the sustainable harvesting of timber, but also the direct and indirect services provided by forests. These services are describes as - provisioning services, regulating services, habitat or supporting services, and cultural services.¹⁷⁶

16.4 Baseline studies

FTCI, the consultants contracted by RTI engaged in extensive formal and informal consultations with stakeholders within the Kartabu-Puruni-Pashanema District in relation to Royal Timber Inc.'s SFEP 2/2020. These yielded information on the perspectives of stakeholders in the face of the projected logging operations within SFEP 2/2020 and ancillary benefits for stakeholders, particularly in terms of employment opportunities, increased trade in goods, new access options for areas in within the Puruni district, and the availability of more services from Central Government and the Regional Development Council, Region 7. The interviewees included large and small miners, loggers, the business community, and residents of Kartabu Village. FTCI also interviewed a

¹⁷⁶ <https://www.fao.org/3/w3641e/W3641E06.htm#1892>

representative the Regional Administration (#7), the Police, the NIS, the Bartica Public Hospital and the GFC respectively, all in Bartica-the capital of Region 7.

16.5 Impact prediction and assessment

16.5.1 Positive Direct Impacts

a) Employment opportunities

RTI' projected operations will include a massive recruitment and transfer of people and equipment to the Base Camp. RTI requires a large number of field operators, auto-mechanics, and heavy-duty machine operators. As far as possible RTI will recruit employees from the Puruni and Kartabu Triangle.

b) Skills training for employees

RTI is committed to create a crew of skilled technicians in the Puruni and Kartabu Triangle within three years. RTI invest in training new employees in RIL principles and practices. RTI will also ensure that its employees share responsibility for compliance with GFC standards and guidelines for sustainable forest management.

c) Road network development

RTI will invest heavily in developing a comprehensive road network within the Puruni and Kartabu Triangle. RTI has intentions to share responsibility for the maintenance of the Kartabu Puruni Road and will work closely with the GFC/MOPW/MNR/GGMC to develop a maintenance schedule of selected or agreed road segments with other stakeholders.

It is expected that GoG officials will take advantage of improved road networks developed by RTI for outreach exercises for monitoring or managing matters of public interest, including matters of public health and security.

d) Revenue for Government

It is expected that the any imminent new large scale logging operations will lead to a significant increase in revenue for the GFC and other GoG entities. The Government will benefit directly from taxes linked to remuneration packages and taxes on the expanded trade in the volume of goods and services expected to be generated by the logging operation. Agencies such as the NIS and GEA is also expected to benefit from increased business activities in the area.

16.5.2 Positive indirect impacts

a) Enhanced interest by public agencies and private developers

The consequent increase in the workforce within the Kartabu Triangle as well as the higher proportion of employed workers within communities caused by RTI' operations and the corresponding increase in the volume of cash flows will lead to the expansion of existing businesses as well as create opportunities for new businesses to the area. There are also opportunities for eco-tourism ventures in the Kartabu Triangle.

b) Community development

RTI' operations will provide opportunities for regular employment and training for persons willing

to work on its forest concession. Further the proposed use of Information Technology and UAVs for forest monitoring purposes will ensure adequate challenges for young people.

c) Regional Development

RTI' proposed logging operations is expected to lead to increase exploration of the area embodied under SFEP 2/2020. RTI has committed to sharing responsibility for the maintenance of the Kartabu Puruni Road. It is expected that a fully functional road will lead to an increase in the flow of goods, expanded economic activities, and provide more justification for a bridge at Puruni Landing.

16.5.3 Negative Direct Impacts

a) Conflict due to restrictions on the use of RTI' concession based road network

In view of the potential negative direct impacts, RTI has committed to manage the use of its roads within the concession area for its own security and for ensuring compliance with its Environmental Authorization and other applicable legal and policy guidelines. RTI will therefore impose restrictions on hunting, fishing, and littering for persons trying to access the concession area. However, conflict may arise as a result of these restrictions.

16.5.4 Negative indirect impacts

a) Potential scarcity of mechanics, technicians

RTI is aware that it will start logging operations in an area already occupied by other loggers and miners who require the same skills sets that RTI will recruit. As expected, new enterprises and investments create new employment options for people already working in the area. RTI will therefore find itself competing for heavy-duty drivers, mechanics and field operators. To address this, RTI has committed to invest more time and money on efforts to retain its employees and prevent them from transferring to other operations within the area.

b) Expansion of public agencies' budgetary provisions

With the proposed logging enterprise, it is expected that there will be expanded activity within the Puruni District. This may force public agencies to expand the scope of their field operations by posting staffs in those areas, expand their budgets and field staff, or to transfer resources from other geographic areas that are less active. For example, the GPF may have to invest in its own facilities at Puruni landing due to increase economic activity in the area.

16.6 Mitigation measures

As a result, RTI has put forward the following mitigation measures:

- a) RTI will ensure at all times in its operation to follow the provisions of the COP, forest management guidelines and prescribed tasks set out in its Environmental Authorization.

- b) RTI' will ensure that its Forest Monitoring Officer will be proactive in engaging stakeholders so that any issues of concern will be addressed in a timely and amiable manner.
- c) All heavy-duty vehicles and logging trucks will be equipped with rotating beacons while traversing the roadways on the concession.

Table 45: Table of expected potential social impacts from RTI' operations

Predicted Impacts	PROJECT ACTIVITIES								
	Planning Phase				Operations Phase				
	Const. of forward camps	Const. of primary access roads	100% Pre-harvest Enumeration	Tree marking operations	Construction of secondary roads	Constr. of Skid trails, Log markets	Felling trees & skidding logs	Log market operations	Log haul to Pine Tree Landing by trucks
Employment	Lo: Rv: St: Av: Im: In: Lp	Ex: Rv: St: Un: M: Sig: Hp	Lo: Rev: St: Un: M: In: Lp	Lo: Rev: St: Un: M: In: Lp	Ex: Rev: St: Un: M: Sig: Hp	Ex: Rev: St: Un: M: Sig: Hp	Ex: Rev: Lt: Un: Im: Sig: Hp	Lo: Rev: St: Av: M: Sig: Hp	Ex: Ir: Lt: Un: Im: Sig: Hp
Concession based conflicts	Lo Rev Lt Un M In Hp	Ex Rev Lt Un M In Hp	Ex Rv Lt Av M In Hp	Lo Rv St AV M In Lp	Ex Hp Ir. Lt Un Sg	Ex Hp Ir. Lt Un Sg	Ex Hp Ir. Lt Un Sg	Lo Rv St Un M In Lp	Lo Ir. Lt, Un M Sg Lp
Other Conflicts	Lo Rev St Av M In Lp	Ex Rv St Un M In Lp	Ex Rv Lt Un M In Lp	Ex Rv St Un M In Lp	Ex Rv Lt Un M In Lp	Ex Rv St Un M In Lp	Ex Rv St Un M In Lp	Lo Rv Lt Un In LP	Lo Ir Lt Un M In Lp
Road Hazards	Lo Rv St Un M In Lp	Ex Rv Lt Un M Sg Hp	Ex Rv Lt Un M In Lp	Ex Rv Lt Un M In Lp	Ex Rv Lt Un M Sg Hp	Ex Rv Lt Un M Sg Hp	Ex Ir Lt Un M Sg Lp	Lo Rv Lt Un M In Lp	Ex Rv Lt Un M Sg Hp

Impact Significance (parameters)

Lo-localised, Ex-Extensive/ Rv-Reversible, Ir-reversible/St-short term, Lt-long term/ Av-Avoidable, Un-Unavoidable/ M-Mitigable, Im-Immitigable/ Sig-Significant, In- Insignificant/ Hp-High probability, Lp-Low probability

Note: All Extensive, Mitigable, Long term, and significant impacts will have to be prioritized.

17.1 RISKS AND RISK ASSESSMENT

17.2 Introduction/Overview

Royal Timbers Inc. (RTI) acquired SFEP 2/2020, over an area of 107,670.54 ha on right bank Puruni River, west of Puruni Landing, for the purpose of developing an integrated logging and sawmilling business. RTI plans to set up three (3) portable sawmilling facilities within the concession area to process the logs harvested from the concession area. The lumber produced will be transported by trucks via the Kartabu-Puruni Road (KPR), to Iteballi, left bank Mazaruni River, from where the lumber will be shipped by barge to Georgetown or other coastal locations.

In the pursuit of its project, RTI will:

- a) Comply with the full suite of sectoral policies, legislation and standards that govern logging, wood processing operations and overarching policies on environmental management, including the conservation of biodiversity, the conservation of fauna and protected areas;
- b) Support multiple use of the forest resources; in particular, RTI will respect the rights of indigenous peoples, and the rights of miners and of other stakeholders in relation to the forest resources on concession area;
- c) Conserve forest resources, unique landscapes and preserve items of archaeological significance;
- d) Manage the timber harvesting operations based on RIL principles;
- e) Collaborate on the shared use of existing and new road networks that RTI will construct for its own operations;
- f) Develop and implement mitigation measures for negative environmental impacts generated from its logging and wood processing operations respectively; and

17.3 Access

The primary means of access to the concession area is via Iteballi, left bank Mazaruni River then via the KPR for about 108km to Puruni Landing, thence across the Puruni River to the eastern boundary of the concession. A 99.8km segment of the KPR west of Puruni Landing forms the southern boundary of SFEP 2/2020 and this road segment will be used to access the concession area and extract forest produce.

17.4 Forest Resources

RTI is committed to the sustainable use of the forest resources within its concession. RTI is aware that its operation will contribute directly to the economic development of Region 7. It is also understood that the activities will modify the forest environment in a negative way.

RTI is satisfied with the following parameters for the forest resources:

- a) The high quantity and quality of the merchantable stock within the concession area;
- b) Suitable terrain for road construction and RIL based timber harvesting operations;
- c) Potential opportunities for value added wood processing;
- d) Opportunities for expansion and utilization of lesser used species in the concession.

17.5 Choice of technology

RTI intends to harvest a wide range of species using the principles of reduced impact logging (RIL) and prescriptions of the COP. There will be strict adherence to RIL principles and prescriptions of the COP, especially regarding buffer zones along waterways, parameters for side drains/ditches and precautions during bridge and culvert construction to reduce environmental impacts and achieve cost savings.

Consequently, RTI will utilise the following equipment in its operation:

- a) Chainsaws designed for directional tree felling and with the proper safety features for the protection of the chainsaw operator.
- b) Bulldozers, motor graders, compactors for main road clearance and surfacing works.
- c) Excavators for mining burrow pits, roadside draining design, and bridge and culvert construction.
- d) Front-end loaders (with fork and bucket) for loading earths into trucks and for loading logging trucks.
- e) Skidders for transferring logs from stump to log market.
- f) Heavy-duty logging trucks with a proven performance under local forest conditions.

RTI is therefore confident that spare parts and the proper maintenance services are available to keep all equipment in their proper functional state. RTI is confident that the use of RIL practices associated with a maximum yield of 20 m³ /ha and prescriptions on felling trees set out in the COP will neither lead to accelerated forest degradation or forest fragmentation and further, will create minimal impact on fauna.

17.6 Constraints-stakeholder engagements

RTI is committed to engaging with relevant stakeholders in order to minimize conflict and create conditions for continuous operations. Also, RTI will push for large scale loggers to organize in some way so that they as a body can make a stronger impact on matters affecting loggers.

Generally, RTI will engage with other road users to ensure that all concerns are managed properly and not escalate into conflict.

17.7 Constraints-shared road use

RTI is aware that shared road use at the concession level is manageable, but conflicts in its use and maintenance may arise. RTI will therefore engage the MOPW, MNR, and GGMC to develop a specific road maintenance programme since the KPR is critical for RTI' operations: however the enterprise does not exercise any control over its use, and cannot, for example, post road signs to regulate its proper use. When using the road, RTI will simply apply basic 'care, consideration, caution, courtesy and common sense' practices in the face of other road users. RTI is also committed to supporting road maintenance efforts, by placing some of its equipment at the service of the authorities or simply proactively undertaking maintenance efforts at its own initiative and cost.

RTI is concerned about the time and effort traditionally required to address conflicts with stakeholders, in an environment dominated by miners.

17.8 Security Issues

RTI is confident that currently security considerations are unlikely to affect its operations. However, the company has envisioned that in a couple of years when its road system is developed, restrictions on hunting and fishing, the proximity of itinerant mining operations, and a diversity of 'bush businesses' traversing the concession area are all potential sources of security concerns. RTI will therefore rely on its stakeholder engagement protocols and the Guyana Police Force to identify and manage stakeholder issues.

17.9 Labour challenges

In order to maintain a successful and viable logging operation that is fully compliant with the legal framework for logging as well as other forest management standards, RTI requires a high number of skilled field operators. It is expected that RTI will compete with other regional enterprises for such field operators. RTI will therefore take reasonable measures, including competitive remuneration packages, to prevent the loss of its employees to other enterprises.

RTI values its employees and their respective training for the tasks required of them. RTI will ensure that it optimises the use of available technology to bolster the management of field data and records, and to achieve efficiency in the conduct of timber harvesting and forest monitoring functions, respectively.

17.10 Markets

RTI strongly believes that the market for local durable timbers will expand and that minimal prices for the best grades of timber will stabilise at US\$1,000.00 per cubic meter. RTI believes that customers will avoid lumber that has been impregnated with chemicals and will aim for more naturally durable timbers, such as those available in local forests.

The company predicts hardwood flooring and decking from tropical timbers will be premium products at the niche market level.

The imminent development of a VPA between GOG and the EU will also guarantee access to more markets.

17.11 Main cost centres

RTI has computed its primary cost centres as follows:

- a) Capital purchases of equipment;
- b) 100% pre-harvest forest inventory;
- c) Road construction and road maintenance respectively;
- d) Timber harvesting and extraction;
- e) Preventive maintenance of equipment;
- f) Labour costs and employee welfare, including training of field operatives;
- g) Concession administrative costs, including costs linked to the ESIA study and report as well as forest concession charges-acreage fees, royalties, and taxes;
- h) Corporate taxes;
- i) Administrative costs linked to Base Camp and forward camps;
- j) Forest monitoring tasks;

- k) International marketing practices; and
- l) Corporate social responsibilities.

17.12 Analysis and conclusion

RTI believes that the twelve (12) items identified at 17.10 will be responsible for most of the operational costs and will be expressed eventually in cost/m³. RTI expects to generate 10,000m² of high grade lumber per annum and all its research point to an annual incremental increase in the price obtained per cubic meter of high grade lumber. RTI is convinced the company will its investments comfortably within ten (10) years. Table 46 shows a simple SWOT Analysis for RTI.

Table 46: SWOT Analysis for RTI prior to the start of operations.

<p>STRENGTHS</p> <ul style="list-style-type: none"> • Location of concession: RTI's concession boundaries are well defined, no existing problems with neighboring concessions, and there are no Amerindian Communities within the concession area. • Large stocks of merchantable timber available within concession. • Wide ranging experience: RTI has a strong and experienced, management team. • Markets: RTI has access to markets based on current operations. 	<p>WEAKNESSES</p> <ul style="list-style-type: none"> • Itinerant nature of mining: this refers to miners operating in blocks proposed for harvesting, extensive use of RTI' logging roads and skid trails, etc.: these situation can negatively impact and complicate RTI's strategic planning. • Unfamiliarity with the mining community in situ: RTI will have to familirise its self with the owners of mining leases within and around the logging concessions. This will take considerable time and effort and will impact the time considerably for the enterprise to begin positive collaboration with them.
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> • Use of new and emerging technologies: RTI can capitalise on new and emerging technologies for wood processing and downstream processing. • New product lines: RTI can capitalise on the large number of merchantable lesser-used species to generate new wood products, including outdoor furniture. • New market opportunities: RTI is in a strong position to adapt to new market conditions and customer behaviour. 	<p>THREATS</p> <ul style="list-style-type: none"> • Competing land use-need to share road use: RTI will share its concession road network with many people who use a wide assortment of vehicles and equipment: conformity with RTI's road use protocols can lead to time consuming conflicts. • Strong national policy support for miners, whose activity drive economic activity in Region 7. • Inability to compete with the mining sector re remuneration packages for heavy-duty operators.

18.1 CUMULATIVE IMPACTS

18.2 Introduction

The combined, incremental effects of human activity, referred to as cumulative impacts, pose a serious threat to the environment. While they may be insignificant by themselves, cumulative impacts accumulate over time, from one or more sources, and can result in the degradation of important resources.¹⁷⁷

RTI's projections are that each year, based on parameters for a sustainable harvest, it will harvest 22, 249.46 m³ per year from 11 blocks. RTI also expects to salvage timber from trees discarded from mining operations. The logs produced within the concession will be converted onsite (within the concession area) to lumber. The lumber will then be brought to coastal locations for sale to local merchants or for export in value-added form to merchants overseas.

18.3 Definitions and scope

Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative impact analysis. While impacts can be differentiated by direct, indirect, and cumulative, the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time. Thus the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal, or private) is taking the actions.¹⁷⁸

In order to effectively address the cumulative impacts they must first be defined.

Cumulative Effects/Impacts for this study may be defined as the impact on the environment which results from the incremental effects of the timber harvesting when added to mining activities, past, present, and reasonably foreseeable future actions. Cumulative effects result from individually minor, but collectively significant, actions taking place over a period.

Cumulative impacts related to socio-economic impacts in Administrative regions 2, 3, 4, 6 and 7 are more difficult to quantify.

The nature of the project, particularly the projections for employment and the planned interventions into the resources along with existing land use are the elements used to determine cumulative impacts.

18.4 Cumulative Impacts

18.4.1 Positive impacts

The consultants believe the positive cumulative impacts will occur away from the concession area itself. The proposed project provides employment opportunities for those skilled field operatives who are not inclined to cope with the rigours and risks of mining and who also wish to be their families on a more regular basis. At Puruni, there are opportunities for women to get employment as

¹⁷⁷ <https://www.epa.gov/sites/default/files/2014-08/documents/cumulative.pdf>

¹⁷⁸ https://link.springer.com/chapter/10.1007/978-3-642-88583-9_87

clerks, checkers and timber graders. Residents of communities in the area are willing to stay and live within their villages providing they can get regular and constant employment. In addition RTI will provide many of its new employees with regular training that will improve their skills and position them to earn better remuneration packages. RTI' operations will attract more people to the Kartabu Triangle who will stay for extended periods.

RTI' operations will develop a fully functional road network within the concession area leading to the expansion of gold mining activity and increases in gold output within the area. Therefore RTI' operations will lead to many ancillary benefits for the economy.

18.4.2 Negative Cumulative Impacts

(a) Stress on families

Based on the proposed operation, RTI will be unable to cater for accommodation for the families of all workers deployed on the concession area. Therefore, field operatives based at the concession will be away from their families for extended periods, and unless managed well, this could lead to undesirable tension within families. In addition. Employees' children will also not benefit from the coaching and counselling of their fathers on a regular basis and this can only be to their disadvantage.

(b) Expanded road network.

Stakeholders, including miners, are sure to take advantage of the expanded road network that RTI will construct. Unlike typical mining roads, these roads will be well constructed and maintained to accommodate heavy-duty timber trucks. An expanded road network could prove to be a challenge for the security forces trying to track down people engaged in illegal practices.

(c) Intensity of interventions on the concession area

The concession area is already impacted by mining operations and it is straightforward at this time to assign responsibility for current environmental issues to mining activities. The interventions necessary to undertake logging will increase the intensity of environmental impacts on the concession area. Over time it will be tedious to assign responsibility for the source of major environmental problems such as forest degradation or poor water quality in streams; the perception could very well be that RTI is responsible and this has implications for RTI's overseas marketing strategy.

(d) Conflicts with national policy

Until mining practices improve dramatically (in a few years) based on current initiatives by the GGMC and the GMSTCI, the expansion of negative environmental impacts in the short term based on mining and logging on the same area could produce data that are not compatible with national level commitments for a green economy or with international obligations set out in various treaties and conventions to which Guyana is a party.

18.5 Mitigation and monitoring - Environmental and Social Management Plan

RTI is committed to running a successful logging operation in line with the terms of its State Forest Authorization and its Environmental Authorization and in keeping within the relevant legislative and policy framework of Guyana.

19.1 EMERGENCY RESPONSE PLAN

19.2 Overview

Everyone in the workplace has a work health and safety duty. A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that workers and other people are not exposed to health and safety risks arising from the business or undertaking.

Officers, such as company directors, have a duty to exercise due diligence to ensure the business or undertaking complies with the Occupational Safety and Health Act (Cap. 99:06). This includes taking reasonable steps to ensure the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks at the workplace.

Workers and other people at the workplace must take reasonable care for their own health and safety, co-operate with reasonable policies, procedures and instructions and not adversely affect other people's health and safety.¹⁷⁹

The Emergency Response Plan (ERP) is the basis for the management of predictable and potential hazards that may arise during its logging operations.

The ERP is intended for use by RTI's field operatives in relation to potential hazards that may arise during its logging operations or other high-risk activity. The ERP specifically provides information and guidance to assist Company personnel in preventing, reporting, responding to accidents. It also sets out responsibilities and a chain of command for responding to emergencies.

19.3 Purpose

The purposes of the ERP include:

- a) To eliminate the potential causes of fire and other emergencies, prevent loss of life and damage to property, and to conserve the natural environment.
- b) To prescribe procedures to be followed in case of emergencies.
- c) To establish a command chain in responding to emergencies

19.4 Policies

All personnel must be aware of and take steps to manage hazards in their work area. In addition, all personnel are expected to alert security if they discover a fire or oil or chemical spill in keeping with the procedures set out in this plan. However, only duly trained personnel would respond to fires. Response procedures shall be posted at strategic points in all work areas.

Emergency Response Teams (ERT) and Fire Response Teams (FRT), respectively will be organized and trained to respond to fire, oil spills, chemical spills, and medical emergencies. These teams will be drawn from the relevant departments based on the nature of the potential hazards associated with each section.

19.5 Responsibilities/ chain of command

¹⁷⁹ https://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=72147

(a) Forest Operations Manager.

The forest operation manager will

- a. Ensure implementation and maintenance of this plan.
- b. Report to relevant authorities in case of an emergency
- c. Review event analysis reports with relevant line managers/ supervisors and the Administrative Manager.
- d. Get as much information as possible about the nature of the emergency from the person making the initial report.
- e. Ensure that the Administrative Manager and members of the relevant ERT are immediately alerted and given the information obtained on the emergency.
- f. Ensure the Operations Manager is informed of the emergency.

(b) Line Managers or Supervisors

Line managers and supervisors will ensure that field operatives are aware of the potential hazards of their workplace and take the necessary precautions.

Specifically, line managers will:

- a. Ensure staffs under their supervision is familiar with and trained in emergency response procedures.
- b. Ensure personnel are provided with and use the prescribed safety equipment to carry out their duties safely.
- c. Ensure an inspection of electrical wiring in each section/ department on a yearly basis. Conduct regular visual checks to ensure wiring is safe and in good condition.
- d. Ensure that oil and other petroleum products used by staff are labelled, safely stored, and handled in accordance with the ERP and any other guidelines provided by the Company.
- e. Ensure that all incidents of fire are reported on in accordance with this plan. Prepare an Event Analysis of any fire, or oil spill that occurs in your Department with the assistance of the

(c) Personnel Clerk

The personnel clerk will ensure the following:

- a. Provide on-going safety training and briefing sessions for staff related to operational hazards.
- b. Oversee and conduct regular inspections of all emergency response/ clean up equipment to ensure they are in working order.
- c. Ensure that the ERTs receive appropriate Training to respond to fire, oil, or chemical spills.
- d. Assist line managers/ supervisors with the completion of the spill report and incident investigations after any spill or fire.
- e. Assist line management with the preparation of an Event Analysis for any oil product spill that exceeds 5 gallons.

(d) Emergency Response Teams (ERTs)

ERT teams comprise: A Fire Response Team whose main objective is to respond promptly to fires or threats of fires; and a Medical Response Team whose priority is to respond to medical emergencies as trained and as set out in this plan.

Generally, ERTs must:

- a. Be aware of the potential hazards of your work area and take precautions to prevent them from occurring during carrying out your duties.
- b. Follow good housekeeping practices to prevent accidents, fires, and other emergencies.
- c. Be alert for fire, oil, or chemical spills in your work area.
- d. Sound the alarm and call security immediately upon notice of any fire.
- e. Call security immediately once you notice an oil sheen, spill, or unplanned release of any chemical anywhere.
- f. Follow the emergency response procedures set out in this document.

19.6 Fire prevention and response

(a) Potential Fire Hazards

Fires can be prevented if potential hazards are identified and managed. Good housekeeping is a major factor in prevention of fires. Discarded combustible material would not be allowed to accumulate. Each work area would be provided with enough non-combustible waste or trash receptacles. Use of flammable cleaning solvents to clean floors, walls, furniture, and equipment would be managed carefully or avoided altogether.

Some potential fire hazards to be avoided are listed below:

- a. Overloaded electrical circuits, unsafe wiring, and defective extension cords;
- b. Improper disposal of cigarette butts;
- c. Mishandling or improper storage of flammable material e.g., gasoline, waste oil, paint;
- d. Improper housekeeping resulting in accumulation of flammable material e.g., paper, cardboard boxes, oil-soaked rags, flammable liquids; and
- e. Improper or careless use of welding torches and wet cell batteries.

(b) Types of Fires and Fire Extinguishers

There are four different types of fires and that may occur on the concession area and these determine the type of extinguisher to be used in an emergency.

Four kinds of fires may occur

- a. Class A Fire: involves ordinary combustible material such as wood, paper, rags, rubbish, and other solids. These may occur at any work site: typical red coloured water fire extinguishers will be posted at all work sites, including forward camps. For buildings, the extinguishers will be placed near the exits for the

- building.
- b. Class B Fire: involves flammable or combustible liquids such as gasoline, fuel oil, paint, and hydraulic fluids. Such fires may occur mainly around workshops, fuel storage areas and parking areas for vehicles. Foam fire extinguishers will be deployed in those areas.
 - c. Class C Fire: fires due to flammable gases such as natural gas and propane. RTI anticipates that only in the mechanical workshop will there be a need for such an extinguisher and at least one of these will be stored near to bottles of flammable gases.
 - d. Class E Fires: these relate to fires of electrical origin and RTI anticipates that such may only occur in the workshop. At least one CO₂ extinguisher will be used in the workshop near to the generator room.

(c) Fire Response Procedures:

Any field operative or security personnel who discovers a fire should:

- a. Activate the fire alarm (gong)
- b. Call security (number to be established) and report the location of the fire. (Security will inform the emergency response personnel who will respond to the fire as trained.)
- c. Ask for help if someone needs rescuing...
- d. Confine the fire by closing doors, windows, and other openings if time permits and if possible.
- e. Evacuate the area and wait in the nearest designated waiting and meeting area.
- f. Provide as much information as you can to emergency response personnel.

19.7 Oil (petroleum product) spill prevention and response

(a) Storage of Oil

The following considerations apply:

Mismanagement of waste oil can lead to the contamination of water and soil. Many components of oil are toxic to living organisms. Contamination from waste oil results mainly from improper storage or disposal. Waste oil must therefore be carefully stored.

The following practices would apply:

- a. Waste oil must be stored in drums. Use of rusting drums must be avoided as they may leak at a future time. Each drum must be labelled with the date that the accumulation started as well as the terms "Hazardous Waste", "Waste Oil", and "Toxic".
- b. All drums containing waste oil must be stored in the waste oil storage area which will have retaining walls and floor made of material which is impervious to the migration of oil. The storage area must have a clearly legible sign stating: "Waste Oil." The storage area must also be protected from the weather by a shed.
- c. The drums will be stored off the ground raised pallets to facilitate detection of any leakage.

- d. Monthly inspection of the waste oil storage area must be carried out to check for any leakage or potential leaks. During these inspections, the condition of the drums must be checked. The floor and the palettes must be checked for any sign of oil leakage.

(b) Oil Spill Response Procedures

In the event of an oil spill the following steps must be taken:

- a. Evacuate the area and warn others, as necessary.
- b. Contact security immediately.
- c. Ask for help if anyone is injured and/ or needs rescuing...
- d. The security staff responding to the call will notify the Administrative Manager, the Oil Spill Response Team, and the Forest Manager
- e. If possible, stop the release e.g., by turning off any valve left open.
- f. Visually inspect the site of the oil spill to obtain enough information to describe the situation to security and response personnel (see Table 36)
- g. Be careful, be alert and keep clear if any hazardous chemical is involved.
- h. The following minimum information would be gathered:
 - ✓ Spilt material (e.g., used oil or gasoline)
 - ✓ Estimated quantity of spilt material (or surface area covered or rate of flow)
 - ✓ Location and direction of the spilt material and direction of flow
 - ✓ People involved, injuries...
- i. Help to direct response personnel to location of the spill.
- j. Response personnel must ensure the release is stopped and clean up the released oil and manage the resultant contaminated material.
- k. On the same day of the spill submit event information to your line manager/supervisor and Administrative Manager. This will assist them in completion of the Oil Spill Report Form.
- l. Line management with assistance from the Administrative Manager and relevant Department Personnel will perform an Event Analysis.

19.8 Plant maintenance

Regular drills would be carried out to ensure the functional aspects of the ERP. This initial draft plan will be refined within six months of start-up of operations. After this, the plan would be reviewed on a yearly basis and updated, as necessary.

19.9 Other protocols

RTI developed an Emergency Response Chart for general application (see Figure 36), a simple reporting format in case of emergencies (see Table 47) and a list of contact numbers in the event of an emergency (see Table 48) to guide the effective management of emergencies.

The Forest Monitoring Officer will review the whole emergency response process to guide its development and make sure everyone understands and internalize the process.

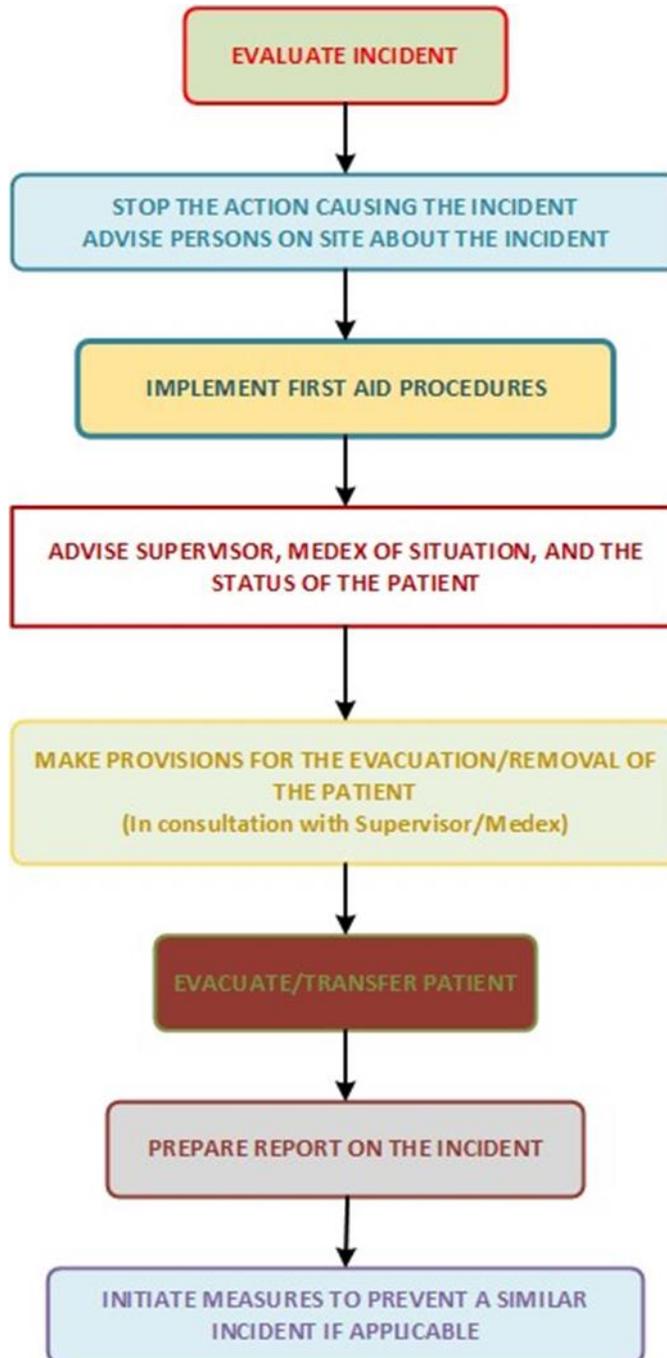


Figure 36: Provisional emergency procedures for RTI

Table 47: Outline of RTI' protocols for addressing emergencies.

#	EVENT	REMARKS
A	EMERGENCY:	
1	Time discovered	
2	Date discovered	
3	Name of responder	
4	First reported by	
B	Reported Injuries	
5	Medical response team dispatched	
C	FIRE HAZARD	
6	Fire response team dispatched?	
D	OIL / FUELSPILL	
7	Type of Oil or Fuel discharged or spilled:	
8	Estimated Quantity Spilled	
9	Exact Location of Spill	
10	Is it flowing/contained?	
11	Weather Conditions:	
12	Ground Conditions	
13	Action Taken: (A, B or C)	

Table 48: Contact phone numbers for emergencies.

#	Agency	Phone No(s).
1	RTI Head Office, Georgetown	592 226-7004
3	Bartica Hospital	592 455-2339
3	Speed Boat Services	To be registered
4	Georgetown Hospital	592 227-8210/2
5	Air Services Limited/Helicopter	222-4537, 222-4368, 222-2993
6	Bartica Police Station	592 455 2222
8	GFC-Bartica Office	592 455 2332
10	Commissioner of Forests, GFC	592 226-7271/4
11	Environmental Protection Agency	225-4679, 225-5469, 225-4173

20.1 CONCEPTUAL CLOSURE PLAN

20.2 Factors that may lead to the closure of RTI Operations

The expected life of the project is 60 years following which the company could exercise the option for a renewal of their TSA for another 60 years.

RTI has prepared a Closure Plan based on the following scenarios:

- a. If the GFC does not grant an extension of the TSA, after its expiry;
- b. If the commercial species required by the company are exhausted;
- c. If the Kartabu - Puruni Road deteriorates or its use becomes too problematic (given the increasing number of stakeholders) to such an extent that transport on it is no longer feasible;
- d. If there is an increase in mining activities within the compartments, or the mining activities in the compartments make field operations inoperable and unprofitable for RTI to continue logging operations.
- e. If, for any reason there is a heightened threat to the safety and security of field crews due to crime and illegal activities

20.3 Objective of Closure Actions

The principal objectives of the closure actions are to:

- a. Conclude all contractual agreements with employees and their Union.
- b. Conclude all obligations to the Government of Guyana (taxes, royalties, fees, etc.)
- c. Decommissioning and removal of all fixtures and structures, equipment, machinery, and other infrastructure from the concession
- d. Clean up all debris (tyres, machine parts, oil drums, etc.) from the forest floor.
- e. Provide for the redeployment of employees, where practicable
- f. Restoration of the Field Base Camp

20.4 Closure Actions:

The core closure actions will be as follows:

- a) In event of the Company's closure, the employees and relevant Government Authorities, Institutions and Organisations should be notified. As the only fixed community in the area, the CDC of Iteballi should be notified. The notification should be given six (6) months prior to the closure of the field operations. (See Table 49 below)
- b) If the Company should ever change ownership, or transferred to any other entity, the employees and relevant Government Authorities, Institutions and Organisations should be notified. As the only fixed community in the area, the CDC of Iteballi should be notified. The notification should be provided six (6) months prior to the change in ownership.
- c) NIS and PAYE contributions for staff be discontinued; employees should be advised of the status of their payments, that is whether all the appropriate

- contributions have been handed over to the NIS.
- d) Severance Pay for Employees/Workers will be paid and other moneys due to them as required by Labour Act and the Termination and Severance Payment Act (TESPA) ;
 - e) Acreage Fees and Royalty Fees and other obligations of the Company required by the Laws of Guyana shall be settled;
 - f) Disposition of social infrastructures of the Company will be managed in collaboration with the GFC;
 - g) Expatriate staff will be repatriated in accordance with national immigration procedures.
 - h) In the event of Company's closure the relevant Government Authorities and the Employees/Workers and local communities will be informed at least three months in advance.
 - i) If the Company should have logging or sawmilling operations in other locations in Guyana, the transfer of employees/workers should be considered.

A detailed Closure Plan will be prepared during the first year of operation of the enterprise.

Table 49: Summary of closure actions

#	Action	Responsible Party	Consultations	Schedule
1	Prepare a checklist of all activities to be undertaken toward the closure of operations	Operations Manager	Forest manager	-180 days
2	Advise the GFC, GRA and NIS about the closure and address any concerns they have	Operations Coordinator	Chief Clerk	-90 days
3	Prepare a list of all redundant staffs and their CVs or profiles with a view to sharing the lists with other companies.	Operations Manager	Forest manager	-90 days
4	Brief employees about the reasons for closure	Operations Manager	Forest manager	-90 days
5	Prepare redundancy packages & Letters of Reference	Operations Manager	Forest manager	-90 days
6	Ensure records related to remuneration packages are up to date	Operations Manager	Chief Clerk	-90 days
7	Take care to secure company assets, especially records	Forest Monitoring Officer	Chief Clerk	-45 days

	Make arrangements to clean up the base camp in the forest area and dispose of all items that could injure animals	Forest Monitoring Officer	Chief Clerk	-45
8	Give employees preference in the sale of disposable assets	Forest Monitoring Officer	Chief Clerk	-30

21.1 THE ENVIRONMENTAL MANAGEMENT PLAN -SUMMARY

21.2 Overview

This chapter summarises the key elements of RTI's environmental management plans.

An Environmental Management Plan outlines strategies and practices that could be implemented to manage the perceived impacts that could arise from the proposed development. It comprises the following elements:

- a) Mitigation measures/Mitigation Plan
- b) Basic road management plan
- c) Wildlife management plan
- d) Capacity building and Training plans
- e) Monitoring Plan

The development of the plans is based on several considerations:

- a) **Management experience:** Royal Timbers Inc. (RTI) was incorporated as Company # 8612 under the Companies Act of Guyana on the 23 of November 2016. The Company garnered significant operational experience through previous work within hinterland areas such as Port Kaituma. RTI developed robust corporate discipline and respect for the public agencies with whom it has engaged; these agencies include GFC, GRA, GEA, and the EPA.
- b) The value of **trained employees.** RTI has ensured through training courses, regular briefings, and coaching that its employees appreciate the company's philosophy on the conservation of the environment and the need for them to share responsibility for full compliance with national guidelines.
- c) **Customer base:** RTI's marketing thrust depends a great deal on customers' confidence that the company is a responsible forest operator.
- d) **Value system/Spiritual values:** The management of RTI believes that the forest could be exploited for financial benefits and at the same time continue to offer a range of aesthetic and therapeutic values.

21.3 Mitigation measures/Mitigation Plan

Impact significance has been taken as a function primarily of the following criteria:

- a) Magnitude and extent.
- b) Reversibility.
- c) Longevity.
- d) Probability of occurrence.

Based on these criteria the main significant impacts, which need to be mitigated, are as follows:

- d) Impacts associated with physical environment: earthworks of various kinds and for various purposes, air quality, water resources, and soil resources.
- e) Impacts related to the biological/ecological environment: timber harvesting activities, wildlife, and ecological relationships.

- f) Impacts related to the socio-economic environment: conflicts over land use, social problems, and road use.
- g) safety, waste management

These matters are presented in Tables 50, 51 in terms of the following:

- a) Predicted impact and proposed mitigation measure and the time frame for implementation (Table 50).
- b) Projected situation after implementation of mitigation measures (Table 51).

Table 50: Potential negative impacts and corresponding mitigation measures.

Predicted impact.	Proposed mitigation measures	Lead agency	Time frame for implementation
1.0 Physical Environment			
1.1 Earthworks will lead to , scarification of soil surface, sub-soil exposure , erosion, soil compaction, and water logging	<ul style="list-style-type: none"> ● Plan roads, bridges and culverts using stock and topographic maps. ● Use appropriate machines for all earth works to reduce the time taken to complete each activity, while minimizing environmental impacts. ● Consider the prevailing weather pattern before initiating major earthworks. ● Follow the recommendations of the CoP (Sections 4.5-4.7, Section 5) 	RTI	During the entire time frame for the project.
1.2 Air quality: Dust and smoke (especially along roads) minor changes in micro-climate	<ul style="list-style-type: none"> ● Vehicles will travel slowly <25 km/hr whenever they pass homesteads or communities. ● All machines must be fully functional to maintain emissions within manufacturers' parameters. ● In any event, dust and smoke do not represent a major impact. However, Occupational Health and safety must be an integral part of planning and carrying out all operations; for example RTI's staff would use dust masks (as well as safety helmets, goggles and ear muffs) during normal work. ● Develop database system to record and address matters relating to dust and smoke hazards. 	RTI	During the entire time frame for the project.
1.3 Water resources: negligible increases in turbidity, temperature, ph.; oil spills	<ul style="list-style-type: none"> ● Strict adherence to RIL principles and prescriptions of the CoP, especially regarding buffer zones along waterways. ● Maximum care to be taken to ensure all vehicles and machinery are in a proper state. Dispense or change lube oil only in designated areas. ● EPA's Brochure on Water conservation to be placed at all public points around the concession. ● Regular briefing sessions for field staff would be formalised. ● Care taken to avoid excessive spillage of borax solutions whenever used to treat (some species of) timber. 	RTI, GFC	During the entire time frame for the project.
2.0 Biological/ecological environment			
2.1 Timber harvesting: destruction of juvenile trees, genetic erosion of species, decline in soil fertility, spillage of oil, increased potential for blow downs	<ul style="list-style-type: none"> ● Implement a system for conducting pre-harvest inventories and preparing stock maps. ● Use directional felling techniques for felling trees. ● Plan skid trails based on stock maps. ● Use winching techniques. ● Use heavy duty machines that are fully functional. ● Train all field operatives in RIL practices 	RTI	During the entire time frame for the project.
2.2 Wildlife: modification, destruction of habitats, population changes	<ul style="list-style-type: none"> ● Ensure a systematic manner of timber harvesting so that once a block is harvested, the operation moves on, so that no further disturbances occur. ● Prohibit employees from hunting and fishing. ● Unique ecosystems, habitats and species will be conserved, by restricting logging in areas where they occur. 	RTI	During the entire time frame for the project.

2.3 Ecological relationships; Modifications of ecological relationships. Increased potential for pests.	<ul style="list-style-type: none"> ● Implement proper RIL practices and prescriptions of the CoP (Sections 8, 9 & 10) ● Prohibit the use of fires on the forest floor. 	RTI, GFC	During the entire time frame for the project.
3.0 Socio-economic environment			
3.1 Conflicts: restrictions of access, alienation of rights	<ul style="list-style-type: none"> ● Develop database system to record and address complaints. ● Engage residents in discussion and consultations to address mutual concerns: ensure the company is positioned to receive and address complaints. 	RTI	As required
3.2 Social problems: crime, use of alcohol, other disagreeable behaviour; increase in life threatening behaviour through exposure to various illnesses.	<ul style="list-style-type: none"> ● Work with public agencies (Police, staff of the Ministry of Health, and staff of the Ministry of Regional Development) in Regions 7, to address emerging issues. ● Develop database system to record and address social problems ● Keep proper records of emerging problems and pass these on to the appropriate agencies. 	RTI	As required
3.3 Road safety: high probability of road accidents.	<ul style="list-style-type: none"> ● Work with MOPW, the GPF, the mining community and other stakeholders to ensure adherence to proper road use practices and to identify road locations requiring special attention. ● Make sure that each vehicle is in a full functional state prior to its use on the roadways, within and outside of the concession area. ● Place appropriate cautionary signs at sharp turns, steep grades, and bridges and near populated areas. ● Promote proper skills set among drivers through regular training. 	RTI	During the entire time frame for the project.
3.4 Waste management: illnesses resulting from a polluted environment	<ul style="list-style-type: none"> ● Observe prescriptions of the Code of Practice for forest operators. 3rd Ed. Sections 8.0, 9.1, 9.2. ● Develop Waste Management Policy and Plan for the forest operation ● Hold frequent briefing sessions with staff to ensure a shared understanding of the consequences of poor control over waste management. ● Distribute and put-up EPA's brochure on waste management at all camps. 	RTI	Monthly
3.5 Indigenous, archaeological assets: loss , destruction modification of habitats, landscapes	<ul style="list-style-type: none"> ● Identify and isolate any assets encountered and post appropriate advisory signs and notices; ensure such sites are recorded on all stock maps. ● Develop database system to record location of Indigenous, archaeological assets ● Consult with the Amerindian Affairs Ministry and the Walter Roth Museum on collaborative efforts to protect any assets discovered. ● Collaborate with communities to address the conservation of existing and emerging assets. ● Offer Training & incentives where appropriate 	RTI	As required

Table 51: Projected situation following mitigation measures.

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
Physical Environment (Land/Soil)	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Operations	<ul style="list-style-type: none"> Removal of specific site vegetation to facilitate the construction of project facilities has the potential to expose the soil to erosion, Scarification of soil surface and sub-soil, soil compaction. 	<ul style="list-style-type: none"> Minimize removal of vegetation and encourages the re-vegetation of site impacted by clearance. Develop land reclamation policy and plan in collaboration with MNR/GFC Installation of drainage system to accommodate surge in storm water. 	Ex: Ir: Lt: Un: M: In: Lp
	Operation of Machineries	Operations	<ul style="list-style-type: none"> Soil compaction from multiple passes of heavy vehicles over soil surface. 	<ul style="list-style-type: none"> Avoid the use of heavy vehicles during periods of heavy rainfall. Design specific routes for heavy vehicles and equipment to use. 	Ex: Ir: Lt: Un: M: Sig: Lo
	Waste Disposal (solid and liquid waste)	Operations	<ul style="list-style-type: none"> May result in soil contamination from indiscriminate disposal of liquid, solid and hazardous waste 	<ul style="list-style-type: none"> Implementation of a sound waste management system at the location of operation 	Lo: Rv: St: Av: M: In: Hp
	Fuel and Oil transportation, handling, and storage	Operations	<ul style="list-style-type: none"> Pollution from fuel and oil because of a spill during transportation, handling, or storage. 	<ul style="list-style-type: none"> Ensure that fuel, oils, and hazardous liquids are stored in a bunded area that has an impervious surface to avoid fuel leaks and spills Due care will be applied to prevent spillage whilst handling fuel, oils, and potential hazardous liquids. 	Lo: Ir: Lt: Av: Im: In: Lp Lo: Ir: St: Av: Im: In: Lp

	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Construction/ Operations	<ul style="list-style-type: none"> ● Potential increase in sediment loads and turbid streams due to surface run off and erosion. Removal of vegetation 	<ul style="list-style-type: none"> ● Implementation of erosion control measures. ● Channel storm water to a settling/forested area before discharge into creeks. ● Create buffer zone around streams and creeks. 	Lo: Ir: St: Un: M: Sig: Hp
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Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
Physical Environment (Water Resources)	Construction of bridges and the installation of culverts	Construction/ Operations	<ul style="list-style-type: none"> Possible reduction of stream flow from the installation of bridges and culverts 	<ul style="list-style-type: none"> Construct bridges and culverts in accordance with the GFC's Code of Practice for Timber Harvesting Operations Temporary water-crossings to be decommissioned after usage to ensure that they do not collapse and block stream flow. Design bridges to allow for the free flow of water, taking into consideration water flow during period of extremely high intensity rainfall. Road culverts should be aligned perpendicular to the road and horizontal to the flow of water 	Lo: Ir: Lt: St: Un: Im: Sig: Hp: Av: Lp
	Waste Disposal (solid and liquid waste)	Construction/ operation	<ul style="list-style-type: none"> Contamination of water in proximity to disposal, modifications in water temperature, turbidity, ph.; Pollution with oil 	<ul style="list-style-type: none"> Avoid the dumping of waste in creeks and streams. Development and implementation of a waste management plan. 	Lo: Ir: St: Un: M: In: Lp
	Fuel and Oil transportation, handling, and storage	Construction/ operation	<ul style="list-style-type: none"> Contamination of water in proximity to disposal, modifications in water temperature, turbidity, ph.; Pollution with oil 	<ul style="list-style-type: none"> All fuel, oils and hazardous liquids will be stored away from streams and creeks. Ensure that all fuel, oils, and hazardous liquids that will be used by the operation is stored and used in a bunded area. 	lo: Ir: Lt: Un: M: In: Lp
Physical Environment (Air)	Operation of chainsaws	Construction/O peration	<ul style="list-style-type: none"> Noise, dust, and smoke generated from the operation of the various equipment. Changes in microclimate. 	<ul style="list-style-type: none"> Ensure that all operative working in proximity to mills and saws be provided with personal protective gear. 	Lo: Ex: Ir: Lt: Un: M: Sig: Hp
	Operation of heavy-duty vehicles and equipment	Construction/O peration	<ul style="list-style-type: none"> Noise generated for the operation of the various pieces of equipment. 	<ul style="list-style-type: none"> Ensure that all operative working on and in proximity to are provided with personal protective gear 	Lo: Ex: Ir: Lt: Un: M: Sig: Hp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
	Clearing of lands and of logs and other materials	Construction/Operation	<ul style="list-style-type: none"> Excessive exposure of soil and constant traversing of heavy-duty vehicles over exposed soil 	<ul style="list-style-type: none"> All employees working in dusty environs will be provided with dust masks. Speed limits will be instituted for vehicles using dusty areas. During extensive dry periods dusty areas will be soaked on a regular basis. 	Lo: R: St: Av: M: In: Lp
	Operation of heavy-duty vehicles and equipment.	Operation	<ul style="list-style-type: none"> Dust and particulate matter resulting from the operations of chainsaws and movement of vehicles. 	<ul style="list-style-type: none"> All employees working in dusty environs will be provided with dust masks. 	Lo: Ex: Ir: Lt: Un: M: Sig: Hp
	Disposal of wood Waste	Operation	<ul style="list-style-type: none"> Improper disposal of waste generated wood processing activities at Base Camp 	<ul style="list-style-type: none"> All dust generate from chainsaws and mills will be spread on the forest floor. 	Lo: Ex: Ir: St: Un: M: Sig: Hp
Biological & Ecological Environment (Flora)	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Construction	<ul style="list-style-type: none"> Destruction of trees and from the clearing of lands for construction purposes. 	<ul style="list-style-type: none"> Clearing of vegetative areas will be restricted to areas where construction activities will occur. 	Ex: Rv: St: Un: Im: In: Hp:
	Harvesting of Logs (Logging and extraction)	Operation	<ul style="list-style-type: none"> Reduction in tree species specific to the areas of logging. Genetic erosion of species Decline in soil fertility due to removal of biomass from poor soils, Increased potential for blow downs of residual trees due to freer flow of air through the canopy/under-storey. 	Use of the GFC COP2018	Lo: Ex: Ir: Rv: Lt: St: Un: M: Sig: Hp: Lp
Biological & Ecological Environment (Fauna)	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Construction	<ul style="list-style-type: none"> Modification, fragmentation, and destruction of habitats (especially in terms of cover and food sources); depletion in 	<ul style="list-style-type: none"> Use of the GFC's COP related to the harvesting of logs and all other guidelines that protect biodiversity. 	Ex: Rv: St: Un: Im: In: Hp:

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
			number, /variety of some species.		
	Presence of humans	Construction and Operation	<ul style="list-style-type: none"> Increase in the level of predation, modifications of prevailing ecological relationships: plant-plant, plant-animal, animal-animal 	<ul style="list-style-type: none"> All employees will be educated on the conservation and protection of wildlife. 	Lo: R: St: Av: M: In: Lp
Socio-economic Environment (Occupational Health & Safety)	All construction and Operation activities	Construction/Operation	<ul style="list-style-type: none"> Risk of accidents from the used of the various equipment onsite 	<ul style="list-style-type: none"> All employees will be educated about the Company's OSH practices. All working environments will be presented with First Aid kits. Appropriate signage will be posted around all working areas. Relevant and appropriate safe gear will be provided to all employees. 	Lo: R: St: Av: M: In: Lp
	Operation of machineries and equipment	Construction /Operation	<ul style="list-style-type: none"> Continuous exposure to excessive noise and vibration from the operation of equipment. 	<ul style="list-style-type: none"> All employees working in environs that cause them to be exposed to occupational hazards will be provided with protective gear. 	Lo: Rev: St: Av: M: Sig: Hp
	Conflict results from the Change in Land Use activities	Construction /Operation	<ul style="list-style-type: none"> Restriction of access, alienation of rights, unplanned changes in lifestyle, restrictions on hunting. 	<ul style="list-style-type: none"> All employees will be educated on how to defuse conflicts. Regular monitoring will be conducted to ensure that no illegal activity occurring within concession and if such is observed it will be reported to the relevant authority. 	Lo: Rev: St: Av: M: In: Lp
	Increase in workforce	Construction /Operation	<ul style="list-style-type: none"> Increase in the incidences of crime, increase in the use of illicit drugs and alcohol, socially 	<ul style="list-style-type: none"> Illicit drugs and alcohol will not be allowed at camps. 	Lo: Rev: St: Av: M: Sig: Hp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
Socio-economic Environment (Employment)			unacceptable behaviour and inappropriate with members of close-by communities.	<ul style="list-style-type: none"> All employees will be trained at a minimal level on how to engage with members of close-by communities. 	
	Hiring of Workforce	Construction /Operation	<ul style="list-style-type: none"> Skills transfer, Training opportunities job creation, increase incomes and cash flows 	<ul style="list-style-type: none"> Members of close-by communities will be sought after. 	Lo: Rev: St: Av: M: Sig: Hp
	Regional Development	Construction /Operation	<ul style="list-style-type: none"> Improvement of infrastructure. Crime; use of alcohol; health risks, disagreeable behaviour 	All staff will be trained in-house on OSH and security	
Socio-economic Environment (Archaeological Resources)	Construction and operational activities	Construction /Operation	Loss, destruction, or modification of the assets	<ul style="list-style-type: none"> If evidence is found, all activities in the vicinity of findings will be suspended. The relevant authorities will be notified. 	

Impact Significance (parameters)

Lo-localised, Ex-Extensive/ Rev-Reversible, Ir-reversible; / St-short term, Lt-long term/ Av-Avoidable, Un-Unavoidable; M-Mitigable, Im-Immitigable/ Sig-Significant, In- Insignificant/ Hp-High probability, Lp-Low probability

21.4 Basic Road Management Plan

21.3.1 Overview

RTI's road corridor plan has two main components (see Table 52):

- a) Maintaining its concession-based roads in a fully function state through proper road maintenance procedures, and adequate road signs.
- b) Monitoring road use by other parties.

Table 52: Core elements of RTI's plan for road corridor management.

Action	Responsibility	Objective	Intervals
1. Monitor the road for tree fall, erosion. Also check bridges and culverts to establish their state.	Forest Manager	Maintain the road in a proper state always for maintaining production and safety.	Daily & weekly depending on which specific road segments are used
2. Post signs at junctions, turns, steep grades and bridges		Safety issues	As required
3. Monitoring the use of the road by third parties	Forest Manager	Find out and maintain a data base of who is co-using the concession area. Other developers will be expected to contribute to road maintenance costs	Daily, as often as the opportunity presents itself or via random visits to areas not being logged

21.3.2 Partnerships

In the pursuit of this plan, RTI will seek support from the EPA, the GFC, the GGMC, GGMDA and the Police.

21.5 Wildlife Management Plan

RTI's management has an interest in the conservation of wildlife and RTI is prepared to work with the authorities to manage wildlife, not only to check on illegal hunting, but also to support concession-based research. The key activities for RTI are set out in Table 53.

Table 53: Core elements of RTI' Wildlife Management Plan

Action	Responsibility	Objective	Intervals
1. Maintain a register and GIS database of sightings of mammals within the concession area. (The register will state Date/Time of sighting/Common name of species observed).	Field Operatives	A GIS data base would be critical to track the number, variety and possibly habits of large fauna	On sight
1. Train field operatives to recognize the various fauna in the concession area. RTI will also source posters from WWF and other agencies for the benefit of its field operatives	Field Operatives	Workers should be able to describe accurately the type of animal observed.	Quarterly
2. Post and maintain no hunting and no fishing signs along the concession roads	Field Operatives	This is an attempt to enforce RTI's no hunting policy.	Not applicable. (All major road junctions, and bridges)
3. All heavy-duty vehicles to be equipped with 'rotating beacons' to warn animals using the road. (Horns may unduly scare the animals).	Drivers/ Mechanics	The objective is to avoid hitting animals using the roadways	Whenever the vehicle is traversing the road.
4. Be on guard for nesting animals during tree felling operations	Fellers	RTI does not wish to kill wildlife or unduly put them at risk	During operations
5. Monitor whether any third party is extracting wildlife from the concession area.	Drivers, technicians	<ul style="list-style-type: none"> ● To check on hunting activities. ● To ensure that RTI's technicians are not blamed unnecessarily for harvesting wildlife 	During operations
6. RTI's employees will avoid all unnecessary noise, open fires and littering and ensure that waste is properly disposed of	All employees	These activities will help conserve fauna.	During operations

21.6 Capacity Building and Training Plans

21.5.1 Overview

RTI intends to build capacity within its operation to address obligations emerging from this EIA Report and to better implement approved forest management prescriptions. The objectives are:

- a) To ensure that each worker at the company takes responsibility for good environmental conduct generally and good forest management practices.
- b) To address the requirements of lead agencies and to better comply with national standards.

21.5.2 Training content

Training for selected staff will be as set out in Table 54. RTI will conduct a Training needs analysis to inform its general capacity building strategy.

Table 54: Training options prioritized for RTI's capacity building project.

#	Target group	Subject areas	Agencies
1	Senior staff	Reduced Impact Logging (Decision Makers' Course)	FTCI
2	Forest Manager Forest Monitoring Officer	<ul style="list-style-type: none"> ● Environmental management ● Code of Practice ● GIS/GPS/UAV/Map reading 	FTCI/GFC/EPA
3	<ul style="list-style-type: none"> ● Forest Managers, ● Block Inspectors, ● Forest Monitoring Officer 	<ul style="list-style-type: none"> ● Code of Practice ● RIL Foundation Course ● OSH ● GIS/GPS/UAV/Map reading 	FTCI Consultant
4	Forest Monitoring Officer	<ul style="list-style-type: none"> ● Conflict management ● Introduction to sustainable mining ● GIS/GPS/UAV/Map reading 	Consultant GMSTC
5	Technicians	<ul style="list-style-type: none"> ● Forest Surveying ● Tree marking ● Directional Felling ● Timber Grading Course, ● Tree ID Courses ● GIS/GPS/UAV/Map reading 	GFC/FTCI
6	Technicians	First Aid	Guyana Red Cross

21.5.3 Methodology

The variety of mechanisms will be used to build capacity, including:

- a) Workshops (Trainers provide workshops to groups of participants, usually ranging from

- three days to fourteen days)
- b) Onsite internship or field work:
- c) Training of Trainers' courses
- d) Training materials: manuals brochures, etc.
- e) Briefing sessions

21.7 Monitoring Plan

21.6.1 Overview

This monitoring plan is intended to address the mitigation measures in a timely and consistent manner. RTI needs to collaborate with several agencies to ensure that the mitigation measures are addressed in a meaningful and realistic manner. Table 55 lists the agencies and the collaboration anticipated. Table 56 provides details of monitoring activities; Table 57 provides a checklist for monitoring activities and Table 58 provides a budget for monitoring the environment management plan.

Table 55: List of agencies targeted for collaboration.

#	Agency	Nature of collaboration
1	Ministry of Agriculture (Meteorological Department)	Collection of rainfall data
2	EPA	Collection/monitoring of environmental data;
3	Guyana Forestry Commission	Consultations, Training, forest management
5	FTCI	Training
6	MOH	Consultations on health issues
7	TPL	Collaboration
8	GGMC	Consultations (mining)
9	GGMDA	Consultations: shared road use
10	MPOW	Ministry of Public Works: roads

It is important to note that RTI, as part of its routine operations, will be maintaining appropriate records.

Table 56: RTI's plan for monitoring operations at the concession area.

Parameter	Responsible Party	Frequency	Location of monitoring
Physical Environment			
Earthworks: <ul style="list-style-type: none"> Field operatives have stock maps. Field operatives have copy of the Code of Practice. All roads, skid trails, sawmill sites, log markets and borrow pits are marked. Machines are in a proper functional state 	RTI, GFC	Quarterly	<ul style="list-style-type: none"> Sites where earthworks are occurring. Field camps
Water Quality: <ul style="list-style-type: none"> Surface water drainage off roads, log markets and other clearings; Cleaning of drainage structures (bridges, culverts) along roads and skid trails; Observance of the integrity of buffer zones along water ways 	RTI, GFC	<ul style="list-style-type: none"> Biannually (PMS) Routine checks, especially in the wet season 	<ul style="list-style-type: none"> PMS Areas being logged; logged over areas; Primary roads and associated drainage structures.
Air Quality: <ul style="list-style-type: none"> Number of illnesses among field operatives apparently related to smoke or dust 	RTI	Biannually	Camp site: sick leave register.
Biological/Ecological Environment			
Timber harvesting. <ul style="list-style-type: none"> canopy openings, retention of seed trees, Integrity of Biodiversity Reserves. quality of stock maps 	RTI	Quarterly	Active logging areas, permanent sample plots and Biodiversity reserves
Wildlife Trapping /hunting <ul style="list-style-type: none"> Movement of live animals away from the concession area Trade in wild meat Traps, firearms, shells 	RTI/GFC	Random checks Random checks Random checks	Puruni crossing

Parameter	Responsible Party	Frequency	Location of monitoring
Ecological Relationships <ul style="list-style-type: none"> Unusual trends, for example accelerated plant mortality, pollution of streams, dead fishes, or other fauna 	RTI, GFC	On observance	Concession area
Socioeconomic Environment			
Conflicts <ul style="list-style-type: none"> No. of mining camps, type of mining, vehicle movements, Complaints lodged with the company. Complaints lodged with the RDC or another public agency 	RTI, GFC, RD C#7 GGMC, Min. of Human Services	Quarterly	Concession area,
Social & Employment issues <ul style="list-style-type: none"> Number of persons recruited from Regions 2, 3. Number of persons trained. Rate of absence from work Disciplinary measures taken 	RTI	Biannually	Concession area
Road safety <ul style="list-style-type: none"> Number of accidents/records Number of fatal accidents/records Number, type, and position of advisory road signs/records 	RTI	Quarterly	Parika Police Station,
Health and Safety <ul style="list-style-type: none"> Emergency Response Plans, Health and safety committees, Status of first aid kits, fire hydrants, Implementation of OHS practices & the regular use of safety gear 	RTI, GFC	Biannually	Sawmill site, field locations, housing quarters
Waste Management <ul style="list-style-type: none"> Waste accumulation & waste disposal procedures Apparent increase in vectors (rats, roaches & ,flies) 	RTI	Monthly	Sawmill complex, field camps
Indigenous/Archaeological assets <ul style="list-style-type: none"> Auditing of archaeological and anthropological resources 	RTI	On observance (Quarterly if observed)	Logging operations [blocks] and sawmill complex

Table 57: RTI's general checklist for monitoring its operations.

ITEM	STATUS (Y-OK/ R-REQ. ATTN.)		
	OK	Requires attention	Responsible Party
Office Area/Field Camp <ul style="list-style-type: none"> Emergency Response Plan posted and visible. First Aid box complete and clean Litter bins are available 			
Personnel : <ul style="list-style-type: none"> Records of issue of safety gears All personnel have and are using safety equipment 			
Fuel Storage Tanks and Fill Point – Transit Log Yard and Camp <ul style="list-style-type: none"> Fire extinguishers and other firefighting aids available nearby Physical condition of storage tanks, hoses, valves (evidence of leaks) 			
Communication Equipment <ul style="list-style-type: none"> Check base station radio set is in working order and signal strength is good with base and with handset for field personnel. Check all field handsets are in working order and fully charged 			
Fire Fighting Equipment and Emergency Equipment <ul style="list-style-type: none"> Check that all fire extinguishers are present, fully charged and the correct number are present with no sign of damage. Check sand buckets are full of dry sand. Check contents of First Aid box are all present and correct 			
Warning/Advice Notices <ul style="list-style-type: none"> Check all notices and signs are posted as required, are undamaged, clean, and legible at Transit Log Yard and Camp and on secondary roads 			
Soak away/Filter at Transit Log Yard and Camp <ul style="list-style-type: none"> Soak away filter is clear of all solid particles. Check drains are not blocked or full 			
Stock maps <ul style="list-style-type: none"> Updated stock maps are available for use by all field crews 			
Basic equipment <ul style="list-style-type: none"> Compass, clinometers, flagging tapes and GPS are available for use by staffs. Equipment tailored for the needs of specific departments (fire extinguishers-workshop; flasks for water collection-forest management division; etc.) 			

ITEM	STATUS (Y-OK/ ATTN.) R-REQ.		
Vehicles <ul style="list-style-type: none"> ● All vehicles equipped with horns, lights and rotating amber lights. ● All vehicles are equipped with appropriate tools, first aid kits. ● All trucks/lorries are equipped with basic communication equipment. ● All vehicles have chains, rope, or straps as appropriate. ● Maintenance schedules for vehicles are in force. 			
Security <ul style="list-style-type: none"> ● All employees have a security badge, carry, and display them on their uniforms 			
Camp Hygiene <ul style="list-style-type: none"> ● All camps are provided with potable water. ● All camps are cleaned regularly, equipped with fires extinguishers, lights and pesticides, other supplies. ● Waste disposal practices/mechanisms are monitored 			
COMPLETED BY: (signature and date)			

Table 58: Breakdown of annual budget for monitoring field operations

Impact/Event	Actions	Equipment/tools/items	Duration	Annual cost (G\$)
1. Earthworks & soil	Field visits, briefing sessions, review of stock maps & other records; review of SOPs	Stock maps, GPS, Compass, Clinometer, Vehicle (ATV), UAV	3 days every three months	500,000
2. Air quality	Review of medical records of field operatives; consult medical personnel	N/A	2 days every three months	500,000
	Analysis of air quality at PMS	Digital Anemometers, Sound Level Meters, Air quality Detectors, etc.	At least one day per Station per quarter. (PMS' within 5 km of RTI' Base Camp will be monitored once per month)	1,000,000
3. Water quality	Review of medical records of field operatives consult medical personnel	N/A	2 days every three months (At the same time being assessed for illnesses linked to air quality).	200,000
	Quarterly monitoring of water quality (PMS)	Clean bottles, ice, cooler to store water earmarked for a laboratory for testing	1 day per PMS, every three months	2,000,000
4. Timber Harvesting	Visits to field crews to verify the use of stock maps, CoP, etc.	Vehicle	3 days every three months	400,000
5. Wildlife	Recruitment of wildlife expert; physical check of camera traps	Vehicle, trail cameras, UAV	Quarterly	2,000,000
6. Eco-relationships	Recruitment of a consultant; field tour across logged over sites within the concession area	Vehicle, camera, UAV	Annually	600,000

Impact/Event	Actions	Equipment/tools/items	Duration	Annual cost (G\$)
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7. Conflicts	Formal discussions with community leaders, representatives of miners, public officials (RDC)	Vehicle, camera	Biannually (one-day session)	500,000
8. Employment	Review of company records		Minimum: 2 days every six months	300,000
9. Social problems	Discussions with public officials (Police, RDC) and community leaders	Vehicle, camera	2 days every three months	900,000
10. Occupational Health & safety	Verify the use safety gear, SOPs; check on the frequency of briefing sessions	Vehicle, camera	2 days every six months	300,000
11. Road safety	Install, replace, and rehabilitate road signs; review safety records	Vehicle, camera, carpentry tools	3 days every three months	400,000
12. Fire equipment	Verify the state of all firefighting equipment	Fire extinguishers, sand buckets, etc.	2 days every six months	250,000
13. Training	Review performance of trained personnel, identify new Training opportunities	Manuals, posters, briefing notes	2 days every six months	2,000,000
14. Archaeological sites, indigenous assets	Replace or rehabilitate signs, fences or remove debris.	Vehicle, camera, carpentry tools	Approximately 3 days every three months	500,000
15. Co-monitoring of the Cuyuni & Puruni River Corridors, respectively	Joint patrols, faunal surveys, other consultations	Drone, Boat & o/b engine; digital camera; radio/phone	One trips per quarter for each corridor	2,000,000
15. Contingencies				2,000,000
TOTAL				16,350,000

NB. While some activities may be conducted ‘in-house’, others require the recruitment of experts.

21.6.2 Core approach to stakeholder issues

RTI will set up a website on which it will post its half- yearly environmental report or part thereof and at the same time set up a mechanism to respond to feedback or reasonable information requirements from stakeholders.

A copy of its environmental reports will also be placed at:

- a) GFC Divisional Forest Station, Bartica.
- b) RTI's Office

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61. Whitmore, T.C. 2012. *An Introduction to Tropical Rain Forests* 2nd Ed. Oxford: Oxford University Press.

Legislation

Amerindian Act Cap29:01
 Civil Law Ordinance 1916
 Constitution 1980 (as amended up to 2004)
 Creeks Act Cap:50:04
 Forests Act 67:07
 Environmental Protection Act 1996
 Hydro-electric Power Act Cap 56:01
 Local Democratic Organs Act 1980
 State Lands Act 62:01
 Water and Sewerage Act 2002

ANNEXES

ANNEX I: Extracts (Section 3.0 and 4.1) of the Terms of Reference for the ESIA study and Report

3. SCOPE OF THE EIA

In accordance with Part IV (11) (5) of the EP Act Cap.20:05, every environmental impact assessment shall contain the following information:-

- (a) Description of the project, including in particular:-
 - (i) the geographical area involved, the physical characteristics of the whole project and the land-use requirements during the construction and operational phases, including plans, drawings, and models;
 - (ii) the main characteristics of the production process, including the nature and quantity of the materials used, plans, drawings and models;
 - (iii) an estimate, by type and quantity, of expected contaminants, residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation) resulting from the operation of the proposed project;
 - (iv) the length of time of the project;
- (b) An outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental factors;
- (c) A description of the likely significant effects of the proposed project on the environment resulting from:-
 - (i) The existence of the project;
 - (ii) The use of natural resources;
 - (iii) The emission of contaminants, the creation of nuisances and the elimination of waste, and a description of the forecasting methods used to assess the effects on the environment;
- (d) An indication of any difficulties (technical deficiencies or lack of knowledge or expertise) encountered by the developer in compiling the required information;
- (e) A description of the best available technology;
- (f) A description of any hazards or dangers which may arise from the project and an assessment of the risk to the environment;
- (g) A description of the measures which the proposed developer intends to use to mitigate any adverse effects and a statement of reasonable alternatives (if any) and reasons for their rejection;
- (h) A statement of the degree of irreversible damage, and an explanation of how it is assessed;
- (i) An emergency response plan for containing and cleaning up any pollution or spill of any contaminant;

- (j) The developer's programme for rehabilitation and restoration of the environment; and
- (k) A non-technical summary of the information provided under the preceding paragraphs.

4. Requirements for the Environmental and Social Impact Assessment and Environmental Impact Statement

4.1 ORGANIZATION OF THE REPORT (ENVIRONMENTAL IMPACT STATEMENT)

The EIA Report shall focus on significant environmental issues and must provide all the relevant information needed by the EPA to consider fully any adverse or beneficial impacts of the proposal.

The introduction to the EIA shall provide an explanation of the scope of the proposal and the issues and decisions which led to the proposal at this time and in this context, including a history of events leading up to project formulation, envisaged time scale for implementation and project life, anticipated establishment costs and actions already taken at the project site.

Suggested table of contents:

Glossary

Executive (non-technical) Summary

Chapter 1: Introduction and Background, ESIA Team (Detail cv in appendices)

Chapter 2: Approach and Methodology, Significance Criteria, Area of Influence (AOI)

Chapter 3: Project Alternatives

Chapter 4: Stakeholder identification and consultation (records/minutes etc. in appendices)

Chapter 5: Legislative and Regulatory Framework

Chapter 6: Description of Proposed Project (location, design etc.)

Chapter 7: Water Resources

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 8: Soils, Land and Geology

- *Introduction*
- *Definitions and scope*
- *Key relevant policy and legislation*
- *Existing information, Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 9: Air Quality

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 10: Climate and Climate Change

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 11: Biological Resources

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Surveys and Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 12: Ecosystem Services

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Existing information, Surveys and Baseline studies*
- *Impact prediction and assessment.*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 13: Noise and Vibrations

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Baseline*
- *Impact prediction and assessment*
- *Mitigation and monitoring- Environmental and Social Management Plan*

Chapter 14: Landscape and Visual Resources

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*

- *Baseline*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 15: Cultural Heritage

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Baseline studies*
- *Impact prediction and assessment*
- *Interactions*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 16: Socio-Economic and Cultural Impacts (direct and indirect)

- *Introduction*
- *Definitions and scope*
- *Key relevant policy, legislation, guidelines, standards etc.*
- *Baseline studies*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Social Management Plan*

Chapter 17: Risks and Risk Assessment

- *Introduction*
- *Definitions and concepts*
- *Key relevant legislation*
- *Prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Chapter 18: Cumulative Impacts

- *Introduction*
- *Definitions and scope*
- *Key relevant legislation, guidelines*
- *Baseline*
- *Impact prediction and assessment*
- *Mitigation and monitoring - Environmental and Social Management Plan*

Appendices

- All relevant documentation from the ESIA including records of consultations, data collection/survey forms etc.
- Emergency Response Plan
- Conceptual Rehabilitation and Closure Plan

Annex II: List of Consultants

A. EXTERNAL CONSULTANTS

1. Environmental Engineering Solutions (EES)

B. FTCI STAFFS

2. Ms. Luan Nero
3. Ms. Mariea Suegrim
4. Ms. Kischeiba Higgins
5. Delyon Roberts
6. Benny Lane
7. Bevin Dundas

C. RESOURCE PERSONS

8. Jagdesh Singh
9. Godfrey Marshall

1. ENVIRONMENTAL ENGINEERING SOLUTIONS

A. Environmental Engineering Solutions EES

Page 1 of 7



ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)

GENERAL INFORMATION

Business Name :	ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)
Address (main office) :	356 Block B, Farm, East Bank Demarara. Georgetown. Georgetown, Guyana. Tel.: +(592) 6500373 E-Mail: isidro_eem@yahoo.com.mx E-Mail: eesguyana@gmail.com
Business No.:	Certificate 130433
Management Staff:	M. Sc. & Eng. Isidro Ubaldo Espinosa (Director) M. Sc. Env. Osbert Ellis (Project Manager)
Services Offered:	Environmental Engineering (Design and Supervision): <ul style="list-style-type: none">• Air Pollution Control• Solid Waste Management• Wastewater Treatment• Contaminated sites: prevention, control and restoration Environmental Studies: <ul style="list-style-type: none">• Environmental Impact Assessment• Environmental Management Plan• Environmental Annual Report• Environmental Planning• Project Development• Research /Training• Site Inspections

Fields of activity and services provided

EES was founded in 2011. EES is the first consultant company in Guyana that offers environmental engineering based on demands in the engineering field. EES is rapidly gaining recognition as a technical qualified company by the Government of Guyana and the Private Sector. Projects developed for the private sector are examples of EES ability to provide local assessment, design and engineering that helps to prevent, control and mitigate the environmental impacts from the public, residential, commercial and Industrial sectors.

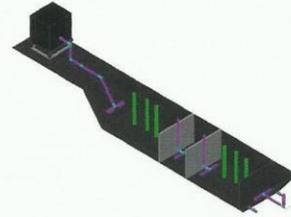
A. Environmental Engineering Solutions EES-Page 2 of 7

EES has carried out the following projects for the Private Sector and the Government of Guyana:

Constructed Wetland Design (2011).

The project implied a conceptual design of a wastewater treatment system – Subsurface Flow System type.

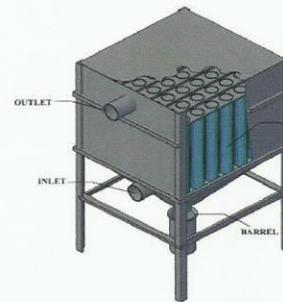
Project beneficiary: Beharry Company Limited.



Dust Collector System Design (2011).

The project implied a conceptual design and supervision of a dust collector system, for the air pollution control.

Project beneficiary: A. Cayume Hakh & Sons, Rice Farmer's Millers & Exporters



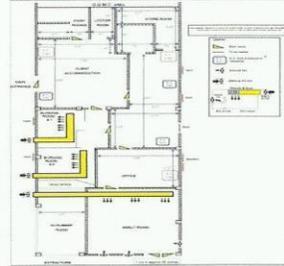
Integrated Solid Waste Management Initiatives (2011).

The project also included the design of bins, containers and the routes collection for recyclable waste for the city of Georgetown. It is supported by the Ministry of Natural Resources and the Environment in collaboration of the University of Guyana and primary and secondary schools.



A. Environmental Engineering Solutions EES Page 3 of 7

Preliminary Design, Fabrication and Installation of a Dilution Ventilation System to Remove Hot Air from Room Spaces and to Dilute Toxic Gases at the Guyana Gold Board Lab Facilities (2011).
Project beneficiary: The Geology and Mines Commission from Guyana.



“Converting Rice Husk Waste into Building Material (Particleboard)” using rice husk and styrofoam from the waste stream – 2012
Project beneficiary: University of Guyana.



“Environmental and Social Impact Assessment (ESIA) for Logging Concessions A, B & C- 2014 (in progress).
Project beneficiary: Baishanlin International Forest Development Inc.



Environmental Management Plan (EMP) for the Construction of a Septage Treatment Plant in Bartica- March 2015).
Project beneficiary: Countrywide Disposal Services (CDS).



A. Environmental Engineering Solutions EES-Page 4 of 7

Environmental and Social Impact Assessment (ESIA) Update for Sherwood Forrest Inc. Logging Concession (March, 2015).

Project beneficiary: Baishanlin International Forest Development Inc.



Environmental and Social Management Plan (ESMP) for Sanitary Landfill Operation in Bartica (April, 2015).

Project beneficiary: General Sanitation Enterprise.



Consolidated Annual Report for Cayume Hakh and Son Cane Grove Rice Mill Operation (April, 2015).

Project beneficiary: A. Cayume Hakh & Sons, Rice Farmer's Millers & Exporters



**Environmental Management Plan (EMP)
for the Wood Processing and Ship Building
Facility at Linden (June, 2015).**

Project beneficiary: Baishanlin International
Forest Development Inc.



**Consolidated Annual Report for Golden
Grove Rice Mill Operation (June, 2015).**

Project beneficiary: A. Cayume Hakh & Sons,
Rice Farmer's Millers & Exporters



**Environmental and Social Management
Plan (ESMP) for Sanitary Landfill
Operation in East Berbice (June, 2015).**

Project beneficiary: Advanced Environmental
Solutions (AES)



Consolidated Annual Report for Service Station (Bartica) (July, 2015).

Project beneficiary: David Coates Service Station



Environmental Report for the Asphalt (Bitumen) Plant Project, Upper Demerara-Berbice (August 2015).

1. Project beneficiary: Region 10, Environmental Impact Assessment.



Environmental and Social Impact Assessment (ESIA) - Physical Environment Chapter Forest Concession (August 2015).

Project beneficiary: Rong-An Inc.



Environmental and Social Impact Assessment (ESIA) - Physical Environment Chapter for Forest Concession (August 2015).

Project beneficiary: Variety Woods and Greenheart Ltd.



Consolidated Annual Report for s Service Station (Lethem) (November, 2015).

Project beneficiary: David Coates Service Station



Environmental Engineering Solutions (EES) works in accordance with international specifications and the Environmental Protection Agency in Guyana to comply with the Environmental Standards and Regulations.

2. LUANN NERO

Curriculum Vitae

Personal Information

Name: Luann Aderita Nero
Date of Birth: January 25, 1986
Nationality: Guyanese
Current Address: Lot 3 Tain Public Road, Corentyne, Berbice,
Guyana Marital Status: Single
Mobile: 615 – 0602
Telephone: 337 – 2898
Email: aderita252003@hotmail.com or luannnero28@gmail.com

Key Competencies

Forest Management: Over six years of knowledge and experience in the field of forest audits and management, with emphasis on forest monitoring and compliance.

Middle Management and Planning: Over five years of experience in supervising staff, planning, and developing conflict resolution skills.

Communication and Capacity-building: Good writing and communication skills, with experience in planning and organizing Capacity Building Workshops for Guyana Forestry Commission (GFC), Independent Forest Monitoring (IFM) and European Union Forest Law Enforcement Governance and Trade (EU FLEGT).

Educational Background

INSTITUTION	DATE	QUALIFICATIO
Technische Universität Dresden <i>(Centre for International Postgraduate Studies of Environmental Management (CIPSEM)</i>	January – July, 2013	Post Graduate Diploma – Environmental Management
University of Guyana	2005 – 2010	Bachelor of Science - Agriculture (General)

Experience

Organization	Designation	Period	Brief Overview of Duties and Responsibilities
FTCI	Course coordinator	2018+	Plan projects and logistics for training programmes, executed by FTCI training staffs
GFC	Environmental Auditing Officer	2011 - 2018	Mainly, ensuring that stakeholders comply with the requirements of the Forests Act Chapter 67:01 of 2009 of the Laws of Guyana (the Forest Act).
	Management Trainee	2010-2011	Conducted audits at lumberyards and sawmills as well as 100% audits at concessions for compliance.

Additional Qualifications and Skills

- 1) Mastering English Language for Report Writing - February – May 2012
- 2) Geographic Information System Fundamentals – November 2011 – February 2012
- 3) Women in Forestry in the Caribbean Symposium – October 23 -25, 2011

3. MARIEA SUEGRIM

Mariea Alessa Suegrim

102, First Street, Craig Village, East Bank Demerara, Georgetown / Tel: (592) 690-9757 /
Marieasuegrim@rocketmail.com

PERSONAL INFORMATION

Date of Birth: 20/10/1992
Age: 25
Nationality: Guyanese
Marital Status: Single

PROFILE

I am an Aspired Career Oriented Individual and I am hoping to become a mature in the near future with my interest specifically in Public Sector. I have great writing and statistical analysis skills that were acquired and developed throughout my academic exposures. I am courteous, dedicated and a very hardworking individual who takes pride in completing any task that is assigned to me. I am very organized, logical and reliable and have great interpersonal skills. As such, I have the capacity to work in a team or individually with minimal guidance. Moreover, honesty and trustworthiness are the two pillars for which I am known for.

EDUCATION

Craig Nursery School	1997-1999
Craig Primary School	1999-2005
Friendship Secondary School	2005-2009
University of Guyana	2012-2016

QUALIFICATIONS

2014-2016 **BSc. Public Management:** (Grade Point Average {GPA} 2.9) University of Guyana, Turkeyen Campus, Georgetown, Guyana.

2012-2014 **Diploma in Public Management:** University of Guyana, Turkeyen Campus, Georgetown, Guyana.

2011 Basic Foundation: Benschop Foundation, Grade A

2010-2012 Microsoft Word: Benschop Foundation, Grade A

2009	CXC General Proficiency	Grade
	Mathematics	Three
	English A	Three
	Office Administration	Two
	Electronic Document Preparation and Management	Three
	Principles of Business	Two
	Principles of Accounts	Three
	Integrated Science	Three
	Social Studies	One
	Visual Arts	Three

WORK EXPERIENCES

Human Rights Commission: General Clerk 2 – Administrative Assistant (Acting)

Responsibilities included:

Preparing and Assembling daily Reports to Administrative Officer, Answering telephone, scheduling Appointments, Composing of Correspondence, composing necessary Notices and Memorandum. In addition, arrangement of Monthly Statutory Meeting, Attend various meetings and preparing minute, reports, review invoices and prepare cheques for payment, Maintains files and prepare documentation, Manage Asset Inventory, Procure request for Quotation, Manage Ledgers, Make purchases of all Janitorial, Stationery and Refreshment, Maintain Call Logs, Timesheets Update, Store and File all relevant Document, Photocopying and Printing of Documents, experience in Government Accounting (IFMAS), schedule Bookings for Travelling, Prepare Agenda for Meetings, Assist with Preparation for Outreaches and Activity of the Commission.etc

Nand Persaud International Communication: Call Agent [2010]

Responsibilities included:

Converting Voice to Text Conversation –Typing at 30-40 words per minute -- Making daily reports to management – Devising new means of attracting potential clients .

EXTRA CURRICULAR ACTIVITIES

Assistant Counselor at Church Camp (Brethren Assembly)

2008-Present: **Brethren Assembly**

Main responsibilities include assisting Senior Counselor with preparation of Camp Activities Typing, Printing of Documents, Camp Registration and Assisting with Finance of Tuc Shop.etc

PROFESSIONAL SKILLS

I am computer literate and proficient in Microsoft Word, Excel and PowerPoint.

INTERESTS

I like to keep up-to-date with current news and events taking place both locally and internationally, travelling, meeting and interacting with persons of different background, culture and race, participating in cultural activities, writing and I also have good time management.

ACCOMPLISHMENTS

Best Graduating Social Studies Student at Friendship Secondary School and Best Camper for Three (3) Consecutive Years (2009-2011).

OTHER

- Holder of US Visa
- Long term goal – to obtain Master's Degree in Project Management and possibly PHD thereafter

REFEREES

Ms. Sharon Nelson

Human Resources Manager

Banks D.I.H Limited

Thirst Park

Tel: (592) 225-0910 ext 2216/680-7407

Email: snelson@banksdih.com

Mr. Deoraj Gyandat

Superintendent of Prison

Timehri Prison

Timehri

Tel: (592)604-7305

4. JAGDESH SINGH

164 Section A, Block Y Grove,
East Bank Demerara, Guyana.

Date of Birth: 28-12-78
Marital Status: Married
Nationality: Guyanese
Language: English

Tele: (592) 641-1451

E-mail: jagdeshtsingh@hotmail.com
jagdeshtsingh@gmail.com

Jagdesht Singh

Background Summary	Natural Resources Management professional with strong skills in project development and management, Geographic Information Systems/Remote Sensing design, management and analysis, Sustainable Forest Management, Forest Law, Policy and Governance, Environmental Law and Policy, Sustainable Development and Climate Change.
Qualifications	<ol style="list-style-type: none">1. September, 2020 – LLB (Bachelor of Laws), University of Guyana.2. October 2003 – September 2004. Chevening Scholar (2003). MSc in Geographical Information Science/Remote Sensing (GIS/RS), Department of Geography, University of Edinburgh.3. October 2000. BSc Forestry, Department of Forestry, University of Guyana4. October 1998. Dipl. Forestry, Department of Forestry, University of Guyana5. December 2001. Certificate Professional Development Program, Institute of Business, University of the West Indies.

Specialist Skills	<ul style="list-style-type: none">● Natural Resources Management and Sustainable Development planning and implementation● Environmental Law, Climate Change, Sustainable Forest Management (SFM) planning and implementation● Forest Law, Policy and Governance● Planning and project management● Monitoring, Reporting and Verification Systems (MRVS) design and implementation● National Forest Monitoring System (NFMS) design and implementation● Communication, team building and training
--------------------------	--

Experience	<ol style="list-style-type: none"> 1. 2018 – Present - Technical Officer, Guyana Forestry Commission. 2. 2014 – 2018 - National Technical Coordinator (NTC) for the implementation of the Project “Forest Cover Monitoring in the Amazon Region”, GFC 3. 2008 – 2014 - Deputy Commissioner of Forests – Forest Resources Management Division (FRMD), GFC. 4. June – December, 2007 - Head, Forest Resources Information Unit, GFC 5. 2004 – 2007 - Head, Geographical Information Systems Unit, EPA. 6. 2004 – 2007 - Lecturer, Department of Forestry, University of Guyana. 7. 2001 – 2003 - Assistant Commissioner of Forests – Forest Resources Management Division (FRMD), GFC. 8. 2000 – 2001 - Environmental Monitoring Officer – Forest Monitoring Division (FMD), GFC.
Interests	<ul style="list-style-type: none"> <input type="checkbox"/> Environmental Law, Sustainable Development, Climate Change, Natural Resources Management, Sustainable Forest Management. <input type="checkbox"/> Use of GIS/Remote Sensing in Natural Resources Management and Environmental Applications <input type="checkbox"/> Developing methods for mapping and managing tropical forest stands and species using satellite/radar imagery
Other Information	<ol style="list-style-type: none"> 1. Chevening Scholar, 2003. 2. Special Award. Awarded the Vice-Chancellor Special Award for Best Graduating Student in the Faculty of Agriculture, University of Guyana. 3. Member of the Board of Directors of the Guyana Lands and Surveys Commission (GL&SC) and the Environmental Protection Agency (EPA), 2010 – 2014.

5. GODFREY MARSHALL

CURRICULUM VITAE: GODFREY EMERSON MARSHALL: FORESTER

48+ years with the Guyana Forestry Commission, and exposure to forestry field tours in Brazil, Malaysia, Sweden, Trinidad & Tobago, and the United Kingdom.

A. PERSONAL DETAILS:

Name: Godfrey Emerson Marshall
Date of birth: 12 November 1954
Place of birth: Bartica, GUYANA
Nationality: Guyanese
Address: 1393 Section A, Block X, Diamond Housing Scheme, East Bank
Demerara, Guyana
Email: gemar@guyana.net.gy
Phone: 592-216-4602 (H); 592-642-1910 (Cell)

B. EDUCATION:

2000: Executive Diploma in Business, University of the West Indies School of Business (sponsored by Guyana Forestry Commission), Georgetown, Guyana.

1999: M.Sc. Forestry – Department of Plant Sciences, University of Oxford, United Kingdom.

1992: B. Sc. Forestry - Universidade Federal de Lavras (*formerly Escola Superior de Lavras*), Lavras, Minas Gerais, Brazil.

1982: Diploma in Forestry - Eastern Caribbean Institute of Agriculture & Forestry, Trinidad & Tobago.

C. PROFESSIONAL EXPERIENCE:

Appointed a Forest Officer, Guyana Forestry Commission on December 7, 1972 and served in various positions (see below) before secondment to Forestry Training Centre Incorporated as a Project Coordinator in September 2002 and as Director, 2005-2014. Formally retired from the Guyana Forestry Commission in December 2014 after 42 years and was re-employed as Technical Adviser with effect from January 1, 2015.

Key positions held at the GFC are as follows:

2015+: *Technical Adviser/Consultant* with the GFC/FTCI; provide technical support to the GFC and Forestry Training Centre Incorporated. (I also engage *informally* in extension services, advising concessionaires, sawmillers and loggers' associations on their projects).

2005 to 2014: *Director, Forestry Training Centre Incorporated*: Co-managed two ITTO projects, PD 68/01 Rev.2(I) and PD 333/05 Rev.2(I), while maintaining collaboration with several partners/donors including the Tropical Forest Foundation, Virginia (USA), Tropenbos International, WWF (Guyana), Iwokrama International Centre, Basic Needs

Trust Fund (Guyana), and Board of Industrial Training (Guyana).

2002-2004: *Project Coordinator, Forestry Training Centre Incorporated: understudied the Project Director, Peter van der Hout PHD.*

2001-2002: *Head, Planning & Development Division: Assisted in identifying and developing strategic goals for the GFC. A strategy for managing research sites and a local forest zonation paper were produced during that period.*

1995-2001: *Deputy Commissioner of Forests, Forest Resources Management Division: Assisted with the development of forest management standards and practices, including leading a task force that prepared the first draft of GFC's Code of Practice and draft guidelines for the preparation of forest management plans and annual plans of operations.*

1992-1995: *Senior Assistant Commissioner of Forests-Field Operations. Coordinated Guyana Forestry Commission's forestry extension, enforcement, and monitoring functions.*

D. Field Tours

I have been exposed to field tours in various countries, including Malaysia, Sweden, Brazil, and the United Kingdom.

E. Languages

I am fluent in English and Portuguese.

F. Recent Publication

Marshall, G. & Kerrett, R. 2010. The Chainsaw milling subsector in Guyana. ETRN NEWS Issue No. 52, December 2010. Pages: 91-97.

G. Projects/Consultancies

I have written project proposals for donor funds from ACTO, FAO, ITTO, and WWF. On a personal basis, I have done consultancies for FAO, ACTO and ITTO projects, respectively. Also, I have written many Forest Management Plans and Annual Plans of Operations for logging companies in Guyana. I have been engaged with ESIA's for local developers since 2006.

H. Other

- Served for one year as a member of the Board of Directors, Guyana Mining School and Training Centre (January -December 2014).
 - Received a *national award: Medal of Service*: November 2015.
-

ANNEX III: COPY OF FACE PAGE RTI'S CERTIFICATE OF INCORPORATION



Company No. 8612

**COMPANIES ACT OF GUYANA
CERTIFICATE OF INCORPORATION**

ROYAL TIMBERS INC.

I hereby certify that the above-mentioned Company, Articles of Incorporation of which are attached, was incorporated under the Companies Act of Guyana on the 23rd day of November, 2016.



Registrar of Companies (Ag)

Dated this 25th day of November, 2016



ANNEX IV: COPY OF RTI'S TIN CERTIFICATE

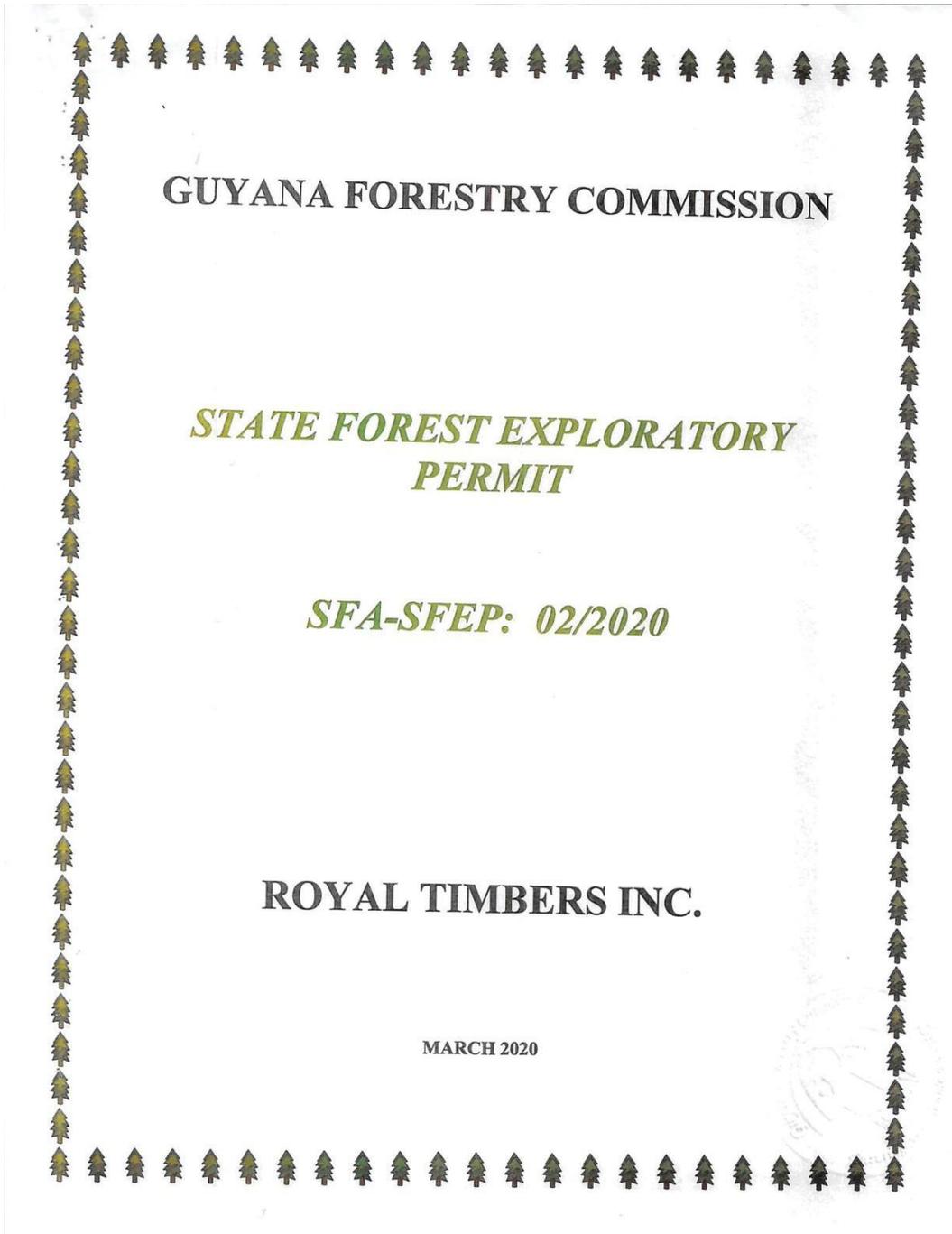

Certificate of Registration
Taxpayer Identification Number (TIN)

Taxpayer Name:	ROYAL TIMBERS INC.
Business Name:	ROYAL TIMBERS INC.
Taxpayer Type:	COMPANY
Address:	LOT 15 GARNETT STREET CAMPBELLVILLE
Date Issued:	December 05, 2016
Tax Office:	HEAD OFFICE
TIN:	<u>016235733</u>

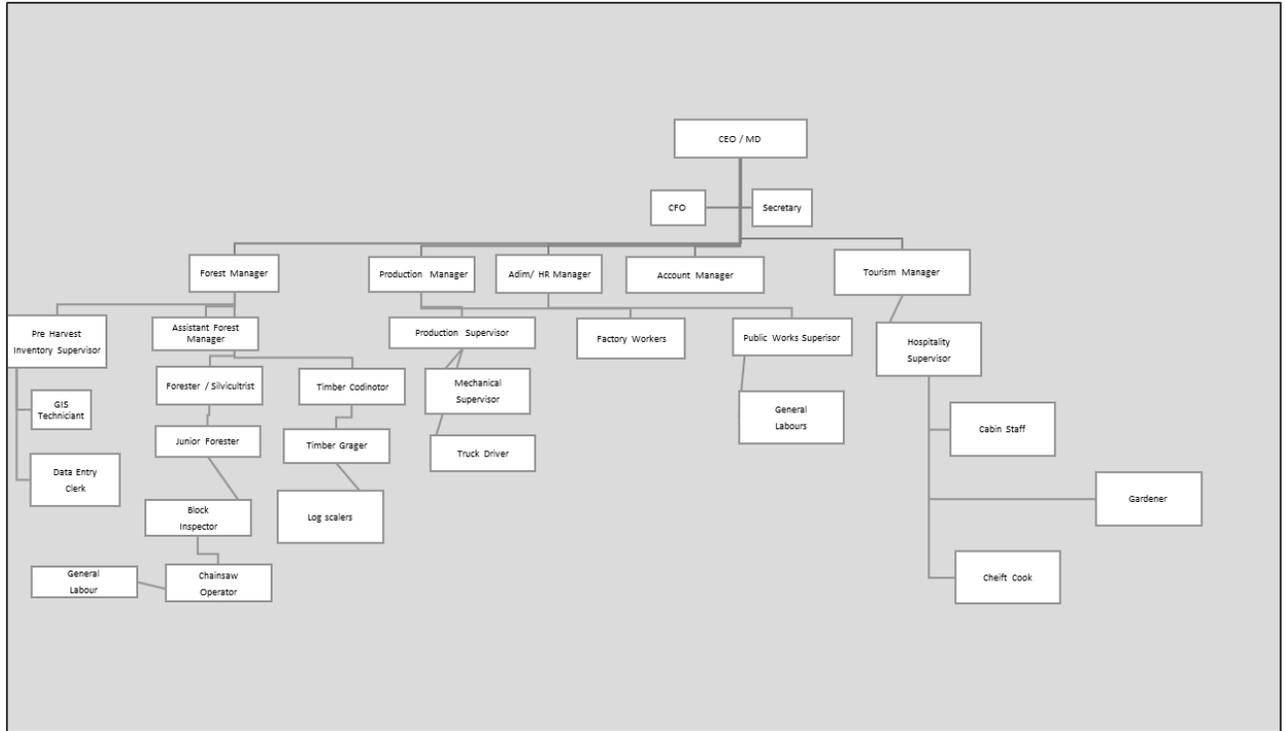
This Taxpayer has been registered under the provisions of the Income Tax (Amendment) (No. 2) Act # 15 of 2006


Commissioner General
Guyana Revenue Authority

GRA/29/277



ANNEX VI: ORGANISATIONAL STRUCTURE OF ROYAL TIMBERS INCORPORATED



ANNEX VII: DESCRIPTION OF BOUNDARIES – Royal Timbers Inc. SFEP 02/20

Left Bank Mazaruni River, Right Bank Puruni River:

Commencing at a point on the **right bank Puruni River** where it intersects the **Kartabu-Puruni road**, having approximate UTM geographic coordinates of **02 37 814 E, 06 90 707 N**; thence along this **road** in a **Westerly** direction for approximately **99.80 km** to a point, having approximate UTM geographic coordinates of **01 57 563 E, 06 90 345 N**; thence by a **cut line** in a **Northeasterly** direction for a distance of **25.42 km** to a point on the **right bank Puruni River**, having approximate UTM geographic coordinates of **01 57 294 E, 07 15 677 N**; thence down the **right bank Puruni River** for approximately **175 km** to the first mentioned point, this being the point of commencement.

Save and except all lands legally held.

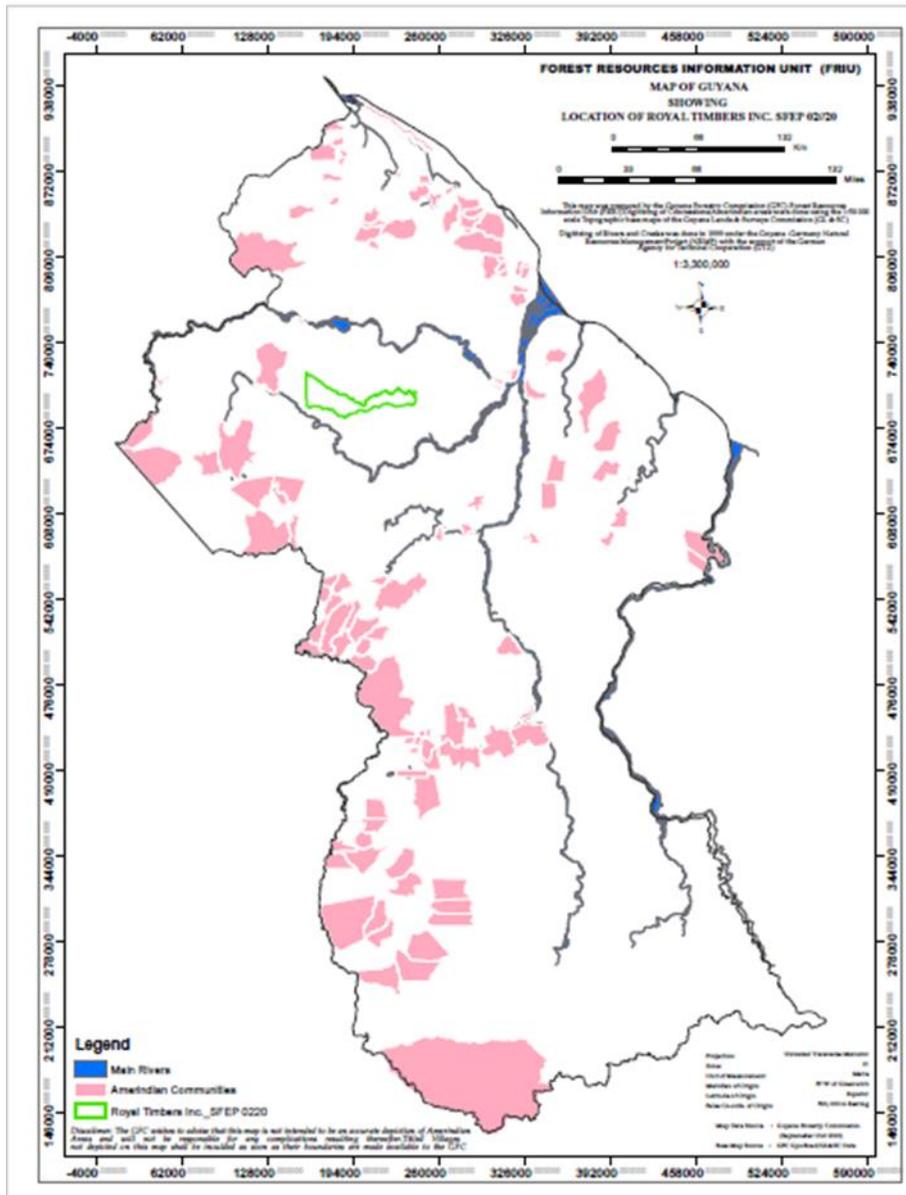
Coordinates have not been field-tested.

Description subject to change upon verification.

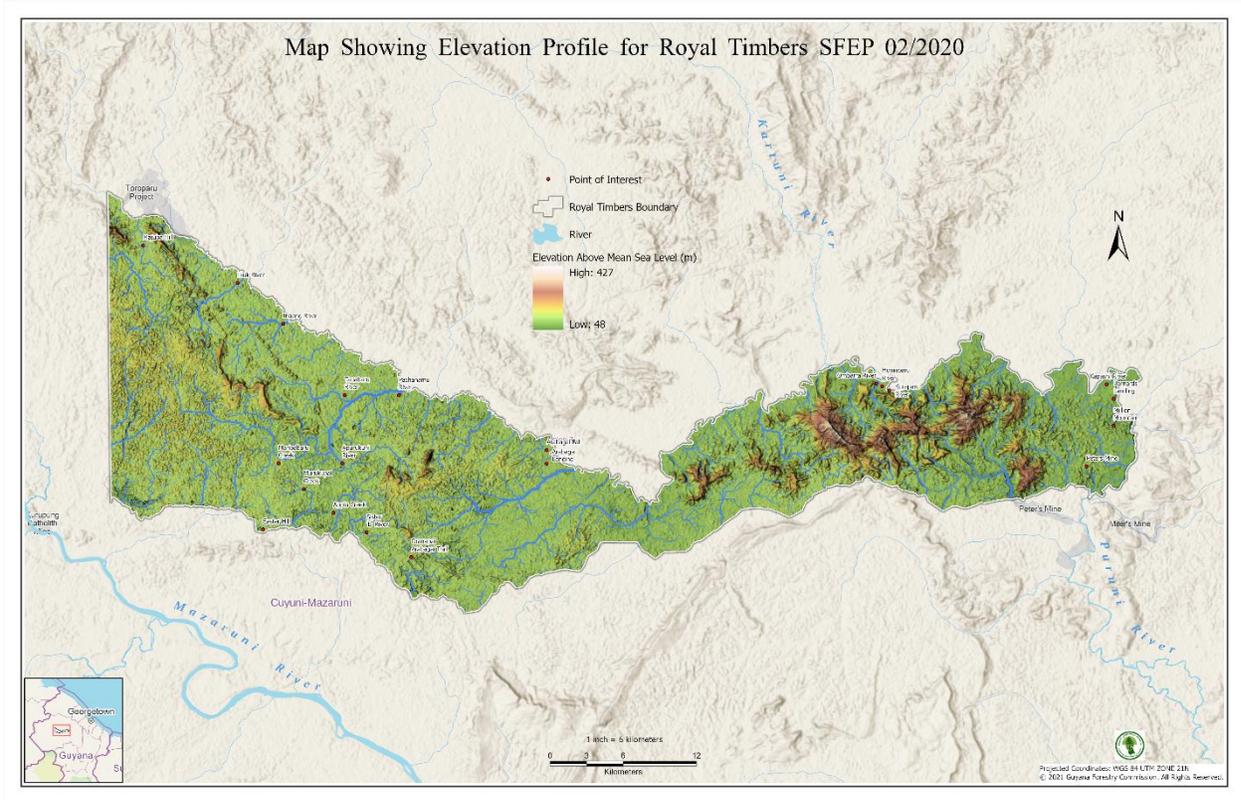
Area: Approximately 107, 673.70ha (266,066.44acres)

Map reference: 24 NE, SE, 25 Entire, 26 NW & SW WGS

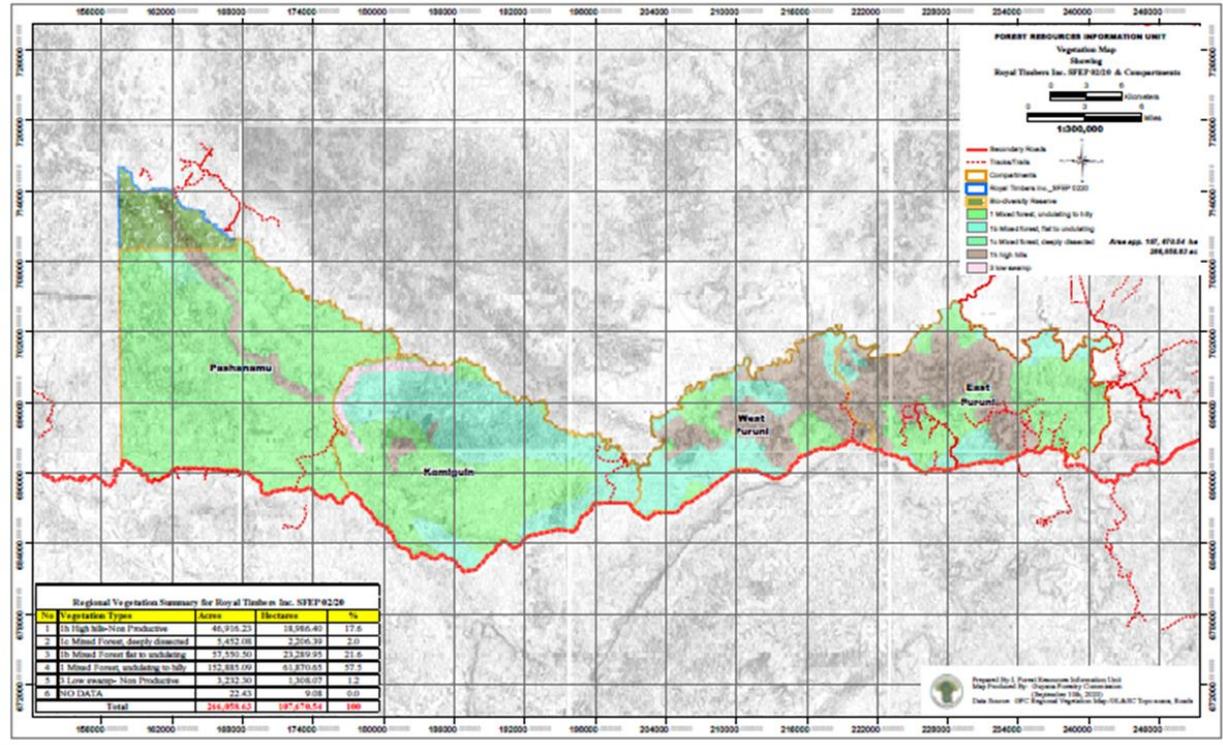
ANNEX VIII: General map of Guyana, showing location of Royal Timbers Incorporated (RTI) Forest



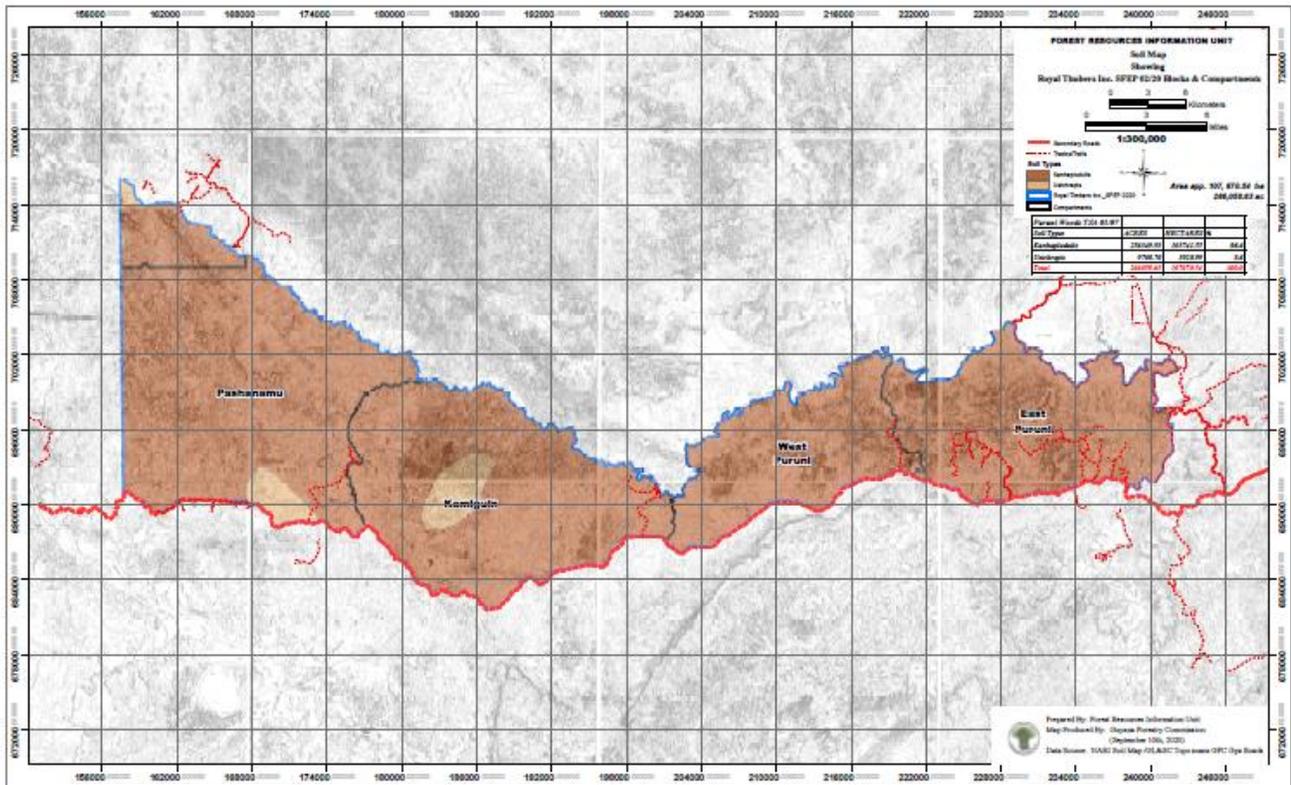
ANNEX IX: MAP SHOWING ELEVATION FEATURES FOR SFEP 2/2020



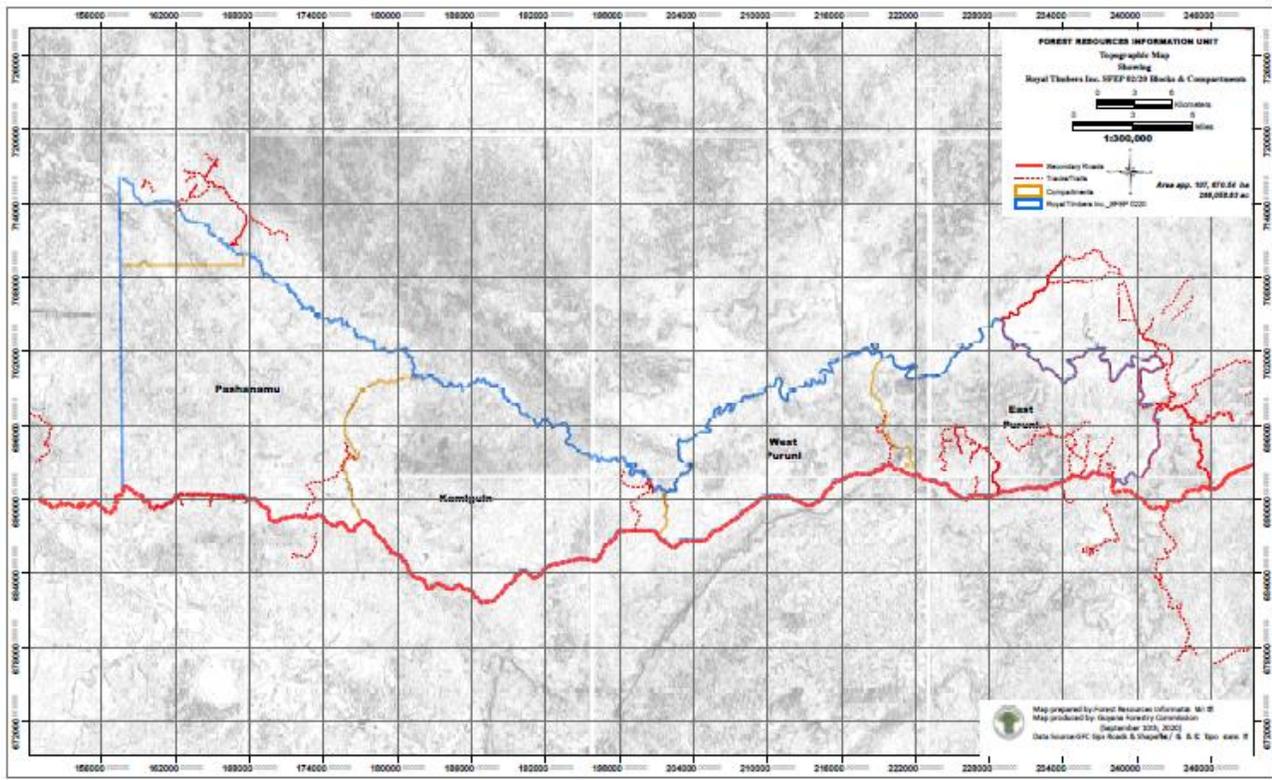
ANNEX X: OUTLINE VEGETATION MAP OF SFEP 2/2020



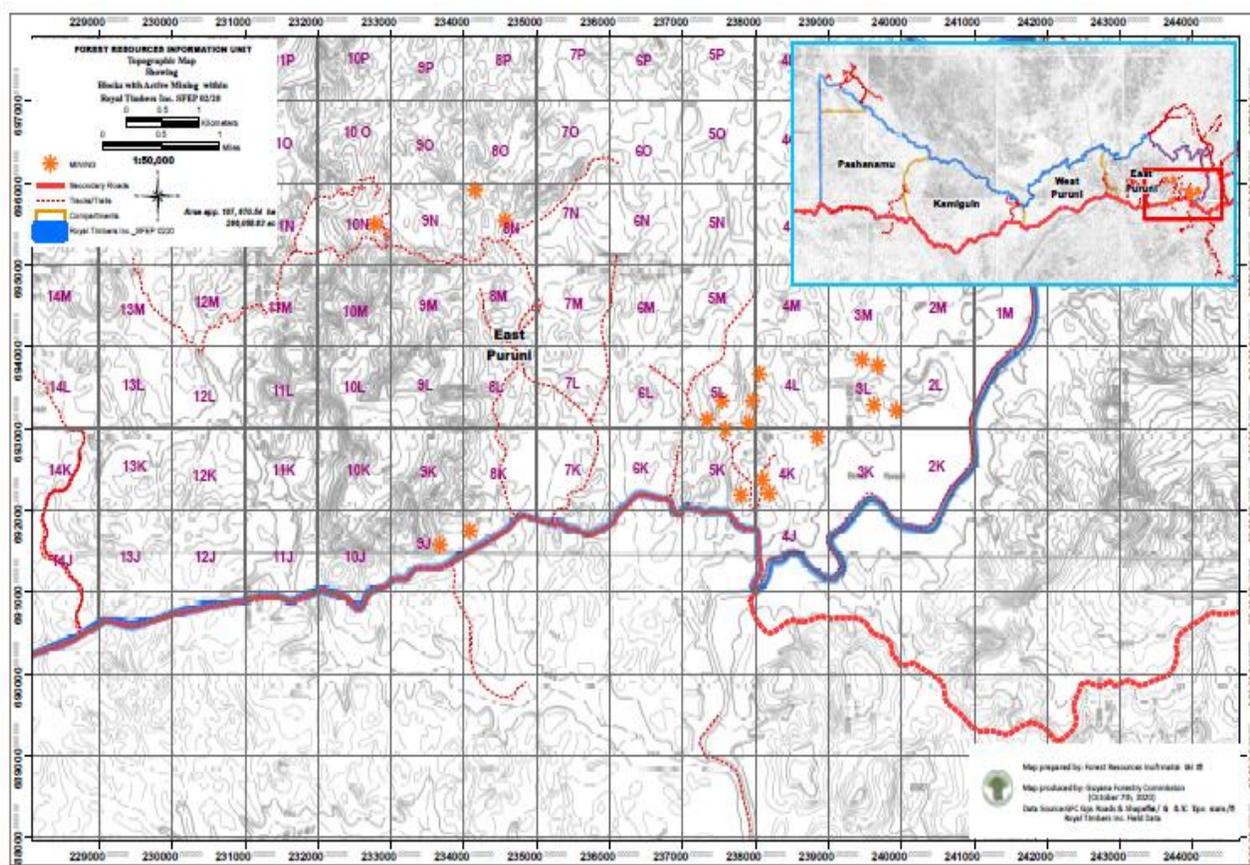
ANNEX XII: Soil type map of the Royal Timbers Incorporated (RTI) Concession



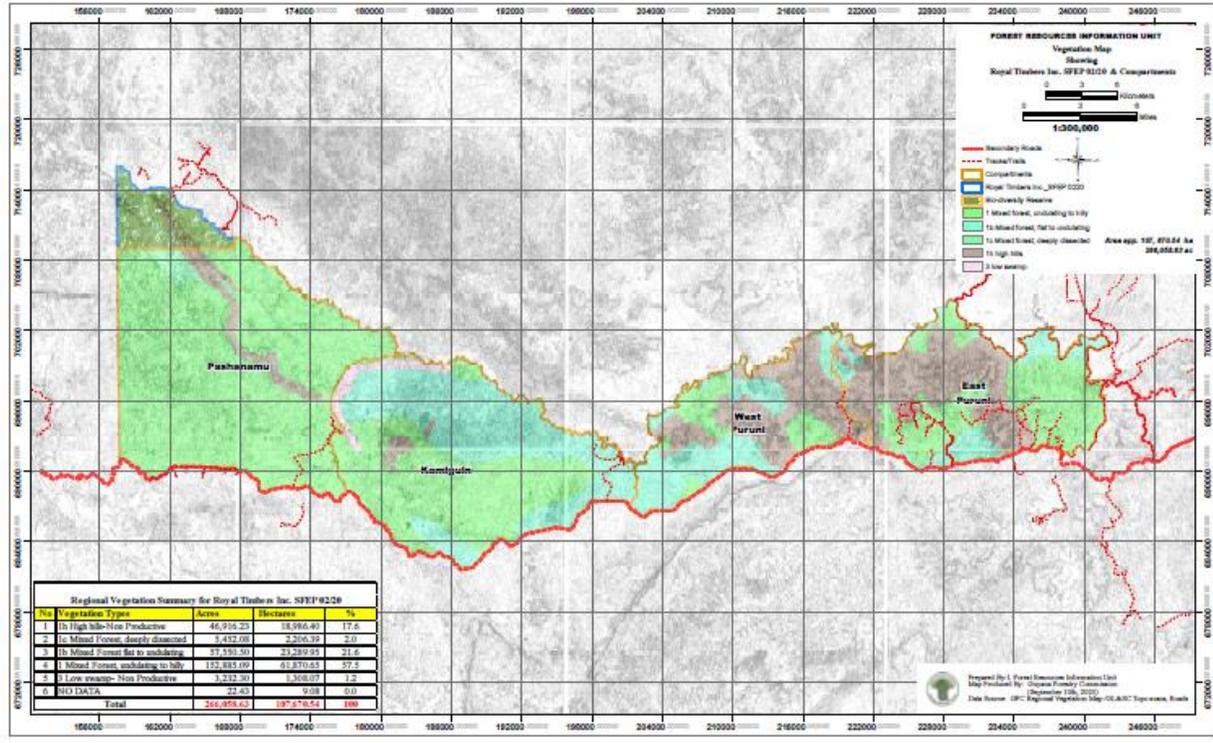
ANNEX XIII: Topographic map of Royal Timbers Incorporated (RTI) Concession, Net Operation Area, Location of Base Camp and Field Station.



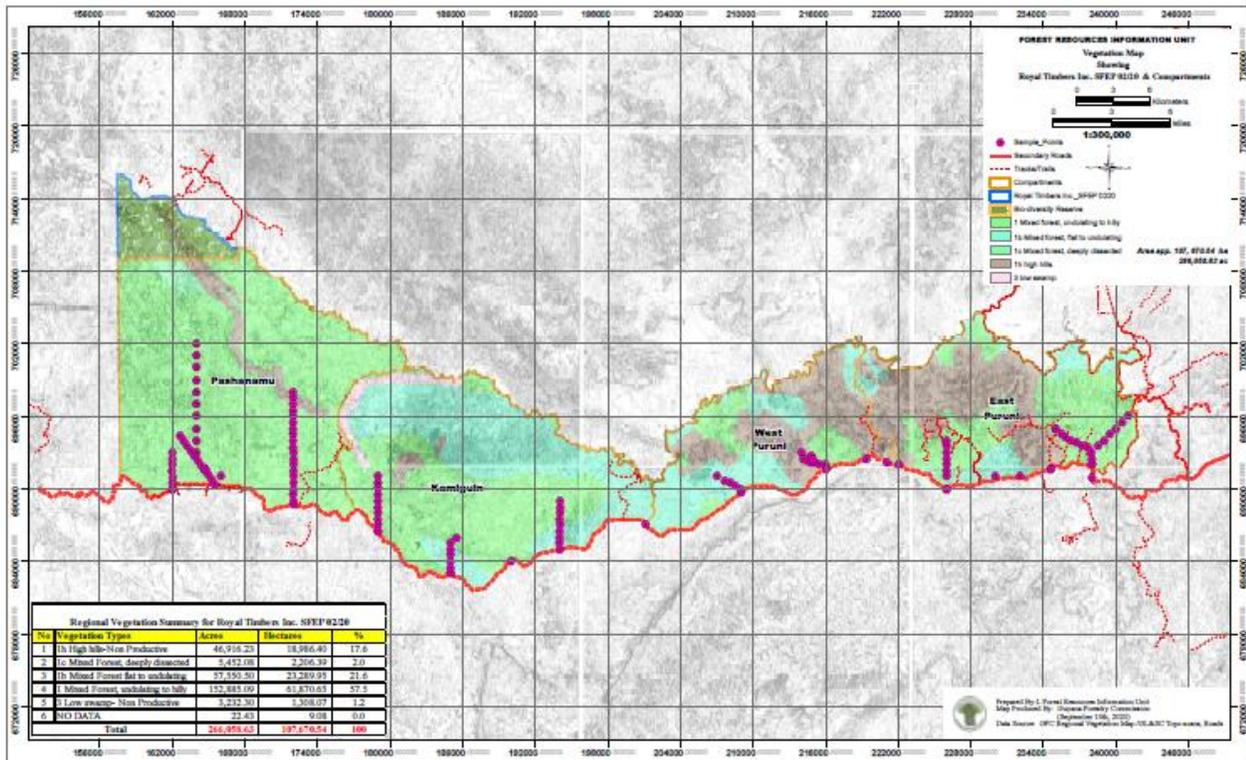
ANNEX XIV: Drainage and current Road Network in East Puruni Compartment, Royal Timbers Incorporated (RTI) Concession



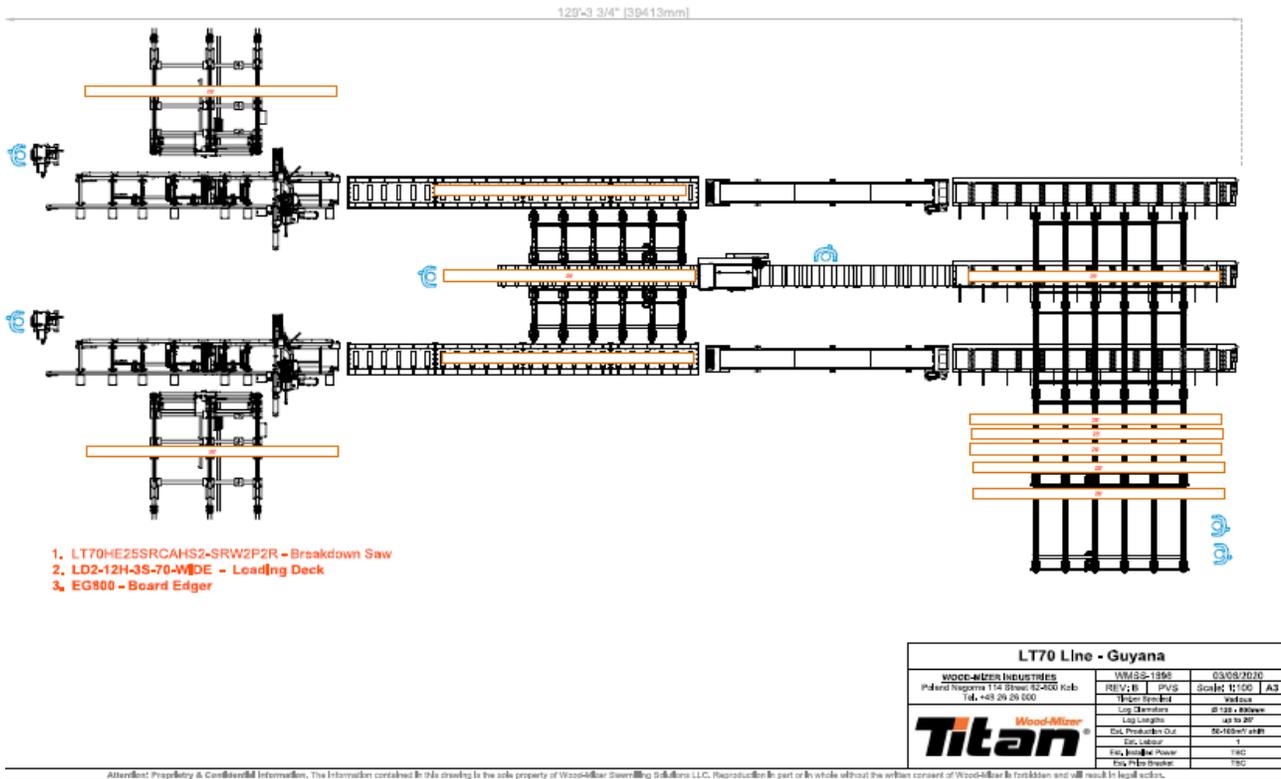
ANNEX XV: Forest Type map of the entire Royal Timbers Incorporated (RTI) Concession



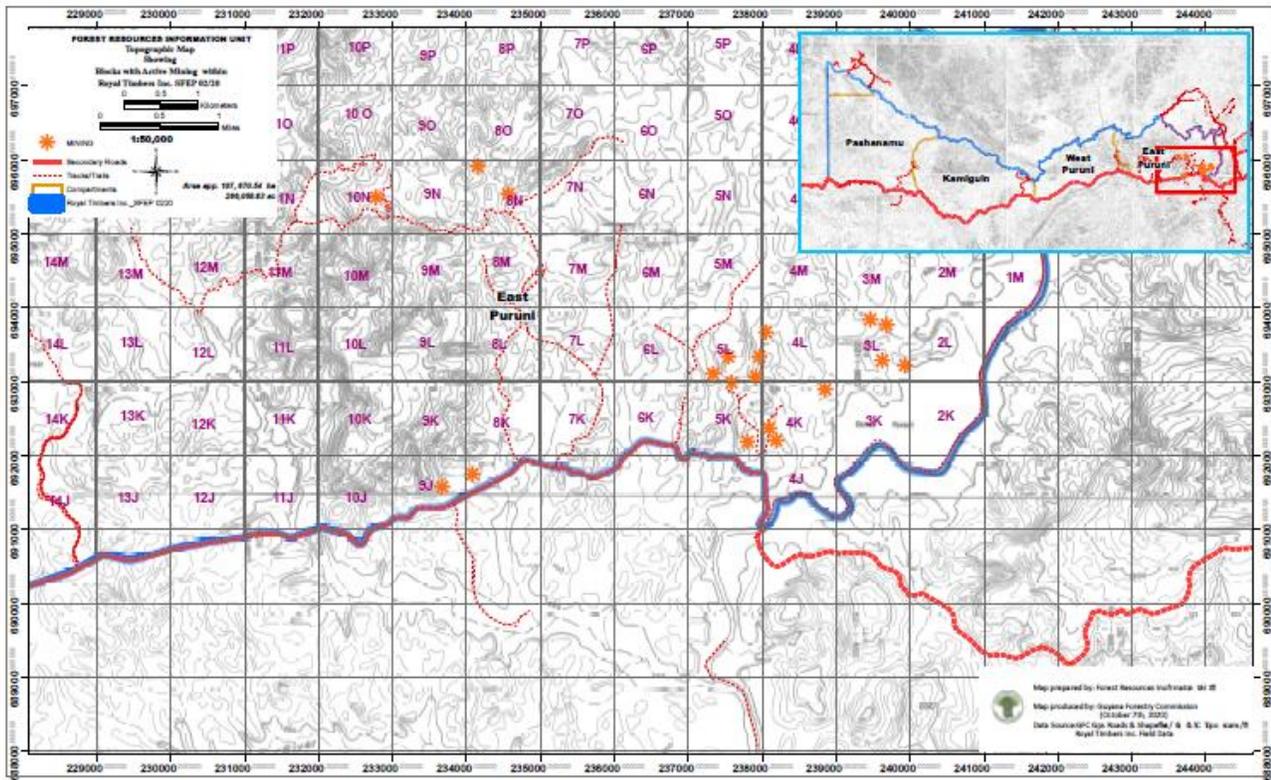
ANNEX XV: Forest type map of, Net Operation Area with inventory transects



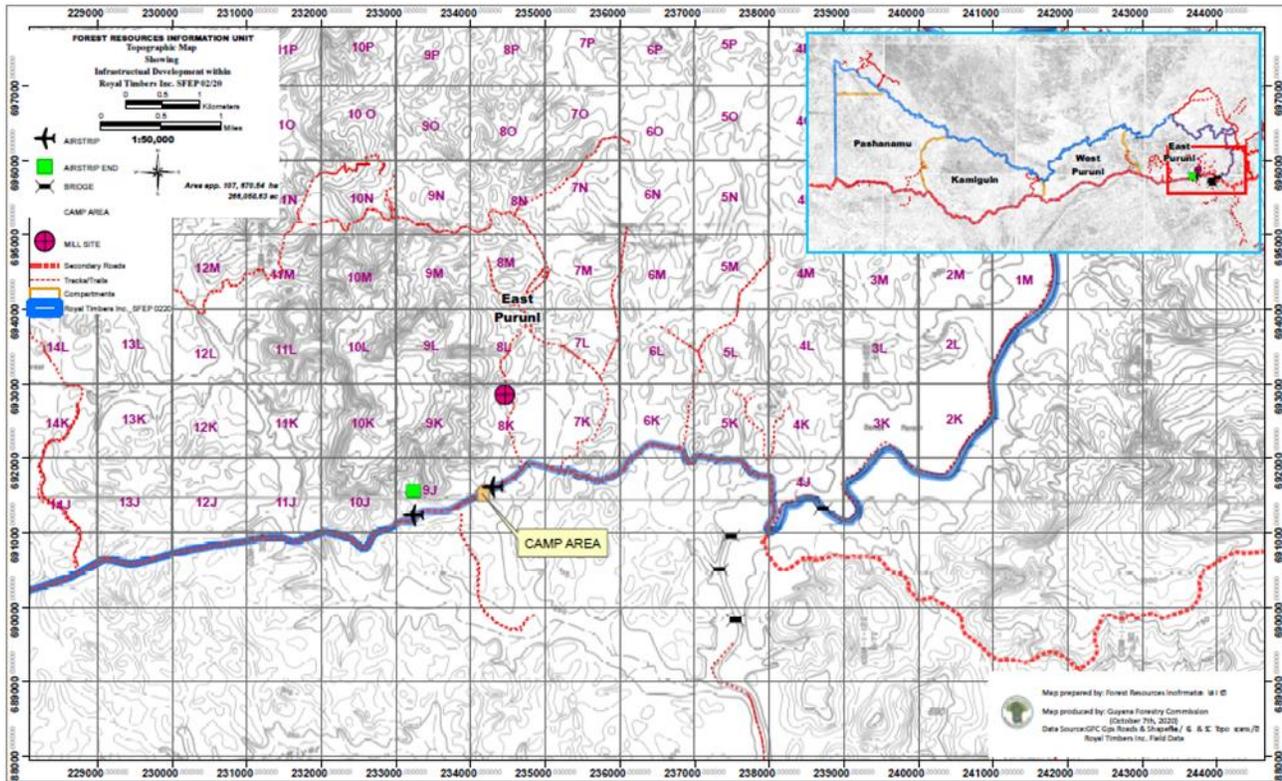
ANNEX XVI: Sawmill Layout Royal Timbers Incorporated (RTI) Concession



ANNEX XVII: Active Mining Areas in Royal Timbers Incorporated (RTI) Concession



ANNEX XVIII: Infrastructure Development and forward planning Royal Timbers Incorporated (RTI) Concession



ANNEX XIX: LIST OF SPECIES TARGETED BY RTI

No.	Local Name	Scientific Name
<i>Lumber</i>		
1	Crabwood	<i>Carapa guianensis</i>
2	Huruasa	<i>Pithecellobium jupunba</i>
3	Purpleheart	<i>Peltogyne spp.</i>
4	Kabukalli	<i>Goupia glabra</i>
5	Locust	<i>Hymenea spp.</i>
6	Shibadan	<i>Aspidosperma spp.</i>
7	Tatabu	<i>Diptotropis purpurea</i>
8	Mora	<i>Mora excelsa</i>
9	Manni	<i>Symphonia globulifera</i>
10	Monkey Pot	<i>Lecythis davisii</i>
11	Greenheart	<i>Chlorocardium rodiei</i>
12	Washiba	<i>Tabebuia sp.</i>
13	Limonaballi	<i>Chrysophyllum pomiferum</i>
14	Tonka-bean	<i>Dipteryx odorata</i>
15	Silverballi	<i>Aniba ovalifolia</i>
16	Wamara	<i>Swartzia leiocalycina</i>
17	Morabukea	<i>Mora gonggripii</i>
18	Tauroniro	<i>Humiria balsamifera</i>
19	Bulletwood	<i>Manilkara bidentata</i>
<i>Plywood</i>		
1	Baromalli	<i>Catostemma spp.</i>
2	Maho	<i>Sterculia spp.</i>
3	Simarupa	<i>Simaruba amara</i>
4	Cedar	<i>Cedrela odorata</i>
5	Dalli	<i>Virola surinamensis</i>
6	Haiawa	<i>Protium spp.</i>
7	Karahoro	<i>Didymopanax morototoni</i>
8	Kurokai	<i>Protium decandrum</i>
9	Moraballi	<i>Pouteria minutiflora</i>
10	Barakaro	<i>Ormosia spp.</i>
11	Soapwood	<i>Pithecellobium spp.</i>
12	Cow-wood	<i>Bagassa tilifolia</i>
13	Futui	<i>Jacaranda copaia</i>

ANNEX XX: GROWTH & YIELD DATA (ALDER 2000)

Appendix A: Species statistics

The *Tim.* column is ticked for commercial species. If more than one local name is used for the same species, they are separated by semi-colon (;). Where two species names are shown joined by an ampersand (&), different nomenclature is used by Barama and Tropenbos for the same local name. *N* shows the total number of trees on all PSPs. *Dinc* is mean diameter increment in cm yr⁻¹. *SE%* is the standard error of *Dinc* as a %. Annual mortality is shown as % yr⁻¹. The defective tree value includes damaged or decaying trees, but not simply poor form. *Dmax* is the 95% percentile of the cumulative diameter distribution. *Model* shows the growth model group. This table only includes species above 20 cm dbh occurring on the PSPs.

Species identification		Trees	Diameter increment		Annual mortality rate		Dmax	Model	
<i>Tim.</i>	Common name	Botanical name	<i>N</i>	<i>Dinc</i>	<i>SE%</i>	Sound	Defective	<i>P. 95</i>	
✓	Huruasa	<i>Aberema jupunba</i>	18	0.566	12.1%	2.56%	14.29%	87.0	N
	Limonoballi	<i>Achrouteria pomifera</i>	1					29.4	A
✓	Haiariballi	<i>Alexa</i>	1906	0.631	1.4%	2.03%	4.31%	56.2	G
	Utudi	<i>Anacardium giganteum</i>	1	0.276	10.5%		0.00%	23.6	C
	Gale, almond	<i>Aniba citrifolia</i>	1	0.624	23.8%	0.00%		27.5	F
	Gale, greenheart	<i>Aniba excelsa</i>	5	0.284	15.6%	0.00%	0.00%	37.5	D
	Silverballi, yellow	<i>Aniba hypoglauca</i>	1	0.061	55.4%	0.00%		33.1	A
	Gale, ginger	<i>Aniba kappleri</i>	1	0.066	52.1%		0.00%	25.5	A
	Mababalli	<i>Aparisthmium cordatum</i>	2	0.182	42.9%	0.00%	33.33%	23.8	A
	Duru	<i>Apeiba echinata & petoumo</i>	126	0.529	5.5%	2.82%	0.00%	63.4	K
✓	Shibadan	<i>Aspidosperma cruentum & album</i>	221	0.540	3.7%	1.07%	0.00%	83.2	P
	Yaruru	<i>Aspidosperma exselsum</i>	82	0.356	6.8%	0.00%	13.33%	69.7	L
	Cowwood	<i>Bagassa tiliifolia</i>	32	0.487	12.3%	2.00%	0.00%	56.1	E
	Manariballi, common	<i>Balizia pedicellaris</i>	11	0.680	15.8%	3.57%	0.00%	81.1	P
	Arara, fine leaf	<i>Bocageopsis multiflora</i>	17	0.220	12.9%	0.00%	10.53%	38.6	D
	Sitkocotton	<i>Bombax</i>	20	0.982	9.5%	4.17%	0.00%	73.6	R
	Wild Cocoa	<i>Bombax jermanii</i>	23	0.441	19.9%	1.85%	8.33%	63.2	E
	Leopardwood; Tibo-kushi	<i>Brosimum guianense</i>	10	0.175	23.7%	0.00%	11.11%	32.7	B
	Dukaliballi	<i>Brosimum rubescens</i>	12	0.384	16.0%	0.00%	0.00%	43.6	E
	Arikadako	<i>Byrsonima aerego</i>	1	0.111	13.2%	0.00%		23.4	A
	Hicha	<i>Byrsonima spicata</i>	54	0.983	7.6%	4.76%	9.09%	40.6	H
	Kanoaballi	<i>Byrsonima stipulacea</i>	4	0.425	26.9%	25.00%		40.3	C
	Wild Guava	<i>Calycolpus goetheanus</i>	4	0.228	39.0%	0.00%		30.7	B
	Kakino	<i>Calyptanthus forsteri</i>	5	0.207	59.7%	7.69%		43.3	D
✓	Crabwood	<i>Carapa guianensis</i>	490	0.548	2.9%	1.88%	7.12%	61.8	K
	Sawari	<i>Caryocar nuciferum</i>	3	0.227	32.7%	0.00%	0.00%	80.0	M
	Warua	<i>Cassia cowanii</i>	3	0.470	34.1%	11.11%		40.2	C
✓	Baromalli, swamp	<i>Catostemma commune</i>	1072	0.510	2.1%	0.74%	2.94%	75.5	P
✓	Baromalli, sand	<i>Catostemma fragrans</i>	480	0.220	3.4%	1.42%	14.73%	43.0	D
	Congo Pump	<i>Cecropia angulata & obtusa</i>	160	1.073	4.1%	3.35%	6.90%	50.1	H
✓	Red Cedar	<i>Cedrela odorata</i>	3	0.823	42.2%	0.00%		65.2	G
	Kumaka	<i>Ceiba pentandra</i>	4	0.872	22.6%	0.00%		45.2	H
	Ruri	<i>Chaetocarpus schomburgkianus</i>	126	0.171	11.1%	2.04%	1.59%	37.9	D
	Hiwaradan	<i>Chaunochiton kappleri</i>	25	0.078	15.7%	1.69%	0.00%	25.3	A
✓	Greenheart	<i>Chlorocardium rodiei</i>	1070	0.218	1.4%	0.48%	1.57%	70.8	M
	Paripiballi	<i>Chrysophyllum pomiferum</i>	1	0.116	24.8%	0.00%		63.7	J
	Barataballi	<i>Chrysophyllum sanguinolentum</i>	3	0.481	12.0%	0.00%		46.7	E
✓	Aromata	<i>Ciathotropis</i>	153	0.653	5.5%	2.33%	2.13%	37.4	F
	Iron Mary	<i>Ciathotropis paradoxa</i>	14	0.309	18.2%	0.00%	6.67%	71.2	L
	Table tree	<i>Cordia exaltata</i>	9	0.161	36.8%	0.00%	12.50%	30.9	B
	Antswood	<i>Cordia nodosa</i>	17	0.402	20.1%	2.63%	0.00%	28.5	C
	Gamma Cherry	<i>Cordia tetrandra</i>	97	0.358	7.7%	0.00%	14.29%	44.3	E
	Aruadan	<i>Couepia exflexa</i>	41	0.310	7.7%	1.02%	15.38%	50.4	E
✓	Wadara	<i>Couratari guianensis</i>	60	0.516	10.1%	0.65%	4.00%	78.1	P
	Kulishiri, hairy black	<i>Cupania hirsuta</i>	6	0.073	39.9%	0.00%	20.00%	27.4	A
	Barabara	<i>Diospyros</i>	59	0.332	11.3%	1.31%	0.00%	50.1	E
✓	Tatabu	<i>Diploptropis purpurea</i>	33	0.391	9.5%	0.00%	0.00%	67.0	L
✓	Tonka Bean	<i>Dipteryx odorata</i>	16	0.425	25.9%	0.00%	0.00%	54.6	E

Species identification			Trees N	Diameter increment		Annual mortality rate		Dmax P .95	Model
Tim.	Common name	Botanical name		Dinc	SE%	Sound	Defective		
	Yariyari, White	<i>Duguetia</i>	3	0.437	23.6%	0.00%		46.3	E
	Hishirudan	<i>Dulacia guianensis</i>	3	0.156	23.2%	0.00%		29.5	B
	Bartaballi	<i>Ecclinusa guianensis</i>	199	0.395	5.5%	1.10%	0.92%	67.4	L
	Manobodin	<i>Emmotum fagifolium</i>	7	0.211	25.8%	14.29%	50.00%	58.6	J
	Devil's ear	<i>Enterolobium cyclocarpum & bar-bebianum</i>	2	0.418	53.7%	0.00%	0.00%	75.8	P
	Wallaba, Hill	<i>Eperua</i>	1	0.450	43.4%		0.00%	79.9	P
✓	Wallaba, Soft	<i>Eperua falcata</i>	211	0.215	4.1%	2.56%	7.45%	68.5	M
	Kakaralli	<i>Eschweilera spp.</i>	4527	0.384	1.2%	0.73%	2.34%	51.0	E
	Banyaballi?	<i>Eugenia coffeifolia</i>	30	0.237	27.1%	0.00%	7.14%	41.9	D
	Wild Cherry	<i>Eugenia patrisii</i>	50	0.300	12.5%	1.64%	0.00%	42.6	D
	Wild Fig	<i>Ficus</i>	5	1.424	26.5%	0.00%	0.00%	65.0	R
	Kumakaballi	<i>Ficus mathewsii</i>	2	0.657	62.1%	0.00%	0.00%	90.5	N
	Manyokinaballi	<i>Geissospermum sericeum</i>	18	0.210	11.4%	0.00%	6.67%	74.2	M
	Devildoor tree	<i>Glycydendron amazonicum</i>	15	0.279	13.3%	0.00%	0.00%	110.5	S
✓	Kabukalli	<i>Goupia glabra</i>	125	0.562	7.1%	1.80%	1.59%	90.0	N
	Karababalli	<i>Guarea guidonia</i>	37	0.640	8.5%	0.00%	5.08%	81.4	P
	Arara, smooth skin	<i>Guatteria</i>	75	0.255	9.5%	3.59%	8.70%	29.4	B
	Shiballidan	<i>Hebapetalum humiriifolium</i>	5	0.281	14.3%	0.00%		28.5	C
	Ituri-ishi-lokodo	<i>Helicostylis tomentosa</i>	4	0.258	28.0%	0.00%		31.5	B
	Jack-in-the-box	<i>Hernandia giunensis</i>	3	0.676	27.4%	0.00%	0.00%	37.9	F
	Wild Rubber	<i>Hevea</i>	30	0.461	10.3%	2.11%	0.00%	63.1	K
	Mabwa	<i>Himathanthus articulatus</i>	3	0.079	39.3%	0.00%	0.00%	34.9	A
	Suradan	<i>Hyeronima laxiflora</i>	93	0.594	6.4%	2.86%	6.98%	72.1	P
✓	Locust	<i>Hymenaea coubanil</i>	17	0.455	10.4%	2.50%	25.00%	103.0	N
	Darina	<i>Hymenolobium flavum</i>	1	0.282	34.6%		0.00%	62.9	L
	Koraroballi	<i>Hymenolobium sp.</i>	16	0.690	14.2%	0.00%	0.00%	143.5	S
	Kakotaro	<i>Ilex martiniana</i>	1	0.000		0.00%		23.8	A
	Warakosa	<i>Inga</i>	58	0.282	9.9%	1.63%	13.79%	36.8	D
✓	Maporokon	<i>Inga alba</i>	34	1.301	7.3%	3.19%	0.00%	91.8	R
	Waiki	<i>Inga rubiginosa</i>	691	0.787	2.2%	2.24%	6.17%	52.5	G
✓	Futui	<i>Jacaranda copaia</i>	62	0.619	8.8%	6.21%	9.09%	55.9	G
	Warakaioero	<i>Laetia procera</i>	65	0.480	8.0%	0.54%	6.06%	51.8	E
	Wirimir	<i>Lecythis confertiflora</i>	807	0.174	2.9%	1.62%	7.49%	52.9	J
	Wina	<i>Lecythis corrugata</i>	2	0.180	49.1%	33.33%	0.00%	38.7	D
	Monkey Pot	<i>Lecythis davisii & zabucajo</i>	130	0.327	8.3%	1.09%	5.00%	58.9	E
	Haudan	<i>Lecythis holcogyne</i>	6	0.217	31.3%	8.33%	0.00%	31.9	B
	Kautaballi	<i>Licania alba & majuscula</i>	207	0.167	4.0%	2.00%	4.96%	39.9	D
	Marishiballi	<i>Licania canescens & micrantha</i>	205	0.204	3.5%	1.68%	6.76%	35.5	B
	Kauta	<i>Licania guianensis & laxiflora</i>	2299	0.306	1.8%	1.21%	4.03%	48.9	E
	Buruburuli	<i>Licania heteromorpha & divaricata</i>	340	0.259	4.2%	2.47%	8.70%	46.5	D
	Unikiakia	<i>Licania hypoleuca</i>	28	0.243	9.0%	1.45%	25.00%	37.3	D
	Konoko	<i>Licania sp.</i>	30	0.262	24.0%	1.82%	3.70%	57.5	J
✓	Silverballi, brown	<i>Licania cannella</i>	5	0.323	31.3%	0.00%	12.50%	51.8	E
✓	Hububalli	<i>Loxopterygium sagottii</i>	3	0.652	23.5%	8.33%		88.3	N
	Swizzle Stck	<i>Mabea</i>	165	0.347	6.7%	3.88%	4.23%	31.2	C
	Baririkuti	<i>Mabea piriri</i>	1					24.9	A
	Wallaba Water	<i>Macrobium</i>	1	0.139	47.9%	0.00%		24.8	A
✓	Bulletwood	<i>Manilkara bidentata</i>	64	0.566	7.7%	0.00%	0.00%	114.7	S
	Kulishiri, white	<i>Matayba oligandra</i>	4	0.159	34.2%	11.11%	33.33%	26.8	A
	Kairima	<i>Maytenus myrsinoides</i>	3	0.255	42.9%	20.00%	0.00%	41.5	D
	Waraia, punctata	<i>Miconia punctata</i>	1	0.254	33.8%	0.00%		28.0	B
	Kudibushi	<i>Micropholis venulosa</i>	53	0.242	9.5%	3.19%	7.14%	35.2	D
	Wanania	<i>Minquartia guianensis</i>	2	0.047	64.7%	0.00%		46.3	D
✓	Mora	<i>Mora excelsa</i>	5	0.163	26.7%	0.00%	0.00%	60.5	J
✓	Morabukea	<i>Mora gongrijpii</i>	295	0.299	3.9%	0.87%	7.47%	72.4	L

Species identification			Trees	Diameter increment		Annual mortality rate		Dmax	Model
Tim.	Common name	Botanical name	N	Dinc	SE%	Sound	Defective	P.95	
	Mamuriballi	<i>Mouriria huberi</i>	16	0.561	15.2%	0.00%		122.9	S
	Silverballi, pear leaf	<i>Ocotea acutangula</i>	2	0.274	23.3%	0.00%		21.7	C
	Silverballi, sawari skin	<i>Ocotea canaliculata</i>	3	0.577	16.0%	0.00%		49.3	G
	Silverballi, "pea's" leaf kere	<i>Ocotea floribunda</i>	4	0.609	11.8%	0.00%		37.7	F
	Silverballi, Shirua	<i>Ocotea guianensis</i>	15	0.399	10.4%	0.00%	0.00%	58.3	E
	Silverballi, Kereti	<i>Ocotea puberula</i>	197	0.576	4.6%	2.49%	7.92%	45.5	F
	Baradan	<i>Ocotea tomentella</i>	37	0.600	13.7%	2.63%	0.00%	94.4	N
	Lu	<i>Denocarpus bacaba</i>	10	0.019	48.0%	4.55%	50.00%	34.7	A
✓	Barakoro	<i>Ormosia coccinea</i>	14	0.198	20.3%	6.06%	40.00%	60.7	J
	Korokoro	<i>Ormosia coutinhoi</i>	3	0.159	35.7%	0.00%		62.5	J
	Lancewood, Karishiri	<i>Oxandra asbeckii</i>	57	0.300	8.9%	0.79%	0.00%	41.5	D
	Mahoballi	<i>Panopsis sessilifolia</i>	1	0.033		50.00%		55.5	J
✓	Dukali	<i>Parahancornia fasciculata</i>	1	0.094	52.2%	0.00%		36.3	A
✓	Burada	<i>Parinari campestris</i>	84	0.598	6.6%	2.46%	3.45%	98.0	N
	Hipanai	<i>Parkia pendula</i>	1	0.332	52.1%		0.00%	101.7	N
	Uya	<i>Parkia ulei</i>	5	0.506	26.8%	22.22%	0.00%	49.7	E
	Adebero	<i>Paypayrola guianensis & longifolia</i>	1	0.050	50.9%	0.00%		23.8	A
✓	Purpleheart; Saka	<i>Peltogyne</i>	55	0.632	6.6%	1.94%	2.78%	109.0	S
	Trysil	<i>Pentaclethra odorata & macroloba</i>	1352	0.495	2.0%	1.71%	3.77%	41.2	F
✓	Hachiballi	<i>Pera</i>	5	0.211	33.8%	0.00%		39.5	D
	Manariballi	<i>Pithecellobium pedicellare</i>	16	0.677	17.1%	3.13%	0.00%	91.2	N
	Soapwood	<i>Pithecellobium jupunba</i>	53	0.620	8.7%	1.69%	1.92%	97.1	N
✓	Buruma	<i>Pourouma essiquirensis & guianensis</i>	20	0.787	11.4%	1.89%	14.29%	37.6	F
	Kamahora, fine leaf	<i>Pouteria filipes & venosa</i>	6	0.226	29.0%	0.00%		40.2	D
	Asepokoballi, fine leaf	<i>Pouteria caimito</i>	2	0.329	22.7%	0.00%		27.1	C
	Aimorakushi	<i>Pouteria cladantha</i>	35	0.256	10.2%	0.00%	3.13%	34.3	B
	Asepoko	<i>Pouteria guianensis</i>	149	0.385	8.3%	0.66%	4.00%	55.0	E
	Moraballi	<i>Pouteria minutiflora & coriacea</i>	235	0.499	4.5%	1.49%	3.41%	56.5	K
	Kokoritiballi	<i>Pouteria reticulata</i>	165	0.445	7.1%	1.01%	2.22%	61.4	E
✓	Suya	<i>Pouteria speciosa</i>	18	0.212	12.5%	0.00%	0.00%	60.1	J
	Kamahora, medium leaf	<i>Pouteria trigonosprema</i>	1	0.908	44.9%	0.00%		34.9	H
	Haiawaballi	<i>Protium beglectum & tenuifolium</i>	19	0.289	15.7%	0.00%	0.00%	70.7	L
✓	Kurokai	<i>Protium decandrum</i>	880	0.728	1.7%	2.33%	5.81%	48.4	G
✓	Haiawa	<i>Protium guianense</i>	24	0.375	10.4%	1.89%	0.00%	28.7	C
	Manariballi, like	<i>Pseudopiptadenia suaveolens</i>	2	1.014	45.8%	0.00%		56.1	H
	Corkwood	<i>Pterocarpus officinalis</i>	65	0.998	7.6%	0.56%	0.00%	60.5	H
	Okokonshi	<i>Quina obovata & indigofera</i>	14	0.273	12.5%	0.00%	11.11%	30.0	C
	Muneridan	<i>Ruizterania albiflora</i>	4	0.196	44.1%	0.00%	33.33%	84.7	M
	Dukuria	<i>Sacoglottis guianensis</i>	10	0.543	9.8%	0.00%	20.00%	58.3	K
✓	Karohoro	<i>Schleffera morototoni</i>	53	0.705	8.3%	4.07%	0.00%	67.7	G
✓	Kaditiri	<i>Sclerolobium guianense</i>	32	1.299	8.8%	6.58%		66.3	R
✓	Hachiballi	<i>Simaba multiflora</i>	5	0.207	21.3%	14.29%	0.00%	43.0	D
✓	Simarupa	<i>Simarouba amara</i>	26	0.937	9.6%	2.44%	12.50%	85.4	R
	Muniridan	<i>Siparuna sp.</i>	1	0.000		33.33%		22.4	A
	Aruadan	<i>Sloanea guianensis</i>	57	0.153	8.1%	1.77%	3.92%	42.3	D
	Black Maho	<i>Sterculia exsucca</i>	30	0.685	13.0%	7.25%	14.29%	39.6	F
✓	Maho	<i>Sterculia pruriens & rugosa</i>	343	0.558	3.9%	2.23%	5.36%	64.7	K
✓	Itikiboroballi	<i>Swartzia benthamiana</i>	53	0.192	7.3%	0.00%	8.82%	58.8	J
	Parakusan	<i>Swartzia jenmanii</i>	52	0.746	8.4%	5.95%	6.67%	127.1	S
✓	Wamara	<i>Swartzia leiocalycina</i>	194	0.170	4.8%	0.50%	4.84%	55.7	J
	Serebedan	<i>Swartzia oblanceolata</i>	9	0.205	33.0%	0.00%	0.00%	52.2	J
✓	Manni	<i>Symphonia globulifera</i>	19	0.960	8.9%	0.00%	0.00%	76.6	R

Hakia	Tabebuia	23	0.363	15.7%	0.00%	4.35%	104.1	N
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ANNEX XXI: LIST OF EQUIPMENT AT HAND

A. Logging equipment

Item No.	Type/Unit	Model	Expected Used Date	Remarks
----------	-----------	-------	--------------------	---------

1.	Bulldozer (2)	D6D/H Caterpillar	Nov 2006	New/Recon.
2.	Skidder (3)	CAT 528 /C	-do-	New/Recon.
3.	Chain Saw (6)	2@070 AV STIHL, 4@066 Stihl	-do-	New
4.	Wheel Loader (2)	966F Caterpillar	-do-	New/Recon.
5.	Pickup (2)	4x4 Toyota Twin Cab	-do-	New/Recon.
6.	Log Trucks (2)	6x6 Mack Truck	-do-	New/Recon.
7.	Lumber Truck (3)	6x6 Mack Truck	-do-	All New

B. Sawmilling equipment

Category	Remarks
Brand	Wood Mizer
Model	LT70HDD62-RX sawmill
Motor	Caterpillar 62 hp Turbo Charged Diesel (4 cylinder, water-cooled)
Log capacity	36" diameter x 20'
Log Handling	Hydraulic Load, Level Clamp, Chain Turner
Feed System	12V Electric (3/4 hp)
Capacity	800 Board feet per hour
Operator Location	Walk, ride or movable remote station

ANNEX XXII: FORMS USED FOR SOCIAL SURVEYS Page 323 of 2

TPTTI: SFEP 2/13

FORESTRY TRAINING CENTRE INCORPORATED
 17 Access Road, Kingston, Georgetown, Guyana
 Tel: 592-223-5061/5062

Q#:.....
 Date:...../...../2018.

Objective: To document and characterize stakeholders' concerns about logging at or near their community or workplace.

A. Basic Information

1. Personal Information (Optional).

Name	Occupation	Gender	Age

2. What is the size of your household?
 ≤ 3 persons. 3-5 persons 5-7 persons >7 persons

3. How long have you been living or working in this area?
 < 1 yr. 1-5 yrs >5 yrs N/A (In transit)

B. Social Issues

4. What do you **like** most about this area? (You may choose more than one option)
 The people. Landscape Economic opportunities Other.....

5. What **features** do you **dislike** most about this community or neighbourhood or area?
 6. Employment opportunities 5. Level of social services 4. Security Issues
 3. Landscape/aesthetics/environment 2. People 1. Other:.....

6. Are you satisfied with the level of community developments in this area?
 Very satisfied Somewhat satisfied Neither satisfied or dissatisfied
 Somewhat dissatisfied Very dissatisfied N/A

C. Logging Activities

7. What aspects of logging are you most concerned about?
 Concession allocation? Expanded road networks? Timber harvesting/ timber transport
 Employment practices All of the foregoing Not sure/not interested

8. Is logging an important or significant contributor to livelihoods in this area?
 Strongly disagree Disagree Neutral/Neither agree nor disagree
 Agree Strongly agree

9. How would you rate the physical impacts of log transport or storage on this community or neighbourhood?
 Major irritant/disgusting Minor irritant/hardly noticeable No discernable impact

Page 1 of 2

TPTTI: SFEP 2/13

10. Have you ever lodged a complaint about any aspect of logging in your neighbourhood to the CDC, GFC or any other agency?

Yes | No

11. If your answer to Q10 is 'yes', how would you characterize the response to your complaint?

Very helpful. Somewhat helpful Not at all helpful No Response

12. Do you think that *additional logging* activity in proximity to your community will bring benefits?

Yes No Not sure

CLIMATE CHANGE

13. Do you think that our everyday actions and activities affect weather patterns in the long term (climate change?)

Yes No Not sure

14. Do you think that there is a special link between logging and climate change?

Yes No Not sure

BIODIVERSITY

15. Do you think that our livelihoods depend on plants and animals occurring naturally in our environment?

Yes No Not sure

16. Do you think that logging affects plants and animals in our environment in a very negative way?

Strongly agree Agree Neutral
 Disagree Strongly disagree Don't know

FUTURE

18. In relation to logging activities, can you kindly state three (3) things that you would **not** want to see happen in your area?

- 1.
- 2.
- 3.

19. Additional Feedback: Please share any additional comments:

Thank you for taking the time to fill out our survey. We rely on your feedback to help us address your welfare. Your input is highly appreciated.

Annex XXIII: NOTES ON THE PUBLIC SECTOR SCOPING EXERCISE-PURUNI DISTRICT

1. Introduction

FTCI interviewed and/or consulted about 60 persons during period March 2-8, 2021 within the Kartabu-Puruni-Pashanema District in relation to Royal Timber Inc.'s SFEP 2/2020 and the company's application to the EPA for an *Environmental Authorization*. The interviewees included large and small miners, loggers, the business community, and residents of Kartabu Village. (Information on the scoping was shared with representatives of the GGMC and GDF respectively at Puruni: the staff(s) were all recently posted to Puruni Landing). FTCI also interviewed a representative the Regional Administration (#7), the Police, the NIS, the Bartica Public Hospital and the GFC respectively, all in Bartica-the *capital* of Region 7.

2. Context

Mining has been the primary driver of economic activity in the Kartabu Triangle/Puruni District since the late 1920s. There has been logging in the *lower* Mazaruni-Cuyuni area since the 1950s, however it was only recently (~2009) that logging started west of the Puruni River. Apart from the construction of the Iteballi-Pappy Show Road in the 1970s & 1980s, communities such as Puruni Landing, Kumong-Kumong, Turtle Creek, and Pashanema were developed entirely at the initiative of miners.

The Iteballi-Pappy Show road is used by every operative within the Kartabu-Triangle. A major concern is the barge crossing at Puruni Landing, however there is *currently* a committee comprising representatives of the MNR, GGMC, GFC, Ministry of Public Works, the mining community, and the logging community reviewing options for a bridge across the Cuyuni River.

Malaria is still the major concern for residents of region 7. However, apart from MEDEX facilities at Kartabu, Iteballi and Puruni Landing, the Ministry of Health provides extension services covering a range of medical issues to the communities in the area. Units of The Police and the GDF respectively are now stationed at Puruni. GGMC has a checkpoint near Iteballi and stations at Puruni Landing and Olive Creek. GFC has a station at Iteballi and is planning to set up a network of forest stations in the western part of the Kartabu Triangle.

3. Summary of the comments

3.1 General comments.

There has been no specific objection to logging operations west of Puruni River, or to the consequent increase in log flows along the Puruni Road.

Regional officials and the business community-traders and transporters of fuel and goods, and hoteliers-welcomes any economic development that increases the volume of commerce in the area and additional

employment opportunities. Large miners are generally disinterested about emerging forestry activity: a few welcome logging because the miners themselves believe that *bulldozing merchantable trees to access gold ore* is distasteful and does not make economic sense. Small miners can benefit from logging road networks to access their mineral licenses.

There is widespread demand for the developer to engage stakeholders so that any potential conflicts can be avoided. Communities are open to new economic developments and would like to see businesses **facilitate** their inputs and actions to **manage** issues such as a potential dust nuisance.

There is general support for an airstrip for persons within a 30km radius of the planned site for the airstrip: the main reasons cited were the evacuation of very sick persons from the area. Large miners currently use helicopters or the aviation facility at Olive Creek.

Communities welcome employment opportunities for their youth.

3.2 Specific comments

3.2.1 Large miners

Large miners within the concession area value privacy as a consequence of the need to protect the extensive assets they deploy in the field. To this end, many have installed barriers (such as locked gates) on their *private* roads. They *expect* and look forward to consultations on the way forward with loggers.

3.2.2 Small miners

Small miners support logging and they are prepared to work with them. The general opinion is that not all potential areas of conflict are easy to address and they would like to see loggers afford them an opportunity to ventilate their concerns.

3.2.3 Communities

Residents at Iteballi are concerned about the dust nuisance created by logging trucks.

Residents at Kartabu Point believe that wood debris discarded at the beaches at Iteballi pollutes the water downstream—the water residents retrieve from the river for domestic purposes.

Prepared by Godfrey Marshall

March 22, 2021

Interviewing team:

Ms. Luan Nero

Ms. Mariea Suegrim

Ms. Kisheiba Higgins

Delroy Roberts

Benny Lane

Godfrey Marshall

ANNEX XXIV: SPECIMEN OF 'EDUCATIONAL' POSTERS TO BE POSTED AT WORK SPACES Page 2 of 2: WASTEWATER (©EPA, Guyana)

Wastewater

Wastewater contains pollutants

Wastewater is water containing wastes from residential, commercial, and industrial processes. This is water we dispose of from our homes, offices, and industries.

Wastewater may contain waste oils, pesticides, fertilizers washed off the land, debris from streets and human and animal waste or sewage. Wastewater from a typical household includes toilet wastes, used water from sinks, baths, showers, washing machines, etc. that flows into drains or is flushed down the toilet.

Wastewater also includes storm runoff, or rain water that collects pollutants that wash off roads, parking lots, and rooftops that can be harmful to our rivers.

Wastewater affects our environment

Dirty water that we flush down our toilets, sinks and drains, and some of it is not so dirty, goes into the nearest waterway, river or beach. However, untreated wastewater when released into waterways may be toxic to fishes, plant, animal and human life by:

- Altering the habitat harming the breeding grounds of fishes leading to a decline in certain species.
- Allowing fertilizers to enter the waterways which then promotes excessive plant growth blocking our waterways and lowering oxygen supply to fish and other water species.
- Polluting our beaches so that we can no longer enjoy swimming, picnics and other fun activities.
- Harming our health from water borne diseases and consumption of contaminated fish and shellfish.

We can Reduce Wastewater at Home

Reducing the amount of water that we use will in turn reduce the amount of wastewater that we produce, so we could:

- Thawing foods on the lowest shelf of the fridge overnight rather than in a container of water.
- Using a container with water instead of running water to rinse your razor while shaving or brushing your teeth.
- Turn off faucets while soaping your skin when taking a shower.
- Use a filled sink to wash dishes rather than running the tap and reuse washing water to water plants.



Environmental Protection Agency
Georgetown, Guyana
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ANNEX XXV: Air Quality-Noise Sampling Field Data Report

Air Quality-Noise Sampling Field Data Report

Distribution of copies:	Isidro Espinosa EES Office Files	Sheet No. 807
1. <u>General</u>		
Location (Site):	Royal Timbers Inc.	Sampler: Company Staff
Sample Date:	September 11-17, 2021	Observer: Biodiversity and Forestry Team
Measurement Duration:	7 days	Sample Type: Outdoor
2. <u>Field Observations</u>		
Current weather:	<input type="checkbox"/> Rainy <input type="checkbox"/> Stormy <input checked="" type="checkbox"/> Sunny <input type="checkbox"/> Cloudy <input checked="" type="checkbox"/> Hot <input type="checkbox"/> Cold <input checked="" type="checkbox"/> Dry <input type="checkbox"/> Wet	
Relative Humidity:	Average Relative Humidity during the survey was 69.62%	

Ambient Temperature:	The Ambient Temperature Reading was between 25.0 °C to 46.2 °C.
Description of Location:	Description of area where Samples were Taken/Read: The measurements of air quality were taken around and within the concessions boundaries to investigate the environmental baseline conditions. The test results represent the initial environmental examination related to Air Quality. The test results are shows in the following table.

3. Measurements (Data)

<i>Air Quality and Total Suspended Particulate (TSP) µg/m³</i>																	
				Time		Data RAM mg/m ³			TEMPO					Noise	Temp.	Elev.	
Sample ID	Collection Date	Coordinates UTM		Start	%RH	TWA	Max.	Ave.	PM2.5	PM10	HC HO	TVO C	Direction	Speed (m/s)	dB Low	Celsius	meter

RT1	15/09/2021	21N 0200937	06867 23	9:5 4	50.3	0.02	0.03	0.01	7.0	9.8	0.00 0	0.76 4	Nil	-	46.2	38.0	98
RT2	15/09/2021	21N 0201468	06897 78	11: 50	53.6	0.02	0.04	0.01	8.6	12.0	0.00 0	0.09 6	SW	0.9	47.3	33.6	90
RT3	15/09/2021	20N 0831823	06896 29	15: 10	35.8	0.01	0.03	0.00	14.1	19.7	0.00 0	0.77 3	Nil	-	42.2	42.2	111
RT4	15/09/2021	21N 0224302	06909 18	10: 55	72.1	0.02	0.05	0.01	17.1	25.3	0.00 0	0.19 3	Nil	-	44.9	28.9	86

4. Standards and Guidelines

Parameter	Type	Averaging Time	Level	Form	References/ Colour Code Results
PM_{2.5}	Primary	Annual	12.0 µg/m ³	Annual arithmetic mean, averaged over 3 years.	USA EPA, 2016 GNBS, 2002
	Secondary	Annual	15.0 µg/m ³	Annual arithmetic mean, averaged over 3 years.	
	Primary and Secondary	24-hour	35 µg/m ³	98 th percentile, averaged over 3 years.	<i>Below Guideline Value</i>
PM₁₀	Primary and Secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year on average over a 3-year period.	

Total Suspended Particles (TSP)	Primary	24-hour	260 µg/m ³	Not to be exceeded more than once per year.	Boundary Guideline Value
		Annual	75 µg/m ³	Annual geometric mean.	
	Secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year.	
		Annual	60 µg/m ³	Annual geometric mean.	
Noise	Categories		Daytime Limits in dB (06:00 – 18:00h)	Night time Limits in dB (18:00 – 06:00h)	Above Guideline Value
	Industrial		100	80	
	Construction		90	75	
5. Comments and Recommendations					
<p>The Air was measure to have an initial environmental examination of the weather conditions and the Air Quality in the areas of assessment. The data presented in during this survey reflect the quality of the air present conditions. No Total Suspended Particulates (TSP), PM_{2.5} and PM₁₀ results were above guidelines values. Noise values were below 90 dB according to Guyana national Bureau Standards (GNBS, 2002). The data assessment reflects an overall good quality of Air at Royal Timbers Inc.</p>					
6. Personnel		Sampled By: Jamal Lewis			

Checked By: Isidro Espinosa

Date: November 12th, 2021



ANNEX XXVI: Soil-Type Classification Data Report

Distribution of copies: Isidro Espinosa		Sheet No. 807						
EES Office Files								
1. General								
Location (Site): Royal Timbers Inc.		Sampler: Company Staff						
Sample Date: September 11-17, 2021		Observer: Biodiversity and Forestry Team						
Measurement Duration: 7 days		Sample Type: Outdoor/ Soil						
2. Field Observations								
Current weather :	<input checked="" type="checkbox"/>	Rainy	<input type="checkbox"/>	Stormy	<input checked="" type="checkbox"/>	Sunny	<input type="checkbox"/>	Cloudy
	<input type="checkbox"/>	Hot	<input type="checkbox"/>	Cold	<input checked="" type="checkbox"/>	Dry	<input type="checkbox"/>	Wet
Relative Humidity :	Average Relative Humidity during the survey was			69.62%				
Ambient Temperature :	The Ambient Temperature Reading was between			25.0 °C to 27.3 °C.				

Description of Location	: Description of area where Samples were Taken/Read: Samples of soil and measurement of moisture content were taken within the Royal Timbers Inc. Logging Concession.
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3. Measurements (Data)							
<i>Initial Soil Type Classification</i>							
SOIL Description							Picture of soil samples collected within logging concession
Sample ID	Collection Date	Location	Moisture Content %	Texture	Consistence	Colour	
RT1	15/09/2021	21N 0200937 UTM 0686723	42.3	Loamy/Sandy	Loose/Weak	Red: presence of iron oxides	

RT2	15/09/2021	21N 0201468 UTM 0689778	68.5	Clayey/Organic material	Friable/firm	Dark brown/Red: organic soil	 <p>RT2</p>
RT3	15/09/2021	20N 0831823 UTM 0689629	84.3	Clayey/Organic material	Soft/loose	Red: presence of iron oxides	 <p>RT3</p>

RT4	17/09/2021	21N 0224302 UTM 0690918	71.3	Clayey/Organic material	Friable/firm	Dark brown/Red: organic soil	
<p>4. Comments</p> <ul style="list-style-type: none"> • Soil moisture content can be determined by the ‘feel’ of the soil in the hand. It will vary over time depending on rainfall or irrigation frequency and proximity to the water table. • Soil texture is determined by the proportions of organic material, sand, silt, and clay in a soil. If a soil is dominated by decomposed plant fibres then it is called an organic soil (commonly known as peat). Mineral soils generally have a small amount or no organic material, and are composed of sand, silt and clay. • Soil consistence describes the strength and coherence of a soil. • Soil colour is an easily observed characteristic for determining different types of soil materials. Usually Munsell colour charts are used to place a soil into a colour grouping. For the purposes of this Soil Identification Key a few broad groups were used. Source: Field Manual for Soil Type Identification (2018). 							
5. Personnel							
	Sampled By: Jamal Lewis						
		Checked By: Isidro Espinosa					

		Date: November 12 th , 2021
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ANNEX XXVI: Water Quality Data Report

Distribution of copies:		Sheet No. 807
(List)		EES Office File Records
1. General		
Location (Site): Quart Stone and Royal Timbers.		Samplers: Company Staff
Sample Date:	September 11-17, 2021	Observer: Company Staff
Measurement Duration: 7 days		Sample Type: Surface water
2. Field Observations		
Current Weather	Sunny Weather Conditions.	
Relative Humidity	Relative Humidity average of 69.62 %.	
Ambient Temperature	The Ambient Temperature Reading was between: 25.0 °C to 27.3 °C.	
Description of Location	<p><u>Description of area where Samples were taken/read:</u></p> <p>The samples were taken around and within the boundaries of the concessions to investigate the environmental conditions. The test results represent the effluent or discharge points that may have pollution. The test results are shows in the following table.</p>	



Test Results														
Water Parameters/ Data Results														
Sample ID	Date	Location	BOD mg/L	COD mg/L	DO mg/L	Oil & Grease mg/L	Temp °C	pH	Conductivity µS/cm 0-2000	Turbidity FAU	TSS mg/L	Total Nitrogen mg/L	Ammonia NH ₃ mg/L	Stream FLOW RATE m/s
RT1	15/09/2021	21N 0200937 UTM 0686723	3.01	7.6	5.3	0.08	25.4	6.51	35	52	9	27.2	0.5	0.24
RT2	15/09/2021	21N 0201468 UTM 0689778	3.08	8.9	4.5	0.25	26.2	6.31	30	26	40	31.0	2.2	0.052
RT3	15/09/2021	20N 0831823 UTM 0689629	3.17	11.3	10.5	0.15	26.7	6.30	36	16	10	Under range	0.8	0.056
RT4	17/09/2021	21N 0224302 UTM 0690918	2.98	18.8	6.91	0.06	25.0	6.20	68	74	10	6.2	1.2	0.007

3. Standards and Guidelines

Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.

Parameter	Guideline	Guideline Color Identification
Temperature (T)	<40 °C	Below Guideline Value
pH	6.0-9.0	
Total Suspended Solids (TSS)	<50 mg/L	Boundary Guideline Value
Chemical Oxygen Demand (COD)	<250 mg/L	
Biological Oxygen Demand (BOD)	<50 mg/L	
Ammonia (NH ₃)	< 5 mg/L	Above Guideline Value
Total Nitrogen (TN)	< 50 mg/L	
Oil and Grease	< 10 mg/L	

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<p>4. Test Methods Biological Oxygen Demand (BOD): SMEWW 5210 B Chemical Oxygen Demand Oil & Grease: USEPA 1664 Total Suspended Solid (TSS): Photometric Total Nitrogen: Persulfate Digestion Method Ammonia: Chromotropic Acid pH, Conductivity, Turbidity, Temperature, TDS: Optical Sensor</p>	
<p>5. Comments and Recommendations</p> <ul style="list-style-type: none"> No constraints during the survey. The values represent the current state of surface water quality of the effluents in compare with the Standards (Guidelines). No indication of pollution were found due to anthropogenic activities. 	
<p>Report Authorized by: Isidro Espinosa</p> 	<p>Date : November 12th, 2021</p>



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