RONG AN INC

INTERIM REPORT ON

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Re

State Forest Exploratory Permit 01/22

RONG-AN'S SAWMILL, 110KM, UNAMCO ROAD

December 30, 2024

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FOREWORD

This report responds to RAI's obligations to the EPA in pursuit of its application for an Environmental Authorization re SFEP 01/2022.

However, RAI itself benefitted from the assessment conducted by FTCI and is better prepared now to take on the responsibility of managing the TSA it expects on the approval of the Report.

The data set for core environmental parameters, particularly for air quality is incomplete. For this reason, this report is only an interim one, given that the consultants need more time to access the concession. Too many errors are made when consultants need to traverse more than 10 km (5km to go, and 5 to return) because of the weight of the equipment carried and the need to fetch samples (water and soil on the return trip). Some of the environmental data used in this report is based on intact forest resources for TSA 01/2017, formerly SFEP 2/2011 (See Annex XV).

Similarly, the consultants have found that stakeholders' concerns raised at meetings in Kwakwani and Ituni in October 2016 no longer exist and the logging community in the area enjoys an excellent business relationship with the company. The logging community in the upper Berbice District has, since 2016, has grown by 25% and the consultants seek out the new people for their opinion, hence the delay in the preparation of this document.

ACKNOWLEDGEMENT

RAI acknowledges the comments or contributions made by the numerous stakeholders consulted over the past two years.

ACRONYMS

AOP	Annual Operations Plan
COP	Code of Practice for Forest Operations, 2018
Dbh	Diameter at breast height
DOE	Department of Environment and Climate Change, 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
FTCI	Forestry Training Centre Incorporated
GEF	Global Environmental Facility, United Nations
GFC	Guyana Forestry Commission
GFFO	Guidelines for Forest Operations, 2018 (Large concessions)
GGDMA	Guyana Gold and Diamond Miners Association
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
GSSFM	Guyana Standard for Sustainable Forest Management
IIC	Iwokrama International Centre
ITTO	International Tropical Timber Organization
LCDS,2030	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
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)
OCC	Office of Climate Change
OP	Office of the President
OSH	Occupational Safety & Health
PAC	Protected Areas Commission
PEFC	Programme for the Endorsement of Forest Certification
PMS	Permanent Monitoring Stations
RAI	RONG-AN INC.
RDC	Regional Democratic Council
SFA	State Forest Authorization
SFEP	State Forest Exploratory Permit
SFGI	Surich Forest Guyana Inc.
TOR	Terms of Reference for the ESIA study
TSA	Timber Sales Agreement
VPA	Voluntary Partnership Agreement
VWL	Variety Woods Limited
WCED	World Commission on Environment and Development

GLOSSARY

Base camp: A permanent field based administrative operations centre for managing field operations. It normally includes accommodation for personnel, office, workshop, fuel depot and medical centre.

Code of Practice-A set of rules or ethical practices and protocols that define mandatory standards for sustainable timber harvesting in Guyana.

Creek head-the network of creeks that form the source of creeks and rivers.

Depot: A site, generally on a riverbank, normally used for the temporary storage of containerized fuel, logs or mining gear.

Forward camp: Simple, temporary tarpaulin covered camps set up from time to time to accommodate field teams engaged in forest inventory, road building or logging crews.

Guidelines for Forest Operators (GFFO) (small concessions/large concessions): a document designed to provide specific information, guidance or recommended timber harvesting practices in Guyana.

Landing: A small clearing on an interior riverbank used as *transit points* for people, rations, equipment, and fuel.

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: A miner who has no mineral license or special skill and who drifts from one mining operation to a next, conducting manual tasks or odd jobs.

Sustainable Development: Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. *WCED*.

Sustainable mining: According to Strongman () *Sustainable mining* involves projects that are financially viable, environmentally sound, and socially responsible; implemented with sound governance at the level of the company, communities, and governments (Strongman, 2002[1]).

Timber depot: an area, generally within a forest concession or a riverbank designated for the storage and sorting of logs. Many loggers refer to concession-based timber depots as 'log markets.'

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)

[1] http://siteresources.worldbank.org/INTOGMC/Resources/Madang-StrongmanPresentationCD-ROM.pdf

EXECUTIVE (NON-TECHNICAL) SUMMARY

A. CONTEXT

The gradual scaling down of bauxite operations in the Kwakwani Hururu-Aroaima-Ituni District (KHAID) since the 1970s left logging as the major economic option for the large number of people who worked with or were dependent on the bauxite operations. The GFC in large measure facilitated the transition of residents to the forestry sector, encouraging the formation of loggers' associations and granting them forest concessions for areas up to 20,000acs (~8, 093ha).

For areas >8093ha the GFC continue to give preference to large scale developers who had the financial resources to manage large tracts of forest resources, which for intact areas required at least an outlay of US$3.0 million dollars. Large scale developers were required to apply for a SFEP that allowed them to conduct exploratory work and to assess whether they can conduct a feasible logging operation in the face of a legal framework influenced to a major extent by local and international initiatives regarding the conservation of biodiversity, the mitigation of climate change, the accommodation of social considerations including the recognition of indigenous peoples and their rights, and a local and international customer base that abhors illegal practices and who link timber purchases to forest management practices certified by independent forest monitoring. During the exploratory period, the developer is required to conduct an environmental and social impact assessment and provide a report for review and approval of the EPA. Once the EPA approves the ESIA Report, the developer is granted an Environmental Permit and then makes application to the GFC for a forest concession that grants formal approval for the start of logging operations.

Rong-An Inc hereby presents its ESIA Report. Rong-An Inc's exploratory works have been delayed due to challenging access options and the consultants' determination to present as clear a picture as possible of the prevailing environmental, biological and socio-economic issues for stakeholders.

B. PROFILE OF RAI

Rong-An Inc. was incorporated in Guyana under the provisions of the Companies Act of Guyana on September 1, 2006 (see Annex III) and its primary place of business Lot A, Block '2', Public Road, Land-of-Canaan, East Bank Demerara, Guyana. The company has other forest concessions and has emerged as a major player in the forestry sector, with investments exceeding US$20m. RAI's most recent investment is a sawmill facility 110km away from Upper Berbice River where it has its base camp for its current TSA 01/2017.

RAI's intention is that logs produced at the area currently held under SFEP 01/2022 will be lumped with those produced at TSA 01/2017. Further RAI will house 90% of all workers on the SFEP area at 110km base camp, thereby avoiding any major alteration to the pristine area at SFEP 1/2022.

Apart from its base camp at 110km, RAI has a huge wood processing facility and wharf at Kwakwani Waterfront, left bank Berbice River, where timber currently produced at TSA 01/2017 is transshipped via a self-propelled barge to Georgetown.

RAI has very experienced technicians on its staff, many with extensive logging experience in Malaysia, Indonesia and Suriname. RAI's capabilities are already very much in evidence at its current TSA 01/2017, 110km, Upper Berbice River.

For the new investment at hand, the company employed fifty-one (51 persons), 32 of whom are Guyanese to conduct exploratory works. RAI's projections are that it will employ an additional 40 Guyanese when it acquires the new forest concession.

RAI's corporate social responsibility practices are already a transformative force for the logging communities in Administrative Regions 6 & 10: the company has re-engineered the 110 km UNAMCO road into an all-weather road and has indirectly allowed many loggers and miners to access forestry and mineral resources on the upper left bank Berbice River. Pending approval of its TSA, RAI has also rented its heavy-duty machines to loggers' associations on left bank Berbice River and purchased logs from them,

energizing the economy of the Kwakwani -Hururu-Aroaima and Ituni district where some 60% of persons[2] depend on logging for their livelihoods.

C. THE Project Area

Based on its application for a forest concession, the Guyana Forestry Commission (GFC) on November 4, 2011, granted the Company a State Forest Exploratory Permit (SFEP) designated 2/2011 for an area of 57,929.60 hectares of forest resources in the upper right bank Berbice River. The goal is a Timber Sales Agreement (TSA that allows the company to formally harvest timber from the concession area).

A prerequisite for the acquisition of the TSA is an Environmental Permit and the Company recruited FTCI to undertake the ESIA study and report for the approval of the EPA and EAB. FTCI in turn recruited several consultants approved by the EPA to take forward the ESIA process.

The primary objective of the company is to harvest timber from the concession area and process the timber at a sawmill at 110 km. Sawn timber (and logs when necessary) will be hauled via the UNAMCO road to points of sale or ports in Georgetown or other coastal locations.

For the logging phase, the company will opt for a 40-year cycle. In line with sustainability criteria, land designation and area computations practices used by GFC, the company's annual allowable area will be 1,051 ha and the annual allowable cut will be 14,0006.03m3. *RAI has recruited people with the expertise to guarantee that that volume of timber can be removed as efficiently as possible and in line with prescriptions of GFC's Code of Practice for TSAs.*

D. THE PROJECT

Preliminary activities

Once RAI secured the SFEP for the area, RAI's first activity entailed an assessment of the social environment, and a financial analysis based on various site variables (see Forest Management Planning in next sub-section) and the haul distance to determine whether logging in the Upper Berbice River is feasible.

Once that assessment was completed, RAI engaged in a range of actions including

a) extensive reconnaissance work at the concession area,
b) discussions with nearby communities-including Apoteri, the logging community, the business community and public officials in the Kwakwani area
c) applied to the EPA for an Environmental Authorization and hired **FTCI** to conduct an ESIA (Report) for review by the EPA and other stakeholders.

Forest management planning

RAI will bring to bear its full expertise and experience to bear on the development of the forest concession.

Based on reconnaissance surveys targeting topography and estimates of the composition and stocking of merchantable species and topographic maps available from the GFC, RAI already organized the concession area into three compartments and has identified a biodiversity reserve. (The biodiversity reserve inadvertently isolates RAI's operations from residents of Rewa and Apoteri who hunt and fish on the right bank Essequibo River, within the concession area).

For the logging operation itself, the core practices will be as follows:

a) The forest regulations, reduced impact logging principles and practices governing all forest interventions, area-based yield control measures, forest management guidelines and prescriptions of the Code of Practice will be the basis for RAI's logging operations.

[2] Personal communication from the AREO, Kwakwani

b) Forest management plans and annual plans of operations will be duly prepared for approval by the GFC; these plans will set out the scheduling of the main interventions such as road layout, road construction and road maintenance works and forest inventory activities, both at the management or reconnaissance level and for 100% enumeration.

c) All logs will be transferred by road to RAI's administrative base/sawmilling facility at 110km.

Partnerships

RAI has already cultivated a relationship with loggers and loggers' association operating in the Upper Berbice District. This relationship is particularly useful for collaboration in the use of the UNAMCO road corridor. (GGMC currently hires contractors for the maintenance of the UNAMCO road corridor.

E. METHODOLOGY FOR THE ESIA STUDY

To address the project impacts in the manner approved by the EPA and the GFC, RAI recruited FTCI to lead and manage the ESIA study. **FTCI has been working in the area for various developers since 2007.** (The most recent trip to the SFEP 01/2022 general was undertaken on December 10, 2024).

In addition to the core consulting team[3], FTCI utilized many technicians with expertise in field (bush) craft, forest surveys, the identification and nomenclature of fauna, forest botany and dendrology, tree identification and forest surveys. The consulting team conducted the ESIA study in accordance with the Terms of reference for the study agreed between the EPA and the consulting team

The methodology[4] for the ESIA study required the consultants to undertake several activities including:

a) Extensive discussions with RAI to understand and evaluate the technical scope of the project and the company's capability (for logging the area)

b) A desk review of thematic maps for the area and any other literature for the general area, including land use plans

c) Consultations with the GFC, EPA and any other public agencies for clarification as required.

d) Consulting with businesses, loggers and miners encamped along the UNAMCO Road, and hunters and fishermen transiting the upper Berbice River.

e) Consulting with representatives of communities (see Section G) below.

f) Undertaking reconnaissance surveys to the concession area and adjacent areas to identify issues pertinent to the ESIA, and including the collection of field data, targeting the dry season and the wet season respectively, and nocturnal faunal surveys.

g) Reviewing the policy and legal framework for forest resources-based activities, including and legislation for the use of chemical substances or any other item covered by the environmental legislative framework

h) Participating in scoping meetings organized by the EPA

i) Reviewing exemplary models for the environmental management for forestry projects of this kind.

j) Developing an environmental management plan for RAI.

[3] CVs for the Consulting team are set out in Annex II
[4] See TOR in Annex I

F. CONSULTATIONS

Consultations with stakeholders were a key component of this study. Consultations were conducted at Apoteri, Hururu, Kwakwani, Jeep Landing, UNAMCO Road, and Ituni. The consultants opted for one-to-one discussions with stakeholders in a more informal setting, since these conversations could be done anywhere, including bush camps.

FTCI found that the same questions were put to many of the same stakeholders with respect to the several developers acquiring forest concessions in the area since 2007. The questions raised at scoping meetings at Kwakwani and Ituni hosted by Rong-An on October 28, 2016, remain the same for the new stakeholders but those in attendance have been able to witness at firsthand how RAI's operations have improved their livelihoods.

FTCI conducted consultations with loggers that share common boundaries with RAI's SFEP on March 17, 2023, at CIOG, Woolford Avenue. Those loggers were very supportive of RAI's proposed logging operations at SFEP 1/2022.

RAI itself conducted consultations at Apoteri and Rewa, but RAI's operations at SFEP 01/2022 are very unlikely to have any major impact on those communities; they are simply too far away. Moreover, RAI has taken the precaution of stating its intent to avoid any logging operations near the right bank Essequibo River, because it has allocated a biodiversity reserve comprising 1, 449 ha on right bank Essequibo River

To date, FTCI has not recorded any objections to RAI's proposed developments.

G. SUMMARY NEGATIVE ENVIRONMENTAL IMPACTS

Summary of impacts

Timber harvesting creates impacts on the physical environment, the biological environment and the social environment.

Impacts on the physical environment

Impacts on the physical environment have their origin primarily in earthworks due to road construction activities, especially excavations linked to borrow pits, bridge and culvert construction and from tree felling activities. These impacts are frequently indicated by increases in dust, noise and vibration, accelerated erosion, and increased sediment loads in water ways.

Impacts on the biological environment

Impacts on the biological environment take various forms. Tree felling for timber *per se* and for road construction and skid trail works leads to alteration in forest structures (in terms of diameter class, species composition and genetic diversity) and in alteration of landscapes. Tree felling alter microclimates (by the creation of small gaps for example) which may give a competitive edge to non-merchantable light demanding species such as *Cecropia spp*. and *Vismia spp.,* myriad vines such as *Bauhinia, Clusia*, grasses such as *Scleria* or as in the case with the current concession palms such as *Astrocaryum*.

Logging operations also interfere in various ways with fauna, primarily disrupting their habitats and forcing their migration (temporarily) to new locations where they may be forced into territorial or conflict situations with other individuals or species. Noise, vibration and dust may cause general stress to animals while tree felling will affect nesting birds or slow-moving arboreal animals such as sloths. The increase in sediment loads in waterways could create conditions unfavorable to riverine fauna.

Hunting if allowed will have direct and indirect impacts on mammalian fauna which in turn will impact seed dispersal.

Impacts on the social environment

The entire area is under some form of mining concession, and these are all dormant. If mining activity develops, there may be conflict over road use and forest conservation practices by different resource users. Also a few hunters have been detected along the access road.; any attempts to restrict or enforce commercial hunting and fishing respectively may also lead to conflict.

A few small loggers in the vicinity of RAI's SFEP area **have started operations**: they all have a good relationship with RAI, particularly as RAI carries out maintenance work on the access 'underdeveloped' road.

There is a direct link between the condition of the UNAMCO Road and the viability of loggers' associations for the simple reason that there is a direct relationship between road conditions and the cost of, or rental for, trucks that removes their produce to the point of sale or export.

There is also the issue of shared responsibility for road maintenance and this report recommends roles for all parties.

H. SUMMARY OF MITIGATION IMPACTS MEASURES

(a) Forest Concession

Dust, noise and modification of the under-storey conditions

RAI will be using RIL practices, with its emphasis on planned interventions in the forest resources Experiences with Celos System in Suriname indicate that even though logging damages the ecosystem, well planned logging does not create any major disruption beyond normal natural mortality, especially when RAI will be removing 13.33m^3over a 40-year period. Roads will be designed and maintained properly to minimize accelerated erosion. Truck speeds will be kept below 60kmh.

Modification of water quality

Storm water draining off roads will be led via ditches (side drains) through a mass of rock or vegetation to trap sediment so that this sediment does not enter waterways.

Fauna

Bicknell et al, 2015, based on his studies at Iwokrama, suggests that RIL has a 'benign effect on birds, bats and large mammals while De Dijn (2011) in (Werger, 2011) recommends that hunting and collection prohibitions should be enforced in order to conserve fauna'. RAI will both implement RIL practices and discourage commercial scale hunting and fishing.

Waste

RAI's standard practice is to bury waste. No burning is ever carried on its concession. Waste oil is sold to chainsaw operators. Sites where waste is buried are normally put at least 150m from any waterway.

Camp Hygiene

Septic systems are used at the base camp for 110km, while field teams will use pit latrines, and these will be positioned at least 200m from any water way. They will be put on elevated ground or otherwise constructed so that surface water does not flow into the toilet pits.

Effluent from kitchens and bathrooms will be led into 'dead' sumps, special pits where the water will be allowed to infiltrate into the soil. These pits will be put some 150m away from any waterway.

Land use

RAI will engage miners whenever necessary to ensure its road standards are maintained, especially in the rainy season when RAI may wish to restrict road use in some compartments.

Similarly, RAI will engage other loggers wishing to haul logs via its concession roads.

(b) UNAMCO Road

RAI is committed generally to the maintenance of the road but anticipates that the authorities will put in place eventually a cost sharing mechanism because RAI itself will only be responsible for about 25% of total road usage, including hauling of timber for other parties.

Key mitigation measures will include the following:

Dust, noise and vibration

a) Truck speeds will be kept below 60kmh. (Currently average truck speed is about 25 km/hr.).

b) Trucks will slow down when passing mining camps and logging camps situate less than 100m from the road

Road safety

a) All trucks will use a rotating beacon at the top of the cab or travel with some lights on

b) No trips by logging trucks will be done at night

c) Trucks will always give way to other vehicles except when climbing a hill when fully loaded

d) Trucks will be kept in fully functional state to avoid oil spills

(c) Sawmilling facility

Training

a) All sawmill operatives will be trained to manage all sawmilling assets in the correct manner.
b) All sawmill operatives will be trained in basic OSH practices and use personal safety gear

Dust, Noise and vibration

a) Operations will be limited to the period 07:00 to 17:00 hours on weekdays and 07:00 to 15:00 hours on Saturdays. No operations will occur on Sundays or national holidays

b) All machines will be kept in a fully functional state to avoid oil spills, excessive noise or fumes

c) Blowers (spewing out sawdust) will

Wood waste

a) Wood waste will be placed in natural depressions in forests nearby and allowed to degrade naturally.

I. FOREST MONITORING

Consultations

Consultations to garner feedback will be the primary monitoring tool for RAI. RAI will deliberately engage the loggers' associations based at Kwakwani to tap into concerns about road usage.

Similarly other loggers adjacent to the concession and the mining community will be formally engaged on a biannual basis.

Environmental management pan

RAI will work with the EPA re an environmental management plan for the sawmill and for the concession respectively which will aid its forest monitoring initiatives. The preservation of the area designated as a biodiversity reserve will be a major focus of RAI.

J. PROJECT ALTERNATIVES

A no project scenario would be an extreme environmental scenario, especially as there are active small loggers in the district, as well as mining commitments over the entire area. Further, it is a widely held view that well managed forest concessions are vital tools for the global forest conservation effort. Also, the deforestation rate in Guyana is still negligible, and selective logging practices practiced locally have never been established as a source of deforestation. The same selective logging practices added to restrictions on yield and minimum diameter limits ensures that forest degradation in any locality is a very temporary, short-term event.

Most of the soil in the concession area may be classified as infertile and so would not support agricultural production without massive inputs of fertilizer. The area is generally flat, and the absence of waterfalls or outstanding elevated terrain also maintains very ordinary landscapes without any special attributes for ecotourism.

Finally, experiences with forest concessions to the south and east of the concession area indicate frequent sightings of an array of mammalian fauna.

K. RISKS

Competing land use

The company has opted for a 40-year cycle and is therefore expected to log just 1,051 hectares per year. The company remains nervous about the timber resources across the concession if mining activities were even *partially developed* within the concession area.

UNAMCO Road

RAI expects to build some 585 km of concession-based roads over a 40-year period which it will have to maintain. In addition, it is committed to *supporting* the maintenance of the 110 km UNAMCO road. RAI is disappointed and even discouraged with the way some loggers skid across the road or leave logs and pieces of timber at the road margin, or even treat the road as a log market virtually blocking the road for short periods. RAI anticipates a more responsible behavior from other parties and financial support for road maintenance activities.

L. CONSULTANT'S RECOMMENDATIONS

The consultants believe that RAI's logging project is sound and that it will energize the economy of KHAID. More importantly, all stakeholders (of KHAID) consulted believe that RAI is a sincere developer that will listen to their concerns, add value to their businesses and provide residents with additional employment opportunities.

None of the people or agencies consulted have categorically objected to the proposed development of the concession area.

Technically based on parameters agreed with the GFC, less than ±37% of the concession area may be considered suitable for logging will occur on just **37%** and that just 600ha (<1% of the entire concession area per annum will be impacted directly by logging.

RAI has consistently demonstrated goodwill in the development of the UNAMCO Road, a very costly exercise, and in its business partnerships with the loggers' associations in the area. The sawmilling facility will add opportunities for log sales by loggers' association as well as afford another opportunity to Kwakwani residents to purchase house building materials.

The concession area is virtually encircled by other forest concessions. Access to RAI's Road network will prevent other loggers from building their own private logging roads and therefore reduce the overall road density in the area.

The consultants also believe that the development of UNAMCO Road will contribute significantly to the development of Administrative Regions 6 and 10.

Finally, RAIs recent construction and operation of a state-of-the-art sawmill will witness RAI playing a critical role in the development of the forestry sector through more taxes to Government, and improved livelihoods for persons in regions 6, 8, 9, and 10.

We recommend that the environmental authorization be issued to RAI.

G. Marshall
Team Leader

1.0 INTRODUCTION AND BACKGROUND, ESIA TEAM (DETAIL CV IN APPENDICES)

1.1 Introduction-RAI

RAI, of Lot 'A', Block '2', Public Road, Land of Canaan, East Bank Demerara, Guyana was incorporated in Guyana on September 1, 2006, under the Provisions of the Company's Act of Guyana as Company # 5637 (see Annex III). The company is fully compliant with applicable local laws, including the provisions of the Income Tax (Amendment) (2) Act 15 of 2006 (see Annex IV).

The primary business of RAI is the production of value-added timber products for sale on the local market and for export[5].

RAI's current management team is shown in Table 1 while the organization chart for the company is set out in Annex V. The members of the management team have been *working together* within the local forestry sector for more than seven years.

Table 1: List of RAI's management team.

#	Name	Nationality	Designation	Remarks
1	Chen Ming	Guyanese[6],[7]	Managing Director/CEO	>25 yrs. experience in Guyana; he has been managing RAI since 2006.
2	Ivan Min	Chinese	HR Manager	4 yrs. administrative experience, Six with RAI
3	Richard Tang	Malaysian	Operations Manager	30 yrs. experience in logging; 24- yrs. experience in Guyana (BCL- 11yrs., DTL -9 yrs. RAI 6 yrs.).
4	Anas Ismail	Malaysian	Chief Surveyor	28 yrs. doing forest surveys; 6 years in Guyana (DTL-2yrs., RAI- 4yrs.).
5	Chan Sia Poh	Malaysian	Chief Engineer	34yrs experience as a mechanic; worked in Guyana for 21 years. (BCL-BCL-11rs., DTL -3yrs., and RAI-5yrs
6	Kenneth Tang	Chinese	Financial Manager	30 years' experience in financial administration, including three *logging* companies, two in Suriname (2010-2015) and RAI (Guyana-2015+)

1.2 The SFEP 1/2017

1.2.1 Administrative arrangements

RAI acquired SFEP 1 of 2017 on July 5, 2017. The SFEP grants the company the right to conduct *exploratory, reconnaissance and research operations* within the concession area *to, inter alia*, establish whether commercial logging in the concession area is feasible. RAI has determined that logging is feasible: however, RAI must acquire an environmental authorization from the EPA- a prerequisite for the acquisition of an SFA-TSA from the GFC. The SFA-TSA in turn will formally grant RAI, the rights to harvest merchantable timber on the concession area under conditions prescribed by the GFC and the EPA. Once GFC grants an SFA-TSA to RAI, the agency will require an FMP and an AOP before logging can proceed. The FMP will set the nature and scope for logging operations -for example schedules for road construction, pre-harvest inventory and production, environmental management measures, (corporate) social issues, and forest

[5] (RAI is already the holder of a State Forest Authorization-TSA 1/2017, situate right bank Upper Berbice River (Region 6).
[6] Mr. Chen Ming was born in Fujian, China; however, he is now a naturalized Guyanese.
[7] Mr. Chen Ming is also the Managing Director of CHINA ZHONGHAO INC which manages the FALLS Gas Stations and ZHONGHAO SHIPYARD INC, which deals primarily with the construction and maintenance of self-propelled barges and tugs (in Guyana).

monitoring operations-for a five-year period. The AOP describes selected operations to be undertaken within a calendar year period.

RAI's field operations are spread over two main areas: its base Camp at 110km, UNAMCO Road and its timber sorting and transhipment facility at Kwakwani Waterfront. Once RAI acquires the area currently under SFEP 01/2022, it will add operations there to the one in TSA 01/2017, avoiding any extensive infrastructural development in the area under SFEP 1/2022 (see Figure

The detailed elaboration of the logging project, its projected impacts on the environmental, biological, and social environments, and plans to mitigate the impacts, all of which form the basis for the EPA's approval of an environmental authorization for RAI, are set out in this ESIA report, prepared in accordance with the terms of reference prescribed by the EPA.

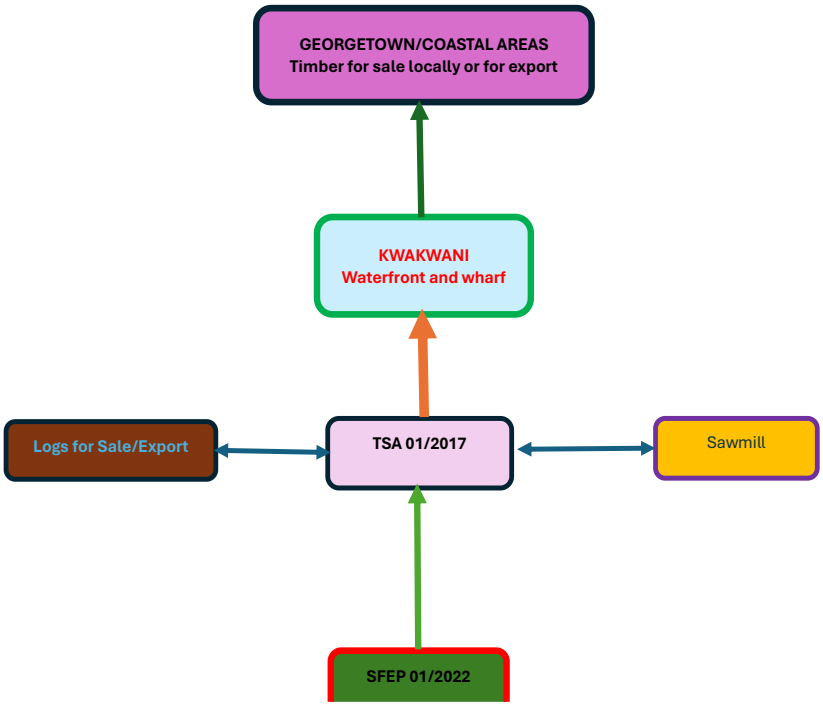

Figure 1: Chart showing the overall structure of RAI's Operations

1.2.2 Consultancy inputs

To develop the ESIA report, RAI contracted FTCI for technical support. FTCI, in line with the multi-disciplinary approach required to conduct an ESIA (see Annex I), contracted several experts (see Table 2, Annex II**).**

FTCI has been involved in the development of ESIAs by itself or in partnership with other Consultants with the following companies in the Upper Essequibo Berbice District:

a)	Sherwood Forest Inc.	SFEP 01/07 (Reserved)
b)	Surich Forest Guyana Inc.	SFEP 01/20 (Converted to
c)	Rong An Inc:	SFEP 2/2011(Converted to TSA 01/2017)
d)	VWL	FEP 01/2012 (Converted to TSA 02/2017)

Table 2: Summary profile of consultants for this ESIA Report

#	Name	Area of Expertise
1	Environmental Engineering Solutions	Environmental Science: the company specializes in the collection and analysis of environmental data based on samples of water, soil, noise, and meteorological events. (Please see Annex II)
2	Forestry Training Centre Inc.	Expertise in forest technology. The corporate entity specializes in providing RIL based forest technology to forest operatives, students, environmental NGOs, communities, and public officers, including staffs of the GFC. Since 2007, FTCI has carried out work related to ESIAs for all forest concessions in the Upper Essequibo-Corentyne Watershed Berbice River. Three experts-Robert Skeete (Forester), Winston Kissoon (Forester), Lou Ann Nero (Environmentalist/Social Scientist)-and two technicians, Delyon Roberts (Forest Surveys) and George Roberts (Botanist) were assigned to this project.
3	Philip Odwin	Wildlife Expert (Specialty-Birds, Fishes)
4	Godfrey Marshall	Forester-Coordinator/Team Leader

All these concessions occur in the same general geographic area, the Essequibo Corentyne Watershed, encompassing the terrain on both banks of the Upper Berbice River. Although, VWL 's TSA 02/2017 is the only concession that shares a common boundary with SFEP 01/2022, in the assessment of the physical environment for SFEP 01/2022, the consultants relied on data for TSA 01/2017 because it was easy to collect data there and at a higher density due to its accessibility.

The team of consultants, in line with the agreed TOR, and in collaboration with the developer, held consultations with stakeholders to identify critical stakeholders' issues and conducted field activities within the SFEP area to gather baseline data.

1.3 Summary baseline conditions-SFEP area

1.3.1 Context

Following on from a public advertisement, RAI successfully made application for and was granted SFEP 01/22. RAI was rather fortunate because the new area is located less than 50 km from the southern boundary of RAI's TSA 01/2017, 110km, Upper Berbice River, where its base camp and sawmill for that location is located. In addition, there is an old Baishanlin trail, which started at Bissaruni Junction that links TSA 01/2017 to SFEP 01/2022.

1.3.2 Geographic location and access

The SFEP area is located east of Essequibo River in Region 6. The area is accessible via the right bank Essequibo River (opposite Apoteri). However, it is not feasible to use this route to take inputs into the concession or to extract logs, due to extensive swamps on right bank Essequibo River and the need to traverse numerous waterfalls and sand bars along the Essequibo River.

The other access trail, commonly referred to as the Haimaruni trail, starts at Bissaruni Junction was partially developed by Baishanlin and runs along the Berbice Corentyne Watershed, passing through SFEP 01/2022 traverses several logging concessions. The Baishanlin or Haimaruni road traverses several forest concessions including SFGI and is used regularly by loggers and hunters. For RAI, its current road network intersects the Baishanlin Road, to the extent that once RAI develops the 'road' it will have a direct 50km road link to SFEP 01/2022.

RAI's SFEP 01/22 has a total perimeter of 175km and shares some 130km of common boundaries with a total of ten other forest concessions-one large concession and nine small concessions. Apart from its

western boundary along the Essequibo River, SFEP 01/22 is **encircled** by other forest concessions (see Annex VIII).

1.3.4 Terrain and hydrology

More than 50% of the area is flat. There are several hills set in rolling terrain east of Berbice River, with elevations reaching up to 550 feet east of Berbice River and at points near the source of Rattlesnake Creek, left bank Berbice River. To the northwestern and to the northeastern areas of the concession respectively, there are sandy ridges with elevation ranging from 350 to 440 feet.

The Upper Berbice River and its major left bank tributary, Rattlesnake Creek dominate the drainage system in the area. There is evidence of extensive flooding in low lying areas along the Berbice River and the Essequibo River in the rainy season, while many of the smaller creeks of the upper Berbice River, run dry in the dry season.

1.3.5 Geology and Soils (see also Section 8.0)

Guyana is an integral part of the Guiana Shield. Guyana itself may be divided in three geological zones or provinces: The Northern Province, The Southern Province, and The Takutu Graben-which lies between the northern and southern provinces.

The Concession area lies within the Takutu Graben, comprising continental sands and silts under a thin tertiary cover. The Takutu formation in this geological formation comprise mudstone, shale, siltstone and sandstone (GL&SC, 2013).

The dominant soil types (in the concession area are Endoaquults (49.9%) and *Kanhapludults (28.0%)*.

Endoaquults are characterised by low humic gleys, including alluvial soils, Regosols and ground water podzols; they are deep soils with poor drainage and extremely low fertility. Regosols are shallow, medium to fine textured, unconsolidated parent material.

Kanhapludults are red, yellow podzolic shallow and well drained soils with severe erosion potential due to the hilly terrain on which they normally occur.

1.3.6 Vegetation and merchantable stocking (see also Section 11)

General Features

Primary rain forest is never homogenous in structure, even where there have been no felling or other artificial disturbances ((Richards, 1998).

The forests within SFEP 02/2022 and surrounding areas are typical of primary forests in Guyana: 'stretches of high forest in Guyana are interrupted by gaps, climber tangles[8] (rope forest), swathes of forest impacted by squalls (see 2), and open swamps, or swamps where there are major gaps in the canopy layer. A particular feature of the forests where there is closed canopy is the heavy presence of spiny palms in the understorey (see Figure 3).

The forest Industry Development Surveys which conducted forest inventories in Guyana in the 1966-1973 considered the forests in the SFEP area as *inaccessible* (Steege, 2000), because there was no road access to the area until early 2000 ((Santos, Johnson, & Narine, 2018).

[8] Forests dominated by woody lianas

Figure 2: Illustration of forests with severely altered structures due to squalls

Figure 3: Illustration of typical understory spiny palms across the SFEP area

Structure and stocking for the district

Ter Steege (2000) described and quantified forests to the southeastern part off Guyana as **'Central Guyana Wet forests'** with about 154 tree species (**See also Section 11.0)**. However, the concession area is at the extreme southeastern area of the Central Guyana Wet Forests zone, to the extent that it overlaps with the northeastern zone of another type, designated ***Southern Dry Forests*.**

Unlike Hans ter Steege who dealt with types at the national and subnational levels, Santos et al conducted reconnaissance surveys at two locations[9] in the vicinity of the concession area during period September 21, 2014, to October 1, 2014, (Santos, Johnson, & Narine, 2018). Santos et al reported that hey collected 218 plant specimens and identified 89 species from 77 genera and 45 families.

For sample location 1, mixed forests:

a) the crown layer was multilayered, three-storeyed with a canopy layer at 40m
b) lianas were present, but epiphytes, lichens and mosses were scarce
c) Dominant species were Mora (*Mora excelsa*), Shibadan (*Aspidosperma sp*.), Kabukalli (*Goupia glabra*) and Wamara (*Swartzia leiocalycina*).

[9] (a) Mixed forests @ 4° 09.71' N, 58° 10.627'W; and (b) Wallaba forests @ 4° 45.297'N. 58° 00.43' W)

For sample location 2, Wallaba Forests:

The forests showed signs of major disturbance, with the canopy layer at 20m and comprising mainly Dakama (*Dimorphandra conjugata*[10]), with *Eperua spp*. as sub-dominants and Turu palms (*Oenocarpus bacaba*) at the lower level

Fortunately, RAI has done 100% enumeration of 12 X 100ha blocks within its **East Berbice Compartment** and has been able to generate the following summary data.

For 40 species of trees with dbh≥35 cm, mean volume per hectare is 17.95m^3

Table 3 and Figures 4 and 5, provide more quantitative data.

Table 3: Species by estimated number of trees and volume, for 1200 ha in East Berbice Compartment

#	SPECIES	No. of Trees	VOL. M3	% BY PECIES	Est VOL./TREE
1	Limonaballi	922	2,585.82	12.0	2.8
2	Locust	348	2,181.39	10.1	6.3
3	Suya	486	1,594.14	7.4	3.3
4	Baromalli	615	1,512.34	7.0	2.5
5	Wamara	916	1,445.66	6.7	1.6
6	Hakia	215	1,246.41	5.8	5.8
7	Simarupa	305	1,207.45	5.6	4.0
8	Burada	208	979.26	4.5	4.7
9	Kabukalli	310	891.35	4.1	2.9
10	Darina	134	888.08	4.1	6.6
11	Wadara	204	842.78	3.9	4.1
12	Crab Wood	411	762.97	3.5	1.9
13	Cow Wood	133	561.05	2.6	4.2
14	Muniridan	123	509.90	2.4	4.1
15	Bulletwood	113	470.85	2.2	4.2
16	Dalli	210	467.97	2.2	2.2
17	Tonka Bean	99	460.44	2.1	4.7
18	Shibadan	163	414.15	1.9	2.5
19	Ulu	91	395.10	1.8	4.3
20	Washiba	61	364.72	1.7	6.0
21	Red cedar	58	350.48	1.6	6.0
22	White Kakaralli	77	282.13	1.3	3.7
23	Tatabu	56	206.22	1.0	3.7
24	Itikiboroballi	53	137.96	0.6	2.6
25	Unknown	35	136.53	0.6	3.9
26	Greenheart	31	118.47	0.6	3.8
27	Purple Heart	32	87.31	0.4	2.7
28	Durban Pine	21	83.18	0.4	4.0
29	White kakaralli	21	76.05	0.4	3.6
30	Maho	30	71.38	0.3	2.4
31	Wamaradan	24	61.41	0.3	2.6
32	Mora	19	49.38	0.2	2.6
33	Iteballi	4	32.27	0.1	8.1
34	Kakaralli	7	18.35	0.1	2.6
35	B/Silverballi	7	12.08	0.1	1.7
36	Red wood	1	11.78	0.1	11.8
37	Soft wallaba	4	9.18	0.0	2.3
38	Durban pine	1	4.89	0.0	4.9
39	Monkey pot	1	2.36	0.0	2.4
40	Barakairo	1	2.07	0.0	2.1

[10] In normal primary forests, Wallaba (*Eperua spp*) would be the dominant canopy species

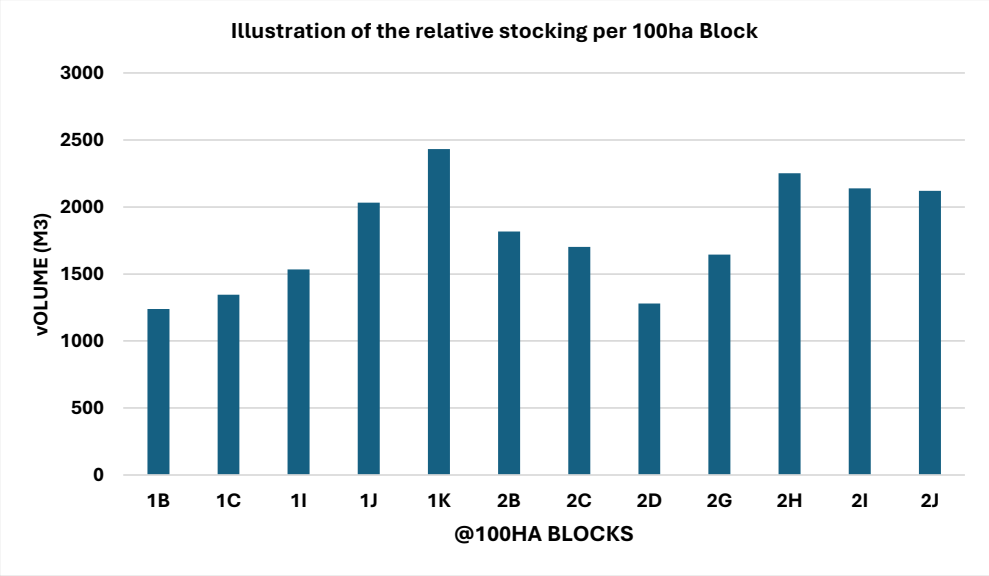

Figure 4: Illustration of the variance in stocking for 12 blocks enumerated

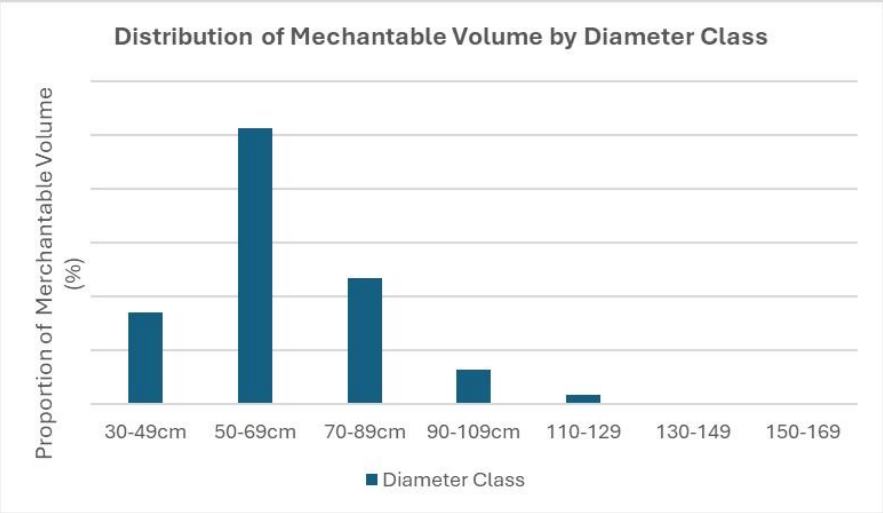

Figure 5: Stand Table: Relative stocking (%) per diameter class for merchantable species

Exploitation history

It is apparent though, based on trees with slash marks, Balata bleeders traversed the concession area, and then carrying any latex harvested to Apoteri, via Rattlesnake Creek. FIDS considered the forestsThe general forest types in the area have been described as

The way forward

Based on vegetation maps available at the GFC, RAI and the GFC has agreed that just 24,539.72 ha (37.3%) of the concession area is considered ***'productive forests***.

The company's ***initial projections*** are:

a) the net available area productive area is **24539.72ha**

b) the sustainable yield for the entire concession is 327,114.44m^3; and

c) the annual yield is 8,177.86 m^3 from an annual productive area of 613.49 ha

1.3.7 Socio-economic issues

1.3.7.1 Overview-Context

The upper Berbice River at the concession area is virtually devoid of any communities. There are currently a few loggers' camps within those small-scale concessions on the eastern and southern perimeter of SFEP 01/2022. A few hunters traverse the old Haimorakabra road previously constructed by the Baishanlin Company.

The Apoteri Amerindian Village lies about 2km west of the westernmost boundary of the concession area, and is separated from the concession by the Essequibo River, RAI's first phase of operations in East Berbice Compartment will be about 52km east of Apoteri. Residents of Apoteri have supported reconnaissance work within SFEP 01/2022; but this has also been the case for all other forest concessions in the general area, including RAI itself for the area now under TSA 1/2017 and VWL for the area under TSA 2/2017

Further, RAI has taken a decision that the westernmost edge of the concession area will be its biodiversity reserve, a fact which effectively isolates Apoteri from the impacts of RAI's operations. That biodiversity reserve is basically swamp that supports an array of fishes, labba, capybara, wild hogs and tapir, which allows any traditional, subsistence level hunting and fishing practices by villagers at Apoteri Amerindian Village or the Rewa Amerindian Village.

Note that the concession area (SFEP 01/2022 is not included in Apoteri community's request for extension to their titled land.

Strictly speaking, the logging community on the perimeter of RAI's SFEP 01/2022 is more a concern for RAI. If mining activity develops that will also be of concern for RAI.

1.3.7.2 Communities

The nearest community to SFEP 01/22 is Apoteri and RAI has already taken care to isolate that community from the impacts of logging (see Figure 6).

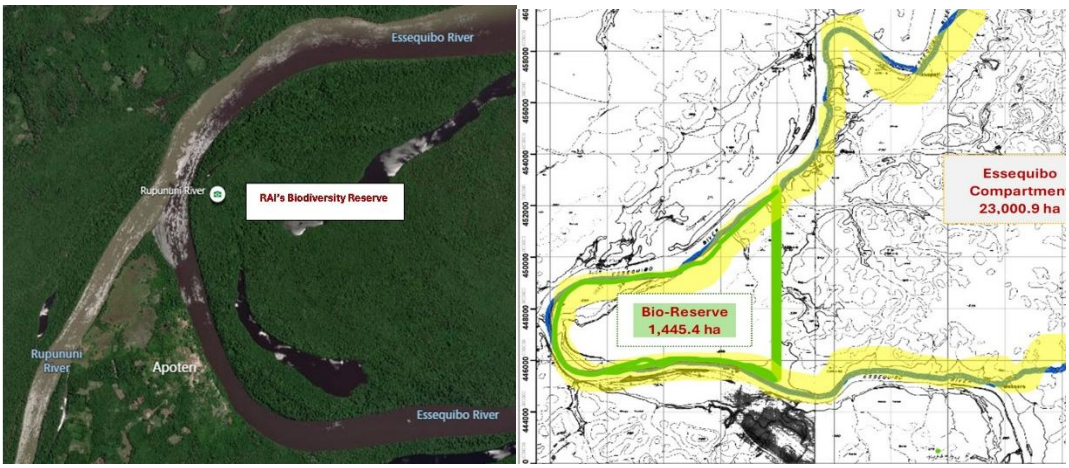

Figure 6: Diagram showing the location of RAI's Biodiversity Reserve relative to Apoteri Village

The consultants are of the view that no other community can reasonably claim to be impacted by RAI's operations. (Incidentally, even if that were so, these communities would also be impacted by logging operations by other concessionaires in the area).

FTCI's consultants have checked with the large concessionaires whose operations occur well north of the SFEP, specifically RAI at TSA 01/2017 and VWL TSA 02/2017 and those do not have any records of any complaints by any community. VWL consults with Fairview Village from time to time, but VWL's operations currently occur on left bank Berbice River, some 60 km from Fairview (Central) Village-RAI's operations at

SFEP 01/2022 will be even much further, and in any case Fairview Amerindian Village is also involved in logging on its own titled lands.

1.3.8 Land Use

1.3.8.1 Roads

The only road in the concession area was the one put in by Baishanlin Company when it held several concessions in the upper Berbice District. This road starts at Bissaruni Junction, about 15 km southeast of Kwakwani, then runs south along the Berbice-Corentyne Watershed, intersecting the northern and southern boundary of SFEP 01/2022. The first 50km of the road was constructed in the late 1970s to serve companies in the Kuruduni District; then the Baishanlin Group extended the road in a southerly direction another 120km, to the extent that it intersects both the northern and southern boundary of SFEP 01/2022. Baishanlin had some problems and stopped both the use and maintenance of the road, causing the road to degrade into a trail due to encroaching vegetation on the roadbed, erosion in hilly areas and wooden bridges that collapsed.

Surich Forest Guyana Inc. (SFGI) rehabilitated the segment of road within its concession starting in 2022, while the GOG maintained the segment of road from Bissaruni Junction to SFGI.

RAI's logging road originated at its 110km Camp, right bank Berbice River and eventually intesected with the old Baishanlin Road: this implied that to access SFEP 01/2022, RAI will develop the segment of 'Baishanlin's Road' between southern boundary of TSa 01/2017 and the northern boundary of SFEP 01/2022, a distance of about 30km

1.3.8.2 Mining

The greater part of SFEP 2/2022 lies in the Berbice Mining District No. 1 (see Annex XIV). The concession area has a no known history of mining activity. (In fact, access was an issue for small scale and medium scale miners).

1.3.8. 3 Forest Concessions

There are several active SFAs in proximity to RAI's SFEP (see Annex VIII). RAI will share the use of its access roads with the nine small concessions in the immediate area. Far from being a major challenge, the small concessions offer several business opportunities for RAI if the small concessionaires are unable to manage the haul distance of more than 300km necessary to get their timber dealers in Region 4.

1.3.9 Collection of baseline data on prevailing environmental parameters

FTCI has been engaged in data collection in the upper Berbice area since 2007, working with all the developers in the area during the period 2007 to 2024.

Access to the area was secured after RAI rehabilitated the Baishanlin old road. To complicate issues, there is heavy flooding in the rainy season, a time when the roads deteriorate rapidly. Further, in the dry season, waterways dry out rapidly in the dry season.

RAI did collect baseline data on water quality within SFEP 01/2022; however, the consultants believed that the comprehensive data set it gathered at SFEP 2/2011(now TSA 01/2017) gives a very good representation of the environmental conditions for intact forests in the upper Berbice area (see Environmental Report at Annex XV).

2.0 APPROACH AND METHODOLOGY, SIGNIFICANCE CRITERIA, AREA OF INFLUENCE

2.1 APPROACH AND METHODOLOGY

2.1.1 Introduction

In taking forward the ESIA the consultants engaged in large number of activities, including:

a) a desk review of ESIAs published by other developers in the upper Berbice District.

b) the development of a stakeholder plan.

c) the collection of baseline data for the concession area.

d) a review of RAI's proposed forest management systems and the corresponding forest technology.

e) the identification and reviewed of predictable direct, indirect, and cumulative impacts linked to the project; and

f) the drafting of an ESIA Report and its review with stakeholders at disclosure meetings.

2.1.2 Desk Review

This phase included the study of thematic maps on topography, vegetation, geology, soils, and mineral licenses for the concession area. At the end of the desk review, the consultants and RAI agreed on the organization of the concession area into compartments blocks (and their respective alpha-numerical codes) and the location and extent of the primary biodiversity reserve.

2.1.3 Development and execution of a stakeholder plan

The logging community in Regions six and ten via communities at Hururu, Kwakwani, Jeep Landing and Ituni have been consulted ad nauseum on concession development in upper Berbice District. The logging community have forged various business relationships with VWL and with RAI that have helped sustain their own logging operations. Log sales at stump and rental of equipment have given the small loggers a competitive advantage and the entire logging community have been unwavering in their support for forest concession development in the upper Berbice River.

2.1.4 Gathering baseline data and information for the concession area

Both formal and informal methods were used to garner social data (see Section 4)

Land use matters were determined from various reconnaissance surveys, and through activities linked to ML inventories and wildlife surveys, respectively.

The scale and location of sample data for the physical environment was based primarily on the consultant's ability to access the concession, in the dry season as well as the wet season, and the mode of access-boat, pick-up, ATV or on foot. Considerable data is available via thematic maps for the SFEP area covering topography, vegetation, soils, and the extent of mining concessions; as far as possible, the consultants sought to validate the information set out in thematic maps. Merchantable timber stocking received special attention because timber is the basis for RAI's project.

2.1.5 Review of RAI's Forest management systems and practices for the forest concession.

The consultants spent several hours with RAI going through the core details of the logging and wood processing operations to be sure RAI and the consultants are on the same page.

In addition, the parties reviewed the legal framework, codes of practice and modalities for the felling cycle, annual allowable area, and annual allowable cut.

Finally, the consultants and RAI collaborated on material shared with stakeholders at scoping meetings and disclosure meetings.

2.1.6 Identification and review of predictable direct, indirect, and accumulative impacts linked to the project.

This item involved the following:

a) Discussion on data and information relative to the TOR.

b) Discussion with the mining community-review of access options, challenges, and hazards.

c) Review of technology to be employed, review of SOPs, and review of terrain, haul distances etc.

d) Elaboration of hazards associated with the project.

e) Identification and discussion on predictable, direct, and indirect and accumulative impacts

f) Elaboration of environmental management plan

2.1.7 Drafting of the report.

This item in the main involved

a) Review of the TOR

b) Consultation with the developer

c) Organization of report. (Determination of level of detail required, data presentation via maps, charts, and appendices, etc.).

2.2 SIGNIFICANCE CRITERIA

2.2.1 Overview

RAI will be conducting logging which will generate **localised** environmental impacts.

2.2.2 Logging

RAI's overall focus will be to create the minimum impacts necessary; this will be achieved through rigid application of RIL principles and its emphasis on planning every intervention within the forest environment. RAI will pay particular attention to conserving water ways because RAI considers water sources and water quality as major environmental assets.

2.3 AREA OF INFLUENCE

2.3.1 Overview

The area of direct influence in relation to RAI's project, encompasses the upper Berbice River. The activities of small loggers on the perimeter of RAI's SFEP (see Annex VII) require special collaboration with those loggers to share standards for environmental management.

2.3.2 The UNAMCO Road and associated secondary roads and trails.

RAI uses the UNAMCO Road to access its concession at TSA 01/2017. This road, currently maintained by GGMC, is used by the logging community along the UNAMCO Road and other large concessionaires such as VWL.

RAI estimates that, after its acquisition of the SFEP area, its vehicular fleet comprise 20% of vehicles using the UNAMCO Road.

3.0 PROJECT ALTERNATIVES

3.1 Overview

Technically, RAI has chosen the most feasible option: Extract logs and convey these to its state-of-the-art sawmilling facility at 110km. The quality of wood processing equipment determines timber recovery from logs harvested.

There is the option of installing portable mills to pre-process logs at the concession area. However, on site wood processing requires more infrastructure and more employees and ancillary housing assets all of which would drastically increase the environmental impacts on the concession area.

The fact that there is a state-of-the art sawmill a mere 50km away (1 hour travelling time) and that just 600ha will be harvested each year provide strong arguments for RAI to link production from SFEP 02/22 with that of TSA 01/2017. (There isn't even the need for any diversion: TSA 01/2017 lies due north of SFEP 01/2022.

3.2 The case for no action (no forest concession issued)

SFEP 1/2022 is just one of the forest concessions in the area. The concessions south of SFEP 1/2022, would need to build roads through the SFEP area to extract their produce and therefore the area would be severely impacted by logging even if it were not issued as a forest concession.

If no forest concession were issued over the area, mining would continue to be a lucrative economic option, and there would be a gradual forest degradation of the forest resources that corresponds to the intensity of mining. RAI's projections are that mining activity will expand due to:

a) Improved efficiency in locating and in extracting gold resources.
b) Stability in gold prices.
c) More investments in the mining sector.

3.3 The case for forest concessions

"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).

The GFC collects revenue from concessionaires through a combination of area-based charges and volume extracted. *"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 substitute for nature preserves, they provide a complementary role when sustainably managed for both timber and non-timber resources"* (Fimbel, Grajal, & Robinson, 2001).

3.4 Peculiarities of local forest resources

Local forest resources are characterized by many species of trees of various ages and sizes distributed randomly, and not all of which are currently *merchantable*. In addition, there are standards for the minimum size (diameter) of trees to 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 local loggers follow the *selection system* (not a *clear-felling system*) for harvesting trees and therefore there will always be (residual) trees logged over forests.

3.5 Peculiarities of logging activity

Merchantable tree selection is based on stem condition, dbh, species, and site conditions. Further, looking elsewhere in the local sector, loggers retrieve on average about 8m^3/ha, or less than six trees/ha. 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. Based on the residual post-harvest conditions, selective logging is generally compatible with other major stakeholders' interest such as watershed management, wildlife conservation and the conservation of biodiversity. Road construction, road maintenance and related earthworks such as the establishment of borrow pits are the main sources of environmental impacts.

3.6 RAI's project

RAI's timber harvesting practices will be in line with national standards and in full compliance with GFC's COP and GFFO (see overview of RAI's project in Figure 7). More importantly, RAI's practices represent *best practices*, used across the forest sector in Guyana.

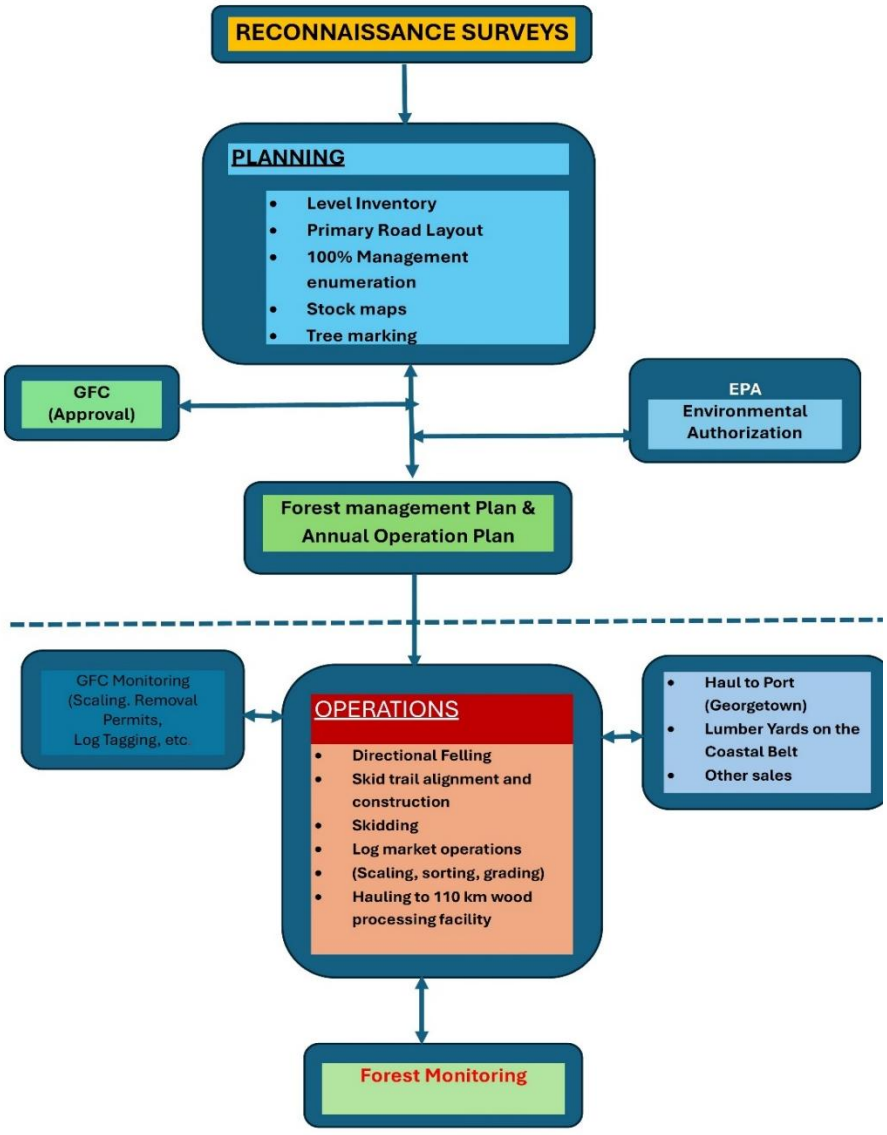

Figure 7: Overview of RAI's Overall logging project

The concession area will be organized into compartments and blocks in line with local standards: logging will be cyclic, where a particular area will be subject to logging for about 20 days, then left alone…. then only areas near to primary roads will continue to be impacted. ***Each year, RAI will harvest less than 1.0% of the concession area***.

The consultants concluded that technically, RAI's operations are technologically sound and in line with what would constitute *sustainable forest management*.

The consultants believe that the award of a forest concession RAI would lead to a more structured development of the upper Berbice-Corentyne Watershed.

4.0 STAKEHOLDER IDENTIFICATION AND CONSULTATION

4.1 Overview:

In a concession comprising 65,844.90 hectares[11], stakeholders' interests regarding the extractive nature and consequences of mining and forestry respectively will vary considerably. Table 4 sets out a list of the stakeholders identified at the outset of the ESIA process.

Table 4: List of stakeholders identified by RAI and its consultants

#	STAKEHOLDER	INTEREST
A	**Public agencies**	
	• EPA	Environmental protection
	• GFC	Forest resources conservation
	• GGMC	Commercial mineral data resources, sustainable mining
	• GLSC	Land management
	• MOPW	Hinterland roads
	• MOAA	Conservation of indigenous assets
	• GPF	Public security
	• PAC	Conservation of biodiversity, wetlands
B	**Environmental NGOs**	
	• WWF	Mining practices; conservation of fauna
	• CI	Mining practices, forest conservation, wildlife conservation
C	**Logging community**	Supplies of merchantable timber; access to resources
D	**Mining community (general)**	Mineral resources and access to them
F	**Business Community**	An assortment of persons engaged in vending goods or in transport services

Generally, the development of the area is driven by developers in the mining and forestry sector respectively; public agencies limit themselves to statutory responsibilities but are interested in strategic development of the general area.

4.2 Consultations

4.2.1 Public agencies

Most of the concerns of public agencies and environmental NGOs, and Amerindian NGOs were articulated at a scoping meeting at the EPA. These concerns were considered in the elaboration of the TOR for the ESIA process and report. There were two issues of concern worthy of note: firstly, the scale of meaningful consultations with stakeholders; and secondly, whether RAI had the capability for managing such a large concession.

[11] This is the actual area the consultants recommended for the SFA_TSA based on conditions on site.

4.2.2 Regional Stakeholders

Although, FTCI and RAI consulted widely. The consultants believe that all the pertinent issues around RAI's SFEP 01/2022 were dealt with **comprehensively** during consultations conducted by RAI and FTCI on October 28, 2022 (see Figure 8 and Annex XVIII).

Figure 8:Flyers for consultations at Kwakwani & Ituni

4.2.3 Logging Community-Upper Berbice

The loggers on the perimeter of SFEP 1/2022 were not around on October 28, 2022. For this reason, FTCI and those loggers met at special ***three-hour meeting for consultations*** on March 17, 2023, at the boardroom of the Central Islamic Organization (CIOG), Woolford Avenue.

The primary concern of the loggers is unrestricted access to the use of the Baishanlin Road segment rehabilitated by RAI.

Once RAI acquires the forest concession for the area under SFEP 1/2022, negotiations between the parties will begin on the terms of such use. At the outset however, RAI has no intention of putting any restriction on any road, once the loggers recognize that as a TSA holder, RAI has certain obligations set out in its Environmental Authorization.

4.2.4 Indigenous Communities

There are no indigenous communities within the concession area. For courtesy and technical assistance, formal consultations were conducted at Apoteri and Hururu, respectively.

FTCI used its own staff for consultations because the agency had already developed a relationship with the two communities.

RAI held independent consultations with residents of Apoteri and Rewa. (Residents of these villages supported reconnaissance work on SFEP 1/2022 and were employed to support 100% forest enumeration).

4.3 The way forward

In planning for stakeholders' issues in the management of the forest concession, a stakeholder map (see Table 5) was prepared and in addition detailed stakeholder analysis is set out in Table 6).

Table 5: Stakeholder map for RAI's Project, SFEP 1/2017

POWER→		
	Disinterested Stakeholders: FMP, AOP, other reports available for scrutiny)	**Extremely interested stakeholders: (Documents –FMP, AOP, other reports provided for scrutiny)**
	• MOPW • MOH • GGMC • GGMDA	• OOTP/DOE/EPA • MNR • GFC • ENV. NGOS • EMPLOYEES
	Disinterested parties: their interests and concerns to be monitored closely.	**Extremely interested stakeholders: information provided on request:**
	• RDC-REG 6 • Logging Community • Timber Dealers • MOAA	• MOHA/GPF • Indigenous (Amerindian) Communities • Business Community
	INTEREST→	

Table 6: RAI's assessments of its stakeholders re SFEP 1/2022

#	Stakeholders	Involvement in Project	Interest in Project	Influence/Power	Impact on Project
1	MNR	Prescribes the overarching policy framework for natural resources development	Facilitating RAI's investments in line with the national political investment framework; monitors the use of the UNAMCO ROAD.	**High interest/high power** approves SFA-TSA based on recommendations from the GFC.	Supports company's investment framework; determines arrangements for the use of the UNAMCO ROAD.
2	GFC	Direct statutory responsibility for forest concession administration	Support for sustainable forestry management and timber production	**High interest/high power** evaluates applications for SFA-TSA; approves FMPs, AOPs.	Monitors the company's compliance with the terms of the SFA-TSA, the COP and the GFFO. Monitors implementation of FMPs and AOPs.
3	GGMC	SFEP area overlaps with Mining District 1.	Supporting sustainable forest management and sustainable mining in Mining Districts No. 1.	**Low Interest/High Power**: Mitigates conflicts Responsible for the mining industry within the concession area	Facilitates engagements with the mining community; supports natural resources management.
4	DOE/EPA	Overarching implications for compatibility with GSDS, allied conservation goals, and applicable international treaties & conventions.	Conservation of biodiversity, ecosystems, and landscapes in Regions 1 and 7; determines whether the proposed project addresses wider stakeholder concerns.	**High interest, high power** determines whether the proposed project addresses wider stakeholder concerns; determines whether an environmental authorization may be issued.	Monitoring implementation of environmental management (plans).
5	Environmental NGOs-CI, WWF	National and regional scale initiatives on forest conservation and climate change mitigation.	Sustainable mining & sustainable forestry practices respectively	**High interest, high power:** considerable advocacy in the natural resources sector (in Guyana and abroad).	Informal oversight of natural resources management across the Guiana Shield.
6	Miners, GGMDA	Shared use of the concession area and the UNAMCO ROAD.	Unrestricted, enhanced access to their claims or mineral licences on the concession area	**High power, Low interest**: Disinterested in logging, just want to promote their own business.	Could potentially stymy RAI's access to some timber resources; shared use of RAI's logging roads is a major administrative burden
7	Public Agencies (MOPW)	Regional scale public road network.	The use of the UNAMCO ROAD and allied linkages to Karrau, Tapir Landing and	**Low interest/High power**; MOPW has overall responsibility for hinterland road networks	Sets standards for road construction/maintenance and the application of a toll structure for road use.

#	Stakeholders	Involvement in Project	Interest in Project	Influence/Power	Impact on Project
			environs, Upper Waini, etc.		
8	Public Agencies-MOH	Management of critical health hazards in rural areas.	Monitoring health hazards in the logging & mining industries, respectively.	**Low interest/High Power**: major interest in health matters generally.	RAI will be expected to provide for the accommodation of health teams during MOH's extension services to the general area.
9	Public Agencies-MOHA/GPF	Oversight of security issues	Maintenance of law and order at Aranka-historically, a community notorious for criminal behaviour.	**High interest/Low Power**: the actions of the agency will have little impact on the project	Support for checkpoints the monitoring of unlawful activities
10	Regional Administration, Regions 1 #7	Regional development: coordination of regional initiatives on health, sports, etc.	Employee data, investment levels. Ensuring that regional initiatives reach RAI's employees.	**Low interest/Low Power**: helps determine which projects are a priority	RAI will be expected to support regional initiatives as part of their CPR and to accommodate regional teams on (business)
11	Logging Community	Shared use of roads infrastructure	Shared environmental management, especially in relation to the use and maintenance of the UNAMCO ROAD	**Low interest/Low Power**; valuable ally in fostering sustainable forest management.	Co-mitigation of applicable environmental challenges.
12	Businesses-vendors, transport services.	Expanded business opportunities	Business opportunities	**High interest/Low Power:** RAI's business is expected to generate forward and back economic linkages	The business community will offer services to employees that RAI will not.... but worker welfare is vital to RAI
13	Employees	Execute the project, and the environmental plans	Skills development, economic benefits, experience	**High interest/High Power:** RAI will depend on their support to meets its economic targets and its environmental obligations.	Various-cost control, production levels, compliance with GFC'S prescriptions, etc.
14	Regional communities	Source of knowledge, skills set	Economic benefits	**High interest/Low Power:** RAI's business is expected to generate forward and back economic linkages	Economic and political support
15	Regional & urban timber dealers	Expanded timber trade, business opportunities.	Expanded timber trade, business opportunities.	**Low interest/Low Power:** demand and supply modalities for timber	Project feasibility drives competitive behaviour.

5.0 POLICY, INSTITUTIONAL AND LEGAL FRAMEWORK

5.1 The natural resources sector

This section relates the suite of policies, legislation, standards, and guidelines that govern 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.

Several public agencies are involved in the management of local forest resources (see Figure 9)[12]. In addition, NGOs OR CIVIC groups and communities are routinely consulted in the development of initiatives for the sector.

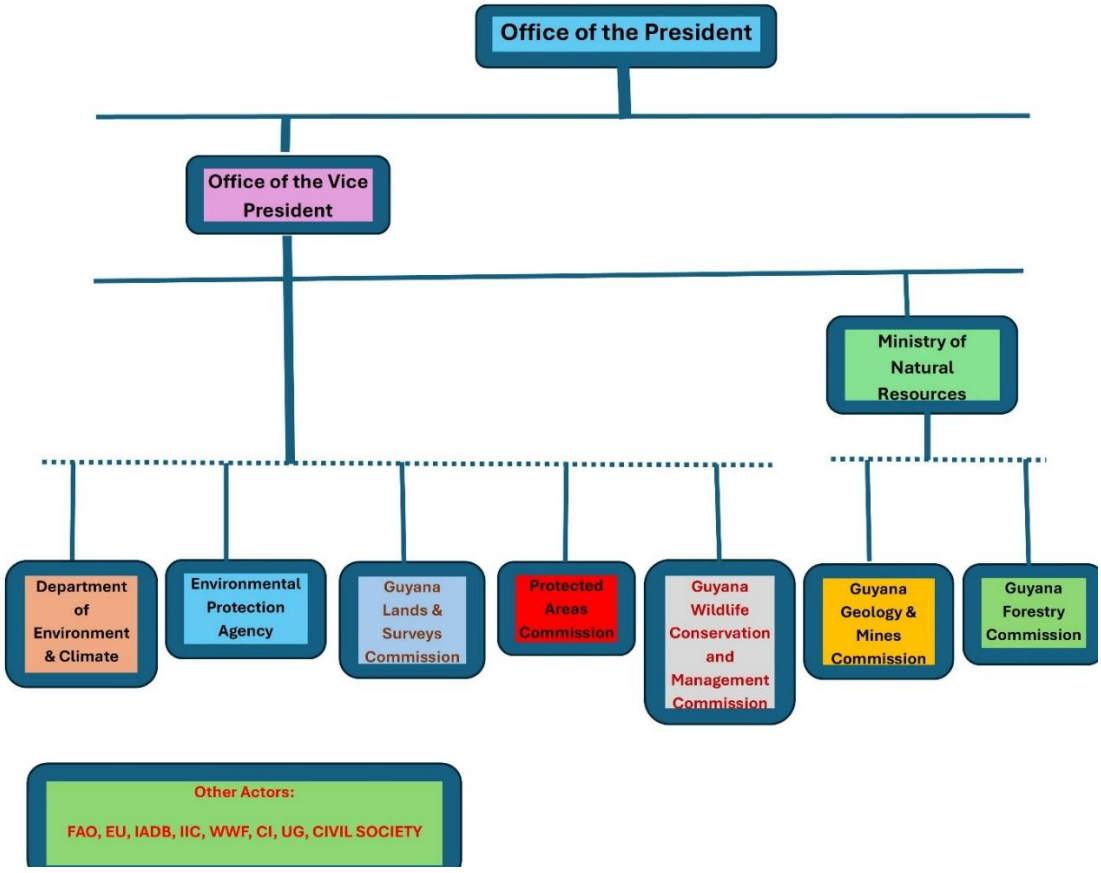

Figure 9 : Chart illustrating the structure for the legal framework for Timber Harvesting Operations

[12] The chart is based on The Official Gazette 133/2020 of Friday, September 11, 2020. (Legal Supplement B-Constitutional Appointments).

5.2 Overarching frameworks

5.2.1 The Constitution of Guyana

Article 36 of Guyana's Constitution of 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 Environmental Protection Act, 1996 and supplementary legislation in 2000, among others, lead the translation of the provisions of the Constitution into practical measures.

5.2.2 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.

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 development activities.

RAI is passionate about forest conservation and allied areas such as the conservation of wildlife. RIL will allow RAI's operations will be based on RIL that emphasizes planning of all forest interventions and machine use. RAI is also fully committed to compliance with all national standards.

5.2.3 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.

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.

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

5.2.4 The National Land Use Plan (GL&SC, 2013)

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 NULP is administered principally by the Guyana Lands & Surveys Commission (see Section 5.6.1.6).

RAI believes in a multiple-use approach to natural resources management. Specifically, RAI has no specific objections to mining. RAI 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.

5.2.5 The LCDS, 2013 (GOG, 2013)

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)

5.2.6 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 stymy 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* sectored (forest) policies.

5.2.7 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.

5.2.8 Environmental Protection Regulations

5.2.8.1 Overview

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.

5.2.8.2 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 Standards[13]. The provisions of these regulations have been considered during baseline studies conducted by RAI.

RAI will take measures to monitor water quality at the *permanent monitoring stations* it will operate throughout the life of the concession.

5.2.8.3 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*. RAI 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.

5.2.8.4 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

The GNBS, in collaboration with the EPA, has published guidelines (see Table 7).

RAI 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.

5.2.8.5 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.

Table 7: GNBS Guidelines for Noise Emission into the Environment
(Source GNBS: GYS263:2010) (First Revision)

Categories	Daytime (06:00h-18:00h) Limits in dB (A)	Night-time (18:00h-06:00h Limits in dB (A)
Residential	75	60
Institutional	75	60
Educational	75	60
Industrial	100	80

[13] See GNBS GYS 262: 2004: Specification for drinking water.

Commercial	80	65
Construction	90	75
Transportation	100	80
Recreational	100	70

5.2.9.5 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. RAI 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.

5.3 Forestry Policy & Forestry Legislation

5.3.1 Forest Policy, and applicable standards and guidelines

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

The NFPS, 2018 is projected to cover the period 2018 to 2028. GFC is the lead agency for the implementation of the NFPS 2018, however actual implementation is carried in partnership with other stakeholders (see Section 5.5.1.2). 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 (Forestry Department) and subsequently the GFC since its inception). The policy includes forest resourced based considerations 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 publication of the Low Carbon Development Strategy (LCDS). However, with the development of the Green State Development Strategy (GSDS) a further revision of the Policy was made in 2018 after a series of multi-stakeholder consultations countrywide.

The NFPS, 2018 reflects GFC's a focus on all the values of forest resources rather than valuing the forest resources simply for its timber stocks.

5.3.1.2 National Forest Plan, 2018 (GFC, 2018).

The National Forest Plan (NFP), 2018 complements 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; however, due to the significant roles by multiple institutions in the Plan, the Ministry of Natural Resources and, as appropriate, the Ministry of the Presidency, will support and coordinate the planning and implementation of (non-timber) activities by other agencies.

RAI participated in consultations linked to the NFP and will continue to support its development and implementation (by methods including providing feedback to the GFC).

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 revised in 2001, 2013 and 2018.

The *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 distilled under 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.

RAI fully embraces the COP and will ensure that all its operations are fully aligned with the COP.

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 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. RAI intends to share responsibility for the sustainable development of the forestry sector by ensuring that all its interventions in the forest resources are in line with the GFFO.

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. RAI has used the guidelines to develop an FMP and an AOP for the SFEP.

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. RAI endeavours to keep track of these requirements and all changes made from time to time.

5.3.2 Forestry Legislation

5.3.2.1 Forests Act 2009

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

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

RAI contributes to discussions on forest policy and forest legislation as often as the opportunities to do so present themselves.

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. RAI will ensure adherence to the forest regulations so that all activities are conducted in keeping with the legal requirements of the Country.

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, 2009

5.4 Other Relevant/Applicable Laws

5.4.1 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. RAI's conservation practices will have to be aligned with the objectives of this Act.

5.4.2 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.

RAI 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.

5.4.3 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.

RAI will ensure compliance with NIS to maintain workers contributions.

5.4.4 Labour Act 1942

The Labour Act 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.

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

5.4.5 Occupational Safety and Health Act 1997

This act provides for the registration and regulation of industrial establishments/ operation ensure 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.

RAI is fully committed to comply with the law to protect and safeguard the welfare of the employees.

5.4.6 Amerindian Act, Cap 29:01

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

RAI 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.

5.4.7 Combating of Trafficking in Persons Act 2005

This Act is intended to 'provide comprehensive measures to combat trafficking in people. RAI will not engage in any unethical behaviour in the recruitment of employees. RAI will only employ people who are not less than 18 years of age and who express an interest in working for RAI 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.

RAI will also ensure that its contractors have employees who are working voluntarily with them and who have proper enumeration packages and job descriptions.

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

This Act relates to certain Conventions relating to the employment of young persons and children. RAI will employ persons who are not less than 18 years of age. RAI will insist that its contractors do not employ anyone whose age is less than 18 years.

5.4.9 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.

RAI is an equal opportunity employer. RAI will employ women at its Base Camp as soon as adequate facilities are available for them. Given the hazardous nature of logging, RAI will not employ more than 20% of its field operatives as women. For 2021, women will be employed mostly for record keeping, timber grading and forest monitoring tasks.

5.5 Regulatory Agencies/Departments

5.5.1 Ministry of the Presidency

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.

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

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 sectored programmes of environmental contents" [Sec. 4(1) (1)]. The mandate to serve as the highest authority for granting 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...."

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.

Of course, the EPA 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.

5.5.1.4 The Guyana Wildlife Conservation and Management Commission

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

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.

The GFC consults with the Guyana Lands and Surveys Commission before issuing forest concession agreements.

5.5.2 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. RAI will provide MNR (via GFC) with biannual maps of its primary and access road network.

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 Draft National Forest Plan that has been developed to implement the 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.

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 Authourisation 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.

RAI 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.

Objectives of the GGMC, include:

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, see Section 5.8) are engaged in several initiatives to manage mining practices. These are expected to bear fruit countrywide in another two to five years. The mining community is well established within the same area in which RAI intends to conduct its logging operations. To the maximum extent possible, RAI will support 'greener mining'[14] piloted by the GGMC and the GMSTCI.

5.5.3 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.

RAI'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. RAI will therefore build up and maintain adequate corporate discipline to assure 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.

[14] http://dpi.gov.gy/small-and-artisanal-miners-are-learning-how-to-mine-greener/

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

5.6 Treaties & Conventions

Guyana has signed on to several international and regional treaties and conventions (see Table 8) to ensure that forest-based developments in Guyana are consistent with global and regional approaches to such development.

5.7 Environmental NGOs & International Agencies

WWF-Guyana and Conservation International (Guyana) Inc. are two very proactive environmental NGOs[15] 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.

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

Table 8: Conventions/International Agreements to which Guyana is a signatory.

No.	Conventions	Ratification/Accession
	A. Biodiversity	
1	+United Nations Convention on Biological Diversity	+Signatory in 1992, ratified in 1994.
2	+Cartagena Protocol on Biosafety	+Acceded to in 2008.
3	+Nagoya protocol on Access to genetic Resources and the fair and equitable sharing of benefits arising from their utilization.	+Acceded to in 2014
4	+Convention on International Trade in endangered species of wild fauna and flora (1973)	+Ratified in 1977
5	+Cartagena Convention or the Protection and development of the Marine environment of the wider Caribbean region (1983).	+Ratified in 2010.
6	+Specially protected Areas and Wildlife (SPAW) Protocol (1990)	+Ratified in 2010
7	+International plant protection convention (1952)	+Acceded to 1970
8	+Convention on the Protection of the World Cultural and the Natural.	+Acceded to in 1977
9	+Ramsar Convention on Wetlands (1971)	+Party

[15] https://www.nre.gov.gy/environmental-management-in-the-mining-sector-wwf/

No.	Conventions	Ratification/Accession
10	+Convention on the Protection of the World Cultural and Natural Heritage (1972)	+Signatory 1977
11	+International Tropical Timber Agreement 1994, 2006	+Signatory 2006
	Environmental conventions to which Guyana is a party	
12	+United Nations Framework Convention on Climate Change	+Signatory in 1992, ratified in 1994.
13	+Montreal Protocol	+Acceded to in 1993.
14	+Kyoto Protocol	+Acceded to in 2003.
15	+Paris Agreement	+Acceded to in 2016
16	+Vienna Convention on the protection of the Ozone Layer	+ Acceded to in 1993
17	+United Nations Convention to Combat Desertification	+Signatory in 1996, ratified in 1997
18	+International Convention for the Prevention of pollution (MARPOL 73/78)	+Acceded to 1997
19	+Basel Convention on the Control of Trans-boundary Movement of Hazardous Waste and their Disposal	+Acceded to in 2001
20	+Stockholm Convention on Persistent Organic Pollutants	+Acceded to in 2007
21	+Rotterdam Convention on Prior Informed Consent for Certain Chemicals and pesticides in International Trade	+Acceded to in 2007
22	+International Plant protection Convention (IPPC), 1951	+Adherence 1970
23	+Minamata Convention on Mercury	+Signatory in 2013
	Other relevant items	
24	+Caribbean Planning for the Adaptation to Climate Change CPACC (and its sequel Mainstreaming Adaptation for Climate Change in the Caribbean (ACCC)	+Signatory 1997
25	+Caribbean Regional Environmental Programme (CREP)	+Signatory 2001
26	+Caribbean Environmental Programme and its Specially Protected Areas and Wildlife (SPAW Protocol)	+Signatory 1990
27	+Treaty for Amazonian Cooperation	+Signatory 1978
28	+Guiana Shield Initiative (and Guiana Shield Facility)	+Signatory 1993

6.0 DESCRIPTION OF PROPOSED PROJECT (LOCATION, DESIGN)

6.1 Overview

RAI's objective for acquiring SFEP 1/2022 is the production of value-added timber products for sale to local markets and for export.

RAI needs a forest concession to assure itself of supplies of logs. RAI **will add value** to the timber sustainably harvested via wood processing operations at 110km. Processed timber will be transported by barge to coastal locations for (local sale) and for export. Timber and logs for sale in Region 4 or for export may be housed temporarily at RAI's timber depot at its 'Kwakwani Waterfront Timber Depot'.

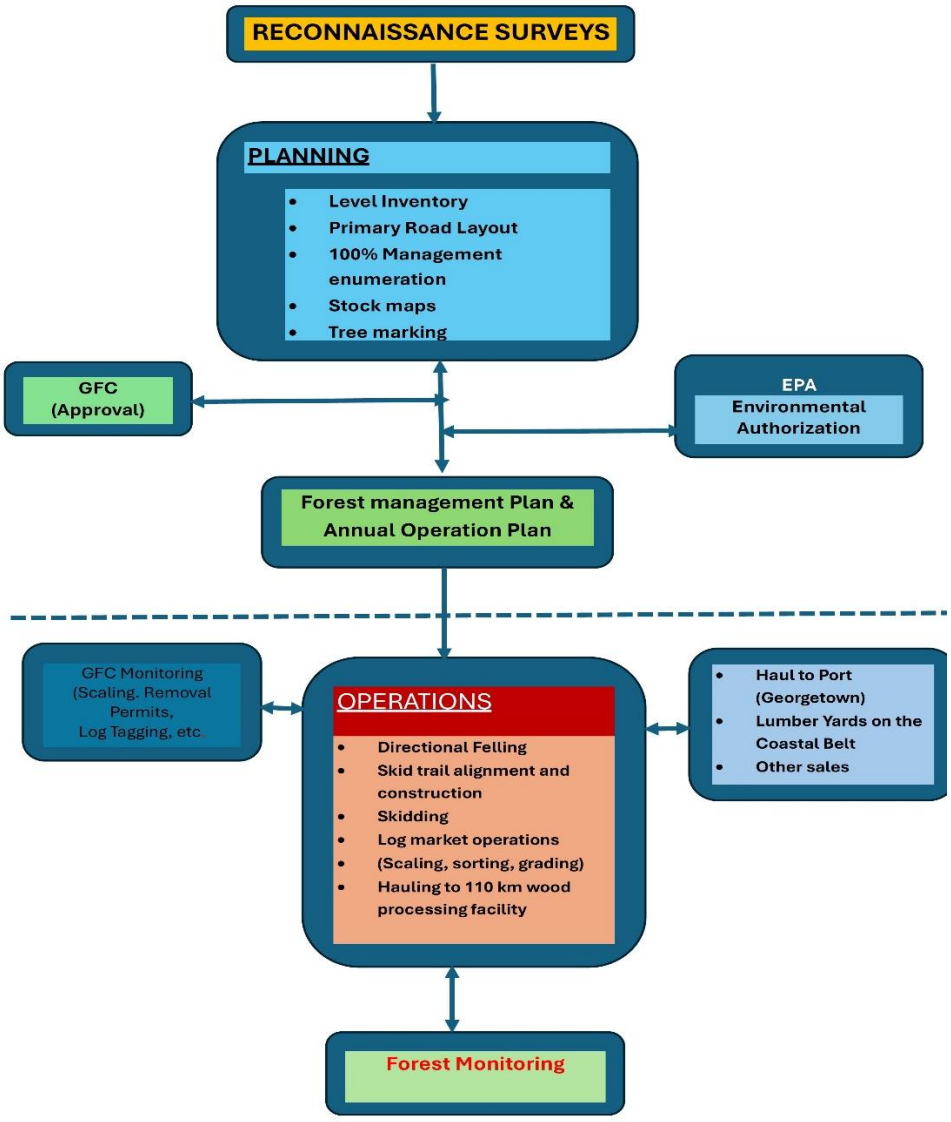

Figure: Outline of projected timber flows-RAI-SFEP 1/2022

There are three main phases to the project:

a) General concession administrative tasks.
b) Timber harvesting operations-concession area.
c) Sawmilling operations, 110km Base Camp.

In taking forward the project, RAI will address the management of **hazards** associated with the project as well as the management of mitigable **socio-economic, biological, and environmental impacts,** respectively.

This document deals primarily with concession-based operations: considerations regarding log transport via the UNAMCO ROAD.

6.2 General concession based administrative tasks.

6.2.1 Context

Administrative tasks cover a suite of activities linked to:

a) conducting environmental scans linked particularly to the natural resources sector generally and the forestry sector.

b) consulting with partners to address overarching challenges to logging in Regions 6 and Region 10.
c) making applications for an SFA-TSA, an Environmental Authorization, and other applicable licences.

d) recruiting staffs and consultants.

e) conducting skills gap analysis and developing and identifying training needs

f) procuring and managing logging and sawmill assets.

g) identifying sites for the first field based administrative centre (base camp); and

h) organizing log transport to Kwakwani Facility, left bank Berbice River via the UNAMCO ROAD and its own access road.

RAI will employ sufficient persons to take forward its *concession-based* operations

Employees will include:

a) Forest surveyors, tree spotters

b) Timber graders.

c) Chainsaw operators

d) Operators of heavy-duty equipment (tractors and trucks)

e) Auto-mechanics and electricians

f) Security and other support staffs

RAI will recruit Contractors for 100% forest inventory, creating long term employment for about 25 people (organized in 3 teams).

Skills sets identified so far include forest surveying and mensuration, tree identification, timber identification, directional tree felling, tree marking, timber grading, heavy-duty equipment operations, log road construction and ancillary earth works, bridge and culvert construction kiln operation, and veneer production operations. Closely allied to skills sets is the need for training. The basis for all formal training will be GFC's Code of Practice for Forest Operations, 2018 (COP), FTCI's RIL training manual, and GFC's Guidelines for Forest Operations (Large Concessions).

6.2.2 ESIA

This ESIA Report, prepared under a TOR agreed with the EPA, is based RAI's application to the EPA for an Environmental Authorization. The Environmental Authorization is a prerequisite for the application to GFC for an SFA-TSA that will grant RAI FORMAL approval to commence the sustainable harvesting of merchantable timber.

The ESIA takes account of the concerns of stakeholders and demonstrates how those concerns will be managed. The core matters for the ESIA will entail the following:

a) An account of the baseline conditions within and around the SFEP area.

b) An account of the major concerns of stakeholders garnered through various means including social surveys and field trips to communities within the concession area.

c) An analysis of the negative and mitigable environmental, biological, and social impacts respectively that will be generated because of logging.

d) Present RAI's plans to manage mitigable impacts.

The environmental management plan set out in the ESIA Report describes RAI's environmental management practices.

6.3 Timber harvesting operations-concession area

6.3.1 Overview

There are two phases of concession-based activities: *planning phases* and *operational phases, which will* continue throughout the active life of the project. Generally planning phases cover a five-year period and are set out in forest management plans, prepared in line with guidelines provided by the GFC. FMPs must be approved before any logging or ancillary operations begin.

AOPs are a subset of FMPs: they cover annual planning and operational events: these are prepared in line with guidelines provided by the GFC. GFC must approve AOPs prior to the calendar year in which the tasks specified will occur.

FMPs and AOPs address specific periods and even specific areas. However, several very general ***preparatory tasks*** that address the entire concession must be carried out.

6.3.2 Preparatory works

To take forward the logging project, RAI (and its consultants) embarked on several basic, preparatory activities.

(a) Consultations:

RAI and its consultants held discussions with the several members of the logging community in the Kwakwani District to determine the status of land use activities in the area, the strategic implications of ongoing and emerging forestry and other land use developments and the specific interests of each category of stakeholder.

(b) Desk based tasks:

RAI's first desk bound task included the following:

a. the perusal of topographic maps of the concession area and the review of reports on the area.
b. the study of the boundaries of the concession area, along with the identification of indigenous and mining communities within the boundaries of the concession area or within a 5km radius
c. the study of access options for the concession area; and
d. the organization of the area into compartments, blocks and a biodiversity reserve.

(c) Base Camp/Forward Camps (SFEP 01/2022)

RAI will set up forward (temporary) camps from time to time to accommodate forest inventory teams, road building teams and logging crews; the location of these will be set out in AOPs prepared for GFC's approval.

(d) Development of an access road and the transfer of equipment for road works.

A major task for the company is the transfer of road building and timber harvesting assets and ancillary equipment to the concession area.

(e) Training of operatives (COP, Forest Regulations, OHS, First AID)

Worker welfare, cost management, and compliance with local (environmental) standards underlie RAI's training programmes. At the very start of field-based operations, RAI set up SOPs covering prescriptions of the COP, timber harvesting practices, occupational safety and health and environmental management practices, respectively. RAI will ensure that staffs are duly sensitized through regular briefing sessions and that measures are put in place to ensure compliance with SOPs and other policies and practices prescribed by management.

(f) Forest organization

The concession area was organized into three compartments): East Berbice, West Berbice and Essequibo (see Table 9, Figure 10). For ease of identification and demarcation in the field, East Berbice Compartments and West Berbice are separated using natural boundaries, while West Berbice and Essequibo Compartment are demarcated with a cut line.

Table 9: List of Compartments within SFEP 1/2022

#	Description	Area (ha)	% of area	General Location
1	East Berbice	19,601.00	29.8	All areas east of right bank Berbice River
2	West Berbice	23,243.00	35.3	All areas between a cut line in a north-south direction corresponding to UTM Coordinate Easting value 33200 and left bank Berbice River
3	Essequibo[16]	23,000.90	34.9	All areas between a cut line in a north-south direction corresponding to UTM Coordinate Easting value 33200 and right bank Essequibo River.
Total		65,844.90	100	

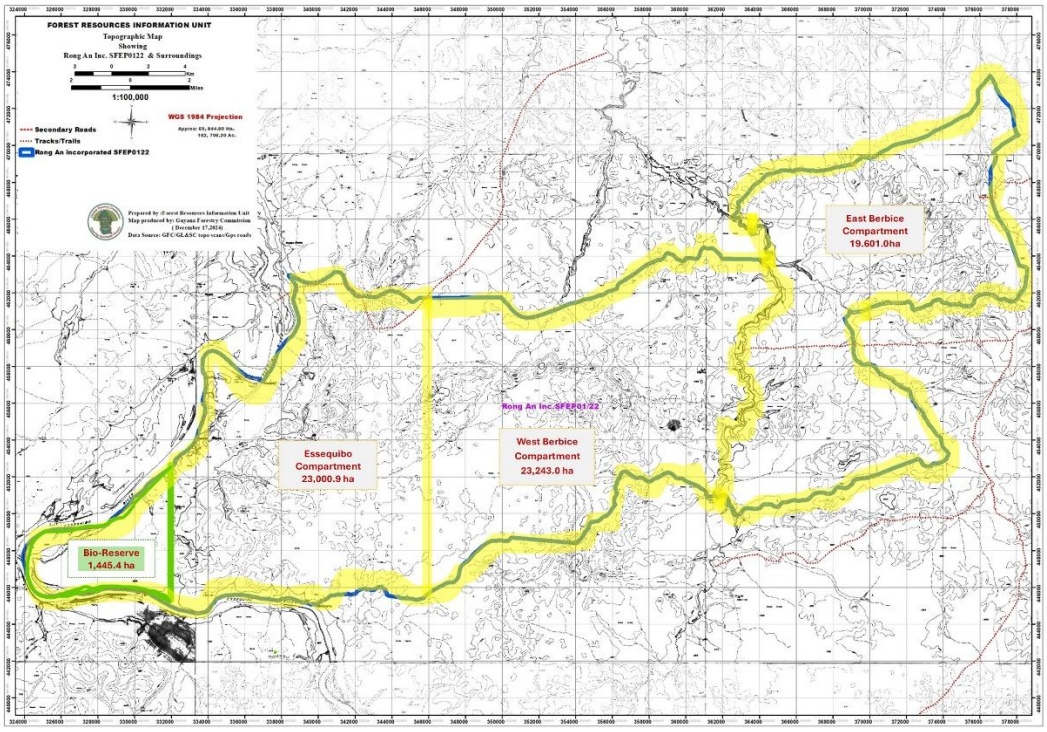

Figure 10: Map of SFEP 1/2022 showing compartments

The concession area is also organized generally into (1,000m x 1,000m) and each block has been labelled with a *unique* alpha-numerical code. For example, the *south-western corner* of Block 14V within East Berbice Compartment has coordinates UTM 21N, 364000, 451000. (100ha rectangular blocks facilitate 100% pre-harvest boundaries and the planning and execution of timber harvests, and management of prescriptions set out in the Code of Practice for Forest Operations (GFC, 2018)).

(g) Signposts

[16] Essequibo Compartment includes a biodiversity reserve of 1445.40ha

Signposts will be placed around the perimeter of the concession area and at points where persons transit the concession on a regular basis.

(h) Record keeping

RAI will elaborate a system of records to ensure that RAI can respond positively to the reporting requirements of agencies such as the GFC, EPA, NIS and GRA. (The system will be like that used on TSA 1/2017).

6.3.3 Timber harvest- planning tasks

Timber harvest planning tasks will be confined to areas that will be logged within a five-year period. The tasks described will be repeated every year because RAI will focus on a 600ha unit per year (see Section 6.4).

The core planning tasks are as follows:

(a) Annual Allowable Cut[17]

RAI will manage the concession area on a 40-year felling cycle which allows the company to harvest up to 13.33 m^3 timber per hectare. The net productive area to be harvested corresponds to 24,539.72 (37.3% of the total concession area). The actual area to be harvested per annum is 613.49 ha; the annual allowable cut is about 8177.86m^3.

(b) 100% forest enumeration

RAI's timber harvesting practices will be based on reduced impact logging principles and practices. Forest enumeration will be based on GFC's guidelines. RAI's timber harvesting practices will be informed by 100% forest inventories of each block to determine the species, number, and size each merchantable tree and their respective spatial distribution, in each block.

(c) Primary and secondary Road alignment

Primary and secondary roads will be aligned based on ground conditions- including stream patterns and the spatial distribution of merchantable timber. Actual road design and construction will be based on applicable prescriptions set out in GFC's COP, 2018 and prevailing soil type.

(d) Planning/alignment of skid trails

Skid trails are linked to the position of access road and the spatial distribution of merchantable trees to be felled. Skid trail alignment is carried out as soon as the tree location map is generated, and the position of access roads is determined.

(e) Tree marking

Following the generation of stock maps for each block enumerated at 100%, RAI will conduct the following tasks:

i. Select the trees to be harvested subject to production priorities, sales, and the sustainable ceiling of 13.3 m^3/ha.

[17] Recommended: GFC will make a final determination.

a. Verify the condition of the trees to be harvested-whether these are free from defects and whether any nests of eagles, for example, and lianas exist on the tree.

b. Verify the site conditions of the tree: slope %, nearness to other trees, and its location relative buffer zones.

c. Cut lianas to control tree fall and avoid undue damage to other trees.

d. Put appropriate markings on the tree prescribing the direction of tree fall, the direction in which the tree should felled to minimize damage to the log.

6.3.4 Timber Harvesting Operations

These comprise the following basic practices:

(a) **Primary and access road construction tasks**. These involve actual construction of roads considering the applicable technical prescriptions of the COP, the EMP. These also involve road corridor management practices agreed with stakeholders including for example, right of way demands, the use of the roads in the rainy season, signage, protection of fauna encountered on the road, and dust management nuisances.

(b) **Felling & bucking operations**. These involve RAI's SOPs; for example, RAI may prescribe the minimum dbh and stem height for specific species of merchantable trees to be felled, and the minimum or maximum length and butt and tip diameters respectfully for logs extracted from the concession. SOPs in this regard would also prescribe the records to be kept, and the way tags or notation are positioned on the stump or log.

(c) **Skidding operations**: These involve the removal of logs from stump by appropriate methods taking due care not to damage the log nor residual merchantable stems.

(d) **Log market operations**: These entail the initial measurement, grading, and sorting of logs relative to the targeted use for them and completion of production registers and permits.

6.3.5 Haul of logs

Logs produced at the concession area will be transferred by truck to the log depot at 110km.

6.4 FMPs, AOPs.

All operations planned are set out in an FMP and AOPs for a specified period for approval by the GFC prior to actual implementation. (These documents will be available for scrutiny by approved stakeholders).

6.5 Wood Processing Operations at 110km, TSA 01/2017

RAI intends to add value to all logs produced at its concession area.

6.6 Challenges

RAI anticipates that some challenges for its operations are predictable. These include:

Labour. The availability of adequate numbers of skilled labourers for concession-based tasks and for its wood processing facilities could be a major challenge.

Fuel costs. RAI's projections are that it will utilize about 4,000 litres of fuel per day. Any *restriction* in fuel supplies or major *increases* in fuel prices will impact on the viability of the company's operations.

6.7 Marketing

RAI has developed business partnerships and marketing expertise that guarantee the immediate sale of timber (products) from the SFEP area.

Logs, sawn timber, and veneer are the products targeted at this time. However, RAI has access to state-of-the-art technology and the company has been studying the (mechanical) properties of many of the lesser used timber species with a view to developing new consumer products and consequently seeking more diversity in its revenue streams.

RAI's target markets are in Guyana, North America, Europe, Asia (China) and the Caribbean. RAI supports independent audits of its forest management practices assuring its customers that the company is serious about sustainable forest management and compliance with local laws.

6.8 Investments

RAI has done extensive financial analysis to determine whether sustainable timber harvesting operations, in association with ancillary responsibilities, would support a viable business. RAI's analysis includes, but is not limited to:

(a) The global demand and global prices for tropical hardwoods timber, mainly for sawn timber and plyboard.

(b) the geographic location of Guyana and of the concession, respectively.

(c) the local economic and financial framework generally and GOINVEST initiatives.

(d) concession based items: these items include the geographic location of the concession, the relative proportion of the twenty (20) most important species and their spatial distribution, and the vagaries of shared use of road networks.

(e) the local legal framework and the context for sustainable timber operations and for timber exports, respectively.

(f) labour issues and skills set, training needs analysis.

All analysis conducted to date indicate that timber harvesting operations at the concession area will be a profitable venture.

6.9 Corporate social responsibility

RAI commits to supporting regional health and educational programmes already being executed by the RDCs, Administrative Regions 6 and 10, respectively. RAI also commits to sharing responsibility for the maintenance of the UNAMCO Road.

6.10 Hazards associated with the project.

Various phases of RAI's project expose its field operatives to several hazards. These hazards relate in the main to employees' proximity to the forest environment (snakes, caimans, and mosquitoes), the regular use heavy-duty equipment and the handling of logs. RAI will provide all employees with personal safety gear and maintain supplies of simple over the counter drugs (insecticides, pesticides) at workplaces for its employees' use.

6.11 Stakeholder engagement

A major aspect of RAI's operations will be engagement with stakeholders. The myriad issues related to shared land use, shared use of concession roads and shared use of the UNAMCO Road require RAI to be proactive in its engagement with stakeholders in order not to stymy timber production.

7.0 WATER RESOURCES

7.1 Introduction

Water is essential to human and other forms of life. Forests are an integral part of the hydrological cycle. Rain forest canopies *redistribute* 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 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 concession area is within the national **Physiographic Area Zone 2, Interior Plains** which is characterised by enormous quantities of fresh water from April through August and from November through January; large to large quantities of fresh water are available for the remainder of the year (GLUS, 2013).

7.3 Definitions and scope (GLASC, 2013)

The following definitions are useful:

(a) Quantitative terms (GLASC, 2013)
Enormous quantities of water refer to discharge rates of >400,000 litres /min.
Very large quantities refer to discharge rates of 40,000 to 400,000 l/m.
Large quantities: refer to rates of 10,000-40,000 l/m.

(b) Qualitative terms (GLASC, 2013)
Fresh water: maximum of totally dissolved solids <1,000 mg/l.
Brackish water: maximum >1,000mg/l but less than 15,000mg/l.
Saline water: TDS>15,000 mg/l

(c) Water hardness (GLASC, 2013)
Soft water: 0-60mg/l
Moderately hard water: 61-120mg/l
Hard water: 121-180mg/l
Very hard water: >180mg/l C

(e) '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).

7.4 Legislation

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

a) 'Surface water systems' includes creeks and rivers.

b) 'Waste' includes any solid material or material that is suspended, dissolved, or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition, or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted.

c) *'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 Environmental Protection (Water Quality) Regulations (Reg.6/2000) (see Section 5.2.9.1) made under the provisions of the EPA Act 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.

7.5 Methodology for base line studies undertaken by RAI.d

NB. This section is incomplete due the small size of the data set. This matter will be looked at as soon as adequate access is guaranteed. Meanwhile the data set for SFEP 02/2011 is presented in Annex XV.

7.5.1 Challenges

Access to the central and western parts of the concession is challenging because there are no roads. Further, there is heavy flooding in the wet season which stymies traversing the concession area. In the dry season, many creeks dry up and any residual water has dubious value. The issue is to judge when conditions are just right, even in the wet season. Water samples for the rainy season were collected during February 16-18, 2024, and August 2-4, 2024, (see Tables 10, 11 & 12; Figures 32, 33).

Samples during the dry season were restricted to riverine areas because the Aranka District was designated a hotspot for Covid-19 infections. Samples were collected for the dry season-Barama District -during period October 14-18, 2020 (see Tables 13, 14 & 15) and samples for the dry season-(Cuyuni District)-were collected October 10, 2020 (see Tables 16, 17, & 18). Dry season data (see Figures 32, 34) are presented for indicative evidence only: RAI commits to continuing and analysing water samples for the dry season at the same sites where samples were collected in the wet season.

Water samples were collected using new, wide mouth polypropylene bottles[18] (see Figure 32). Once the proper notation[19] was placed on the bottles, they were stored in a cooler with ice for the trip to Georgetown. Trips were organized in such a way that water samples were not kept for more than four days and that the water samples could be delivered to Kaizen Laboratory within a few hours of its arrival in Georgetown. Bottles are discarded after use; they are never reused or recycled.

[18] These were sourced from either Kaizen Laboratory or GAFSONS Industries Ltd; in the rare case that the bottles were not available, ordinary new water bottles-based on advice from Kaizen Laboratory - were sourced from Weiting & Richter Ltd.

[19] Sample #, Abbreviated name of the concession; there is a separate data sheet where the UTM Coordinates, date, and concession details

The samples collected were organised into two batches. 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. The water samples taken during the same period were sent directly to Kaizen Environmental Services (Guyana) Inc. Laboratory. The results for these are summarised in Table 12 (see also scanned Analysis Data report) in Annex XVIII. The same process was followed in October for the samples collected during the *dry season,* though the field team composition was different. In situ results are presented in Tables 11, 14 and 17, while results generated by Kaizen Environmental Services (Guyana) Inc. Laboratory are presented in Tables 12, 15 and 18.

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 19) 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, and European Union (EU) 1998 Drinking Water Standards (Table 20).

Table 10: Water Quality Sampling Field Data Report-Wet Season

ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)

Water Quality Data Report

Distribution of copies: (List) EES Office File Records	**Sheet No.**
1. General	
Location (Site): Rong An INC.	**Samplers: Company Staff**
Sample Date: February 16 -18, 2024	**Observer: Company Staff**
Measurement Duration: 3 days	**Sample Type**: Surface water
2. Field Observations	
Current Weather	Sunny Weather Conditions.
Relative Humidity	Relative Humidity average of 67.97 %.
Ambient Temperature	The Ambient Temperature Reading was between: **26.9 ^{0}C to 2.1 ^{0}C.**
Description of Location	Description of area where Samples were taken/read: The samples were taken around and around 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.

Table 11: Water sampling data -Wet Season (EES)

ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)

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 ppm	Total Nitrogen mg/L	Ammonia NH_3 mg/L	FLOW RATE m/s
RA1	16/02/2024	21N 0376719 UTM 0465925	ND	ND	6.3	ND	26.0	7.53	67	73	68	42.67	2.89	0.186
RA2	17/02/2024	21N 0380889 UTM 0474255	ND	ND	6.1	ND	25.7	6.69	69	85	71	41.34	2.41	0.542
RA3	18/02/2024	21N 0352044 UTM 0493783	ND	ND	6.6	ND	25.8	4.59	63	70	77	45.67	2.17	0.062

*ND-Not Detected

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 ºC	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 (NH3)	< 5 mg/L	Avobe Guideline Value
Total Nitrogen (TN)	< 50 mg/L	
Oil and Grease	< 10 mg/L	

ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)– Guyana
Environmental Assessment/Air Lab/Water Lab
https://eesgy.org/
650-0373

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1. Measurements (Raw Data)

Surface Water Quality Analysis

4. Test Methods

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

5. Comments and Recommendations

- No constrains during the survey.

Report Authorized by:
Isidro Espinosa (Director)

Date: March 14, 2024

Figure: Map showing the location of sample points-wet season

Table 12: Field Data Report-SFEP 01/2022 (Dry Season)

ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)

Water Quality Data Report

Distribution of copies: (List) EES Office File Records	**Sheet No.**
1. General	
Location (Site): Rong An INC.	**Samplers: Company Staff**
Sample Date: August 02 -04, 2024	**Observer: Company Staff**
Measurement Duration: 3 day	**Sample Type**: Surface water
2. Field Observations	
Current Weather	Sunny Weather Conditions.
Relative Humidity	Relative Humidity average of 65.97 %.
Ambient Temperature	The Ambient Temperature Reading was between: **26.9 ^{0}C to 2.3 ^{0}C.**
Description of Location	Description of area where Samples were taken/read: The samples were taken within the boundaries of the concessions investigate the environmental conditions. The test resul represent the effluent or discharge points that may have pollutio The test results are shows in the following table.

Table 13: Surface Water Analysis-Dry Season

ENVIRONMENTAL ENGINEERING SOLUTIONS (EES)

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 ppm	Total Nitrogen mg/L	Ammonia NH_3 mg/L	FLOW RATE m/s
RA1	03/08/2024	21N 0374066 UTM 0467036	1.07	10.87	6.6	0.05	23.0	6.59	67	63	61	28.02	1.73	0.166
RA2	03/08/2024	21N 0380889 UTM 0474255	0.93	11.56	6.3	0.05	25.7	6.69	68	60	63	23.06	1.81	0.642

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 ºC	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 (NH3)	< 5 mg/L	Avobe 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 Suspend Solid (TSS): Photometric
Total Nitrogen: Persulfate Digestion Method
Ammonia: Chromotropic Acid
pH, Conductivity, Turbidity, Temperature, TDS: Optical Sensor

5. Comments and Recommendations

- No constrains during the survey.

Report Authorized by: **Isidro Espinosa (Director)**	**Date:** October 09, 2024

Table 14: 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	COD	DO	TSS	N as HN3	Total N	P	CN (Tol.)	P04	C1	Surfac-tant	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-able solids				<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; 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 HN3	Total N	P	CN (Tol.)	P04	C1	Surfac-tant	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) 05
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	>4.0	<250 (t.v.<100	<250 t.v.<100										
Textiles	5.0-9.0			<250	>4.0	<500 (t.v. 100)						300	<0.2 deter-gents	<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	<free 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 Sir Lanka.
General environmental guidelines	5.0-9.0	<40	<50	<250		<50 as TSS	<10		<2	<1 Free: 0.1		<Cl: 0.2		<0.5	<400 MPN per 100 mls	<10	WB Std: Fluorine: 20; No limits given for metals.

Table 15: US EPA Standards for Recreation, Propagation and Maintenance of Healthy Environment

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

(b) 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

(c): European Union (EU) 1998 Water Standards

Pollutants	**Units**	**Guideline Value**
Electrical Conductivity	µS/cm	2500

7.6 Results and Discussion

7.6.1 Overview

For the results of the surface water quality analysis conducted for RAI's forest concession, most of the parameters analysed were within the acceptable range in comparison with the standards and guidelines mentioned below (Tables 19, 20).

7.6.2 Significance of values

- ***PH*** - The pH analysis of the surface water samples collected within and around the RONG-AN INC. (RAI) concession during the wet season ranged from 4.31 to 7.56 ph. The lowest pH indicated acidity for the water sample taken at the GPS location of 21N0214470/UTM0773625. However, the pH parameters were within the limits (5.0 - 9.0 pH) GNBS Guidelines for Industrial effluent into the Environment as well as the US-EPA and World Bank Group IFC EHS Guidelines. During the dry season, pH values ranged from 6.3-9.36. Considering the guideline values from GNBS (pH 5-9), 9.36 is outside the upper limit and may be due to high levels of carbonates CO_3 or high levels of organic matter in decomposition. Aquatic life can exist with current pH levels of the water.
- ***Water Temperature***– The surface water temperature reading ranged from 26.9 to 31.5 ^{0}C (during time of collection in the field for the wet and dry seasons respectively) and 12 to 15 ^{0}C (during time of laboratory analysis by Kaizen Environmental Services Inc.) All values are within the GNBS accepted range of <40 ^{0}C, which is considered healthy for living organisms.
- ***BOD (Biochemical Oxygen Demand)*** – BOD levels of the surface water sample average was 8.10 mg/l and were all within the GNBS accepted range of <50 mg/l as well as the World Bank Group IFC EHS Guidelines of 30 mg/l.

It is noted that the DO values in situ were lower at the moment of monitoring. It is expected that BOD is significantly higher than DO; results due to the definition of BOD, BOD not only represent the DO in aquatic systems but also represent the consumption of O_2 demanded by the content of organic matter in the water body over time.

It is important to note that in the dry season (see Table 15, 18), the concentration of O_2 decreased and the content of organic matter increased in the waterbody over time while in wet season (see Table 12) the concentration of O_2 will increase due to increase in water flow and force oxygenation due to the rapid and turbulent flows as natural oxygenation beside that the organic matter may reduce or diluted due to the increase in the volume of water bodies. Some water samples didn't allow to perform BDO due to sample preservation time. DOB5 have a time constrain and is due to preservation time related to the time of travelling.

- ***Total Suspended Solids*** - TSS results of the surface water samples collected were within a range of 7 to 159 mg/l. Indicating that the water samples S2-4 (80 mg/l), S1-3 (101 mg/l) and S4-6 (159 mg/l) were above the GNBS (<50 mg/l) Guidelines as well as the World Bank Group IFC EHS Guidelines of 50 mg/l, indicating high content of suspended particles as natural condition of water within the concession. *The suspended particles maybe 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 8 mg/l – 95 mg/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 1.6 mg/l – 8.8 mg/l and were within the GNBS and World Bank Group IFC EHS limits of <10 mg/l. Monitoring indicated that OG concentration present in the surface waters of the RAI concession were within the accepted limits.

  During the monitoring exercise, some values were above the GNBS guidelines, for the samples S1-3 (12.6mg/l) it is suspected that that the high values correlate to a leakage of oil from oil barges (see Figure 35) , floating pumps feeding water to inland mining pits or outboard engines. Those values may not be steady or permanent.

  For samples S1-7 (15.6 mg/l), S2-8 (28.2 mg/l), S3-9 (29.6mg/l) and S4-10 (26.2mg/l), having an average of 24.9ml/l, values were above the GNBS Guidelines (<10mg/l); such values may be associated with effluents originating from RAI's temporary camp.

- ***Turbidity***- The turbidity level of the water samples ranged from 19.9 to 262 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.*

  Also, frequent boat movement in shallow water keeps agitating the water and sediments on the stream bed.

- ***Electrical Conductivity-*** Electrical Conductivity of the surface water samples within the RAI area ranged from 28 - 114 µS/cm and were all within the European Union (EU) standards for drinking water i.e., 0 - 2500 µS/cm. Most streams range between 50 to 1500 µS/cm. Freshwater streams ideally should have electrical conductivity ranging from 150 - 500 µS/cm to support aquatic life.
- ***Total Nitrogen-*** Total Nitrogen highest concentration was 2.52 mg/l; concluding that all values were all below the World Bank Group IFC EHS Guidelines of 10 mg/l.
- ***Nitrates-*** Nitrate levels of surface water samples were not detected and therefore were all within the accepted range of 10 mg/l.
- ***Total Dissolved Solids (TDS) -*** All sources of natural water contain minerals. These minerals characterise the total dissolved solids in inorganic form or salts like potassium, calcium, magnesium, chlorides, bicarbonates, and sulphates. Heavy metals may be present too but normally in low concentration from natural sources. During the surveys, the values found ranged from 19-248ppm. Normally the higher values are found in the rainy season due to the water force that develop great mixing of organic and inorganic matter and water.

Impacts on water resources are likely to emerge from three situations: earthworks necessary for road construction and maintenance, skidding logs, and the discharge of pollutants on the forest floor.

7.7.2 Impacts from 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.

The hydrological balance in watersheds depend on the nature of the vegetative cover and capacity of the soil to retain water. 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 (D'Almeida et al, 2006; ter Steege et al 1996). 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.

7.7.3 Impacts from Skidding

Skidding is responsible for residual stand damage which impacts forest degradation and therefore the hydrological cycle; less skidding will lead to less compaction (ter Steege 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

RAI is committed to conserving water resources within the concession area. The key approach to mitigation to be employed by RAI is to make environmental conservation a 'state of mind'. The Forest Monitoring Officer will be tasked to provide briefing sessions to all employees to instill in them to the maximum extent possible to need to think about conservation of the environment generally and the conservation of water resources.

The company plans six key initiatives to translate its concerns into action (please also see Table 21).

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 waterways.

b) Planning versus weather sensitive events: All earthworks and skidding operations will be planned with great care to reduce road density, skid trail density and the deployment of machines. Road construction and road maintenance works will be avoided during the rainy season.

c) Side drains: RAI will take measures to avoid water running from roadside drains directly into streams; the storm water will be channeled via scrub vegetation or rocks to filter out sediment to the maximum extent possible. Wherever convenient, side drains will lead to pits ('dead sumps') at roadside to allow the storm water to infiltrate into the soil rather than flow over land.

d) Permanent Monitoring Stations: RAI has identified five monitoring stations where water samples will be taken four (4) times per year, two during dry spells and two during the rainy season.

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

f) The forest monitoring officer will be responsible for water conservation practices. Technical input will be sought from a duly qualified consultant to retrieve and interpret water quality data.

Table 16: Water quality monitoring Plan for RAI

ACTIVITY	INSTITUTION (S) RESPONSIBLE	FREQUENCY OF MONITORING	LOCATION OF MONITORING
Conduct 'Environmental Awareness sessions' for all field operatives using GFC's Cop.	RAI (Forest Monitoring Officer)	Biannually	BASE CAMP
Avoid earthworks during the rainy season.	RAI (Forest Monitoring Officer)	Biannually (Several times during the rainy season)	Roadways
***Surface water* drainage off roads, log markets and other clearings.**	RAI (Forest Monitoring Officer)	Wet season	Roads, skid trails & log markets
Cleaning of drainage structures (bridges, culverts) along roads and skid trails.	RAI (Forest Monitoring Officer)	Biannually	Roads, skid trails & log markets
Observance of the integrity of buffer zones along water ways	RAI (Forest Monitoring Officer)	Biannually	Current work areas re (AOP)
Data Collection at Permanent Monitoring Stations	RAI (Forest Monitoring Officer)	Biannually	Permanent Monitoring Stations
Requirements • **Transportation (ATV)** • **GPS Device** • **Water bottles** • **Laboratory Services** BUDGET **G$1,000,000.00 per annum (including costs for laboratory analysis)**			

NB. Given the size of the area, the time taken to organize trips to riverine areas (particularly in the dry season), and the time taken to collect samples, transport same to Kaizen Laboratory, RAI will opt for biannual sampling, taking the entire suit of water quality parameters.

However, there will be quarterly checks to verify that areas chosen for Permanent Monitoring points are not disturbed by mining activity. (Where permanent monitoring stations are degraded due to mining, RAI will choose another area within 500m of the permanent monitoring station lost.

8.0 SOILS, LAND & GEOLOGY

8.1 Overview

Soil type and landform are key variables when planning timber harvest systems. In planning earth works for road construction, the prevailing soil types and its location are major determinants about the extent of the construction works required and their costs.

Soil fauna is vital for the mineral nutrition of plants. Soil invertebrates are important litter decomposers (Whitmore, 2012).

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 Section 8.0: 'Operational Hygiene' of the GFFO, refer to the conservation of water resources through adequate soil protection and soil conservation practices.

8.2 Definitions and scope

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 (Strahler & Strahler, 1996). Soil is the natural terrestrial surface layer containing living matter and supporting or capable of supporting plants (Strahler & Strahler, 1996)

8.3 Baseline information

From a lithological perspective, GLSC (2013) categorizes the geology of the concession area as Takutu Graben, characterized by 'Continental sands and silts under thin Tertiary Cover' with formations being the Takutu Group and Rewa Fm (GL&SC, 2013).

8.4 Methodology

No soil samples were collected due to challenges with access to the heart of the concession and reliance was placed on data published by GFC (Annex XI, Table 17), which the consultants have found to be consistent with data collected in other areas.

Table 17: Soil types occurring on SFEP 01/2022(Source GFC)

Description	Hectares	%	Remarks
Endoaquults	32,877.25	49.9	Low humic gleys, including alluvial soils, Regosols, and ground water podzols; deep soils with poor drainage
Endoaquepts	79.60	0.1	Low humic gleys of low base status, ground water laterites including alluvial soils; deep soils with very poor drainage
Kanhapludults	18,466.45	28.1	Red, yellow podzolic soils; deep well drained soils
Quartzpsamments	8,505.58	12.9	Regosols, white, quartz phase; deep soils, excessively drained
Ustchrepts	523.65	0.8	Lithosols, acidic, rock phase; shallow, excessive drained soils
Ustochrepts	4629.42	7.0	Red, yellow latosols, light textured phase; very deep, well drained soils
No Data	762.94	1.2	n/a
TOTAL	65,844.90	100.0	

8.5 Results

Not applicable.

8.6 Impact Statement and Assessment

Soils absorb the impacts of all timber harvesting operations: these operations include road construction and maintenance, skid trail construction, tree felling, log market construction and the setting up of field camps. Physical damage and erosion hazards are very intense where major earth movement occurs such as cuttings on slopes (Richards, 1998). The skidding of logs 'smears the surface layers of soil and closes pores, reducing infiltration capacity and increasing the likelihood of overland flow and erosion ((Richards, 1998).

8.7 Mitigation measures

The forest monitoring officer will be responsible for overall soil conservation practices.

RIA's efforts to manage water and waterways are also linked to soil conservation, and the two activities will be done at the same time.

Other specific actions are as follows:

a. planning all interventions so that heavy-duty machines will impact the minimal distance possible and for the minimal time possible; road works will be limited to the dry season. (Only emergency interventions will be scheduled during the rainy season).

b. soil samples will be taken and analysed at the same time as the water samples from the PMS.

c. Staff will be briefed quarterly on the need for proper soil and water conservation practices.

d. RAI will post signs (see Figure 11) at workplaces to remind staffs about environmental conservation.

Figure 11: Typical aids for promoting employees' behaviour in relation to soil conservation

9.0 AIR QUALITY

INCOMPLETE

9.1 Introduction-Air quality

In the pursuit of its general logging operations RAI's vehicles will be emitting exhaust fumes and creating dust clouds while traversing roads within and beyond the concession area. Air quality is a major concern for RAI as it addresses air pollution hazards confronted by its employees and other persons and fauna in the vicinity of its operations.

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 (Environmental-Pollution-Centers 2017).

9.2 Definition and scope

The term 'air pollution' covers all air contaminated by substances, whatever their physical state, which are harmful to health or otherwise dangerous (ILO, 1977).

In its education and awareness activities, the EPA (2017) set out the following: "When polluted air is inhaled it can damage our lungs, cause respiratory problems as wheezing and shortness of breath; toxicity to the gastrointestinal tract, liver, skin, or sense organs and can also affect our concentration, slow our reflexes and even make us confused and sleepy. In livestock it accumulates in their bones and causes deformities. All air pollutants are dangerous to human health, animals, or plants whether there is short term impact or long term. Therefore, we should protect ourselves, and the plants and animals around us that we depend on".

EPA, 2017. Air pollution. Guyana Chronicle. EPA-741_environmental_protection_agency. http://guyanachronicle.com/2017/09/02/air-pollution (seen September 7, 2019)

Air pollution is one of the most serious environmental problems confronting civilization today and is most often caused by human activities i.e. mining, construction, transportation, industrial work, agriculture, smelting, etc. (Environmental-Pollution-Centers 2017). This is becoming an increasingly significant problem to growth and development of cities and communities. The air pollutants of major public health concern include: particulate matter, carbon monoxide, ozone, nitrogen dioxide, sulphur dioxide and metals, such as lead (Hedges, 2004)(World-Health-Organization 2012).

Particulate Matter (PM) - also known as particle pollution is a complex mixture of extremely small particles and liquid droplets that get into the air (USEPA 2017). Once inhaled, these particles can cause serious health effects and can affect the lungs and heart of human beings (USEPA 2017). Particulate Matter comprises both coarse and fine particles. The coarse particles (PM10) have an aerodynamic diameter between 2.5µm and 10µm. Fine particles have an aerodynamic diameter less than 2.5µm (PM2.5). These particles are formed from gas by chemical reactions; and condensation of high-temperature vapours during combustion (Fierro 2000).

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 (Alias, Hamzah, and Kenn 2007). 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 (Fierro 2000, p.5) (Alias, Hamzah and Kenn 2007, p.258). 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 (Alias, Hamzah and Kenn 2007, p.256). 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 (residential, commercial, or cultural monuments) (Hedges 2004, p.58).

9.3 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 (Mecklenburg-County-NC 2012). 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 (World-Health-Organisation 2006).

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 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 18), the World Health Organization and EAS Inc. Indoor Air Quality Guidelines (Table 19) Source: Air Quality Survey Rice Mill Industries, EES files, Strangroen, Guyana 2019).

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 SFEP 1/2017, however, a preliminary assessment of air quality was done from June 14 through July 7, 2019, and the data reflected the Total Suspended Particulate (TSP) concentration of the Project location.

The consultants consider that air quality data collected for the dry season, see Annex XXVIII, may be too localised to represent a concession exceeding 400,000ha and are not included in the discussion.

9.4 Methodology/Monitoring Procedure

site was recorded. Conversions from milligrams per cubic meter (mg/m3) to micrograms per cubic meter (µg/m3) were The Total Suspended Particulate (TSP) measurements were taken using the Thermo pDR-1000AN personalDataRAMTM Particulate Monitor (Figure 38). TSP measurements recorded in milligram per cubic meter (mg/m3), were taken at various sample sites (see Map 3) after a log interval of 5 minutes (Thermo-Electron-Corportation 2005). After the 5-minute interval log time, the real time Concentration value, the Maximum Concentration value, and the Time Weighted Average (TWA) concentration in milligrams per cubic meter (mg/m3) were recorded from each sample site. The wind direction and temperature at time of monitoring at each done by taking

the milligrams per cubic meter (mg/m3) measurements x 1000 (Hedges 2004, p.23). Micrograms per cubic meter (µg/m3) 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 18). 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.

Table 18: National ambient air quality standards (USEPA, 2016; US EPA, 2016)

Parameter	Type	Averaging Time	Level	Form
$PM_{2.5}$	Primary	Annual	12.0 µg/m³	Annual arithmetic mean, averaged over 3 years.
	Secondary	Annual	15.0 µg/m³	Annual arithmetic mean, averaged over 3 years.
	Primary and Secondary	24-hour	35 µg/m³	98th percentile, averaged over 3 years.
PM_{10}	Primary and Secondary	24-hour	150 µg/m³	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/m³	Not to be exceeded more than once per year.
		Annual	75 µg/m³	Annual geometric mean.
	Secondary	24-hour	150 µg/m³	Not to be exceeded more than once per year.
		Annual	60 µg/m³	Annual geometric mean.

Table 19: Indoor air quality guidelines for TVOC and HCHO (EAS Inc., 2015; WHO, 2010)

Parameter	Guideline		Notes
TVOC	0.3 mg/m³	300 µg/m³	Low Level of Concern
	0.5 mg/m³	500 µg/m³	Accceptable Level
HCHO	0.1 mg/m³	100 µg/m³	Short-term (30 min)

9.5 Results and Discussion

9.5.1 Overview

No data was collected for Air Quality. This acvtivity is pending the development of adequate pathways at the concession area. RAI and the consults will in the interim rely on data collected at SFEP 2/2011, formerly held by Rong-An.

9.5.2 Total Suspended Particles

9.5.3 PM2.5 and PM10

9.5.4 Formaldehyde (HCHO)

9.5.5 Total Volatile Organic Compounds (TVOC)

9.5.6 Noise

9.6 Mitigation measures

9.6.1 Overview

The forest monitoring officer will be responsible for mitigation measures targeting air quality. RAI is committed to taking whatever measures are feasible to ensure that air quality remains at tolerable levels, and always within the established ranges.

9.6.2 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 a duly qualified consultant 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.

9.6.3 Permanent Monitoring Stations

Air quality will be monitored initially at the permanent monitoring stations to be implemented by RAI while water quality and soil quality parameters are taken.

9.6.4 UNAMCO Road

On the UNAMCO Road, the following measures will apply (see also Table 29, Annex XX):

a) Trucks will always travel < 65km/hr. and will always be using rotating orange beacons on the top of the cab or travel with its main beam on.

b) Trucks will always slow down to 25 km/hr. near communities, camps or other human dwelling, unless there are humps on the road when trucks will come to a stop before crossing the hump; and

c) No logs will be hauled at night.

Table 20: Summary of mitigation measures for air quality monitoring: SFEP 01/2022

ACTIVITY	PARTY RESPONSIBLE	FREQUENCY OF MONITORING	LOCATION
Data Collection at PMS	RAI (SLO)	Quarterly	PMS
Ensure all vehicles are in a fully functional state	RAI (SLO)	Quarterly	RAI B/Camp
Engagement with the mining community, other stakeholders	RAI (SLO)	Quarterly	Buckhall
Requirements • Transportation (ATV) • GPS Device • Thermo pDR-1000AN personalDataRAMTM Particulate Monitor • Laboratory Services			
BUDGET G$1,000,000.00 per annum (including costs for laboratory analysis)			

10.0 CLIMATE AND CLIMATE CHANGE

10.1 Overview-definitions, concepts

Climate may be defined as 'a generalized statement of the prevailing weather conditions at a given place based on statistics of a long period of record and including mean values, departure from those means, and the probabilities associated with those departures' (Strahler and Strahler, 1996).

Basics of Climate Change. Greenhouse gases emitted by human activities alter Earth's energy balance and thus its climate. Humans also affect climate by changing the nature of the land surfaces (for example by clearing forests for farming) and through the emission of pollutants that affect the amount and type of particles in the atmosphere. Scientists have determined that, when all human and natural factors are considered, Earth's climate balance has been altered towards warming, with the biggest contributor being increases in CO_2. (National Academy of Sciences, 2014).

Greenhouse gases in the atmosphere, including water vapour, carbon dioxide, methane, and nitrous oxide, absorb heat energy and emit it in all directions (including downwards), keeping Earth's surface and lower atmosphere warm. Adding more greenhouse gases to the atmosphere enhances the effect, making Earth's surface and lower atmosphere even warmer (National Academy of Sciences, 2014).

The term ***global warming*** is used to describe the rising temperatures resulting from human activities while the term climate change refers to the complete suite events that will change, including patterns of temperature, wind, and rainfall (Primack & Corlett, 2005).

Forests contain a substantial part of the Earth's **carbon**, current rates of forest loss contribute 20% of total emissions of CO_2 (Van Bodegom, Savenije & Wit, 2009). According to Richards (1998), forests maintain climatic equilibrium through its impacts on microclimates based on damping effects on wind movement, humidity in the forest environment, temperatures in the forest environment, transpiration, evapotranspiration, and hydrological influences.

10.2 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 (ter Steege et al, 1996).

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 (GL&SC, 2013; ter Steege et al, 1996). 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 (GL&SC, 2013).

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 through 23°C.

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.

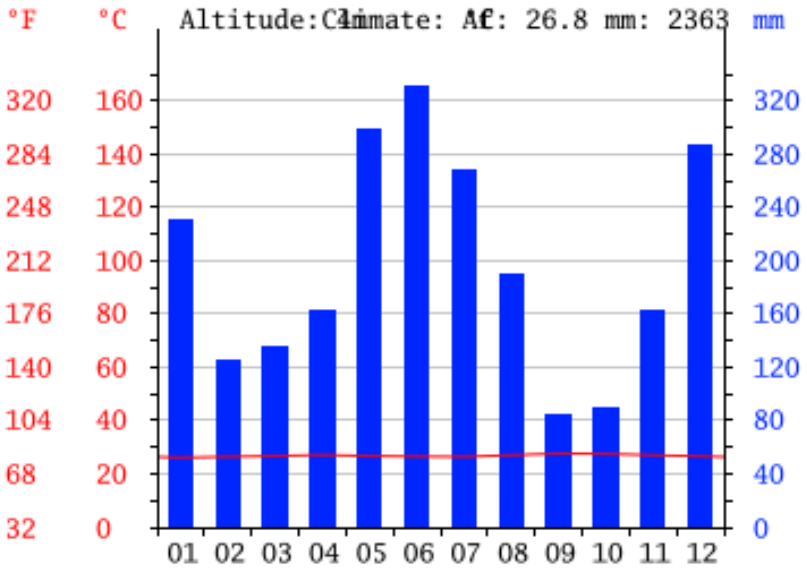

Figure 12: Climograph for Georgetown

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.

The climate of Apoteri[20]

Apoteri, located in Guyana, has a predominant Tropical rainforest climate, identified by the Köppen climate classification as 'Af'. Positioned close to the equator, it experiences elevated temperatures and a high amount of rainfall throughout the year. Rainfall is a significant factor in Apoteri, with elevated levels of precipitation commonly observed each month. The lowest amount of rainfall occurs in February, with an average precipitation of 9mm (0.35"). However, May sees a considerable increase, with average rainfall of 166mm (6.54"). This intense rainfall continues until August, after which there is a steady decline, with December recording an average rainfall of 19mm (0.75").

Temperature in Apoteri remains relatively high throughout the year. The lowest daily average low temperatures of around 22.2°C (72°F) are observed in July whilst the highest daily average high temperatures peak in March at around 34.5°C (94.1°F). It's not just the temperatures that are high; the relative humidity in the area remains above 59% throughout the year, indicating a permanently moist atmosphere.

Wind speeds are also interesting to observe in Apoteri, ranging from 7.2km/h (4.5mph) in July to 16.3km/h (10.1mph) in February. Moreover, the region experiences limited sunshine during May

[20]https://www.weather-atlas.com/en/guyana/apoteri-climate#:~:

to September with only 5.6 to 9.4 sunshine hours per day, compared to an average of 10.5 sunshine hours per day in October.

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.

10.3 Key relevant policy, legislation, guidelines, standards etc.

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'.

An Office of Climate Change (OCC), within the OOTP was established in 2017 to drive the Government's *Green Development Agenda*. The OCC uses the motto 'building the Government's climate resilience'. (Please see section 5.6.1.1)

10.4 Global Initiatives to safeguard forests.

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.

According to (Ghazoul & Shiel, 2010) 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* (Sheil, Putz & Zagt, 2010).

c) **Governance**: combat on corruption, the Kyoto Protocol and REDD+

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.

10.5 Initiatives in Guyana

In Guyana, the Office of Environment and Climate Change situate within OOTP, works across the Government of Guyana to support work on climate adaptation, mitigation, and forest conservation; it drives the development of the GSDS 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. The guidelines were defined in the final draft of the Nationally Appropriate Mitigation Actions (NAMA): greening of Towns in 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 ESIAs 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.

h) The establishment of a PES project with Norway.

i) The development of a VPA with the EU (2018-2023)

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.

10.6 Initiatives by RAI

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.

RAI will take five approaches to local initiatives to manage climate change:

a) Keep abreast of national policy positions and discussions initiated mainly by the OOTP:

b) Follow the guidelines, standards and practices recommended by the GFC and the EPA: RAI 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 sectored 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.

RAI's **forest monitoring officer** will be responsible for managing the company's efforts at climate change mitigation. RAI's climate change-based initiatives will be linked to data collected on water quality and air quality, respectively.

11.0 BIOLOGICAL RESOURCES

11.1 Overview

RAI's focus on forest resources conservation targets not just the conservation of flora and fauna, but also includes the conservation of the functional processes-for example predation, pollination processes, and seed dispersal mechanisms-that sustain forest resources. Issues of avoiding pollution, reducing instances of accelerated erosion, ensuring proper disposal of waste, and minimizing alteration of natural waterways-receives (and will receive) as much attention as directional felling of trees.

SFEP 01/2022 is virtually intact, and devoid of any roading infrastructure and it has been challenging to conduct wildlife surveys there. Fortunately, FTCI has conducted forest surveys and wildlife surveys respectively within all the nearby large concessions including TSA 01/2017 held by RAI itself, TSA 02/2017 held by VWL. In the past, FTCI was also involved in wildlife surveys in the Baishanlin suite of forest concessions which no longer exist but has been the forerunners of the concessions today.

11.2 Flora

11.2.1 Desk review-the Forest resources

(Steege, 2000) classified the forests within SFEP 01/2022 primarily as *Central Guyana Wet Forests and he described the following attributes for the type:*

a) These forests are characterized by a "high abundance of commercial and often near endemic species such as *Swartzia leiocalycina*, *Chlorocardium rodiei*, *Mora excelsa*, *Mora gonggrijpii*, *Alexa imperatricis*, *Alexis leiopetala* and *Clathrotropis spp*. *Mora excelsa* dominated forest is commonly found along the rivers often in association with *Carapa spp*. Swamps with *Pterocarpus* and *Tabebuia insignis* are not uncommon in creek heads. Extensive forest stands dominated by *Eperua falcata* and *Eperua grandiflora* with *Swartzia leiocalycina* are found on white sand soils of this region with (the latter one occurring also on the lighter brown sands).

b) There is a high abundance of (a) *Eperua grandiflora* (Ituri Wallaba 348trees/100ha; *Eperua falcata* 284 trees/100ha; Goupia glabra-240 trees/100ha; *Geissospernum spp*.) - 240 trees/100ha; Licania 208/100ha; Kakaralli and (*Eschweilera spp*)-200 trees/100ha.

c) Traditional, more popular high value species are represented as follows: Carapa guianensis (44 trees/100ha Manilkara bidentata 28 trees/100haGreenheart (Chlorocardium rodiei 4trees/100ha Purpleheart (*Peltogyne spp*)-20 trees/100 ha.

The consultants also perused a vegetation map (see Annex X) of the concession area, and this yielded the information set out in Table 21 Mixed forests on undulating to hilly terrain encompasses 70% of the forest types in the concession area and represents the area most amenable to sustainable logging. RAI selected a hilly area in the northern part of the concession area where, based on the vegetation map, there is more diversity in forest types.

Table 21 Forest types occurring within SFEP 1/2022:

#	Forest Type Description	Area	%	Typical species
1	1.1 Mixed forests on high hills	5,216.86	7.9	Purpleheart, Baromalli, Korokororo, Black Kakaralli, Haiariballi, Kabukalli.
2	1.4 Mixed forest on basic rocks	17,879.94	27.2	Purpleheart, Baromalli, Korokororo, Black Kakaralli, Haiariballi,
3	1.5 b Mixed forest South Guyana	523.74	0.8	Purpleheart, Baromalli, Korokororo, Black Kakaralli, Haiariballi,
4	2.3 White sand forest	8,499.52	12.9	Soft Wallaba, Ituri Wallaba, Baromalli, Korokororo, Black Kakaralli, Haiariballi,
5	3.2 Open Swamp	32,961.68	50.1	Mora, Crabwood, Trysil, Corkwood, White Cedar
8	No data	763.17	1.2	NA
Total		65,844.91	100	

11.2.2 Perusal of pre-harvest inventory data

The consultants benefitted from RAI's ongoing pre-harvest inventory activities and was able to analyse data from 12 blocks (1,200ha) within the East Berbice Compartment of the concession area.

11.2.3 Field work

To validate the data appearing in the various reports and more particularly to check on the current condition of the vegetation, the consultants reviewed preharvest data (100% enumeration) gathered from 12 100ha blocks in the East Berbice Compartment.

11.2.4 Main observations

Generally, too, based on data from sub-plots, there is a robust understory vegetation, representing juvenile trees of the species in the canopy layer. Most understorey species measured were juveniles of the species Mora, Aromata, Crabwood and Maho.

The most common lianas were Kufa (*Clusia spp*.), Mibi (*Heteropsis jenmanii*), Monkey ladder (*Bauhinia guianensis*) and Kapadullah (*Davilla spp*.). Palm trees common in the area were present were Ite (*Mauritia flexuosa)* in the swampy areas and representatives of *Astrocaryum* spp. and *Bactris spp*. on sloping ground.

11.2.5 Conclusion

RAI can run a feasible logging operation based on an estimate of 17.93 m^3 /ha.

11.3 Fauna

11.3.1 Overview

Guyana is a relatively rich country in terms of faunal assets (see Tables 22, 23).

Table 22: 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[21]	1,426	1,365	1,416	1,765

**Fresh water only.*

Table 23: Number of mammals described 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**

[an] Including a new species and name revisions in Simmon and Voss (1998) and Voss et al(2001).

The SFEP area 2/2022 has abundant avian and mammalian fauna, especially along the banks of the upper Berbice River. There is evidence that hunters visit the area occasionally, while fishermen traverse upper Berbice River, mostly in the rainy season.

For this work, the consultants relied primarily on camera traps set up in Surich Forest Concession, because of lack of road access to SFEP 01/2022. In addition, FTCI had done work for the TSA 1/2027 along the Berbice River between RAI's 110 km Camp and Rattlesnake Creek.

11.3.2 Methodology

The primary method used to collect data were camera traps (see Figure 13). For terrestrial surveys targeting mostly mammals, ground dwelling birds and reptiles near RAI's base camp near Aranka, three trail cameras were deployed for a 72-hour period. For the *other* areas, opportunistic sampling was done along trails in the area-using the technique set out in Figure 14, except that the line may represent a road segment. Boat captains and miners were also consulted about wildlife in the area. Other means used to identify fauna were animal tracks and spoor.

[21] The computation of the values for totals are not quite clear to the consultants.

Figure 13: Illustration of Camera traps used for estimating the occurrence of fauna.

For birds and bats, nets were used: these were set up for 30-minute periods in shaded areas in the early morning and in the late afternoon, respectively. For birds also, the consultant used a *'Birds' App'* (see Figure 53) with pre-recorded bird calls.... these pre-recorded calls, when made attracts birds of the same species and these were photographed when they came within range of the wildlife consultant.

For fishes, a seine was used for 30-minute periods in the morning and in the afternoon over a two-day period (see Figure 54).

The main publications used to support this baseline study were (Eisenberg, 1989) and (Restall, Rodner, & Lentino, 2006).

CHART SHOWING METHODOLOGY FOR FAUNAL STUDIES (EXCEPT RIVERINE ORGANISMS)

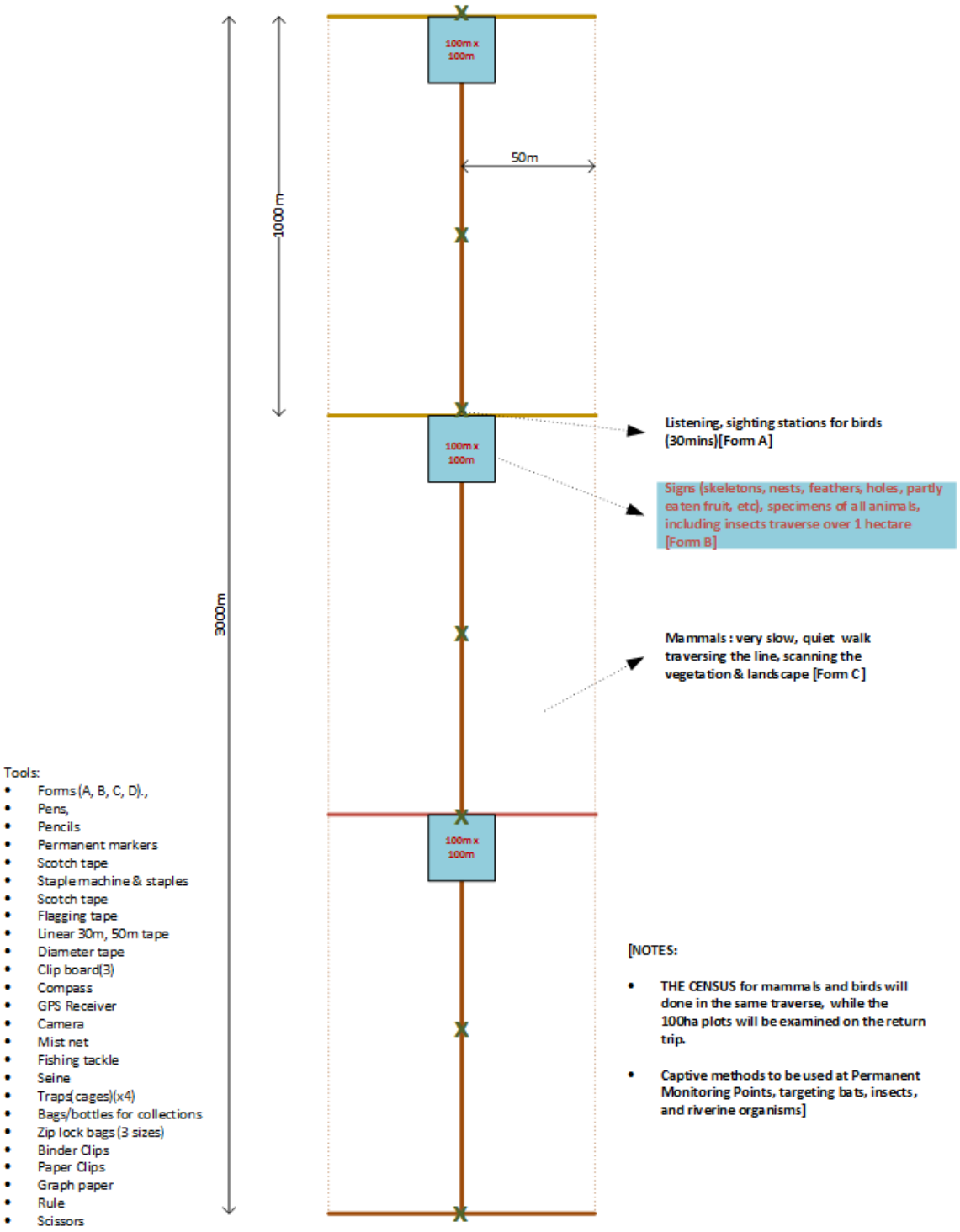

Figure 14: General scheme used to undertake terrestrial wildlife surveys

.11.3.3 Results

The results for the faunal surveys are listed in Table 24-Mammalian fauna, Table 25-Reptilian fauna, Table 26 -Avian Fauna, Table 27-Fishes, Table 28-Insects, and Table 29-Amphibians.

Table 24: List of mammals recorded in SFEP 1/2022

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
1.0 MARSUPIALIA/Opossums								
1.1	DIDEPHIDAE/Didelphinae: Opossums							
1.1.1	PHilander opossum	Gray four-eyed opossum				+		
1.1.2	Marmosa murina	Murine mouse Opossum				+		
2.0	CHIRPOTERA/BATS							
2.1	PHYLLOSTOMIDAE							
2.1.1	Carollia perspicillata	Common short-tailed bat	+					
2.1.2	Rhinophylla pumilio	Little fruit bat	+					
2.2	MOLOSSIDAE							
2.2.1	Molossus molussus	Free tailed bat	+					
2.3	EMBALLONURIDAE							
2.3.1	Saccopteryx bilineata	White lined sac winged bat				+		
2.3.2	Saccopterx leptura	Brown Sac-winged bat				+		
3.0	PRIMATES							
3.1	CEBIDAE							
3.1.1	ALOUATTINAE: Alouatta seniculus	Howler monkey	+				II	
3.1.2	CEBINAE: Cebus olivaceus	Wedge-capped Capuchin				+	II	
3.1.3	CEBINAE: Saimiri sciurieus	Squirrel Monkey				+	II	
4.0	CARNIVORA/Carnivores							
4.1	PROCYONIDAE							
4.1.1	PROCYONIDAE: Nasua nasua	South American Coati	+					
4.2	FELIDAE							
4.2.1	PANTHERINAE: Panthera onca	Jaguar		+	+		I	CR
4.2.2	FELINAE Leopardus pardalis	Ocelot				+	I	
4.2.3	FELINAE Puma concolor	Puma					II	
4.2.4	FELINAE Herpailurus yagouaroundi	Jaguarondi				+	II	
5.0	PERISSODACTYLA							
5.1	TAPIRIDAE/Tapirs							
5.1.1	Tapirus terrestris	Tapir			+		II	CR
6.0	ARTIODACTYLA							
6.1	TAYASSUIDAE/Peccaries							
6.1.1	Pecari tajacu	White-lipped peccary				+	II	
6.1.1	Tayassu tajacu	Collared peccary				+	II	
6.2	CERVIDAE/Deer							
6.2.1	Mazama americana	Red brocket deer	+					
6.2.2	Mazama gouazoubira	Gray brocket deer						

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
7.0	RODENTIA							
7.1	DASYPROCTIDAE							
7.1.1	Dasyprocta agouti	Red-rumped agouti	+					
7.2	AGOUTIDAE							
7.2.1	Agouti paca	Paca				+		
7.3	SCIURIDAE							
7.3.1	Sciurus aestuans	Guianan squirrel				+		
8.0	XENARTHRA							
8.1	DASIPODIDAE							
8.1.1	Dasypus septemcinctus	Armadillo	+					

Method of detection: S-seen; Heard T-Track/Sign; R-reported.

Table 25: List of reptiles recorded in SFEP 1/2022

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R	I	II
1.0	LEPTODACTYLIDAE							
1.1	Eleutherodactylus sp.							
1.2	Leptodactylus knudseni							
1.3	Leptodactylus sp.							
2.0	TEIIDAE							
2.1	Ameiva ameiva	Lubo lizard	+					
2.2	Kentropyx calcaratus	Forest lizard	+					
3.0	GEKKONIDAE							
3.1	Hemidactylus mabouia	Skink lizard				+		
4.0	TROPIDURIDAE/Lizards							
4.1	Tropidurus hispidus					+		
4.2	Plica plica	Forest lizard	+					
4.3	Plica umbra	Forest lizard	+					
5.0	Amphisbaenidae							
5.1	Amphisbaenidae alba					+		
6.0	DENDROBATIDAE							
6.1	Epipedobatuss femoralis		+					
7.0	COLUBRIDAE/Serpents							
7.1	Chironus carinatus	Black racer				+		
7.2	Leptophis ahaetulla	Vine snake	+					
8.0	BOIDAE							
8.1	Corallus caninus	Emerald tree boa				+		
8.2	Boa constrictor	Land Camoudi				+		
8.3	Epicrates cenchria	Rainbow boa				+		
9.0	VIPERIDAE/							
9.1	Laches muta	Bushmaster				+		
9.2	Bothrops atrox	Labaria	+					

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R	I	II
10.0	ALLIGATORIDAE							
10.1	Melanosuchus niger	Black caiman				+		
11.0	TESTUDINIDAE							
11.1	Geochelone denticulata	Yellow foot turtle	+					
14.0	IGUANIDAE							
14.1	Iguana iguana	Iguana	+					LC

Table 26: List of avian fauna recorded at SFEP 1/2022

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
1.0 ACCIPITRIDAE: Hawks, Eagles								
1.1	Ictina plumbaea	Plumbeous kite	+					
1.2	Leucoternis albicollis	White hawk	+					
1.3	Elanoides forticatus	Swallow tailed kites	+					
1.4	Spizaetus tyrannus	Black hawk eagle	+					
2.0 AOPDIDAE: Swifts								
2.1	Chaetura spinicaudus	Band rumped swift	+					
3.0 BUCCONIDAE: Puffbirds								
3.1	Nonarchus tectus	Pied puffbird	+					
3.2	Bucco capensis	Collared puffbird	+					
4.0 CRAPRIMULGIDAE: Nighthawks, Nightjars								
4.1	Caprimulgus nigrescens	Blackish nightjar	+					
5.0 CARDINALIDAE: Grosbeaks, Saltators								
5.1	Saltator grossus	Slate coloured grosbeak	+					
5.2	Cyanocompsa cynaoides	Blue-black grosbeak	+					
5.3	Caryothraustes canadensis	Yellow-green grosbeak	+					
6.0 CATHARTIDAE: Vultures								
6.1	Cathartes melambrotus	Greater yellow head vulture	+					
6.2	Sarcoramphus papa	King Vulture	+					
7.0 COLUMBIDAE: Pigeons, Doves								
7.1	Patagioenas plumbea	Plumbeous pigeon	+					
7.2	Leptotila rufaxilla	Gray fronted Dove	+					
7.3	Patagioenas subvinacea	Ruddy pigeon	+					
8.0 COTINGIDAE: Cotingas								
8.1	Querula purpurata	Purple throated fruit crow	+					
8.2	Lipaugus vociferans	Screaming pia		+				
9.0 CRACIDAE: Curassows, guans								
9.1	Penelope marail	Spix's guan	+					
9.2	Crax alector	Black Curassow	+					
10.0 CUCULIDAE: Cuckoos								
10.1	Piaya melanogaster	Black bellied cuckoo	+					
11.0 EMBERIZIDAE: Emberizine Finches								

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
11.1	Oryzyborous angolensis	Chestnut bellied seed eater		+				
12.0 FALCONIDAE: Falcons, Caracaras								
12.1	Falco rufigularis	Bat falcon		+				
12.2	Ibycter americanus	Red throated caracara	+					
12.3	Herpetotheres cachinnans	Laughing falcons		+				
13.0 FORMICARIDAE: Ground Antbirds								
13.1	Formicarius analis	Black face ant thrush	+					
13.2	Hylopezus macularis	Spotted Antpitta	+					
14.0 FRINGILLIDAE: Cardueline finches								
14.1	Euphonia cayennensis	Golden sided euphonia	+					
14.2	Euphonia plumbea	Plumbeous euphonia	+					
15.0 FURNARIIDAE: Ovenbirds								
15.1	Dendrocolaptes certhia	Amazon barred wood creeper	+					
15.2	Xiphorhynchus pardalotus	Chestnut rumped wood creeper	+					
16.0GALBULIDAE: Jacamars								
16.1	Galbula dea	Paradise Jacamar	+					
16.2	Jacamerops aureus	Great Jacamar	+					
17.0 ICTERIDAE: New World Black birds								
17.1	Psarocolius viridis	Green Oropendola	+					
18.0 PARULIDAE: Wood warblers								
18.1	PHaeothlypis rivularis	Riverbank warbler	+					
19.0 PICIDAE: Woodpeckers								
19.1	Melanerpes cruentatus	Yellow tufted woodpecker	+					
19.2	Dryocopus lineatus	Lineated woodpecker	+					
19.3	Celeus undatus	Waved woodpecker	+					
19.4	Piculus flavigula	Yellow throated woodpecker	+					
19.5	Piculus chrysochloros	Golden green woodpecker	+					
19.6	Campephilus rubricollis	Red necked woodpecker	+					
20. PSITTACIDAE: Parrots								
20.1	Touit batavicus	Lilac tailed parakeet	+					
20.2	Brotogeris chrysoptera	Golden winged parakeet	+					
20.3	Gypopsitta caica	Caica parrot	+					
20.4	Amazona dufresniana	Blue cheeked parrot	+					
20.5	Pionus menstrus	Blue headed parrot	+					
20.6	Amazona farinosa	Mealy parrot	+					
20.7	Ara chloropterus	Red and green macaw	+					
20.8	Pionus fuscus	Dusky Parrot	+					
20.9	Pionites melanocephalus	Black headed parrot	+					
21.0 PSOPHIIDAE: Trumpeters								
21.1	Psophia crepitans	Gray winged trumpeter	+					
22.0 RAMPHASTIDAE: Toucans								

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R		
22.1	Pteroglossus viridis	Green aracari	+					
22.2	Ramphastos vitellinus	Chanel billed toucan	+					
22.3	Pteroglossus aracari	Black necked aracari	+					
22.4	Selenidera culik	Guianan toucanet	+					
22.5	Ramphastos tucanus	White throated toucan	+					
23.0 THAMNOPHILIDAE: Typical antbird								
23.1	Cymbilaimus lineatus	Fasciated antstrike	+					
23.2	Thamnophilus murinus	Mouse coloured antstrike	+					
23.3	Thamnophilus doliatus	Barred antstrike	+					
23.4	Ceromacra tyrannina	Dusky antbird	+					
23.5	Myrmeciza ferruginea	Ferruginous backed antbird	+					
23.6	Herpsilochmus stictocephalus	Todd's antwren	+					
23.7	Myrmotherula menetriesii	Gray antwren	+					
24.0 THRAUPIDAE: Tanagers								
24.1	Ramphocelus carbo	Silver beaked tanager	+					
24.2	Tangara punctata	Spotted tanager	+					
24.3	Coereba flaveola	Bananaquit	+					
24.4	Tangara velia	Oral rumped tanager	+					
25.0 TINAMIDAE: Tinamous								
25.1	Crypturellus variegatus	Variegated Tinamou	+					
26.0 TROCHILIDAE: Hummingbirds								
26.1	PHaethornis superciliosus	Long tailed hermit	+					
26.2	PHaethornis ruber	Reddish hermit	+					
26.3	Topaza pella	Crimson topaz	+					
27.0 TROGLODYTIDAE: Wrens								
27.1	Henicorhina leucosticta	White breasted wood wren	+					
28.0 TROGONIDAE: Trogons								
28.1	Trogon viridis	Green backed trogon	+					
29.0 TYRANNIDAE: Flycatchers								
29.1	Tomomyias poliocephalus	Gray crowned flycatcher	+					
29.2	Myiopagis gaimardii	Forest Elaenia	+					
29.3	Colonia colonus	Long tailed tyrant	+					
29.4	Tyrannus melancholicus	Tropical king bird	+					
29.5	Zimmerius gracilipes	Slender footed tyrannulet	+					
29.6	PHilohydor lictor	Lesser kiskadee	+					
30.0 VIREONIDAE : Vireos								
30.1	Hylophilus thoracicus	Lemon chested greenlet	+					
30.2	Vireolanius leucotis	Slaty-capped shrike vireo	+					
30.3	Hylophilus musicicapinus	Buff-cheeked greenlet	+					

Table 27: List of fishes recorded at SFEP 1/2022

#	SCIENTIFIC NAME	COMMON NAME	IDENTIFICATION			CITES	IUCN
			S	R	O		
1	SERRASALMIDAE						
1.1	Serrasalmus nattereri		+				
1.2	Metynnis hypsauchen						
2	LORICARIIDAE		+				
2.1	Ancistrus spp						
3	ERYTHRINIDAE						
3.1	Erythinus erythrinus	Yarrow	+				
3.2	Hoplias malabaricus	Huri	+				
3.3	Hoplias marcpthalmus	Haimara	+				
4	CYNODONTIDAE						
4.1	Hydrolicus scomperoides	Biara	+				
4.2	Leporinus falcatus		+				
5	CICHLIDAE						
5.1	Cichlasoma festivum	Patwa	+				
5.2	Crenicichla alta	Sunfish	+				

Table 28: List of insects recorded within SFEP 01/2022

#	SCIENTIFIC NAME	COMMON NAME	IDENTIFICATION				CITES	IUCN
			S	H				
1.0	COLEOPTERA/ Beetles							
1.1	1.1 CERAMBYCIDAE							
1.1.1	1.1.1 Long horned beetles		+					
1.2	1.2 CURCULIONOIDEAE							
1.2.1	1.2.1 Snout beetles		+					
2.0	LEPIDOPTERA/Butterflies		+					
3.0	HEMIPTERA/Cicadas, etc		+					
4.0	ORTHOPTERA/Grasshoppers		+					
5.0	MANTODEA/Praying Mantis		+					
6.0	ODONATA/Dragonflies		+					
7.0	HYMENOPTERA/Ants, bees, etc		+					
8.0	DIPTERA/Flies		+					

Table 29: List of amphibians recorded at SFEP 1/2017

#	SCIENTIFIC NAME	COMMON NAME	METHOD OF DETECTION				CITES	IUCN
			S	H	T	R	I	II
1.0	BUFONIDAE/Toads							
1.1	Bufo marinus	Common Toad	+					
1.2	Bufo guttratus	Land toad	+					
2.0	HYLIDAE/Frogs							
2.1	Hyla granosa	Tree frog	+					
2.2	Hyla boans	Barking frog		+				

11.4 Impact Assessment

11.4.1 Flora

A major impact of the selection system of timber harvesting based on diameter limits for merchantable trees, the selection of merchantable species, and the selection of trees of good form, is the *high grading* or *creaming* of the logged forest ((Fimbel, Grajal, & Robinson, 2001). 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 $20m^3$/hectare for a felling cycle of 60 years is applied. Logging also removes trees from the forest at a faster rate 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*[22], *Renialmia spp*, *Miconia spp,* and *Trema spp)* which eventually influence the floristic composition of the forest in the long term (Steege et al, 1996).

The removal of logs during timber harvesting tasks represents 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.

Poorly executed logging and skidding damages residual trees and may unwittingly produce forest gaps and forest fragmentation which creates a modified, mostly unfavourable environment for seedlings of merchantable species that thrive in shade.

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).

11.4.2 Fauna

Fauna thrives in tropical forests because these provides innumerable habitats and niches, including those linked to the vertical stratification of forests, where 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). Some animals are active only by day (most birds, monkeys), some only by night (labba, bats, owls, opossum) 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 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

[22] This is a commercial species, but the mass of seedlings does not always translate into well stocked stands of the species.

deal on the species of animals and their capacity to adapt quickly to changes (Fimbel, Grajal, & Robinson, 2001). Incidentally, the species composition of gaps is an indicator of animal activity: for example, the seeds of Burburu (*Solanum stramonifolium*) are dispersed by bats, birds, and monkeys (van Andel, 2000)

Based on casual observation in logged over forests, impacts from logging are temporary, in the sense that the population of terrestrial animals such as deer, tapir, agouti, powis, and jaguars in logged over forests **appears** to be the same as in intact forests. This scenario exists currently in the Ianna District where mining has been in existence for many, many years, although strictly speaking there has been no specific study in this regard. However, a resident of Ianna pointed to a particular pond in the community where an otter lives, free of any molestation by residents there.

11.5 Mitigation and Monitoring Measures

For flora, RAI will follow strict RIL practices, **planning all interventions** in the forest resources and paying special attention to *directional tree felling* and *skid trail planning*. RAI will make every effort to avoid water ponding in any form which restricts tree growth.

RAI 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.

RAI'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 continue to carry out all forest functions and while some ecological relationships are destroyed, new ones emerge.

For fauna, RAI'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 RAI**. Signage to this effect will be posted along the primary roads. (RAI and its consultants will rely on trial cameras for all future work related to wildlife censuses at the monitoring stations or elsewhere).

Forest gaps stymy the movement of fauna that will not use open spaces (Fimbel, Grajal, & Robinson, 2001). 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.

RAI has interest in water conservation because it is strongly related to general ecosystem health and the survival of riverine fauna in particular; consequently, RAI will support research targeting any kind of water conservation studies on the concession area. RAI will also work with the wildlife authorities to conduct a more comprehensive census of fauna on the concession area.

12.0 ECOSYSTEM SERVICES

12.1 Introduction

RAI recognizes that the forest management standards developed by the GFC as well as international stakeholders' preference for some form of forest management certification are linked to the conservation *(of the tangible and intangible benefits respectively*) of forest resources. RAI is also aware of the EPA's and local environmental NGO's drive for heightened awareness of the need for environmental management and the conservation of biodiversity. Then there are the attempts by the public at large and the media to link erratic weather patterns with climate change. RAI is passionate about sustainable forest management and its employees pay close attention to local and global developments on sustainable forest resources management.

12.2 Definitions and scope

An '*ecosystem' may be defined as* a 'group of organisms and the environment with which the organisms interact' (Strahler & Strahler, 1996).

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'*.

ITTO-IUCN (2009) defines ecosystem as *'all plants, animals and micro-organisms in an area together with their physical environment, interacting as a functional system'*.

Three terms are also work looking at:

a) ***'Ecosystem approach'*** is 'a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (ITTO/IUCN, 2009).

b) ***'Ecosystem management***' refers to the integrated management of an ecosystem (ITTO/IUCN, 2009).

c) **'Ecosystem services' refer to** the direct and indirect contributions of ecosystems to human well-being; the concept *'economic goods and services'* is synonymous with ecosystem services (TEEB, 2010).

An ecosystem refers to a set of biotic and abiotic components woven together in such a way that the system sustains itself. The biotic components refer to animals, plants, and micro-organisms while the abiotic components refer to edaphic and atmospheric parameters, respectively.

The coexistence of plants and animals in the forest environment led to the following:

(a) *plant-plant* interactions (such as epiphytic plants or parasitic plants on a host tree),

(b) *animal-plant* interactions (such as animals feeding on plants or their fruits, bees pollinating flowers or birds disseminating seeds); and

(c) *animal-animal* interactions (such as predation, for example carnivores feeding on herbivores)

For local tropical forests, abiotic components include:

(a) ***Soil***-which provide mechanical support to plants, facilitate their growth through nutrient cycling processes from the weathering of primary rock, the decomposition of organic material and the leaching of solutes (Richards, 1998). Soil ph., soil temperature, soil moisture, soil texture and water retention capacity are also major factors influencing plant growth and soil biology.

Edaphic properties are frequently linked to landform; for example, the classification of montane and sub-montane forests is based on altitude. Certain edaphic properties (soil texture, ph., extremely free drainage, or impeded drainage due to hardpans) in association with landform may severely restrict the nature of the vegetation present. Hammond (2005) refers to the Guiana Shield as a vast expanse of low-land forests, mountains, wetlands, and savannah. The diversity of forest types in Guyana (see Figure 15) is aligned to topography and terrain.

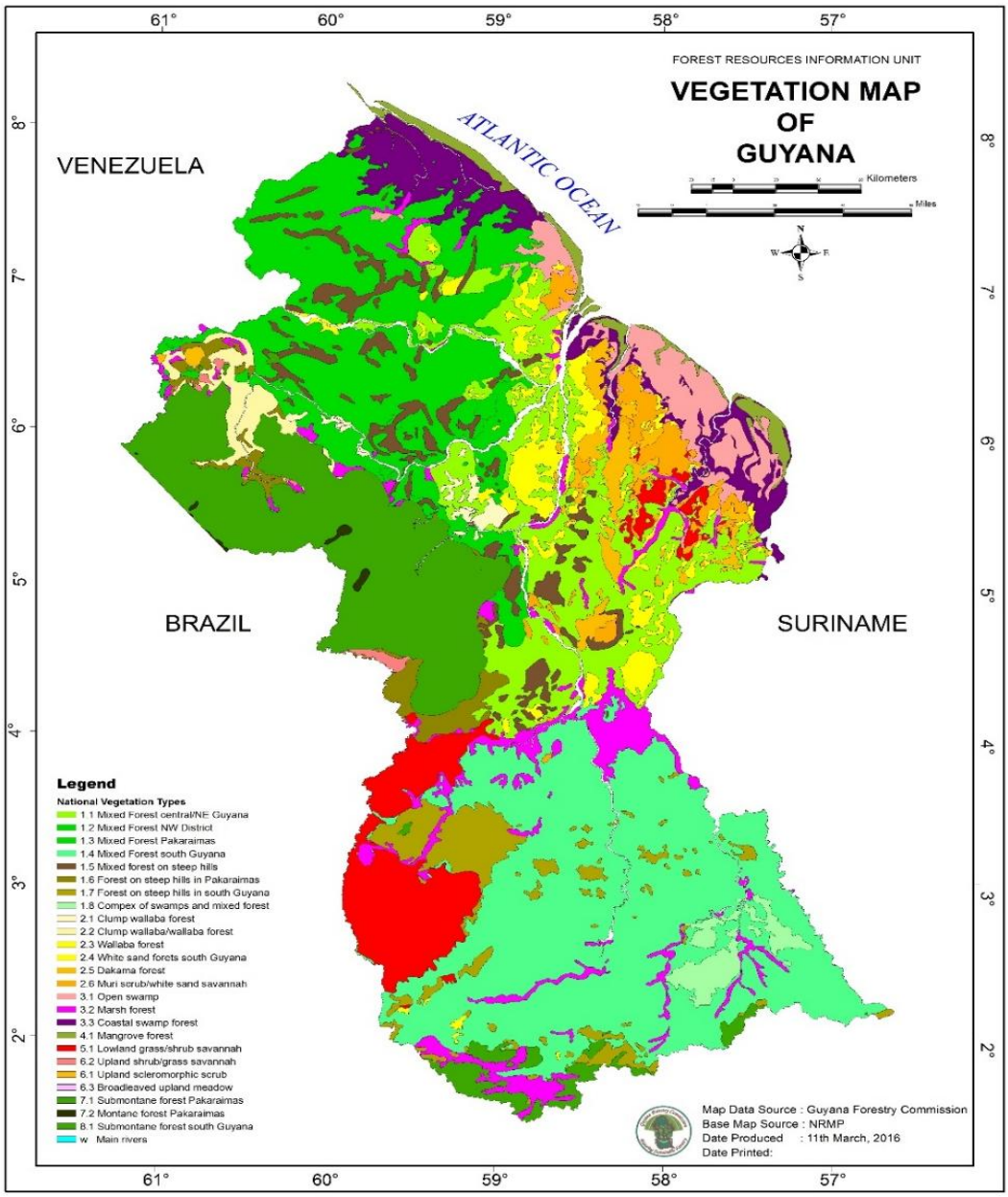

Figure 15: Vegetation map of Guyana indicating the diversity of forest types (GLSC, 2013; GFC 2019)

(b) ***Environmental (including microclimatic) phenomena:*** rainfall, wind, sunlight, relative humidity.

The interaction of biotic and abiotic components of ecosystems creates what are commonly referred to *geo-chemical cycles*: for example, the carbon cycle or the hydrological cycle.

12.3 Key relevant policy, legislation, guidelines, standards etc.

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 ≥8,000ha must be preserved (and managed as biodiversity reserves). RAI has already earmarked an area of 15,894 ha for a biodiversity reserve (see Map 2).

The *Protected Areas Act 2011* has the following preamble: an Act to provide for the protection of Guyana's natural heritage and natural capital, the creation, management and financing of a national system of protected areas; *the maintenance of ecosystem services of national and global importance* including climate regulation; the establishment and management of a protected areas trust fund; the fulfilment of Guyana's international environmental responsibilities; public participation in protected areas and conservation; and related purposes.

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

12.4 Existing information, Surveys and Baseline studies

The protected areas network (see Figure 16), 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 km^2 of *private property* managed by the *Konashen Indigenous Community*. In addition, within the '*productive forests'* category on *active* forest concessionaires, forest concessionaires *and* the GFC together co-manage a total of 866.6 km^2 of biodiversity reserves[23].

[23] Holders of forest concession agreements/ State Forest authorizations for areas >8000 ha must establish a biodiversity on an area equivalent to 4.5% of the area designated as *productive forests* of the concession. The location of the reserve must be agreed with the GFC.

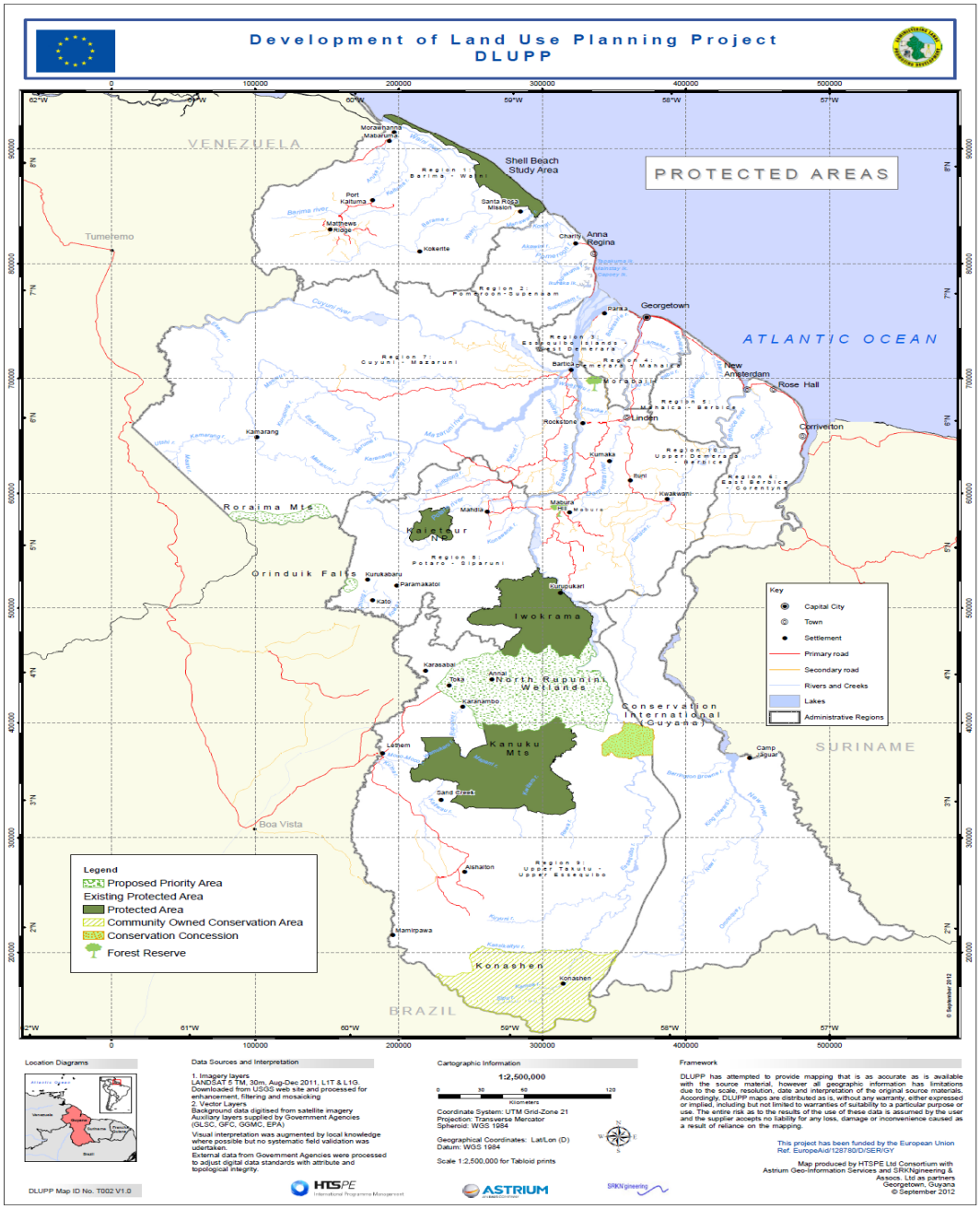

Figure 16: Map of Protected Area at December 2012 (GLSC, 2013)

According to TEEB (2010), ecosystems are critical because they provide humans with *four categories* of services (see also Table 30):

(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

(d) *Cultural services*: experiences with aesthetic phenomena.

Table 30: Typical ecosystem services garnered from forests

THE EONOMICS OF ECOSYSTEMS AND BIODIVERSITY: CATEGORIES OF ECOSYSTEM SERVICES (http://www.teebweb.org/resources/ecosystem-services/)
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.
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.
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.
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.
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.
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.
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.
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.
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
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
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
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)
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.
3.0 Habitat or Supporting Services

THE EONOMICS OF ECOSYSTEMS AND BIODIVERSITY: CATEGORIES OF ECOSYSTEM SERVICES (http://www.teebweb.org/resources/ecosystem-services/)
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.
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.
4.0 CULTURAL SERVICES
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.
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.

12.5 Impact prediction and assessment.

The key issues of interest for loggers are the functional aspects of forests and the need to ensure that these processes are not unduly disrupted because they form the basis of forest sustainability.

The core processes include:

a) *Pollination*: this refers generally to the transfer of pollen between flowers: birds and insects are the main agents

b) *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 (Basset, 1999).

c) *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.

d) *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.

12.6 Mitigation and monitoring - Environmental and Social Management Plan

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.

RAI will be using RIL principles and practices in association with the COP and GFFO. Other measures to be taken to conserve water resources, soil and air quality will also contribute to

ecosystem conservation. These measures will be articulated in FMPs, AOPs and annual reports to the EPA. RAI will undertake regular efforts to get workers to take a responsible approach to environmental conservation.

Damage to the shared ecosystems within the area held by SFEP 01/2022 is inevitable. Mining leads to the removal 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 RAI. The draining or back filling of exploratory pits and mined sites are areas where miners and RAI can cooperate.

13.0 NOISE AND VIBRATION

INCOMPLETE

13.1 Introduction

Major sources of noise and vibration in forestry operations emanate from equipment used for earthworks linked to road construction and road maintenance respectively, tree felling activities and log skidding and log transport. Also, at base camps, generators and other mechanical equipment in workshops generate noise and vibration.

The proximity to noise is a major hazard for humans as well as animals. RAI is committed to mitigating noise and vibration in every case where this is achievable. Employee sensitization about the issues of noise and vibration and their respective mitigation will be RAI's main thrust in its noise and vibration mitigation practices.

13.2 Definitions and scope

The term 'noise' covers all sound which can result in hearing impairment or be harmful to health or otherwise dangerous (ILO, 1977).

The term 'vibration' covers any vibration which is transmitted to the human body through solid structures and is harmful to health or otherwise dangerous (ILO, 1997).

13.3 Legislation

The Environmental Protection (Noise Management) Regulations 2000 (see Section 5.4.3) is the primary noise management legislation in Guyana. The EPA and the GNBS have published standards (see Tables 7, 41) 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 31: GNBS Guideline Values for noise in specific environments (Source: GNBS 2010)

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

13.4 Baseline information

Clusters of noise measurements were taken in at various locations within and around the SFEP 2/2011 (now converted to TSA 1/2017) and given the comprehensiveness of that data set, the consultants will use that information (see Annex 15).

13.5 Results and Discussion

See Annex 15

13.6 Impact Assessment

Employees of RAI 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.

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.

13.7 Mitigations Measures

RAI 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.

14.0 LAND SCAPE AND VISUAL RESOURCES

14.1 Introduction

Landscapes in the concession area are a combination of forest types and landform (see Figure 17).

Figure 17: Typical landscapes within SFEP 1/2022

Annex X illustrates the landform across the concession area.

14.2 Definitions and Scope

Rainforest landscapes are influenced by variables such as weather, drainage, and soil (Ghazoul & Shiel, 2010). Some authors use the term 'landscape ecology'-the study of spatial patterns, processes and change across biological and cultural structures within areas encompassing multiple ecosystems (Wade and Sommer, 2006). At a regional scale, the Guiana Shield may be described as 'a massive landscape designated simply as a land of old rock, poor soils, much water, extensive forests and few people' (Hammond, 2005).

14.3 Key relevant policy, legislation, guidelines, and standards.

Restricting forest fragmentation is a major objective of RIL practices and selective logging.

Sections 4.3.1 and 4.3.2 of the (mandatory) COP with prescriptions on the need for pre-harvest data for more 'economical forest harvesting' and Section 5.1 which seeks to 'limit the area cleared' for road networks in essence restrict the formation of forest gaps, forest fragmentation and forest degradation.

14.4 Impact prediction and assessment

Logging 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 & Shiel, 2010). Fires and extended flooding alter landscapes. Sediments produced from accelerated erosion that in turn emanates from poor road design or road maintenance could the aesthetic values of the river and by default, the landscape.

14.5 Mitigation and monitoring

RAI anticipates that its embrace of RIL practices will support forest conservation and conservation of landscapes. Every effort will be made to avoid forest fires, stream pollution, deforestation, and forest degradation.

RAI's priority is to ensure that all employees share responsibility for avoiding forest fires and stream pollution. RAI 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. Smokers will be asked to carry a small bottle or tin to store cigarette butts until these can be disposed of in pits near the camp.

There will be two main measures to avoid stream pollution, as follows:

a) No major road works will be carried out in the rainy season, and no activity requiring earthworks will be done during a rainstorm

b) No water from side drains or ditches will be allowed to enter directly into water courses: preferably such water will be led into special pits ('*dead sumps'*) where it will lodge and allowed to infiltrate into the soil. Alternatively, the water will be channelled 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.

RAI will post signs (see Figure 18) at workplaces to reinforce information passed on during briefing sessions.

Figure 18: Typical signage RAI will use to encourage good practices

15.0 CULTURAL HERITAGE

15.1 Introduction

It is desirable to conserve assets that reflect our cultural heritage. Many persons would have traversed the concession area in the past, and it is desirable to protect any asset that indicates the story of their trip. RAI will encourage initiatives that identify and preserve any item of archaeological importance.

15.2 Baseline information

To date, no assets of archaeological importance have been detected within the concession area. RAI's employees will be living and working on the concession area for several weeks at a time and staffs will be encouraged to document events they find interesting.

15.3 Impact predictions

In the pursuit of its logging operations, RAI will develop the concession area in a general east west orientation. Unless field operatives are vigilant, items of indigenous or archaeological importance may be destroyed.

15.4 RAI's policies

RAI will adopt the following policies in the development of the concession:

a) The location of RAI's biodiversity reserve effectively isolates RAI's operations from Apoteri Amerindian Village.

b) RAI 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.

16.0 SOCIO-ECONOMIC AND CULTURAL IMPACTS (DIRECT AND INDIRECT)

16.1 Introduction

The impacts generated by RAI's proposed development of its forest concession are linked to increased access to the upper Berbice River generally, and RAI's road networks, in particular. On the other hand, road networks generally allow the business community and public officials particularly the Ministry of health to extend their extension activities further inland. move larger amounts of cargo at a faster rate.

16.2 Definitions and scope

In a concession with an area more than 65,000ha of intact forests, stakeholders' interest covers a wide range of interests. All stakeholders are concerned about the quality of water within major waterways because it affects human health directly. Other stakeholders might be concerned with the integrity of watersheds or faunal populations or endemic tree species in the area. The National Forest Policy Statement 2018 (GFC, 2018) deliberately includes not only provisions for the sustainable harvesting of timber but also the whole gamut of services generated by forests. TEEB (2010) described the services as -provisioning services, regulating services, habitat or supporting services, and cultural services (TEEB, 2010).

16.3 Baseline studies

RAI's consultants engaged in extensive formal and informal consultations with stakeholders. The consultations, include discussions linked with the developers of other SFEPs in the Upper Berbice District.

16.4 Impact prediction and assessment

16.4.1 Positive Direct Impacts

Residents of Kwakwani, Hururu Ituni and even Apoteri are hoping that they will be recruited by RAI. RAI's corporate social responsibility thrust will kick in when operations start. Priority will be given to collaboration with other developers to keep the UNAMCO Road in a proper condition and to control the dust nuisance in the dry season. Mining activity will expand as miners take advantage of improved road networks to access their 'new' areas for gold mining activity. Public officials will take advantage of improved road networks developed by RAI to monitor issues of public health, public security and other monitoring or outreach functions.

16.4.2 Positive indirect impacts

The expansion of business in the upper Berbice District will encourage other businesses such as GTT or Digicel who would set up Cell Towers in the hinterland improving communication links with the interior.

A higher volume of economic activity in the Upper Berbice District may encourage agencies such as the MOH, the MOHA and the MOPW to invest more resources into the area, expanding social and extension type services to the general area.

16.4.3 Negative Direct Impacts

RAI may need to impose restrictions on the use of its roads within the concession and this could be a cause for conflict. At the same time, RAI wants to place restrictions on hunting, fishing, and littering and this may not go down well with persons accessing the concession area.

Vehicles transiting RAI's road networks and UNAMCO Road will add to the volume of impacts from noise, and vibration more hazards from dust. Excessive vehicular traffic on logging roads represents a hazard and may stymy production. For example, if a miner's truck suffered a mechanical defect on the roadway, it may end up blocking loaded logging trucks from passing.

Figure 19: A typical situation along the UNAMCO Road in the dry season

Easy access to the forest concession may be worrisome to the GPF, the mining community and RAI's field officers.

16.4.4 Negative indirect impacts

Expanded activity in the upper Berbice District may put a strain on public agencies with limited budgets, forcing them to, on the one hand to allocate resources for hinterland areas, and on the other hand reducing some activities in more populated, urban areas where their presence and actions are more meaningful.

The core impacts are summarized in Table 32 and detailed in Table 33.

Table 32: Core socio-economic and cultural impacts

#	Issue	Nature of Impact
1	Employment	• Creation of opportunities for employment and training • Expanded business
2	Concession road network	• Expanded gold mining operations. • Restrictions on road use leading to conflict. • Opportunities for expanded services by public agencies • Increased opportunity for disagreeable activities
3	Road hazards	Dust hazards More congestion, more risk of accidents

16.5 Mitigation measures

The following measures will form the basis of RAI's response:

RAI will follow the provisions of the COP, forest management guidelines and prescribed tasks set out in its Environmental Authorization.

RAI's Forest Monitoring Officer will be proactive in engaging stakeholders so that any issues of concern will be addressed in a timely and amiable manner.

All logging trucks and heavy-duty vehicles will either travel with their lights on always or carry rotating beacons.

Table 33: Matrix of potential social impacts from RAI's Operations

Predicted Impacts	PROJECT ACTIVITIES								
	Planning Phase				Operations Phase				
	Const. of forward camps	Const. of primary access roads	100% Pre-harvest Inventories	Tree marking operations	Construction of secondary roads	Constr. of Skid trails, Log markets	Felling trees & skidding logs	Log market operations	Log haul to 110km/Kwakwani 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.

17.0 RISKS AND RISK ASSESSMENT

17.1 Introduction/Overview

There is considerable similarity between the area that RAI manages in the upper Berbice River (TSA 1/2017), and the area embodied under SFEP 1/2017: the long-haul distance and shared use of the 110km 'UNAMCO' road come readily to mind. RAI believes it has a good grasp of the variables that will impact on production. More importantly, mining activity is not considered as formidable a threat to sustainable logging as first contemplated.

RAI thinks that human resource issues represent the most serious threat to the company (see Table 45). Also, RAI has been able to identify which staffs are most vulnerable to risks (Table 46) and therefore staffs requiring special attention.

From an ecological perspective, RAI believes that the use of RIL principles and practices and the fact that the company will be harvesting less than 2% of the concession area each year, the company's logging operations will not have any significant impact. There will be modifications to the forest environment, including *commercial degradation* of forest stocking, but the short-term impact will not disrupt forest dynamics to the extent that ecological processes will be unduly stymied or halted.

17.2 Access

RAI has benefitted from the UNAMCO ROAD but will add another 50km of primary road before it starts production. RAI is quite prepared to use existing mining roads, but its preference is for designing its own roads considering the need to cater for logging trucks (with pole trailers) and consequent considerations on road curvature and road grade. RAI does not think that access nor the long haul will be a problem, based on its experience in Region 6, and the fact that hall distances exceeding 100km is the norm in the forestry sector.

17.3 Forest Resources

RAI is satisfied with the following parameters for the forest resources:

a) The quality of the merchantable stock, both in terms of the species composition and the distribution of diameter classes.

b) Terrain that is manageable for road construction and RIL based timber harvesting operations.

c) Opportunities for value added wood processing in the plywood sub-sector.

d) Opportunities to develop wood products –including furniture and exotic flooring- based on the diversity of merchantable species in the concession.

17.4 Choice of technology

RAI's timber harvesting operations will be based on RIL principles and practices which require that every aspect of the forest interventions be ***planned*** to reduce environmental impacts and achieve cost savings.

Consequently, RAI will deploy the appropriate machine for every intervention including but not limited to:

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.

RAI is confident that spare parts and the proper maintenance services are available to keep all equipment in their proper functional state. RAI is confident that the use of RIL practices associated with a maximum yield of 20 m^3 /ha and prescriptions for 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.

17.5 Constraints-shared Road use

For RAI, shared road use at the concession level is manageable (see Table 45): generally, RAI will engage with other road users to ensure that all concerns are managed properly and in a timely manner so that concerns do not escalate into conflict. The company will ensure proper communication, posting signs advising how it intends road use discipline to proceed.

For the use of the UNAMCO ROAD, RAI will simply apply basic 'care, consideration, caution, courtesy and common sense' practices in the face of other road users. RAI is also committed to supporting road maintenance efforts, by placing some of its equipment at the service of the authorities or, if necessary, proactively undertaking maintenance efforts at its own initiative and cost.

17.6 Legal framework and Policy Conflicts

No policy conflicts are anticipated that cannot be resolved by dialogue; RAI's only concern is the time required for addressing these. RAI will be monitoring developments in the natural resources sector and will ensure strict adherence to provisions of its environmental permit, and commitments in its FMP and AOP. RAI will have a monitoring officer whose specific responsibilities include checking that RAI's field operations are fully aligned to its permits and SFA.

RAI is particularly concerned about the negative effects of non-compliance with sectored policies, standards and guidelines because such non-compliance can severely affect its reputation as a reputable and responsible timber producer when implementing its marketing plans.

17.7 Constraints-Stakeholder engagements

RAI is committed to engaging with stakeholders to minimize conflict and create conditions for continuous operations. Two senior staffs will have specific responsibility for engaging stakeholders and for managing their concerns. RAI will monitor stakeholders' road use and behaviour as well as receive complaints at its outpost at 38km, UNAMCO ROAD.

17.8 Security Issues

RAI believes that currently security considerations are unlikely to stymy its operations. However, 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. RAI will rely on its stakeholder engagement protocols to identify and manage stakeholder issues.

17.9 Labour challenges

RAI has a human resources policy which guides its personnel management issues. RAI will stress the need for flexible working hours to address the peculiarities of logging operations and time sensitive production targets to ensure profitability.

RAI will ensure major attention to human resources issues because these can sap corporate time, stymy production and cause major stains on the reputation of the company.

The following issues require RAI to pay special attention to its employees:

a) RAI's success as an enterprise will depend on the self-discipline of every employee, especially in a situation where several employees will be required to work without direct supervision for extensive periods (weeks). Poor judgement, or carelessness, leading to misapplication forest management prescriptions may lead to hefty fines and severely damage the reputation of the company.

b) RAI will expend huge sums to recruit and train field operatives and machine operators. RAI will spend considerable sums providing staffs with personal protective equipment, basic accommodation and recreational facilities. RAI will also spend time on briefing sessions, educational aids, the development of manuals and standard operational procedures.

c) Finally, RAI will deploy field operatives with expensive and delicate devices, assets such as ATV or other utility vehicles, large amounts of field gear, and large amounts of fuel and oil. It is vital that field operatives be sufficiently responsible to take care of all assets and avoid wastage of consumable items.

d) RAI needs to consider employees safety, dietary preferences, and religious leanings so that work can go on smoothly. RAI needs to address gender issues. RAI needs to consider potable water supplies and Wi-Fi.

e) RAI must always make provision for timely medical attention for all field operatives, if required.

f) Finally, RAI must make provision for managing conflicts among staffs or between the company and each staff as quickly as possible. Staff's access to social media can cause major problems for the company and its reputation.

17.10 Markets

RAI believes that the market for local durable timbers will expand. RAI 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. RAI believes that its capability for selling in high end markets will depend entirely on its marketing efforts.

17.11 Ecological issues

"Tropical rainforests typically comprise a closed green evergreen canopy of about 25m or more in height, with an abundance of thick stemmed woody climbers and both herbaceous and woody epiphytes. Edaphic factors including physical-chemical properties and drainage regime influence the floristic, physiognomic and structural characteristics of the tropical rain forest community" (Turner, 2001). *RAI will argue that the*

use of RIL, selection felling of trees based on diameter at breast height limits and special measures to avoid forest fires and forest fragmentation, means that low intensity logging (about 4 trees per hectare) will have just negligible short-term impact on tropical forests.

In considering just flora, low intensity logging as practiced in Guyana will lead to commercial degradation of the forests. However, as trees are removed and some ecological relationships between species are disrupted, other ecological relationships emerge.

The story with fauna is different, however, given the capacity of tropical forests to host a wide diversity of fauna. All timber harvesting practices impact forest wildlife and their habitat through the destruction or degradation of habitat, disruption of faunal movement and the interruption of ecological interactions between organisms (Fimbel, Grajal, & Robinson, 2001).

The impact of logging on wildlife depends on the technology used and the same logging practice has different effects on various groups of animals such as bats, ungulates, birds, reptiles and amphibians.

Long term shifts in the abundance and species composition of aquatic communities can also occur because of timber harvesting due to excess sediment loads in waterways (Pringle & Benstead, 2001).

17.12 Main cost centers

RAI has computed its main cost centres as follows:

a) Labour costs and employee welfare, including training of field operatives.

b) Capital purchases of equipment.

c) 100% pre-harvest forest inventory.

d) Road construction and road maintenance respectively.

e) Timber harvesting and extraction (including hauling logs to 110km base camp).

f) Preventive maintenance of equipment.

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 social responsibilities.

i) Corporate taxes.

j) Administrative costs linked to 110Km Base Camp and forward camps; and

k) Forest monitoring tasks

l) International marketing initiatives

17.13 Analysis and conclusion

The twelve (12) items identified at 17.12 will be responsible for 98% of the operational costs and will be expressed eventually in cost/*m3*. RAI is convinced the company will recover its investments comfortably within fifteen (15) years.

Table 34 shows a simple SWOT Analysis for RAI, Table 35 shows a simple risk assessment template for the enterprise and Table 36 shows that staff with a score ≥9 require special attention.

Table 34: SWOT Analysis for RAI prior to the strat of operations

STRENGHTS	WEAKNESSES
• Location: RAI's concession boundaries are well defined, virtually no problems with neighbours. • No Amerindian Communities within the concession area. • Large stocks of merchantable timber are available. • Wide range of experience: RAI has a strong management team. • Markets: RAI has access to markets based on current operations on another SFA.	• Unfamiliarity with the mining community *in situ:* **(**No opportunity to develop a shared understanding of RAI's obligations as the holder of a large concession. It will take considerable time and effort for RAI to get to know its neighbours and to begin positive collaboration**.**
OPPORTUNITIES	**THREATS**
• New technologies: RAI can capitalize on new emerging technologies for wood processing and • New product lines: RAI can capitalize on the large number of merchantable species to generate new wood products • New market opportunities: RAI can adapt to new market conditions and customer behaviour.	• Competing land use-need to share road use: RAI will share its concession road network with many people using a wide assortment of vehicles: conformity with RAI's protocols can lead to time consuming conflicts. • Strong national policy support for miners • Inability to compete with the mining sector re remuneration packages for heavy-duty operators.

Table 35: Table illustrating RAI's general assessment of risks

ID	Risk	Consequence	Probability	Rating	Risk score	Assessment
1	Workers consider their welfare packages inadequate:	High staff turnover	0.4	5	2	Extreme
2	Worker indiscipline	Inability for compliance with standards	0.3	4	1.2	High
3	Conflict arising from shared road use	Administrative burden, reduced efficiency	0.4	4	1.6	High
4	New mining activity in blocks targeted for harvesting	Reduces production	0.3	4	1.2	High
5	Onerous legal framework	High administrative burden	0.3	4	1.2	High
6	Security issues with third parties, conflict	Reduces efficiency	0.3	3	0.9	Low
7	Unpredictable markets	Planning production becomes challenging	0.2	4	0.8	Low

Table 36: RAI's assessments of staffs who are prone to hazards at work

#	EMPLOYEE/CATEGORY	WORKSPACE												Total
		OFFICE	Mechanical Workshop (Base Camp) (Wood processing complex-Manaka)				Field Camps/Field Operations					BHR		
		Electric Shock	Inhalation of toxic fumes	Bruises, burns, cuts	Fractures , punctures	Electric Shock	Snakebites/ Insect bites	Bruises, burns, Cuts	Fractures , punctures	Fatal injury (falling trees)	Lost in the forest	Minor Accidents	Fatal Accidents	
1	FOREST MANAGER	0	0	0	1	0	1	0	1	1	1	1	1	7
2	SUPERINTENDENT -ROAD SURVEYS	0	0	0	0	0	1	1	1	1	2	2	1	9
3	SUPERINDTENDENT-LOG PRODUCTION	0	0	0	0	0	0	0	0	1	1	1	1	4
4	SUPERINTENDENT -WORKSHOP	0	1	1	1	1	0	0	0	0	0	1	1	6
5	BLOCK INSPECTORS	0	0	0	0	0	2	2	2	1	1	2	2	12
6	HVY -DTY MACHINE OPERATORS	0	1	1	0	0	1	1	1	0	0	2	2	9
7	CHOKER-MEN FOR HVY-DTY MACHINES	0	1	1	1	1	1	1	1	1	0	2	2	12
8	LORRY DRIVERS & CHOKERMEN	0	1	1	1	0	0	1	0	0	0	1	2	7
9	CHAINSAW OPERATORS & CHOKERMEN	0	1	0	0	0	2	2	1	2	1	2	2	13
10	FOREST TECHNICIANS	0	0	0	0	0	2	2	2	2	2	2	2	14
11	MECHANICS	0	1	1	1	1	1	1	1	0	0	2	1	10
12	SAWMILL TECHNICIANS	0	1	2	2	1	0	0	0	0	0	0	0	6
13	CLERICAL STAFF	0	0	0	0	0	0	0	0	0	0	1	0	1
14	SECURITY	0	1	0	0	0	1	0	0	0	0	0	0	2
15	MEDEX	0	1	0	0	0	0	0	0	0	0	0	0	1
16	COOKS	0	1	0	0	0	1	1	0	0	0	0	0	3
17	STORE KEEPERS	1	0	0	0	0	0	0	0	0	0	0	0	1
	UNLIKELY, VERY LOW PROBABILITY													
	LIKELY, REAL CHANCE OF OCCURRENCE													
	VERY LIKELY, REAL CHANCE OF OCCURRENCE AT ALL TIMES													

18.0 CUMULATIVE IMPACTS

18.1 Introduction

Loggers generally cannot afford the wages paid by the mining sector, and frequently operatives in the logging sector transition to the mining sector. It is also the case that many miners eventually opt for a more regular job in the timber industry where there are predictable pay dates and more options for family time.

Forestry developments in intact forests eventually lead to expanded mining activity. It is anticipated that forestry developments in intact forests will drive sustainable mining practices.

18.2 Definitions and scope

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 (including those linked to jewellery businesses) 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.

18.3 Cumulative Impacts

18.3.1 Positive impacts

The consultants believe that 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 closer to their families on a more regular basis. At RAI's base camp and at Buckhall there will opportunities for women to get employment as cooks, clerks, checkers, and timber graders.

The additional people in the concession area will result in a higher volume and flow of fresh meat, vegetables, water, and beverages across Regions 2, 3, 4 and 7. The demand for meat and vegetables will increase and coastal farmers will be assured of income which could lead them to expand their cultivation. Much of the fresh vegetables available in the concession area are transported from Georgetown, Linden and Kwakwani. k Essequibo. Therefore, this project will have positive benefits for all those (vendors and boat captains) in the food supply chain.

Emphasis on occupational safety and health has witnessed a massive expansion in the sale of safety vests and 'wellingtons' long boots. In fact, in Georgetown (Water Street) and Linden, there are vendors who just deal with products useful for bush craft.

18.3.2 Negative Cumulative Impacts

(a) Stress on families

Field operatives based at the concession will be away from their families for extended periods. Income earned will have to be divided between each employee's concession based 'home' and the family home. Unless managed well, this could lead to unnecessary stress within families.

RAI will not cater for families on the concession area. 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 RAI 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 of interest to the mining community. The interventions necessary to undertake logging will increase the intensity of environmental impacts on the concession area. If mining activity develops, 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; this has implications for RAI's 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.

18.4 Mitigation and monitoring - Environmental and Social Management Plan

RAI is committed to running a successful logging operation in line with the terms of its State Forest Authorization and its Environmental Authorization.

19.0 EMERGENCY RESPONSE PLAN

19.1 Overview

The ERP is intended for use by RAI'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.

19.2 Purpose

The purposes of the ERP are:

(a) To eliminate the potential causes of fire and other emergencies, prevent loss of life and damage to property and the environment.

(b) To set out procedures to be followed in case of emergencies.

(c) To establish a command chain in responding to emergencies

19.3 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) must be identified 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.

19.4 Responsibilities/ chain of command

(a) Forest Operations Manager.

The forest 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 on the nature of the emergency from the caller.

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 staff under your 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 your 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.

19.5 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 manage 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. RAI 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 RAI anticipates that such may only occur in the workshop. At least one CO_2 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.

19.6 Oil (petroleum product) spill prevention and response

(a) Storage of Oil

The following considerations apply:

a. 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.

b. The following practices would apply:

c. 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”.

d. 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.

e. The drums will be stored off the ground on raised pallets to facilitate detection of any leakage.

f. 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.

19.7 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.

19.8 Other protocols

RAI developed an Emergency Response Chart for general application (see Figure 20), a simple reporting format in case of emergencies (see Table 37 and a list of contact numbers in the event of an emergency (see Table 38) 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.

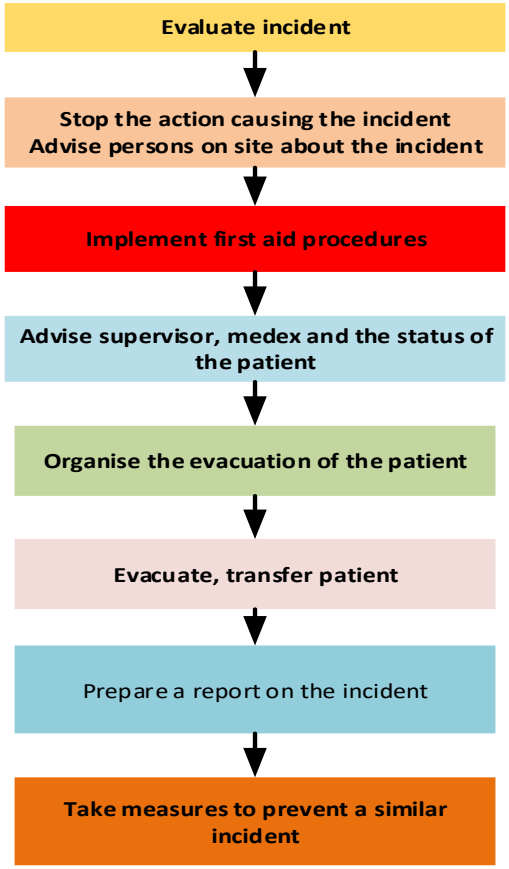

Figure 20: Outline of RAI'S draft emergency procedures

Table 37: Illustration of RAI'S Emergency Report Form

#	EVENT	REMARKS
A	**EMERGENCY:**	
1	Time discovered	
2	Date discovered	
3	Name of responder	
4	First reported by	
B	**Reported Injuries**	
5	If so, was the medical response team dispatched	
C	**FIRE HAZARD**	
6	If so, was the 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 38: Contact phone numbers for emergencies

#	Agency	Phone No(s).
1	RAI Head Office, Georgetown	592 266 5841
2	Kwakwani Hospital	592 268-2204, 592 227-4135
3	Linden Hospital	592 254 1256-9
4	Georgetown Hospital	592 227-8210/2
5	Air Services Limited/Helicopter	222-4537, 222-4368, 222-2993
6	GFC-Kwakwani Office	592 260 4084
7	Commissioner of Forests, GFC	592 226-7271/4
8	Environmental Protection Agency	225-4679, 225-5469, 225-4173

20. CONCEPTUAL CLOSURE PLAN

20.1 Factors that may lead to the closure of RAI 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.

RAI 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 there is an increase in mining activities within the compartments, or the mining activities in the compartments make field operations inoperable and unprofitable for RAI to continue logging operations.

c. If, for any reason there is a heightened threat to the safety and security of field crews.

20.2 Objective of Closure Actions

The primary 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

20.3 Closure Actions:

The core closure actions will be as follows:

a) In event of the Company's closure, the GFC, the employees, the Trade Union, RDC and relevant Government authorities, institutions and organizations would be notified. The authorities would be given adequate notice prior to the closure of the field operations (see Table 39).

b) If the Company would ever change ownership, or transferred to any other entity, the employees, the relevant Government authorities, institutions, and organizations would be notified. The notification would be provided six (6) months prior to the change in ownership.

c) NIS and PAYE contributions for staff be discontinued; employees would be advised of the status of their payments, that is whether all the appropriate contributions have been handed over to the NIS, GRA, respectively. 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). Acreage fees, royalties and taxes of all descriptions required by the Laws of Guyana shall be honoured.

d) Disposition of social infrastructures of the Company will be managed in collaboration with the GFC and the RDC. A comprehensive site clean-up activity will be undertaken at all workplaces to remove all foreign debris from the forest environment.

e) RAI will duly inform the FPA regarding the availability of trained technicians. RAI will also explore other ways of assisting ex-workers in any material away (for example gifts of tools, priority in the sale of vehicles, etc.). Expatriate staff will be repatriated in accordance with national immigration procedures.

f) If the Company would have logging or sawmilling operations in other locations in Guyana, the transfer of employees/workers would be considered.

Table 39: Summary of key steps for closure of field operations

#	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	Personnel 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
8	Plan 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
9	Give employees preference in the sale of disposable assets	Forest Monitoring Officer	Chief Clerk	-30

21.0 THE ENVIRONMENTAL MANAGEMENT PLAN -SUMMARY

21.1 Overview

This chapter summarises the key elements of RAI's environmental management plans.

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**: the CORE MANAGEMENT team of the company has been involved in logging via TSA 1/2017 in the Upper right bank Berbice River for many years. The Company has also garnered experience from its engagements with the EPA. The experience of the company has allowed it to develop robust corporate discipline and respect for the public agencies that manage forests.

b) The value of **trained employees**. RAI has ensured through regular briefings, training courses, 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**: RAI'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 RAI believes that the forest could be exploited for financial benefits and at the same time continue to offer a range of therapeutic values.

21.2 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:

a) Impacts associated with physical environment: earthworks of various kinds and for various purposes, air quality, water resources, and soil resources.

b) Impacts related to the biological/ecological environment: timber harvesting activities, wildlife, and ecological relationships.

c) Impacts related to the socio-economic environment: conflicts over land use, social problems, and road use.

d) safety, waste management

These matters are presented in Tables 40, 41 in terms of the following:

a) Predicted impact and proposed mitigation measure and the time frame for implementation (Table 40).

b) Projected situation after implementation of mitigation measures (Table 41).

The issue of **waste management** (see Item 3.4, Table 51) requires further elaboration, even though RAI will follow prescriptions of the COP.

Tree debris, comprising tree crowns and log ends due to the bucking of logs at stump will be left in the forest (at stump). Log ends arising from trimming logs at log markets and bark will be collected and deposited in natural depressions on the forest floor or special pits constructed to receive effluents from camps. Wood ends will also be used in conjunction with roadside ditches to restrict sediments from entering natural waterways.

Wood waste will also be generated at the wood processing site. Such wood waste will be taken into the forest and dumped in natural depressions.

Liquid waste generated at base camps and forward camps will be channelled to special pits dug to a depth of about 9m, and lined with tree debris where some filtration will occur and where the filtered wastewater will infiltrate into the soil. Such pits will be put at least 500m from camps and 300m from waterways. Kitchen waste including cooked food as well as discarded plant-based material will be put into pits lined with wood ends. Cans and bottles will be duly covered with earth after dumping to avoid injury to animals that forage in such pits.

RAI will employ both septic tanks and pit latrines for the disposal of human waste. The effluent from septic tanks will be channelled to pits lined with wood waste to facilitate its infiltration into the soil. Pit latrines and septic tanks will be put at least 300m from natural water courses.

Plastics, metal parts, batteries will be put into drums and buried at pre-determined points that will be well marked. Waste oil will be stored in drums and sold to anyone who wants it, including chainsaw operators or farmers who use it to treat fence posts as protection from termites. Waste oil not sold, along with any other chemical waste such as paint and grease will be put into drums and buried at pre-determined points on the forest floor.

Table 40: Potential negative impacts and corresponding mitigation measures

Predicted impact.	Proposed mitigation measures	Lead agency	Time frame for implementation
1. Physical Environment			
1.1 Earthworks Grubbing, cut and fills, scarification of soil surface, sub-soil exposure , erosion, compaction, water logging	• 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)	RAI	During the entire time frame for the project.
1.2 Air quality: Dust and smoke (especially along roads) minor changes in micro-climate	• None. 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, RAI's staff would use dust masks (as well as safety helmets, goggles, and earmuffs during normal work. • Vehicles will travel slowly <25 km/hr whenever they pass homesteads or communities.	RAI	During the entire time frame for the project.
1.3 Water resources: negligible increases in turbidity, temperature, ph.; oil spills	• 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.	RAI, 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	• 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.	RAI	During the entire time frame for the project.

Predicted impact.	Proposed mitigation measures	Lead agency	Time frame for implementation
of oil, increased potential for blow downs	• Train all field operatives in RIL practices		
2.2 Wildlife: modification, destruction of habitats, population changes	• Ensure a systematic manner of timber harvesting so that once a block is harvested, the operation moves on (and animals can return). • Restrict hunting activities by placing advisory notices at strategic points in and around the concession area. • Unique ecosystems, habitats and species will be conserved, by restricting logging in areas where they occur.	RAI	During the entire time frame for the project.
2.3 Ecological relationships; Modifications of ecological relationships. Increased potential for pests.	• Implement proper RIL practices and prescriptions of the CoP (Sections 8, 9 & 10).	RAI, GFC	During the entire time frame for the project.
3. Socio-economic environment			
3.1 Conflicts: restrictions of access, alienation of rights	• Engage residents in discussion and consultations to address mutual concerns.	RAI	As required
3.2 Social problems: crime, use of alcohol, other disagreeable behaviour; increase in life threatening behaviour through exposure to various illnesses.	• 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.	RAI	As required
3.3 Road safety: high probability of road accidents.	• 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.	RAI	During the entire time frame for the project.
3.4 Waste management: illnesses resulting from a polluted environment	• 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.	RAI	Monthly

Predicted impact.	Proposed mitigation measures	Lead agency	Time frame for implementation
	• Distribute and put-up EPA's brochure on waste management at all camps.		
3.5 Indigenous, archaeological assets: loss, destruction modification of habitats, landscapes	• Identify and isolate any assets encountered and post appropriate advisory signs and notices. • Ensure such sites are placed on all stock maps. • Build fences around assets and place appropriate signs after consultation with MOA. • 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	RAI	As required

Table 41: 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	• 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.	• Minimize removal of vegetation and encourages the re-vegetation of site impacted by clearance. • Installation of drainage system to accommodate surge in storm water.	Ex: Ir: Lt: Un: M: In: Lp
	Operation of Machineries	Operations	• Soil compaction from multiple passes of heavy vehicles over soil surface.	• 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	• May result in soil contamination from indiscriminate disposal of liquid, solid and hazardous waste	• 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	• Pollution from fuel and oil because of a spill during transportation, handling, or storage.	• Ensure that fuel, oils, and hazardous liquids are stored in a bunded are that has an impervious surface. • Due care will be applied to prevent spillage whilst handing fuel, oils, and potential hazardous liquids.	Lo: Ir: Lt: Av: Im: In: Lp. Lo: Ir: St: Av: Im: In: Lp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
Physical Environment (Water Resources)	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Construction/ Operations	• Potential increase in sediment loads and turbid streams due to surface run off and erosion. Removal of vegetation	• 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
	Construction of bridges and the installation of culverts	Construction/ Operations	• Possible reduction of stream flow from the installation of bridges and culverts	• 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	• Contamination of water in proximity to disposal, modifications in water temperature, turbidity, ph. • Pollution with oil	• Avoid the dumping of waste in creeks and streams. • Development and implementation of a waste management plan.	Lo: Ir: St: Un: M: In: Lp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
	Fuel and Oil transportation, handling, and storage	Construction/ Operation	• Contamination of water in proximity to disposal, modifications in water temperature, turbidity, ph. • Pollution with oil	• 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/ Operation	• Noise, dust, and smoke generated from the operation of the various equipment. • Changes in microclimate.	• 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/ Operation	• Noise generated for the operation of the various pieces of equipment.	• Ensure that all operative working on and in proximity to are provided with personal protective gear	Lo: Ex: Ir: Lt: Un: M: Sig: Hp
	Clearing of lands and of logs and other materials	Construction/ Operation	• Excessive exposure of soil and constant traversing of heavy-duty vehicles over exposed soil	• 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	• Dust and particulate matter resulting from the operations of chainsaws and movement of vehicles.	• 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	• Improper disposal of waste generated wood processing activities at Base Camp	• All dust generate from chainsaws and mills will be spread on the forest floor.	Lo: Ex: Ir: St: Un: M: Sig: Hp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
Biological & Ecological Environment (Flora)	Clearing of lands for the construction of base camps, roads, log markets and mechanical workshops	Construction	• Destruction of trees and from the clearing of lands for construction purposes.	• 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	• 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 though 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	• Modification, fragmentation, and destruction of habitats (especially in terms of cover and food sources); depletion in number,/variety of some species.	• 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:
	Presence of humans	Construction and Operation	• Increase in the level of predation, modifications of prevailing ecological relationships: plant-plant-plant • Plant-plant • plant-animal, • animal-animal	• All employees will be educated on the conservation and protection of wildlife.	Lo: R: St: Av: M: In: Lp

Environment Type	Project Activities	Project Phase	Potential Environmental Impact	Main Mitigation Measure	Impact Significant after Mitigation
Socio-economic Environment (Occupational Health & Safety)	All construction and Operation activities	Construction/ Operation	• Risk of accidents from the used of the various equipment onsite	• 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	• Continuous exposure to excessive noise and vibration from the operation of equipment.	• 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	• Restriction of access, alienation of rights, unplanned changes in lifestyle, restrictions on hunting.	• 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	• Increase in the incidences of crime, increase in the use of illicit drugs and alcohol, socially unacceptable behaviour and inappropriate with	• Illicit drugs and alcohol will not be allowed at camps. • All employees will be trained at a minimal level on how to engage with	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)			members of close-by communities.	members of close-by communities.	
	Hiring of Workforce	Construction /Operation	• Skills transfer , training opportunities job creation, increase incomes and cash flows	• Members of close-by communities will be sought after.	Lo: Rev: St: Av: M: Sig: Hp
	Regional Development	Construction /Operation	• 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	• 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

21.3 Basic Road management plan

21.3.1 Overview

RAI's road corridor plan has two main components (see also Table 42):

a) Maintaining its concession-based roads in a fully function state through proper road maintenance procedures.

b) Monitoring road use by other parties, including signs posted at the appropriate points.

21.3.2 Partnerships

In the pursuit of this plan, RAI will seek support from the EPA, the GFC, the GGMC, GGMDA and the Police.

Table 42: Core elements of RAI'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.	Daily, as often as the opportunity presents itself or via random visits to areas not being logged

21.4 Wildlife management plan

RAI's management has an interest in the conservation of wildlife and RAI 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 RAI are set out in Table 43.

Table 43: Core elements of RAI's Wildlife Management Plan

Action	Responsibility	Objective	Intervals
Maintain a register of sightings of mammals within the concession area. (The register will state Date/Time of sighting/Common name of species observed).	Field Operatives	A data base would be critical to track the number, variety and possibly habits of large fauna	On sight
Train field operatives to recognize the various fauna in the concession area. RAI 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
Post and maintain no hunting and no fishing signs along the concession roads	Field Operatives	This is an attempt to enforce RAI's no hunting policy.	Not applicable. (*All major road junctions*, and bridges)
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.
Be on guard for nesting animals during tree felling operations	Fellers	RAI does not wish to kill wildlife or unduly put them at risk	During operations
Monitor whether any third party is extracting wildlife from the concession area.	Drivers, technicians	• To check on hunting activities. • To ensure that RAI's technicians are not blamed unnecessarily for harvesting wildlife	During operations
RAI'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

21.5 Capacity Building and Training Plans

21.5.1 Overview

RAI intends to build capacity 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 44. RAI will conduct a training needs analysis to inform its general capacity building strategy.

Table 44: Training options prioritized for RAI'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	• Environmental management • Code of Practice	FTCI/GFC/EPA
3	• Forest Managers, • Block Inspectors, • Forest Monitoring Officer	• Code of Practice • RIL Foundation Course • OSH	FTCI Consultant
4	Forest Monitoring Officer	• Conflict management • Introduction to sustainable mining	Consultant GMSTC
5	Technicians	• Forest Surveying • Tree marking • Directional Felling • Timber Grading Course, • Tree ID Courses	GFC/FTCI
6	Technicians	First Aid	Guyana Red Cross

21.5.3 Methodology

The mechanisms to be used to build capacity, include:

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

21.6 Monitoring Plan

21.6.1 Overview

This monitoring plan is intended to address the mitigation measures in a timely and consistent manner. RAI needs to collaborate with several agencies to ensure that the mitigation measures are addressed in a meaningful and realistic manner. Table 45 lists the agencies, and the collaboration anticipated. Table 46 provides details of monitoring activities; Table 47 provides a checklist for monitoring activities and Table 48 provides a budget for monitoring the environment management plan.

Table 45: List of agencies targeted for collaboration.

#	Agency	Nature of collaboration
1	Ministry of Agriculture (Meteorological Department)	Collection of meteorological data
2	EPA	Collection/monitoring of environmental data;
3	Guyana Forestry Commission	Consultations, training, forest management
4	Upper Berbice Forest Producers Association, other loggers' associations in the district	Consultations (road use and maintenance, purchases
5	FTCI	Training
6	MOH	Consultations on health issues
8	GGMC	Consultations (mining)
9	GGMDA	Consultations: shared road use
10	MOPW	Ministry of Public Works

It is important to note that RAI, as part of its routine operations, will be maintaining appropriate records.

Table 46: RAI's plan for monitoring operations at 'SFEP 01/2022

Parameter	Responsible Party	Frequency	Location of monitoring
Physical Environment			
Earthworks: • 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	RAI, GFC	Quarterly	• Sites where earthworks are occurring. • Field camps
Water Quality: • 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	RAI, GFC	• Biannually (PMS) • Routine checks, especially in the wet season	• PMS • Areas being logged. • logged over areas. • primary roads and associated drainage structures.
Air Quality: • Number of illnesses among field operatives apparently related to smoke or dust	RAI	Biannually	Camp site: sick leave register.
Biological/Ecological Environment			
Timber harvesting. • canopy openings, • retention of seed trees, • integrity of Biodiversity Reserves. • quality of stock maps	RAI	Quarterly	Active logging areas, permanent sample plots and Biodiversity reserves
Wildlife Trapping /hunting • Movement of live animals away from the concession area • Trade in wild meat • Traps, firearms, shells	RAI/GFC	Random checks Random checks Random checks	70 km check point

Parameter	Responsible Party	Frequency	Location of monitoring
Ecological Relationships • Unusual trends, for example accelerated plant mortality, pollution of streams, dead fishes, or other fauna	RAI, GFC	On observance	Concession area
Socioeconomic Environment			
Conflicts • No. of mining camps, type of mining, vehicle movements, • Complaints lodged with the company. • Complaints lodged with the RDC or another public agency	RAI, GFC, RDC #2 GGMC, Min. of Human Services	Quarterly	Concession area,
Social & Employment issues • Number of persons recruited from Regions 2, 3. • Number of persons trained. • Rate of absence from work • Disciplinary measures taken	RAI	Biannually	Concession area
Road safety • Number of accidents/records • Number of fatal accidents/records • Number, type, and position of advisory road signs/records	RAI	Quarterly	Parika Police Station,
Health and Safety • Emergency Response Plans, • Health and safety committees, • Status of first aid kits, fire hydrants, • Implementation of OHS practices & the regular use of safety gear	RAI, GFC	Biannually	Sawmill site, field locations, housing quarters
Waste Management • Waste accumulation & waste disposal procedures • Apparent increase in vectors (rats, roaches & ,flies)	RAI	Monthly	Sawmill complex, field camps
Indigenous/Archaeological assets • Auditing of archaeological and anthropological resources	RAI	On observance (Quarterly if observed)	Logging operations [blocks] and sawmill complex

Table 47: RAI's general checklist for monitoring its operations.

ITEM	STATUS (Y-OK/ R-REQ. ATTN.)		
Office Area/Field Camp • Emergency Response Plan posted and visible. • First Aid box complete and clean • Litter bins are available	Y (OK)	Requires attention	Responsible party
Personnel : • 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 • Fire extinguishers and other firefighting aids available nearby • Physical condition of storage tanks, hoses, valves (evidence of leaks)			
Communication Equipment • 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 • 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 • 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 • Soak away filter is clear of all solid particles. • Check drains are not blocked or full			
Stock maps • Updated stock maps are available for use by all field crews			
Basic equipment • 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.)			
Vehicles • 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 • All employees have a security badge, carry, and display them on their uniforms			
Camp Hygiene • 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 48: Breakdown of annual budget for monitoring of field operations

Impact/Event	Actions	Equipment/tools	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	3 days every six months	600,000
2. Air quality[24]	Review of medical records of field operatives; consult medical personnel	N/A	2 days every six months	300,000
3. Water quality[25]	• Review of medical records of field operatives consult medical personnel. • biannual monitoring of water quality (PMS)	Clean bottles, ice, cooler to store water earmarked for a laboratory (Kaizen) (Laboratory services)	1 day per PMS, every six months: one during the dry season and one day in the wet season. For each PMS	1,000,000
4. Timber Harvesting	Visits to field crews to verify the use of stock maps, CoP, etc.1	Vehicle	3 days every three months	500,000
5. Wildlife	Recruitment of wildlife expert; physical check of traps and shells along frequently used concession roads	Vehicle, trail cameras	Biannually	500,000
6.Eco-relationships	Recruitment of a consultant; field tour across logged over sites within the concession area	Vehicle, camera	Annually	500,000
7. Conflicts	Discussions with community leaders, representatives of miners, public officials (RDC)	Vehicle, camera	Biannually (one-day session)	400,000
8. Employment	Review of company records		2 days every six months	150,000

[24] RAI will seek further legal advice on the issue of medical records.
[25] RAI will seek further legal advice on the issue of medical records.

Impact/Event	Actions	Equipment/tools	Duration	Annual cost (G$)
9. Social problems	Discussions with public officials (Police, RDC) and community leaders	Vehicle, camera	2 days every six months	800,000
10. Occupational Health & safety	Verify the use safety gear, SOPs; check on the frequency of briefing sessions	Vehicle, camera	2 days every six months	200,000
11. Road safety	Install, replace, and rehabilitate road signs; review safety records	Vehicle, camera, carpentry tools	3 days every three months	200,000
12. Fire equipment	Verify the state of all firefighting equipment		2 days every six months	150,000
13. Training	Review performance of trained personnel, identify new training opportunities		2 days every six months	1,000,000
14. Archaeological sites, indigenous assets	Replace or rehabilitate signs, fences or remove debris.	Vehicle, camera, carpentry tools	Approximately 3 days every three months	300,000
15. Co-monitoring of the Berbice River Corridors and Haimorakabra Road, respectively	Joint patrols, faunal surveys, other consultations	Boat & o/b engine; digital camera; radio/phone	4 trips per year	1,000,000
15. Contingencies				500,000
TOTAL				**8,100,000**

NB. While some activities may be conducted 'in-house', others require the recruitment of experts.

21.6.2 Core approach to stakeholder issues

RAI 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, Kwakwani

b) RAI's Administrative Centre, 110 km, UNAMCO Road

c) RAI Outpost, Kwakwani

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ANNEXES

Annex I: Terms and scope of environmental and social impact assessment-Rong-An Inc-SFEP 02/2022

TERMS AND SCOPE FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

Rong - An Inc

SFEP 02/2022

Left & Right Bank Berbice River, Right Bank Essequibo River Region No. 6

CONTENTS

PREAMBLE

This Terms and Scope for the Environmental Impact Assessment (EIA) for the proposed large-scale logging project, has been prepared in accordance with Part IV, 11 (8) of the Environmental Protection Act (EP Act.), Cap. 20:05, Laws of Guyana. It incorporates those questions and matters received from members of the public during the mandated twenty-eight-day public comment period referred to in Part IV, 11 (7) of the EP Act. Further these Terms and Scope has been prepared by the Environmental Protection Agency (EPA) after consultation with Forestry Training Centre Incorporated (FTCI), the firm it has approved to carry out the EIA.

This Terms and Scope sets out the requirements, both general and specific, that should be addressed by the consultant in the conduct of the EIA.

1. INTRODUCTION

The EPA received from Rong An Inc. an Application for Environmental Authorization for the proposed large-scale logging operation situated within SFEP 01/2022, left & right bank Berbice River, right bank Essequibo River. Region No. 6. The Application was made in accordance with section 11(1) of the EPA Act, Cap. 20:05 and was accompanied by a summary of the project with information on:

- the proposed site, design, size and duration.
- the possible effects on the environment; and
- a non-technical explanation.

The EPA conducted a review of the Application and determined in accordance with Part IV 11 (2)(b) of the EP Act, Cap.20:05, that the project may significantly affect the environment and will require an EIA. The EPA, consequently, and in accordance with Part IV 11 (6), of the EP Act, Cap.20:05, published in a daily newspaper, a notice of the project and made available to members of the public the aforementioned project summary.

In accordance with Part IV 11 (4) of the EP Act, Cap.20:05, this EIA will be carried out by an independent and suitably qualified firm. Forestry Training Centre Incorporated (FTIC) was approved by the EPA as the firm to conduct the EIA which shall: -

(a) identify, describe and evaluate the direct and indirect effects of the proposed project on the environment including: -
  (i) human beings.
  (ii) flora and fauna and species habitats.
  (iii) water.
  (iv) soil.
  (v) air and climatic factors.
  (vi) material assets, cultural heritage and landscape.
  (vii) natural resources, including how much of a particular resource is degraded or eliminated, and how quickly the natural system may deteriorate.
  (viii) the ecological balance and ecosystems.
  (ix) the interaction between the factors listed above; and
  (x) any other environmental factor which needs to be considered or which the Agency may reasonably require to be included; and
  (xi) in accordance with Part IV, 11 (4) (b) of the EP Act Cap.20:05, the EIA must assess the project with a view to the need to protect and improve human health and living conditions and the need to preserve the stability of ecosystems as well as the diversity of species.

This Terms and Scope guides the preparation of the Environmental Impact Assessment, referred to herein as the Environmental and Social Impact Assessment (ESIA).

2. BACKGROUND INFORMATION

RONG-AN INC (RAI) has applied for Environmental Authorization to undertake logging within State Forest Exploratory Permit (SFEP) 01/2022 situate in the upper Essequibo-Berbice District. The size of the concession is approximately 65,844.9 hectares of intact forest resources.

This project will involve standard logging operations that include forest planning, inventory, felling and extraction of logs, furthermore RAI proposes to invest US$1.9 million in the development of the concession area over period 2023-2024, with roading works accounting for 80% of the budget.

RAI plans to harvest timber from the concession area in line with parameters agreed with Guyana Forestry Commission (GFC) and transfer the timber to large concession (LC) 01/2017, where it will be integrated with timber that RAI produces at that concession. RAI intends to harvest a wide range of species using the principles of reduced impact logging (RIL) and prescriptions of the Code of Practice (COP).

The concession area will be organized into three compartments, these compartments will be organized into 1000mx1000m blocks, each block having a unique alpha-numerical code. RAI will adopt a systematic system of forest development in line with the Annual Allowable Cut (AAC), Forest management Plan (FMP) and Annual Operation Plan (AOP) agreed with the GFC.

Approximately Fifty-four (54) field operatives (41 employees and a total of 13 contractors) will be engaged in the development of SFEP 1/2022. RAI has opted for a 40-year felling cycle that allows the company to harvest 13.33m3/hectare. Therefore, RAI's projections are that each year, based on parameters for a sustainable harvest, and indicative forest types appearing on the vegetation map, the company will harvest 8,177.86 m3 per year from six (6) blocks, this implies a mean monthly production of 675.0 m3.

Activities associated with all design phases.

- conducting forest inventories.
- conducting major earthworks: site preparation, road building, skid trail construction, laying out culverts and bridges and log/lumber depot construction.
- Selective and directional felling of trees, skidding logs to log markets, and conveying the logs via RAI's logging roads and a portion of the Haimorakabra Road to LC 1/2017.
- Sorting and stocking the logs by species, dimensions as per 'customer orders,' and
- Environmental management.
- Optimum utilization of the concession area for the sustainable production of timber for the local and export markets, in line with sectored standards for the conservation of biodiversity, watershed and landscapes.
- Full attention to appropriate OSH practices
- Respect for other resources users and other developers utilizing RAI's logging roads or otherwise traversing the concession area.

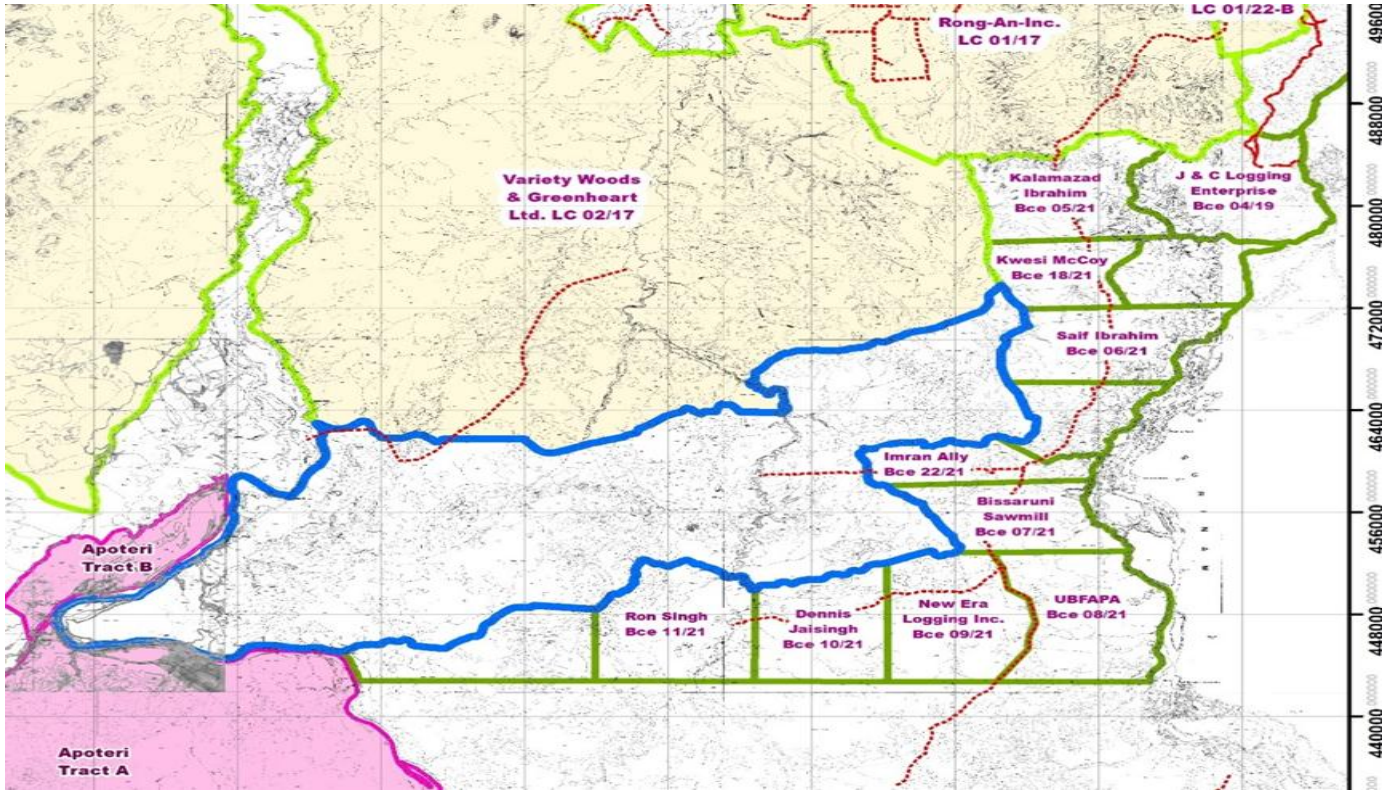
- *Timber harvesting*

The logging operations will follow RIL principles and address the requirements of the Code of Practice (COP) and Guidelines for Forest Operations (GFFO). The procedures/protocols to be followed in the development of the concession area are summarized as follows:

- Construction of primary and access roads: RAI 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.

- Productive forests: RAI will conduct additional reconnaissance work to determine the extent of productive (and non-productive forests), and to reassess the integrity areas already selected as biodiversity reserves.
- Biodiversity reserve: RAI will assess areas based on sightings of fauna and flora and establish partnerships with other agencies, including NGOs to manage these as biodiversity reserves.
- Compartments and blocks: Work has already been done to divide up the concession area into four compartments to allow for the orderly and systematic development of the forest concession. RAI will move to divide up areas designated as productive forests.
- 100% pre-harvest inventory: RAI will conduct 100% pre-harvest inventory within all blocks. This is essential to obtain stock maps that will form the basis for planning timber harvesting operations, including the identification of buffer zones and other applicable restrictions.
- Data processing: RAI will conduct processing of inventory and topographic data using computer hardware and software and integrating critical prescriptions of the Code of Practice for Timber Harvesting (for example the setting out buffer zones).
- Skid trail layout, Log market layout: RAI will use the stock maps produced to plan skid trails and log markets to match harvesting stock.
- Skid trail, log market construction: RAI will construct skid trails with a bulldozer prior to tree felling.
- Tree marking and liana cutting: RAI will have planning teams that will conduct tree marking and liana cutting prior to felling once the alignment of the skid trail is completed. (Tree marking and liana cutting speed up the rate and at which trees are felled by conducting all the preparatory tree felling activities and allowing the feller to focus on the actual felling activity).
- Directional tree felling: RAI will conduct directional felling of trees to conserve timber quality and to facilitate the skidding.
- Skidding of logs to log markets: RAI will use choker skidders with appropriate logging rigs to remove logs from stump to mill sites.
- Scaling & Grading: RAI's staff will be trained to scale and grade timber.
- Occupational health and safety: RAI will implement occupational health and safety measures in accordance with the COP and proper RIL practices.

Figure 1: Map showing SFEP 01/2022 (blue border) in relation to other forest concession



Source: Guyana Foresty Commission (GFC), 2022

3. SCOPE OF THE ESIA

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, considering 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 program for rehabilitation and restoration of the environment; an

(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 ESIA 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 ESIA 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
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 on the biophysical and socio-economical setting for the proposed project area*
- *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

4.2 Study Area/Area of Interest (AOI)

The Study Area/Area of interest (AOI) for the purposes of this ESIA has an area of 65,844.90 hectares is initially delimited Left & Right Bank Berbice River, Right Bank Essequibo River Region No. 6, between Easting UTM Coordinates 21N 324000 and 379000 and Northing 21N 445000 and 474,000. (It is expected that the ESIA will determine and delineate the actual Area of Interest by considering the extent of direct and indirect interactions between the proposed project and the physical, biological and social environments.

The study area or AOI should include not only the project site but also areas where direct and indirect impacts are anticipated. For example, it might include downstream water bodies affected by project

discharges, habitats of wildlife species that could be disrupted, or communities potentially impacted by increased traffic, noise and air emissions.

Cumulative Effects: The study area may also need to consider cumulative effects, which are the combined impacts of the proposed project in conjunction with other past, present, and reasonably foreseeable future actions.

Specific Project Location

Describe project location to include overall positioning of the block(s) to be logged; an indication of the proposed components in relation to one another and surrounding areas; acreage to be logged, boundaries, buffer zones/setback distances, roads, rivers, streams, outfalls, and any community settlements; relationship to other logging activities in the area; and clear definition of the boundaries within which the activity is intended to occupy.

Mapping and Use of Geographical Information System

Mapping, as referred to in this Terms and Scope, shall be spatial data to scale, represented in digital or printed format. Mapping should be illustrated with the use of photographs, map sheets and diagrams at easily understood and appropriate scales to illustrate the spatial extent of the project and the impact area. Printed maps of the site area should clearly indicate the layout of the facilities in the context of the immediate site, as well as relative to the wider study area. Each printed map shall be at appropriate/easily understood scales for the overview being illustrated (e.g. 1:10 000 or 1:5000 for site plans) and shall be inserted at the point of reference in the text in the ESIA. If any of the maps are large and/or bulky, these should be incorporated into one of the appendices, as appropriate. All maps and figures shall adhere to the following guidelines:

Spatial data shall be appropriately scaled.

Map/figures shall be clearly legible and include proper legends/keys.

Maps/figures shall be dated and the source of the data stated.

Maps/figures shall include an appropriate scale and a north arrow.

The use of scanned documents, texts or graphics is not acceptable.

Due to the scale and nature of this intended project and the study area, the use of geographical information systems (GIS) to represent spatial data shall be required wherever practicable. Submitted data shall be presented in a working GIS project compatible with ARC Pro and ARC Map and be organized into discrete themes (i.e. shape files — or GEO Data bases). Data themes shall illustrate, but not necessarily be limited to, the following features/attributes:

a) Proposed logging site.
b) Roads (all classes).
c) Built development (e.g. camps, villages, etc.).
d) Location of existing logging operations and their associated infrastructure.
e) Protected/Managed Areas.
f) Demographics of the study area.
g) Agriculture.

h) Recreation.
i) Topography (contour lines at appropriate intervals, preferably in meters) including derived digital elevation models (DEMs) and triangulated irregular networks (TINs).
j) Sampling points for baseline data.
k) Proposed monitoring stations/points.
l) Intended effluent points.
m) Proposed buffer zones/setback distances.
n) Site layout, i.e. major building footprints and storage areas.
o) Property holdings and land tenure.
p) Flora, including endemic species, and faunal habitats.
q) Forested areas inclusive of forest reserves and wetlands.
r) Administrative areas (e.g., regional corporation).
s) Water resource—rivers/streams, standing water bodies, aquifers/groundwater resources, known groundwater recharge areas, wells, watershed, etc.
t) Soil and geology; and
u) Known archaeological sites and sites of historical interest.

Digital data themes or shape files should be clearly labeled/annotated with supporting metadata. The use of GIS would not otherwise exclude the use of photographs, map sheets and diagrams at easily understood and appropriate scales to illustrate the spatial extent of the project and the impacted area. Such photographs should be indexed to the map sheet to aid in the illustration process. Updated high resolution aerial and satellite imagery should be used as reference data.

4.3 Methodology and significance Criteria

Describe the general methodology used in the conduct of the ESIA, including data collection and analysis, impact analysis, cumulative impact analysis, formulation of mitigation measures and monitoring programme, and assessment of alternatives. A method of determination of impact significance must be clearly outlined, including specific significance criteria that would allow the reader to understand the level of impact of the project on key ecological and socio-cultural components and how these levels were estimated.

4.4 Project alternatives

The Project Proponent is required to examine alternatives to the project design, focusing on its impact on the environment. This investigation should include, but not necessarily be limited to, the following aspects:

- Any feasible alternatives to the project design as formulated, such as the project location, sources of materials, resources, technology and management.
- The Project Proponent is required to describe the findings of any work or study undertaken to date (either by comparing potential options or selecting a preferred option such as previous option studies or preparatory assessments). This should include any issues identified during consultation with the public, regulatory authorities, special interest groups and other key stakeholders during such studies related to the alternatives and proposed project. The reasoning for the selection of the proposed project compared to other potential options should be given.

- The Project Proponent will benchmark, where applicable, the preferred alternative against case studies of similar projects and will describe reasonable alternatives to the proposed project that would achieve similar objectives. This extends to, but is not limited to, the project alternatives such as technology selection, extraction techniques, treatment of effluent, operation and maintenance procedures; and
- The no action' alternative must also be considered. Provide a comparison of impacts because of a continuation of existing activities and conditions with those of the proposed project and action alternatives. This will demonstrate potential changes in the existing socio-cultural and environmental baseline conditions without the project. Alternatives shall be discussed in sufficient detail to clarify the reasons for preferring certain options and rejecting others. The reasons for choice of the preferred option(s) must be explained, including the following:

    - A comparison of the adverse and beneficial effects (both to the environment and community) used as the basis for selection.
    - Compliance with government policy.
    - Compliance with the principles and objectives of sustainable development.
    - The impact of significant delay or abandonment of the project before all the proposed phases are completed.

4.5 Legislative and regulatory Framework

Examine the general policy, legislative and regulatory framework such as national policies and legislations relevant to the project, which are not environmental media specific, and to assess the extent to which the project is in line with these requirements. This examination should include, but not necessarily be limited to the following:

- Environmental Protection Act and the authorization process
- National environmental policy and legislation, planning and development control frameworks including protected areas and environmental quality standards with implications for the project, such as environmental protection, health and safety and land-use control.
- Regional and international agreements and conventions relevant to the project and its activities; and
- Regulatory agencies responsible for environmental protection and planning, their resources and capacity to address the issues raised by the project.

4.6 Stakeholder identification and Consultation

This is enshrined In Part IV (11) (9) of the EP Act, which states: During the environmental impact assessment the developer and the person carrying out the environmental impact assessment shall: -

(a) Consult members of the public, interested bodies and organizations.
(b) Provide members of the public on request, and at no more than the reasonable cost of photocopying, copies of information obtained for the purpose of the environmental impact assessment.
The EPA has determined that consultations should be conducted with (but not limited to) the following stakeholders:

- Environmental Protection Agency, (EPA).
- Environmental Assessment Board (EAB).
- Guyana Forestry Commission (GFC).
- Guyana Geology and Mines Commission (GGMC).
- Guyana Lands and Surveys Commission (GL&SC)
- Ministry of Amerindian Affairs.
- Guyana Lands and Surveys Commission (GL&SC).
- Guyana Wildlife Conservation Management Authority (GWCMA).
- Regional Democratic Council (RDC) Region no.6 (Ituni and Kwakwani)
- Guyana Gold and Diamond Miners Association (GGDMA) and
- Other Loggers and Miners in the vicinity
- Other business interests that maybe affected by the projects

The ESIA shall address the concerns raised during the scoping and during the consultation(s)as part of the conduct of the ESIA. **The principles of Free and Prior Informed Consent must be adhered to**. The ESIA report must demonstrate that public concerns have been adequately considered by suggesting possible modifications to the project proposal or by clarification of items within the document.

All public consultation results must be documented and relevant records included in the appendices of the EIS. These records shall also contain details on the manner in which the public was notified, the groups targeted, a description of the stakeholder consultation process, a list of all stakeholders included in the process, the number of meetings held, location of the meetings, dates held, minutes of all meetings, a copy of the survey questionnaires used (if any), and the results of surveys.

4.7 Description of the Project

A detailed project description will be provided, including design, and the various phases of the proposed project covering construction and operations; historical and current state of operations and/or exploration. Project description shall include:

- Process description of all phases (site preparation, extraction, storage, transportation, rehabilitation, decommissioning) of the proposed harvesting process; flow diagrams as far as possible to illustrate the process, including, but not be limited to:
    - Type of machinery to be utilized.
    - Method and rate of extraction, storage and transportation.

- Identification of staffing, support facilities and services that would be required during the different phases of the activity.

- Discussion of the proposed project in context of existing and/or other proposed projects or activities in the project area.

4.8 ENVIRONMENTAL SETTING/BASELINE CONDITIONS/STUDIES

Existing Information/studies

Baseline data for the specific environmental medium including data compiled by review of existing information and from NGOs, published, experts and other sources will be presented in separate chapters.

Each chapter must contain an assessment of the environmental consequences on that specific medium imposed by the project stresses for each element of the project including construction, operation and closure. The impacts must be classified based on the impact assessment methodology. The assessment must include impacts classification after implementation of mitigation measures. Mitigation (environmental management) measures and monitoring protocols must be included for respective chapter and medium to address the identified impacts.

The following is a general guide to the expected level of assessment and type of information required:

All readily available information relevant to the proposed project site and the Area of Interest (AOI) will be assembled and reviewed including local maps and any existing ESIAs. The AOI will encompass the watershed and water bodies that may be possibly affected by liquid and solid waste emanating from the project operations. The review as far as possible will examine documents held by but not limited to the EPA, the GGMC, the GFC, the GL&SC, the Ministry of Indigenous Peoples Affairs, the Hydro-meteorological Department, other local authorities and NGOs. The review will also examine data on environmental, economic and social variables which may include site geology, hydrogeology, surface water flow, land use in the project area and its vicinity, the proximity of indigenous communities and the likely presence of archaeological resources in the area etc.

Examples of documents to be reviewed include:

- Forestry studies for the area
- Geological publications for the area
- Data on terrestrial and aquatic Resources of the area
- Indigenous groups reports
- NGOs information on the AOI
- Land use and topographic Maps, etc.

All readily available historic baseline data for the bio-physical and socio-cultural and socio-economic environment must be assembled and evaluated. The historic baseline data will possibly include but not limited to:

- Biological resources in the area including the presence of any unique ecosystems, natural habitat or endangered and or critically endangered species
- Livelihoods and Economic Activities of the AOI
- Employment and Labor and Income and Household data of the AOI
- Historical and cultural association of the AOI with Indigenous Peoples
- Permanent or transient uses of the AOI by Indigenous Peoples
- Hydrology data
- Contamination levels in soil and surface water.
- Risk of natural hazards, e.g. flooding and seismic events
- Local meteorological conditions

Baseline Studies/Assessment

Field and additional studies will be undertaken to fill appropriate data and knowledge gaps to enable a comprehensive description of the baseline data for the specific medium.

The data presented shall be representative of the study area/area of interest. The term 'representative' defines the extent to which a set of measurements taken at a collection site spatially and temporally reflects the actual conditions within the study area / area of interest Therefore, in instances where the data are being collected and reported from stations that are located off site i.e. outside the boundaries of the study area or area of interest a justification must be provided to demonstrate that the data are representative of the study area/ area of interest . Otherwise, the proponent will be required to provide more accurate, site-specific data. The study must include changes that may occur before the project commences considering previous, ongoing (i.e. other operations within the defined study area/ area of interest) or future activities that could reasonably be determined to have a combined effect. Sufficient detail must be given to allow a clear understanding of the likely negative impacts of the proposed project and to assess the effectiveness of any proposed mitigation measures on the specific module. An examination of any positive impacts should also be included to ensure as comprehensive an assessment as possible. Adequate spatial and temporal samples shall be taken to ensure a proper assessment of baseline conditions.

Baseline studies shall include but not necessarily be limited to the following:

Climate, Climate Change and Air Quality

This section should examine the proposed Project in relation to climate change initiatives being undertaken nationally, such as, European Union Forest Law Enforcement, Governance and Trade (EU FLEGT) Voluntary Partnership Agreement (VPA); REDD+; and Guyana/Norway Agreement.

Further, as far as practicable the following should be described

- The wind regime of the project area, including wind speed and direction, prevailing wind conditions, seasonal variations and storm conditions as supported by representative meteorological data for the area.
- Rainfall in the areas, including seasonal variations.
- Air Temperature and Relative Humidity.
- Greenhouse Gas emission rate.
- Appropriate ambient air quality parameters associated with expected emissions of this type of project and supporting baseline data.

Noise and Vibration

The baseline shall present, assess and discuss:

- Ambient noise and vibration levels representative of the present study area supported by relevant data on:
    - Peak and average sound pressure and vibration levels.
    - Background noise and vibration levels.
    - Data on ambient sound pressure level and vibrations from readings taken for morning and afternoon and a range of descriptors used to ensure the respective areas are adequately characterized.

Land and Soils

This baseline will present:

- Soil characteristics of the site including, but not limited to:
    - Description supported by a map of the soil types and their distribution in the study area.
    - Topography is evidenced by a topographical map that shows the elevation patterns at the site and zone of impacts.
    - Soil quality baseline (extractable, what does this mean?).
- Existing Levels of soil contamination/degradation in the Field.

Waste Management

Describe and assess the expected waste streams from the proposed project activities onto the land during the construction, operational and decommissioning phases of the project. This will include information on the quantity, form (liquid, solid, gas), hazard, and toxicity of each significant waste stream, as well as any attributes that may affect its likelihood of dispersal in the environment, as well the associated risk of causing environmental harm.

Water Resources

- Surface Water Quality-including, but not limited to:
    - Assessment of ambient water quality of any natural watercourses upstream and down-stream of the site.
    - Assessment types and sources of contaminants in any streams draining from the project site into main natural water courses.
    - Water quality (based on parameters mandated by EPA Forestry EIA guidelines).
    - Analysis must include assessment of seasonal variations, and comparison of findings with acceptable water quality standards (GNBS interim Industrial Effluent Standards, World Health Organization, IFC where applicable).
    - Assessment of point and non-point sources of pollution to determine the type and extent of contamination in the area including an identification of the location of any legal or illegal gold/other mining, forestry, dumping or other activities within the project location that may be a source of pollution
- Surface Hydrology and Drainage- mapping and discussion of the existing drainage patterns/characteristics of the sites and wider study area, and the dry season and wet season flow rates of the watercourses.

Biological Environment

For this medium the baseline shall include:

- Aquatic and Terrestrial flora and fauna: characterize the biological environment to include the following:
    - Use of site-specific field surveys to assess the terrestrial and aquatic environments for impact prediction and development of mitigation and monitoring programs. The sampling regime must be scientifically rigorous and statistically significant to allow for future comparisons. Life cycles, seasonality and migration of species (where applicable) shall also be captured.

- Flora-map and describe the existing terrestrial and aquatic vegetation.
- Provide information on plant species and communities that are present within the study area, including information on any rare or endangered plant species and information on any specialized or unique plant communities that may be present.
- Mapping of plant communities and the area of estimation of any community type that may be lost due to project activities.
- Fauna of the site and their use of the surrounding environments - document and describe any species of wildlife including, but not limited to, amphibians, fish, reptiles, birds, mammals and invertebrates, that use the study area/ area of interest
- Provide a detailed habitat assessment, including identification of those of resident species of major watercourses on site, and especially those which will be altered by the project (where applicable).
- Describe any freshwater fisheries (whether commercial, subsistence, or recreational), including the species targeted by local communities in the study area.
- Identify and describe environmentally sensitive species (Plants, seeds vine) the areas of study/ area of interest; Utilization of the forest products so community can benefit.
- Identify rare, threatened, endangered and endemic species.

Ecosystem Services

The baseline should examine the direct and indirect contributions of the project area to biodiversity, health and human wellbeing with an emphasis on current users or beneficiaries. Further, the ESIA will need to provide information and assessments of forest functions and services, potential impact of the project on those functions and services, and what management measures would have to be implemented in the project design to achieve sustainable management of the project.

Social and Economic, and Cultural Environment

The baseline will describe the social and economic baseline of the project. Representation of the baseline conditions will be relevant to the proposed project's area of interest, as it relates to its potential biophysical and socio-economic and cultural impacts. This may be achieved through the collection, reporting and analysis of appropriate and sufficient data from relevant sources (including Census data, information from Village Councils, local government, community-based organizations) and primary research. Map overlays (depicting any communities within the areas of potential impact) should be used to provide a spatial portrayal of socio-economic and cultural data. Field studies shall be undertaken to fully establish an appropriate social baseline, and to update information that may no longer be current. Appropriate data gathering methods shall be used commensurate with the level of detail required to determine risk to socio-economic and cultural components.

The social baseline shall include, but not be limited to, the following information:

- Information about the traditional, existing and proposed land use in the project's area of interest identified above, and the nature, size, location and duration of their potential interactions with the environment. Land use shall be described both for amenity and aesthetics, and in terms of its importance to cultural activities
- Customs, aspiration and attitudes - indicate (by providing documentation) the acceptability of the proposed project to nearby communities and users of the area.

- Archaeological, cultural and historic value of the areas.

4.9 Impact Assessment

Identify all impacts that could arise during each phase of the operation and distinguish, where applicable, between negative and positive impacts, direct and indirect impacts, immediate, short-term and long-term impacts, and cumulative impacts. To illustrate significance, direct comparisons should be made between estimates of the potential impacts and the baseline conditions for given parameters/indicators.

Describe impacts quantitatively, as far as possible, and consider those that can occur in unforeseen circumstances. The reliability of forecasts and predictions shall be indicated as appropriate. Impacts must be categorized and illustrated using an appropriate format e.g. matrices where applicable. Data from other existing activities using the same technology should be used to compare or assist in the prediction of impacts for this proposed project, where applicable.

Areas of impact/hazards shall be illustrated in map form and those that are unavoidable or irreversible must be specifically identified. Significant changes to baseline conditions shall also be quantified where possible. A determination of impact significance shall be provided for each key environmental or socio-economic and cultural component (by major phase or activity) after considering the application of proposed mitigation measures (i.e. rank the significance of residual effects following mitigation.

The potential impacts to be discussed include, but are not limited to, those related to:

- Human beings including, but not limited to, such aspects as:
- Community (health, safety, socio-cultural).
- Investigate possible effects to demographic and socio-economic and cultural profiles of the communities that would be potentially affected by the project e.g. consider neighbouring farmlands, local employment and training, local procurement, vulnerable groups (youth and elderly, handicapped, other users of the area etc.), transport, health services, security, lifestyle and culture. The potential for unplanned settlements, overloading of any community infrastructure and social conflict between workers and communities, and the potential for the project to result in displacement/relocation of community members and/or services should also be included.
- Identify Project-Related Employment, estimate the direct employment that the project is expected to generate, this includes jobs created during construction, operation, and maintenance phases of the project. Document the following: Job types and categories. number of jobs, skill levels required and wage rates and benefits.
- The introduction of increased dangers (e.g. fire, explosion, spills, chemical and other hazardous substances, if applicable) to the surrounding environment, including neighbouring communities.
- Infrastructure and utilities (roads, bridges, water, electricity, services, waste disposal). Consider the indirect impact of accessibility of this area to humans and the attendant demand on infrastructure and utilities.
- Impact of the project on transportation planning and traffic — discuss potential health and safety impacts due to changes in traffic conditions, such as increased volumes and increased incidence of large/heavy vehicles.

- Discuss the potential for changes to air quality that might increase human exposure to contaminants/pollution including the impacts of the increased volume of dust and the potential health impacts associated with exposure to these contaminants/pollutants.
- Flora and fauna including, but not limited to, such aspects as:
    - Impacts on terrestrial and aquatic habitat use and ecology.
    - Impacts to sensitive species such as endangered or subsistence/commercially exploited species.
    - Expected changes in the health of flora and fauna will result from the introduction of the activity. This must include any expected changes to species count and diversity within the study area. The assumptions used for making such correlations must be explained.
    - Natural habitats - determine/estimate the degree of habitat fragmentation or degradation likely to occur both in qualitative and quantitative terms (i.e. acreage or extent of habitat fragmentation or reduction as well as the reduction in biodiversity and available ecological niches).
    - Wider impacts on terrestrial ecology of the study area, as effects are transferred along the food chain.
- Surface Water Quality — including, but not limited to, such aspects as:
    - Ambient water quality describes and assesses the water uses of surface water bodies found within the concession.
    - Identify point and non-point sources and their impacts on surface water quality.
    - impacts of road(s) and bridge(s) construction on water quality, run off on surface water quality.
    - Impacts of sedimentation on surface water quality.
- Air quality, climate and climate change, including, but not limited to, such aspects as:
    - the generation and movement of dust-off site during the different phases of operation.
    - Air quality because of exhaust emissions from machinery and equipment.
- Noise: estimate the potential for increased noise from the operations and vehicles, both unloaded and loaded, to the nearby communities (where applicable) and fauna.
- Soils and terrain: Assess the potential for operations to affect the stability of the substrate in terms of slope stability (i.e. vulnerability to land slippage, erosion), shear strength, porosity and compressibility. This assessment should be done in the context of baseline pre-development conditions.
- Solid waste: identify the activities of all phases of the project that may produce both hazardous and non-hazardous solid waste, and assess the possible impacts associated with the type of waste produced.
- Impacts on archaeological and historical sites and cultural resources of interest, where applicable.

4.10 MITIGATION AND MONITORING - Environmental and Social Management Plan

Mitigation measures and monitoring should be presented in the form of an Environmental and Social Management Plan (ESMP) that must be presented for each medium. The ESMP shall be management plan for the project that seeks to manage identified impacts and environmental issues (by media) resulting from the proposed project, describing the specific measures to be taken to avoid, manage or compensate for identified potential negative impacts. Mitigation measures shall specifically

describe how existing pollution would be handled to prevent a cumulative effect with respect to the intended project.

Proposed mitigation measures to reduce adverse effects and measures to enhance benefits must be clearly described. A list of all commitments for mitigation, monitoring and follow-up measures must be clearly recorded and included in the respective chapters for each environmental medium.

In consideration of significant adverse impacts that were identified propose realistic, feasible measures by employing Best Available Technologies Not Entailing Excessive Cost (BATNEEC) and Best Practicable Environmental Options (BPEO) to avoid, mitigate or remedy such impacts to acceptable levels. These should satisfy, and show comparison with, local environmental, health and safety standards/guidelines and, where these are not available, international standards/guidelines shall be used. In those cases where negative impacts are known or expected to be significant, it is to the proponent benefit to follow the impact hierarchy of avoidance, minimisation, and mitigation in the project planning. Avoidance of impacts (e.g. to sensitive areas) should be the first choice and is the most beneficial to the Applicant in economic terms. If significant impacts can be avoided, the costs and delays associated with mitigation planning and permitting are also avoided. If impacts cannot be entirely avoided, it is to the Proponent's benefit to minimise impacts for the same reasons. Mitigation is the least desirable course of action because of the costs and delays related to mitigation planning, design, permitting and implementation, as well as potential for some measure of degradation to or loss of natural resources.

A detailed monitoring plan must be provided within the ESMP for the different aspects of the project to ensure that mitigation measures are achieving their objectives. Where monitoring indicates that objectives are not being met, contingency plans to minimise adverse situations that may arise (or that have arisen) must be described. Monitoring programmes shall address the physical, biological and social impacts of the project. The parameters/indicators to be monitored and their respective frequencies of measurement must be detailed.

4.11 Cumulative Impacts

As mentioned, is section 4.2, an assessment will be conducted of the cumulative environmental effects that are likely to result from the proposed activities in combination with other existing, approved and proposed projects in the area that could reasonably be considered to have a combined effect. The cumulative assessment must be based on an adequate understanding of the design and operation of the proposed activity, as well as other existing, approved and proposed projects.

4.12 RISK ASSESSMENT

Both human health risk assessment and ecological risk will be assessed and shall consider using one to several of the following approaches:

addressing actual or perceived risks using a descriptive or qualitative approach

calculation or determination of a relative risk index based on information on several selected factors.

relative comparisons of the perceived risks of the alternatives being evaluated; and/or

a quantitative, probabilistic approach focused on actual risks of the alternatives being evaluated.

Risk assessment considerations will include human health and ecological risks, and combinations thereof. The results of the assessment including baselines and mitigation measures are to be presented in a separate chapter.

4.13 Emergency Response Plan.

An Emergency Response Plan (ERP) should be prepared outlining the response procedures and preventive measures that are essential for effective and timely management of an emergency. The following should be considered:

a) what possible emergencies may occur and what actions can be taken to prevent an emergency.
b) what precautions would minimize the effects of an emergency, should one occur.
c) what immediate actions personnel should take to contain an emergency.
d) whether employees have the skills necessary to carry out the procedures outlined within the ERP.
e) who will assume temporary command of the emergency effort.
f) who oversees which parts of the emergency operation.
g) what kinds of special services and mutual aid support are available to sustain rescue actions.
h) how key personnel will obtain information and assess reports to make critical decisions; and
i) what media relations procedures are necessary in the event of an emergency.

4.14 Conceptual Rehabilitation and Closure Plan

A conceptual closure plan shall be developed and shall include guidelines to minimize environmental degradation and to enhance the potential for long-term environmental restoration success. These guidelines shall address permanent protection of the environmental baseline conditions assessed and restoration of habitat compatible with native culture.

4.15 OTHER INFORMATION

Environmental assessment requires interdisciplinary analysis. Experts in their relevant fields should interpret information obtained and where necessary, appropriate references and technical/scientific analyses shall be provided to support such interpretations. This shall also apply to social issues, especially when dealing with sensitive matters.

An environmental impact assessment shall be submitted for public comment in accordance with Section 11 (10) of the EP Act Section 11(10) stipulates a period of not less than sixty (60) days to receive public comments and this EIA and EIS would be made available for such comments as part of an administrative record.

To aid the review process, the following information should be submitted to the EPA:

- Four (4) hard copies and one (1) digital copy of the EIA report to be submitted to the EPA in the first instance for preliminary review. If the EPA is not satisfied with the original submission, the documents will be returned to the Proponent to address these concerns; If the submission is deemed acceptable, the proponent will be requested to submit a further 10 hard copies and two (2) digital copies of the EIS.

- Digital copies of the EIS should be in PDF format and the Executive Summary in Microsoft Word. Each Module/Volume of the EIS and each Appendix must be individual PDF files; all spatial and mapped data required must be provided digitally in a GIS format compatible with ARC Pro and ARC Map

These will be copied and used for the public comment process, as well as being available to other departments/agencies that would have a critical role in the evaluation of the EIS.

ANNEX II: CVs OF CONSULTANTS

1. EES
2. FTCI
    a. Robert Skeete
    b. Lou Ann
    c. Winston Kissoon
    d. Mariea Suegrim
3. Philip Odwin
4. G. Marshall

ENVIRONMENTAL ENGINEERING SOLUTIONS

A. Environmental Engineering Solutions EES

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): • Air Pollution Control • Solid Waste Management • Wastewater Treatment • Contaminated sites: prevention, control and restoration Environmental Studies: • Environmental Impact Assessment • Environmental Management Plan • Environmental Annual Report • Environmental Planning • Project Development • Research /Training • Site Inspections

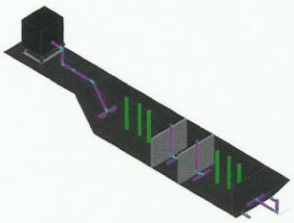
Fields of activity and services provided

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.

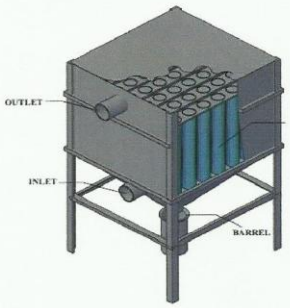
A. Environmental Engineering Solutions EES-Page 2 of 7

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.

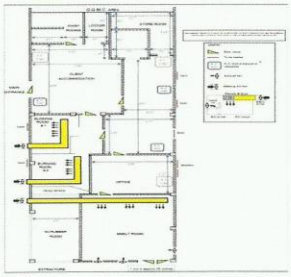


Dust Collector System Design (2011).
The project implied a conceptual design and supervision of a dust collector system, for the air pollution control.
Project beneficiary: A. Cayume Hakh & Sons, Rice Farmer's Millers & Exporters



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.

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).

Environmental and Social Impact Assessment (ESIA) Update for Sherwood Forrest Inc. Logging Concession (March, 2015).

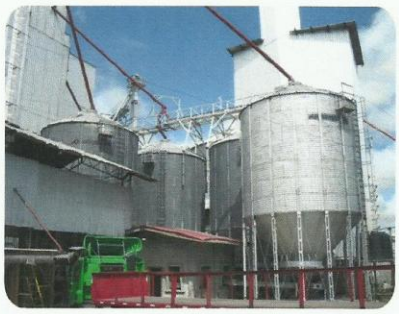
Project beneficiary: Baishanlin International Forest Development Inc.

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).

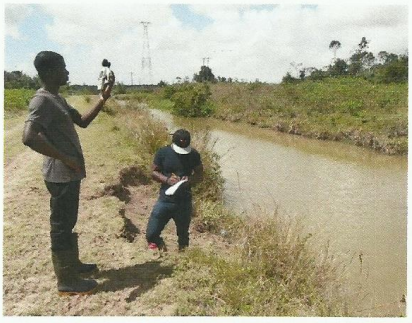
Project beneficiary: Baishanlin International Forest Development Inc.

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 Assesment.

Environmental and Social Impact Assessment (ESIA) - Physical Environment Chapter Forest Concession (August 2015).
Project beneficiary: Rong-An Inc.

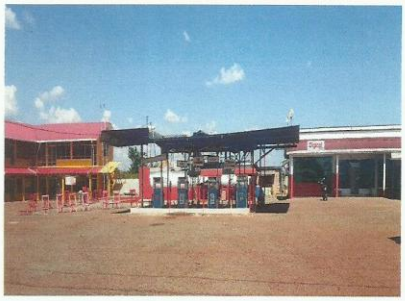
A. Environmental Engineering Solutions EES: Page 7 of 7

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

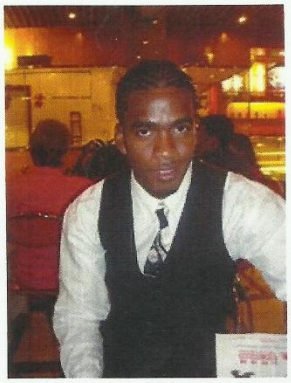


Environmental Engineering Solutions (EES) works in accordance with international specifications and the Environmental Protection Agency in Guyana to comply with the Environmental Standards and Regulations.

ROBERT SKEETE

Curriculum Vitae
Robert Skeete

Personal Information



Name: Robert Dellon Skeete

Address: Lot 26 & 27 Windsor Castle, Essequibo Coast, Guyana, South America.

Date of Birth: 24th July, 1989.

Nationality: Guyanese

Marital Status: Single

Contact Information:

Phone #: 592-679-6686, 592-695-2343, 592-651-1748

E-mail: rskeete724@gmail.com

Education

2013: University of Guyana: BSc. Degree in Forestry.

2010: University of Guyana: Diploma in Forestry.

2005-2006: Guyana School of Agriculture: Certificate in Forestry.

2001-2005: Anna Regina Multilateral School.

Experience

2016- Present – Forestry Training Centre Inc; Forester

2013- 2015 – Guyana Forestry Commission; as a Monitoring Inspector.

2009: Sand Springs Mining Company: Field Technician for ESIAs

2008: Amaila Falls Hydro Project; Field Technician for Rapid Assessments

Training Courses Attended

2016: Dale Carnegie: Skills for Success. Supervisory Management Course

2015: FTCI; Chainsaw Operation and Maintenance

2009: University of Guyana; Anthropology Summer School

2008: FTCI: Reduce Impact Logging

2006: FTCI: Reduce Impact Logging

LOU ANN 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

Experience

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 *(Centre for International Postgraduate Studies of Environmental Management* (CIPSEM)	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 programs, 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

WINSTON KISSOON

CURRICULUM VITAE: WINSTON KISSOON: FORESTER

2 years of working with the Forestry Training Centre Inc. and have been exposed to forestry field work across the country.

A. ***PERSONAL INFORMATION:***

Name: Winston Kissoon

Date of birth: January 22, 1991

Place of birth: Port Mourant Guyana

Nationality: Guyanese

Address: Aranaputa Valley, North Rupununi, Region #9

Email: wkissoon@yahoo.com

Phone: +5926419307

B. ***EDUCATION:***

2017: M.Sc. Agro-Forestry- University of Granma, Bayamo, Cuba

2015: B.Sc. Forestry- University of Granma, Bayamo, Cuba

C. ***PROFESSIONAL EXPERIENCE:***

Assigned as a Forester by the Forestry Training Centre on January 7, 2019. Seconded from the Guyana Forestry Commission to the Forestry Training Centre Inc. on 2nd October 2017.

D. ***FIELD TOURS***

I have been exposed to a number of forestry field tours around the country.

E. ***LANGUAGES***

I can defend myself in English and Spanish

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

Philip Odwin.

PHILLIP ODWIN: CURRICULUM VITAE

1. Personal Details

Name:	Phillip Sylvester Odwin
Date of Birth:	October 31, 1989
Place of Birth:	Bartica, Guyana
Address:	34 Fort Street, Kingston, Georgetown
Email:	odwinphillip@gmail.com
Contact details:	Telephone: 592-227-1500, 592-671-8050

2. Education

2000-2004: Kingston Community High School

2005-2007: Adult Education Remedial School

Acquired: Junior High certificate in English Language, Mathematics, and Social Studies

3. Skills: Trapping animals

- Fishing (rod, seine, cast net)
- Bird identification, colouration, call, flight pattern
- Bush craft

4. Work Experience:

- 2008-2010: Employer: Total Logistics:

  Position held: Port Agent

  Job Description: Clerical task, record keeping

- 2010-2014: ***Wildlife surveys*** with various professionals including Michael Braun.

- 2015-2016: **Forestry Training Centre Incorporation**:

  Forest Technician (18 days), Kaburi, West Mazaruni

  Job Description: measuring, assessing trees and creating circular plots for a 2% ML inventory; identifying and recording fauna encountered at or near sample plots

- Wildlife technician (2016-January-February 2016), **Forestry Training Centre Incorporation**

  Job Description: **Trapping animals**, photographing, and identifying the various species of animals encountered UNAMCO Road, Kwakwani Ituni, Bissaruni and Haimorakabra.

- 2016-2017:

  - *Wildlife surveys* (2 weeks-2016) with **Eustace Alexander, Region 1** (Barama, Barima & Waini) and Region 3 (Fort Island); Region 7 (Bartica to Sherima; Kartabo-Marshalls Falls, Kartabo-Kamaira falls)

  - **Aurora Goldmines** Wildlife surveys (20 days-March 2016, 20 days September 2016, and 20 days January 2017) supporting **Leon Moore**, bird expert.

- 2017:

  - September 24-30, 2017: **Forestry Training Centre Inc.**: Wildlife surveys-Rong-An Inc forest concession, right bank upper Berbice River.

  - October 6-8, 2017: **Forestry Training Centre Inc.:** Wildlife surveys-Toolsie Persaud Timber Traders Inc. forest concession, Puruni District

  - October 13-18, 2017: **Forestry Training Centre Inc.**: Wildlife surveys-Toolsie Persaud Timber Traders Inc. forest concession, Puruni District

  - October 26-November 2, 2017: **Forestry Training Centre Inc.**: Wildlife surveys-TTPTI forest concession (SFEP 2/2013), Puruni District

- 2018:

  - February 19-March 1, 2018: **Aurora Gold Mines**. Wildlife Studies: Bird Surveys

  - March 26-April 5, 2018: **Aurora Gold Mines**. Wildlife Studies: Bird Surveys

  - April 22-27, 2018: **Forestry Training Centre Inc.** / Toolsie Persaud Timber Traders Inc. (Waiamu, right bank Cuyuni River, Kartabo Triangle). Wildlife surveys.

  - May 22-28, 2018: **Forestry Training Centre Inc. / Toolsie Persaud Timber Traders Inc. (Waiamu, right bank Cuyuni River, Kartabo Triangle**). Wildlife surveys

  - September 24: Tour guide duties, **Wilderness Explorers**, Mahaica River

  - September 30 – October 4, 2018: Bird surveys: Accompanying **Waldyke Prince** on a shore bird survey, Essequibo Islands (Region 3).

- October 6, 2018 (Botanical Gardens); October 13, 2018, Botanical Gardens), November 2, 2018 (Abary River): Bird Surveys, **Wilderness Explorers**.

- November 20-25, 2018: **Forestry Training Centre Inc** /Faunal surveys: TPTTI, Puruni District

- **2019**
  - January 17-21, 2019: **Forestry Training Centre In**. Faunal surveys: Aranka District-Ianna District, NWD, Region 1

  - January 23-Feb 2,2019: **Environmental Resources Management** (www.erm.com/en/service)**:** Coastal bird surveys: -Guyana's Coastland, from 63 Beach, Corentyne to Essequibo Islands & Dartmouth, Essequibo Coast. Accompanied Waldyke Prince.

5. References:

a) Leon Moore-Bird specialist, wildlife photography
b) Waldyke Prince-Wildlife Specialist

GODFREY MARSHALL

CURRICULUM VITAE: GODFREY EMERSON MARSHALL: FORESTER

46+ 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. However, I 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. ETFRN NEWS Issue No. 52, December 2010. Pages: 91-97.

G. Projects/Consultancies

I have successfully written project proposals for support 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 am currently engaged in the preparations of ESIAs for local developers.

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 the Face page of the Company's Certificate of Incorporation

Company No.: 5637

COMPANIES ACT OF GUYANA

CERTIFICATE OF INCORPORATION

RONG-AN 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 1st day of September, 2006.

REGISTRAR OF JOINT STOCK COMPANIES GUYANA

Registrar of Companies

Dated this 17th day of July, 2014

Annex IV: Copy of RAI's TIN Certificate

GRA

Certificate of Registration

Taxpayer Identification Number (TIN)

Taxpayer Name: RONG-AN INC
Business Name:
Taxpayer Type: COMPANY
Address: LOT 'A' BLOCK '2' PUBLIC ROAD
LAND OF CANAAN
EAST BANK DEMERARA

Date Issued: September 19, 2016 **Date Amended:** September 19, 2016

This Taxpayer has been registered under the provisions of the Income Tax (Amendment) (No. 2) Act # 15 of 2006

Tax Office: HEAD OFFICE

TIN: 010311292

Commissioner General
Guyana Revenue Authority

GRA10140653

Annex V: Description of the boundaries of SFEP 01/22

Rong-An-Inc SFEP 01/22

Left & Right Bank Berbice River, Right Bank Essequibo River.

Commencing at the **mouth** of an **unnamed tributary** on the **right bank Essequibo River** having approximate **UTM** geographic coordinates of **03 38 559 E, 04 63 336 N;** thence up the **left bank** of this **unnamed tributary** for an approximate distance of **6.5 km** to the **mouth** of a **unnamed tributary** having approximate **UTM** geographic coordinates of **03 43 991 E, 04 62 469 N;** thence up the **left bank** of this **unnamed tributary** to a point near its **source** having approximate **UTM** geographic coordinates of **03 45 649 E, 04 62 093 N**; thence by a **cut line** in a **Easterly** direction for an approximate distance of **4.4 km** to a point on a **Trail (Road)** having approximate **UTM** geographic coordinates of **03 50 132 E, 04 62 123 N;** thence along this **trail** in a **North-easterly** direction for an approximate distance of **9.8 km** to a point on an **unnamed tributary** having approximate **UTM** geographic coordinates of **03 58 619 E, 04 64 148 N;** thence down the **right bank** of this **unnamed tributary** to its **mouth** on an **unnamed tributary** of the **Berbice River** having approximate **UTM** geographic coordinates of **03 60 024 E, 04 64 080 N**; thence across an **down** the **right bank** of this **unnamed tributary** for an approximate distance of **1.6 km** to the **mouth** of another **unnamed tributary** of the **Berbice River** having approximate **UTM** geographic coordinates of **03 61 142 E, 04** 64 **831 N**; thence up the **left bank** of this **unnamed tributary** for an approximate distance of **1.3 km** to a point having approximate **UTM** geographic coordinates of **03 62 146 E, 04 64 216 N;** thence by a **cut line** in a **Easterly** direction for an approximate distance of **2.1 km** to a point on the **Berbice River** having approximate **UTM** geographic coordinates of **03 64 279 E, 04 64 191 N;** thence across an down the **right bank Berbice River** for an approximate distance of **5.6 km** to a point where it **intersect** a **Trail (Road)** having approximate **UTM** geographic coordinates of **03 62 674 E, 04 66 518 N;** thence along this **Trail** in a **North-easterly** direction for an approximate distance of **17.4 km** to the **intersection** with a large **unnamed tributary** of the **Berbice River** having approximate **UTM** geographic coordinates of **03 76 735 E, 04 74 133 N;** thence up the **left bank** of this **large unnamed tributary** to a point where it **intersects** an **old trail** having approximate **UTM** geographic coordinates of **03 78 270 E, 04 70 918 N**; thence along this **trail** in a **South-westerly** direction for an approximate distance of **6.4 km** to a point having approximate **UTM** geographic coordinates of **03 77 662 E, 04 65 709 N;** thence by a **cut line** in a **South-easterly** direction for an approximate distance of **1.9 km** to a point near the **source** of a **large unnamed tributary** of the **Berbice River** having approximate **UTM** geographic coordinates of **03 78 299 E, 04 63 838 N;** thence down the **right bank** of this **large unnamed tributary** of the **Berbice river** to a **point opposite** the **mouth** of an **unnamed tributary** having approximate **UTM** geographic coordinates of **03 69 068 E, 04 61 364 N;** thence across and up the **left bank** of this **unnamed tributary** for an approximate distance of **10.8 km** to the mouth of an **unnamed tributary** having approximate **UTM** geographic coordinates of **03 74 345 E, 04 53 329 N;** thence up the **left bank** of this **unnamed tributary** to a point near its **source** having approximate **UTM** geographic coordinates of **03 72 676 E, 04 53 282 N**; thence by a **cut line** in a **South-westerly** direction for an approximate distance of **2.3 km** to a point near the **source** of **another unnamed tributary** of the **Berbice River** having approximate **UTM** geographic coordinates of **03 70 485 E, 04 52 425 N;** thence down the **right bank** of this **unnamed tributary** to its **mouth** on the **right bank Berbice River** having approximate **UTM** geographic coordinates of **03 62 910 E, 04 50 270 N;** thence down the **right bank Berbice River** for an approximate distance of **2.3 km** to a point opposite the **mouth** of a **large unnamed tributary** having approximate **UTM** geographic coordinates of **03 61 702 E, 04 51 367 N;** thence across and up the **left bank** of this **unnamed tributary** to a point near its **source** having approximate **UTM** geographic coordinates of **03 54 213 E, 04 48 740 N**; thence by a **cut line** in a **North-westerly** direction for an approximate distance of **3.5 km** to a **point** near the **source** of an **unnamed tributary** of the **Essequibo River** having

approximate **UTM** geographic coordinates of **03 50 733 E, 04 49 064 N;** thence down the **right bank** of this **unnamed tributary** to its **mouth** on the **right bank Essequibo River (this point being Massara)** having approximate **UTM** geographic coordinates of **03 39 794 E, 04 45 420 N;** thence down the **right bank Essequibo River** for an approximate distance of **45.3 km** to the **mouth** of an **unnamed tributary,** this being the point of commencement.

Save and except all lands legally held.

Coordinates have not been field- evaluated.

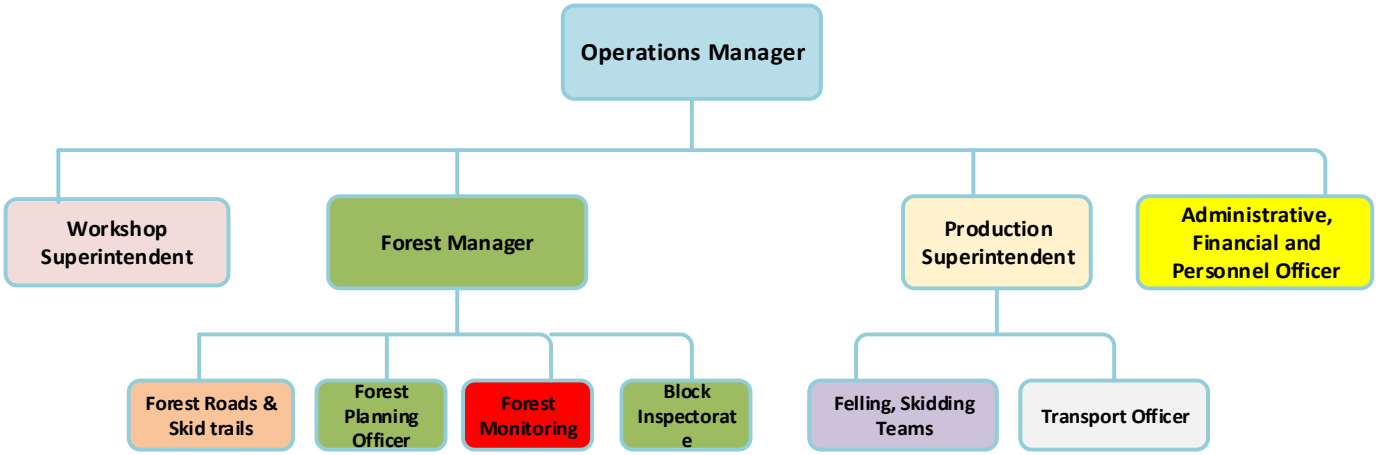
Description subject to change upon verification

Approximate area: 65,844.9 Hectares (162,706.2acres).

Map reference: 56 SE, 57 NE, SE, SW.

WGS Projection

Annex VI: Organizational Chart for RAI's Logging Operations



Note

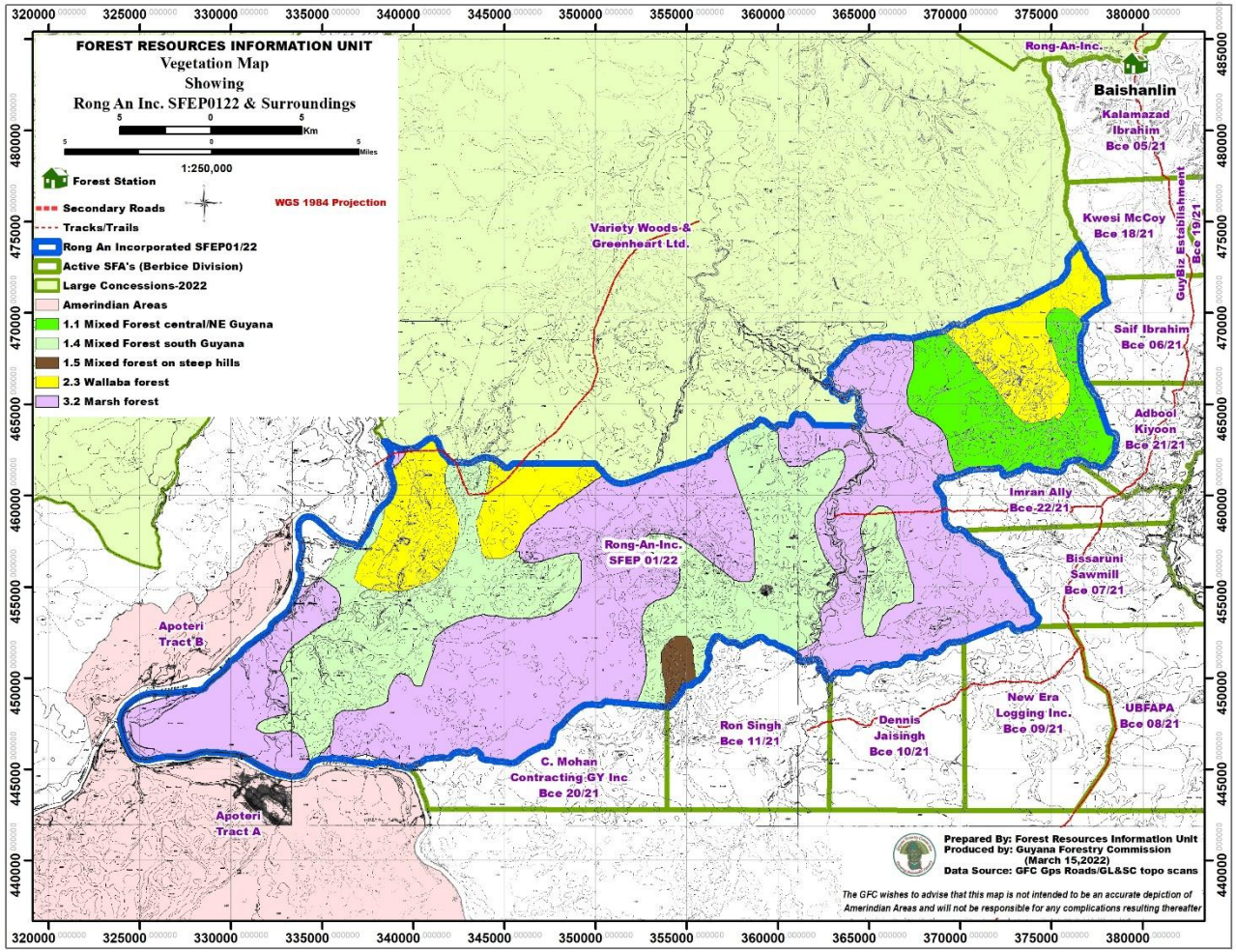
The Forest monitoring officer is responsible directly for environmental matters and stakeholder issues

Annex VII: Core Skills Sets for RAI's Logging Operations

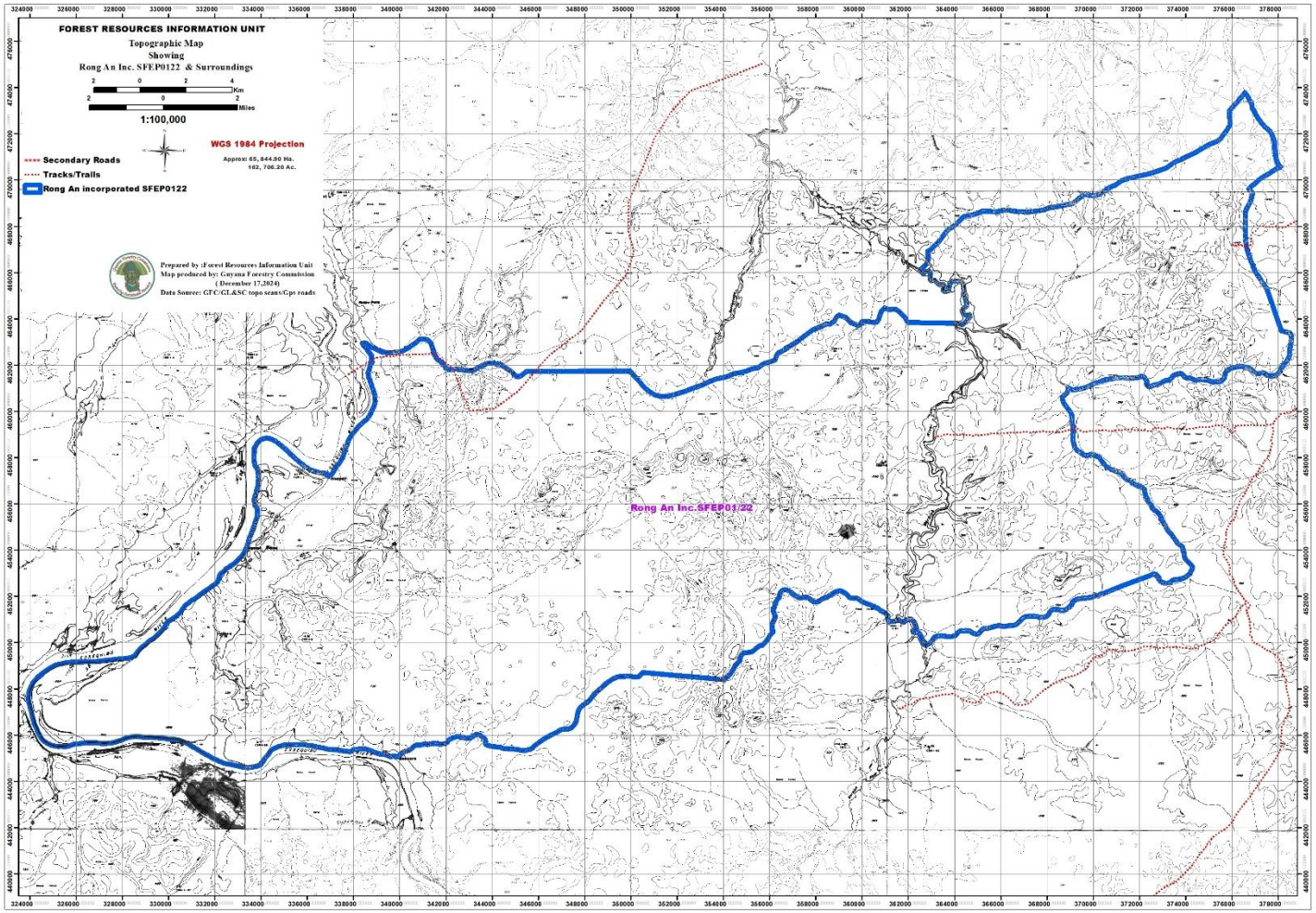
#	Name	Designation	Competencies & Experience
1	Chen **Ming**, Businessman	Managing Director	*Overview:* Mr. Chen is an experienced businessman and is the CEO of **China Zhonghao Inc., Rong-an Inc**. and **Zhonghao Shipyard Inc**., *three companies that are registered in Guyana*. *Management Experience*: 1. 1995-2001: Investments in garment trading in China 2. 1998: Visited Guyana and initiated investments in logging and fuel distribution 3. 2002 to present: real estate business in China 4. 2009: Developed a computer software company in China
2	Richard **Tang** (Engineer)	Operations Manager	*Overview:* Acquired 28 years of experience in forestry management, 23 of which was garnered in Guyana. Competencies include timber harvest planning, timber production operations, and road and bridge construction. *Logging Experience*: 1989-1991: *Daiya Malaysia*, Sarawak, Malaysia 1991-1993: *Samling Group*, Sarawak, Malaysia 1994-2004: *Barama Company Ltd*, Guyana 2005-2013: *Demerara Timbers Ltd*., Guyana 2014+: *Rong-an Inc*, Guyana
3	Anas Ismail (Engineer)	Chief surveyor	27 years of experience in forest surveys, 5 of which was garnered in Guyana forest. Apart from surveying, expertise has been acquired in tree species identification, block demarcation, and 100% pre-harvesting enumeration. Experience 1990-2006: *Menchunmg SDN BHD*, Sarawak, Malaysia 2006-2010: *Ho San Timber*, Sarawak, Malaysia 2010-2012: *Sam Lin San*, Solomon Island 2012-2014: *Demerara Timber limited*, Guyana 2014+: *Rong-An Inc*., Guyana

4	Chan Sia Poh (Engineer)	Chief engineer	*Overview* 33 years' experience -21yrs of which has garnered in Guyana-in mechanical workshop administration and practices, exceptional skills with timber harvesting heavy-duty equipment and rigging, metal fabrication and welding. *Experience* 1984-1996: *Samling Engineering Ltd*., Sarawak, Malaysia 1996-2010: *Barama Company Ltd.*, Guyana 2011-2012: *Demerara Timber Ltd*, Guyana 2014+ *Rong-An Inc*., Guyana
5	Kevindra Tularam (Forester)	Marketing Manager	*Overview* Garnered experience through working with both public entities and private enterprise; comprehensive knowledge in the application of local forestry legislation, timber export procedures and requirements, chain of custody practices and implementation of APOs and FMPs. *Experience* 1996-1999 years: Environmental Auditing Officer, Guyana Forestry Commission 1999+: Rong-An Inc. Duties include stock map preparation, timber grading, chain of custody practices, and timber export documentation.
6	Kenneth Tang (Accountant)	Financial Manager	Overview 30+ years of experience in finance and accounting, including nine (9) years of accounting and financial management experience in private forestry sector, expertise in forestry costing and funding. *Experience* 1981 – 1997: *Assistant Accountant*, The Hong Kong Shipyard Ltd., Hong Kong 1997 – 2002: *Accounts Manager*, Leung Wan Kee Shipyard Ltd., Hong Kong 2002 – 2005: *Financial Manager*, Dynasty Forestry N.V., Suriname 2005 – 2010: *Project Account Manager*, Leung Wan Kee Shipyard Ltd., Hong Kong 2010 – 2013: *Accounts Manager*, Tacoba Forest Consultant N.V, Suriname 2014- 2015: *General Manager*, Essential Woods Exporter N.V., Suriname 2015+: *Financial Manager*, Rong-an Inc., Guyana

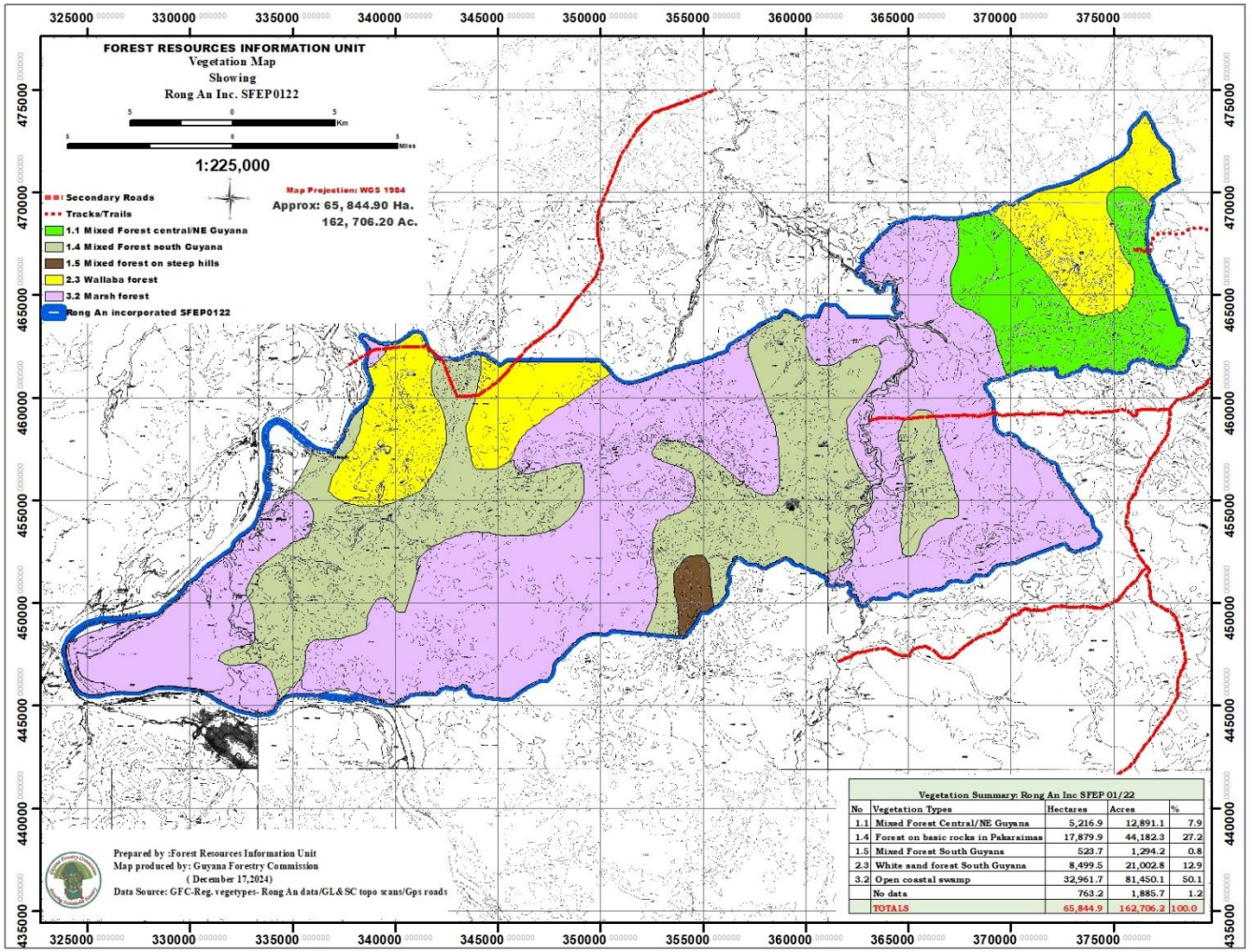
Annex VIII: Map of SFEP 01/22 and surrounding areas



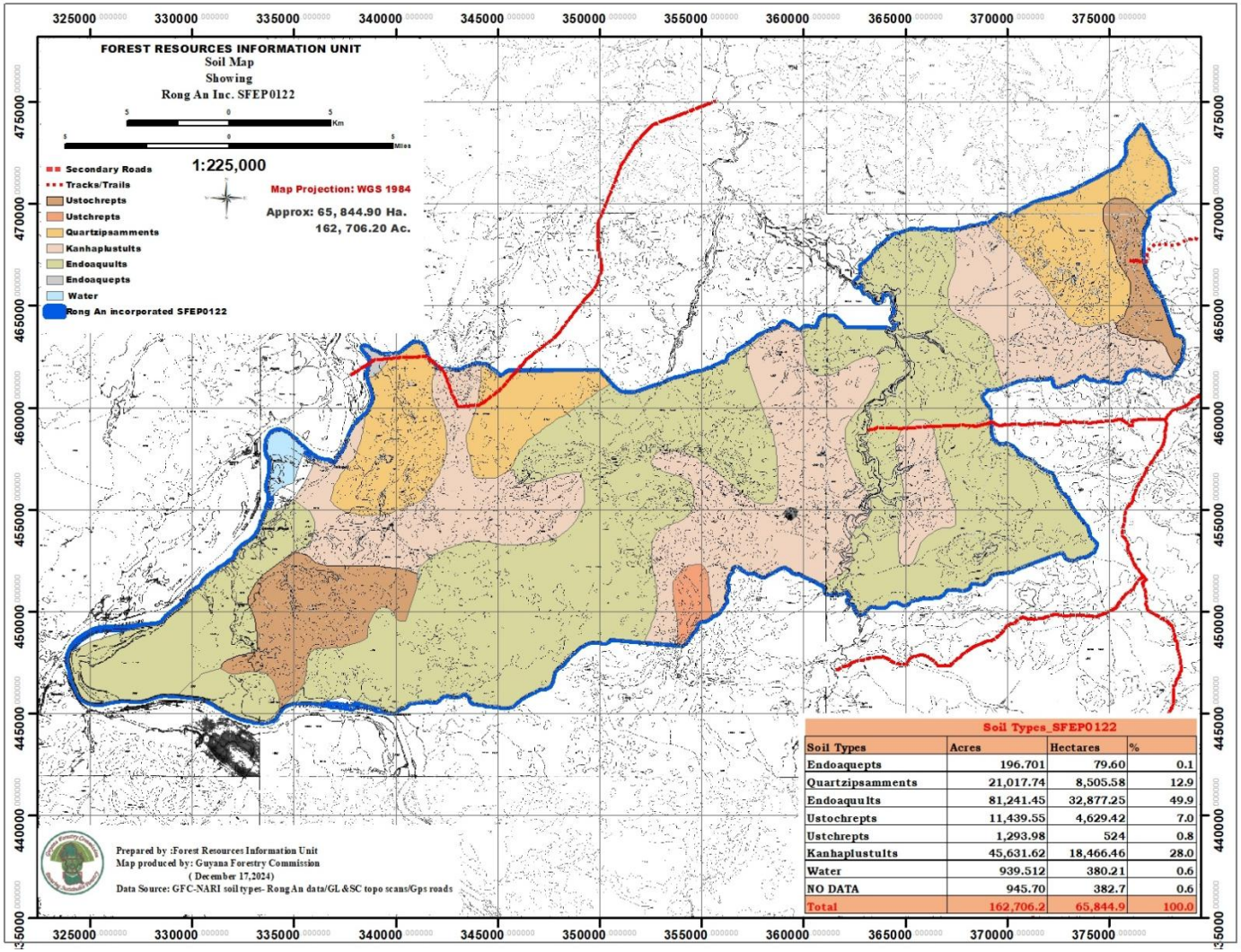
Annex IX: Topographic map of SFEP 01/22



Annex X: Vegetation Map of SFEP 01/22



Annex XI: Soil map of SFEP 01/22



Soil Types_SFEP0122

Soil Types	Acres	Hectares	%
Endoaquepts	196.701	79.60	0.1
Quartzipsamments	21,017.74	8,505.58	12.9
Endoaquults	81,241.45	32,877.25	49.9
Ustochrepts	11,439.55	4,629.42	7.0
Ustchrepts	1,293.98	524	0.8
Kanhaplustults	45,631.62	18,466.46	28.0
Water	939.512	380.21	0.6
NO DATA	945.70	382.7	0.6
Total	162,706.2	65,844.9	100.0

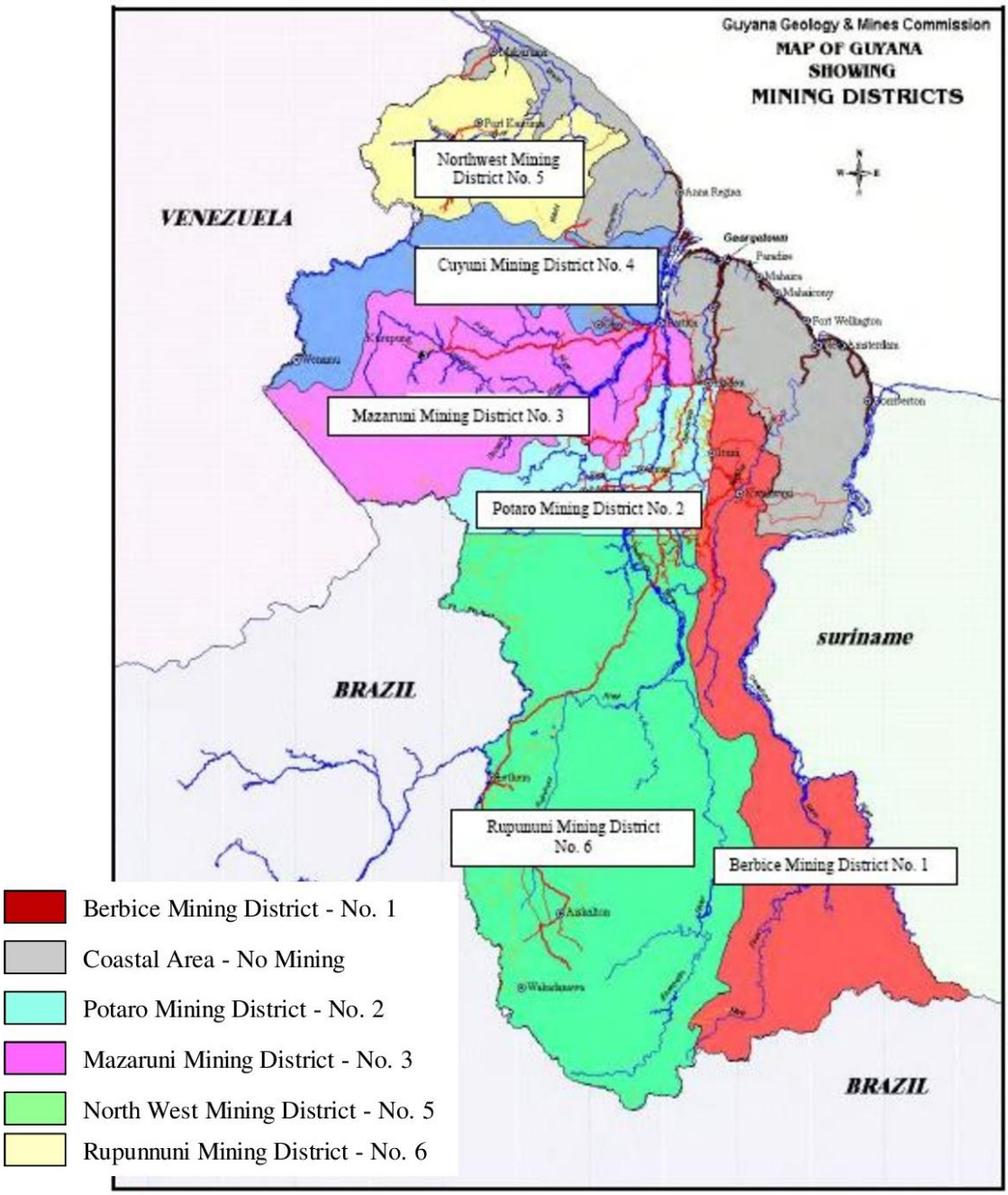
Annex XII: List of equipment available for the development of SFEP 01/22

Section/Department	*Particulars*	*Model*	*No. of Pieces*
Road Construction	Bulldozer	Shantui	5
	Excavator	CAT SD22F	1
	Chainsaw	Stihl 051	1
	Chainsaw	320C	1
	Total		**8**
Road Maintenance	Grader	Shantui	2
	Excavator	CAT SD22F	1
	Dump Truck	BJ3366-DJPFA	5
	Chain Saw	Stihl	2
	Total		**10**
Skidding	Skidder	CAT 527	3
	Bulldozer	SHANTUI SD22F	4
	Chainsaw	Stihl	4
	Total		**11**
Trucking/Hauling	Logging Truck	Kingwood C	3
	Logging Truck	HOWO 500 6x6	8
	Log Loader	SHANTUI s160w-2	5
	Log Loader	ZHONG SL6W-2	1
	Low-bed trailer		3
	Total		**20**
Log Pond/Depot & Marine Transport	Chainsaw	Stihl 051av	4
	Self-propelled barges	Double screw @2000m^3 Capacity	1
	Speed boat	Cap Yamaha 100Hp Engine	1
	Log Loader	Shantui S160-2	4
	Total		**10**
Transport/Utilities	Fuel Truck	HOWO 4 X 6	4
	Pick-Up	Toyota 4 x 4 Hilux	5
	Jeep	Ford 6 x 6	1
	Crane		1
	Truck		1
	Total		**12**
GRAND TOTAL			**71**

Annex XIII: List of staffs available for the development of SFEP 01/2022

#	First Name	Surname	Nationality	Responsibility/Skills set
1	Chen	Ming	Chinese/Guyanese	Managing Director
2	Kevindra	Tularam	Guyanese	Forest Operations Manager
3	Withney		Chinese	Finance Manager
4	Neo		Chinese	Translator
5	Chan Sia	Poh	Malaysian	Chief mechanic
6	Jeffrey	Loh	Indonesian	Log Truck Mechanic
7	Anas	Bin Semail	Malaysian	Chief surveyor
8	Amruddin	Nohong	Indonesian	Trick Driver/Loader Operator
9	Maijoko		Indonesian	Bulldozer Operator
10	Carl	Williams	Guyanese	Chainsaw operator
11	Sukardin		Indonesian	Grader operator
12	Hensly	Smith	Guyanese	Chief Scaler
13	Devon	Thomas	Guyanese	Block Inspector
14	Demion	Bowen	Guyanese	Block Inspector
15	Deride	Mamage	Guyanese	Block Inspector
16	Elias	Kenny	Guyanese	Production Clerk
17	Daniels		Guyanese	Production Clerk
18	Azad		Guyanese	Head Driver
19	Gairy		Chinese	Sales representative
20	Eric	Alfred	Guyanese	Chainsaw Operator
21	Charles	Joel	Guyanese	Loader Operator, Kwakwani
22	Curt		Guyanese	Chainsaw helper, Kwakwani
23	Quacy		Guyanese	Security, Kwakwani
24	Steve		Guyanese	Log yard foreman, Kwakwani
25	Rudy		Indonesian	Loader Operator. Kwakwani
26	Shavany			Production Clerk, Kwakwani
26	Levon			China saw Operator, Kwakwani

Annex XIV: Map showing Mining Districts in Guyana



Source: GGMC.

Annex XV: Consolidated Environmental Data for SFEP 1/2011 -EES

NATURAL ENVIRONMENTAL BASELINE CONDITIONS-THE PHYSICAL ENVIRONMENT-RONG-AN INC SFEP 01/2011

Prepared by EES for FTCI

1.0 Soils

Soil Description

Soil moisture is defined as the water that is held in the spaces between soil particles. This is the measurement of water found in the upper 10 cm of soil, the information is valuable in baseline study to a wide range of government agencies and private companies concerned with weather and climate, runoff potential, flood control, soil erosion, slope failure, reservoir management, geotechnical engineering, foundation and water quality.

The soil types in the area have been previously classified and recorded in detail in accordance with FAO's soil classification system. To date the study team have encountered sandy loams and red earths on the concession area, with more clayey soils near streams and in marsh/swamp conditions. Such soils (the sandy loam in particular) are suitable for road construction. The soil conditions would be even better for road construction on higher ground. Many of the creeks encountered had clear 'white water', evidence of clay soils as well as the absence of erosion.

Procedure

During the wet season, eighteen (18) soil samples of approximately 36 inches in depth of soil were taken within the Rong-An Inc. Concession on June 18, 2015, July 08 and 12, 2015, and August 03, 2015 (see Figure 1). During the dry season, ten (10) soil samples were taken within the Rong-An Inc. Concession on January 12, 13 and 14, 2016, and February 05, 06 and 07, 2016.

Soil samples were taken based on accessibility to the site. The pH and moisture content of the soil samples were measured in-situ using a Vernier technology device (LabQuest) with a pH and soil moisture probe and the soil type was identified physically.

Results and Discussion

The general soil type of the concession area is predominantly **sand and sandy clay;** this was noted from the various soil samples collected throughout the project area. The colour of the soils ranged from light brown, brown, dark brown and grey, either showing some indication of light weathering or oxidation. During the wet season the percentage soil moisture content ranged from 7.6 to 25.1 % and soil pH ranged from 4.3 to 5.8, while during the dry season the percentage soil moisture content ranged from 2.4 to 51.9 % and soil pH ranged from 4.3 to 5.8 and this is considered common for sandy and clay soils or soils rich in humus. Figure 1 illustrates sample collection activity while Figure 2 illustrates the distribution of samples across the concession area. Table 1 shows basic parameters for each sample recorded.

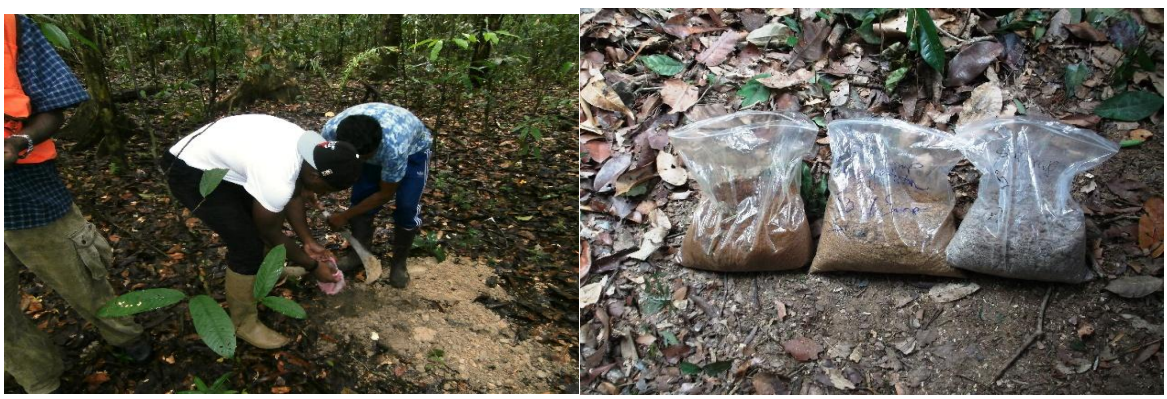


Figure 1: Soil collection activities-wet season

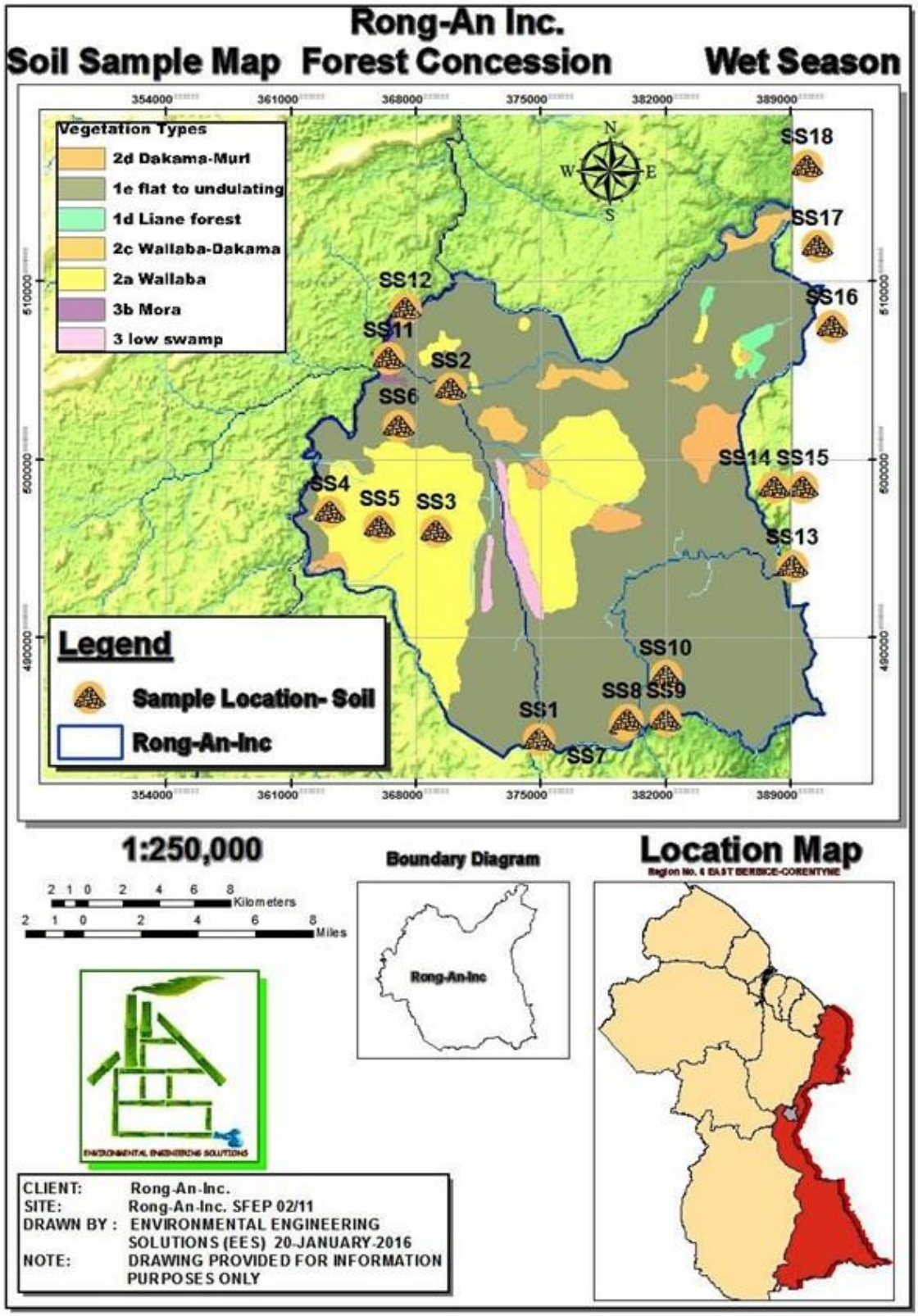


Figure 2: Map[26] of the concession area showing sample points, wet season.

[26] Similar maps exist for all parameters but have been removed from this Annex.

Table 1: Soil Moisture Content (%) and Soil pH collected from various soil samples at Rong-An Inc's. Forest Concession

Soil Type (Sand, Clay and Sandy Clay)							
		Soil Depth		**Data**			
Sample ID	**Coordinates UTM, 21N**	**Top**	**Sub**	**Soil Moisture (%)**	**Soil Type**	**Soil pH**	**Colour**
Wet Season							
S1	0356667,0494233	√	----	16.4	Sand	4.3	Dark grey
S2	0356100,0496312	√	----	11	Sand	4.9	Dark grey
S1	0374930,0484328	√	----	19.5	Sand	4.6	Dark grey
S2	0369958,0503973	√	----	25.1	Sand	5.4	Light Brown
S3	0369146,0496005	√	----	14.0	Sand	5.8	Brown
S4	0363199,0497061	√	----	20.4	Sand	4.8	Reddish Brown
S5	0365991,0496242	√	----	9.2	Clay	5.4	Brown
S6	0367050,0501910	√	----	8.4	Sand	4.4	Light Brown
S7	0379771,0485154	√	----	18.6	Sand	4.7	Dark Grey
S8	0379880,0485426	√	----	16.7	Sandy clay	4.9	Light Brown
S9	0382036,0487846	√	----	9.2	Sandy clay	4.6	Brown
S10	0382596,0488636	√	----	8.9	Sandy clay	4.3	Brown
S11	0366483,0505705	√	----	7.6	Sandy clay	4.5	Brown
S12	0367425,0508495	√	----	17.2	Sand	4.3	Grey
S13	0389110,0494045	√	----	14.9	Sandy clay	4.7	Brown
S14	0388100,0498503	√	----	9.4	Sand	4.7	Grey Black
S15	0389684,0503008	√	----	13	Sand	4.7	Grey Black
S16	0391362,0507494	√	----	15.8	Sandy clay	4.5	Brown
S17	0390518,0511991	√	----	8.7	Sand	4.8	Grey Black
S18	0389967,0516509	√	----	11.9	Sand	4.6	Dark Brown
Dry Season							
S1	0372259,0497992	√	----	32.5	Clay	5.2	Dark Brown
S2	0376739,0496396	√	----	51.9	Sandy Clay	4.8	Dark Brown
S3	0373115,0495007	√	----	4.8	Sand	4.7	Light Brown

S4	0362066,0501568	√	----	32.6	Clay	4.5	Grey
S5	0364878,0501476	√	----	8.5	Sand	4.3	Brown
S6	0370400,0501806	√	----	9.9	Sand	4.4	Dark Brown
S7	0372253,0510371	√	----	15.2	Sand	5.7	Brown
S8	0371990,0508009	√	----	2.4	Sand	5.7	Brown
S9	0370420,0510131	√	----	18.4	Sand	5.8	Brown
S10	0390306,0512074	√	----	11.6	Sand	4.5	Brown

Of the eighteen (18) soil samples taken within the wet season as well as the ten (10) soil samples taken within the dry season from the Rong-An Inc. Forest Concession, the general soil type was found to be predominantly sand, clay and sandy clay. The pH of the soils at the Project Area is generally acidic and this is considered common for sandy soils. However, the colour of the soils ranged from grey to dark grey, light brown, dark brown and brown.

2. NOISE CONDITIONS

Noise pollution also called sound pollution is defined as a form and level of environmental sound that is generally considered likely to annoy, distract or even harm people or animals (BusinessDictionary 2015). Most industrial plants located near a residential area will need to be respectful of others residing within earshot regarding their production of noise pollution (BusinessDictionary 2015). The existing sound environment throughout the Rong-An Inc. Forest Concession was characterized almost completely by sounds of nature since the concession area is remote lands with no communities, land use or nearby public roads. The areas where noise readings were taken were generally very quiet with winds, rain, rustling of trees and chirping of birds in the background.

Procedure

Noise levels were recorded during the wet season at twenty one (21) points within the Rong-An Inc. Forest Concession on June 18, 2015, July 08 and 12, 2015, and August 03, 2015, while in the dry season noise levels were recorded at fifteen (15) points on January 12, 13 and 14, 2016, and February 05, 06 and 07, 2016, using a Sound Level Meter (ExTech 407730) (Figure 3). Table 2 presents noise values for all sample points on the concession area.

Figures 3: Field Analysis of Noise Level Measurements during the Wet Season

Table 49: Noise Levels within Rong-An Inc. Forest Concession

Sound Level (dB)							
Sample ID	Coordinates UTM, 21N	Time		Data	Wind		Remarks/ Comments
		Start	End	Decibel (dB)	Direction	Speed (m/s)	
Wet Season							
N1	0374930, 0484328	15:25	15:27	46	NW	0.0	The areas where noise readings were taken were generally very quiet with winds, rain, rustling of trees and chirping of birds in the background.
N2	0365426, 0505748	09:03	09:05	40	NW	0.0	
N3	0366045, 0505140	09:35	09:37	48	NW	1.2	
N4	0369958, 0503973	10:15	10:17	41.5	NW	0.0	
N5	0365991, 0503955	11:00	11:02	42	NW	0.0	
N6	0369146, 0496005	11:20	11:22	40	NW	0.0	
N7	0363199, 0497061	11:32	11:34	41.8	NW	0.0	
N8	0365991, 0496242	12:09	12:11	50.2	NW	0.0	
N9	0367050, 0501910	12:36	12:38	46.3	NW	1.2	
N10	0379771, 0485154	09:55	09:57	42	NW	1.3	
N11	0379880, 0485426	10:03	10:05	43.6	NW	0.0	
N12	0382036, 0487846	10:50	10:52	40	NW	0.9	
N13	0382596, 0488636	11:26	11:28	40	NW	2.0	
N14	0366788, 0505676	09:20	09:22	40	NW	0.0	
N15	0366483, 0505705	09:35	09:37	40	NW	0.0	
N16	0367425, 0508495	10:20	10:22	47.4	NW	0.0	
N17	0389110, 0494045	10:21	10:22	44.7	NW	0.0	
N18	0388100, 0498503	10:31	10:32	40.2	NW	0.0	
N19	0389684, 0503008	10:40	10:42	48.7	NW	0.0	
N20	0391362, 0507494	10:52	10:53	40	NW	0.0	
N21	0390518, 0511991	11:02	11:04	40	NW	0.0	
Dry Season							
N1	0371353, 0502020	13:10	13:12	40	NW	0.0	Generally, very quiet with winds, rain, rustling of trees and chirping of birds in the background.
N2	0372259, 0497992	09:24	09:26	51.2	NW	0.7	
N3	0376739, 0496396	11:20	11:22	40	NW	0.0	
N4	0373115, 0495007	12:30	12:32	40	NW	0.0	
N5	0371348, 0494991	13:20	13:22	40	NW	0.0	
N6	0362066, 0501568	12:54	12:56	40	NW	0.7	
N7	0364465, 0501664	15:24	15:26	40	NW	0.6	
N8	0372253, 0510371	08:57	08:59	51.2	NW	0.0	
N9	0371990, 0508009	13:16	13:18	40	NW	0.0	
N10	0371311, 0509714	09:46	09:48	40	NW	0.0	
N11	0370420, 0510131	10:56	10:58	40	NW	0.0	
N12	0390963, 0503674	11:22	11:24	40	NW	0.0	
N13	0391376, 0508677	11:52	11:54	40	NW	0.7	
N14	0391118, 0510259	12:10	12:12	40	NW	0.0	

N15	0390306, 0512074	12:35	12:37	40	NW	0.0	

Furthermore, the noise measurements of the areas recorded around the Rong-An Inc. Concession were all below the 100 dB Daytime (06:00 h -18:00 h) Industrial limits of the Guyana National Bureau of Standards (GNBS) Guidelines for the Measurement and Assessment of Noise in the Environment.

Results and Discussion

Noise levels within the Rong-An Inc. Concession ranged from 40 dB to 50.2 dB. The sampled areas never exceeded 51 decibels (dB). During the wet season within the Rong-An Inc. Concession, the Sample Points N8 (50.2 dB), N19 (48.7 dB), N3 (48 dB), N18 (40.2 dB), N16 (47.4), N9 (46.3), N1 (46), N17 (44.7), N11 (43.6), N10 (42), N5 (42), N7 (41.8) and N4 (41.5) showed small increments in noise levels and this was as a result of sounds from high winds, rain and birds chirping in the background, while, during the dry season the Sample Point N2 (51.2) and N8 (51.2) were the only two (2) locations that showed an increase in noise level.

3. AIR QUALITY

Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere (World Health Organization 2012). This is becoming an increasingly significant problem to growth and development of cities and communities. The air pollutants of major public health concern include: particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulphur dioxide and metals, such as lead (Hedges 2004) (World Health Organization 2012).

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 the Project Area, however, the air quality within the project area can be considered good since major activities to affect air quality was limited. As an indicator of Air Quality within the project area, a preliminary assessment was done of Particulate Matter reflected in the Total Suspended Particles concentration during the wet season (June 18, 2015, July 08 and 12, 2015, and August 03, 2015) and dry season (January 12, 13 and 14, 2016 and February 05, 06 and 07, 2016) for the Concession area.

Particulate Matter (PM) is the term for a mixture of solid particles (dust, dirt, soot, and smoke) and liquid droplets suspended in the air. These PM emissions originate from a variety of sources, such as vehicles, factories, industrial sites, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood (Hedges 2004, p.58). Particulate Matter comprises both coarse and fine particles. The coarse particles (PM_{10}) have an aerodynamic diameter between 2.5μm and 10μm. They are formed by mechanical disruption (e.g. crushing, grinding, abrasion of surfaces), evaporation of sprays, and suspension of dust. Fine particles have an aerodynamic diameter less than 2.5μm ($PM_{2.5}$). These particles are formed from gas by chemical reactions; and condensation of high-temperature vapours during combustion (Fierro 2000).

Total Suspended Particulates (TSP) refers to all particles in the atmosphere that are less than 100 micrometres. The amount of PM_{10} and $PM_{2.5}$ are related to the amount of total suspended particulates (TSP) in the air (Alias, Hamzah, and Kenn 2007).

Particulate Matter guidelines and standards are instituted (Table 5) 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 (Fierro 2000, p.5)(Alias, Hamzah and Kenn 2007, p.258). These health effects are especially associated with PM_{10} and $PM_{2.5}$. The PM_{10} fraction from TSP can reach the lower regions of the respiratory tract. On the other hand, $PM_{2.5}$ can absorb more toxic and carcinogenic compounds than larger particles and penetrate more easily deep into the lungs (Alias, Hamzah and Kenn 2007, p.256). 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 (residential, commercial, or cultural monuments) (Hedges 2004, p.58).

The purpose of the ambient air quality standards (see Table 3) 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 (Mecklenburg-County-NC 2012). The WHO Air Quality Guideline (AQGs) are intended for worldwide use but have been developed to support actions to achieve air quality that protects public health. 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 (World-Health-Organisation 2006).

Table 50: Air Quality Standards and Guidelines

Air Pollutant	*Mecklenburg County NC*	*NAAQS*	*OSHA*	*WHO (1999)*	*WHO (2006)*	*NHMRC (1996)*	*Malaysia*
PM2.5	*15µg/m3 annual mean*	*15µg/m3 annual mean*	---	---	*10 µg/m3 annual mean*	---	---
	65µg/m³ 24-hour average concentration	*35µg/m3 24-hour average concentration*	---	---	*25 µg/m3 24-hour mean*	---	---
PM10	*50µg/m3 annual mean*	*50µg/m3 annual mean*	---	---	*20 µg/m3 annual mean*	---	---
	150µg/m³ 24-hour average concentration	*150µg/m3 24-hour average concentration*	---	---	*50 µg/m3 24-hour mean*	---	*150µg/m3 24-hour average concentration*
TSP	*75µg/m3 annual mean*	---	*Permissible Exposure Limits (PELs, TWA 8-hour exposure)*	---	---	*90 µg/m3 annual mean*	---
	150µg/m³ 24-hour average concentration	---	*15 mg/m³ (total) 5 mg/m3 (for respirable fraction)*	*120 µg/m3 24-hour average*	---	---	*260µg/m3 24-hour average concentration*

Source: (World Health Organization 2006, p.10), (Mecklenburg-County-NC 2012), (Environmental-Protection-Authority 2001), (United-States-Environmental-Protection-Agency 2012), (Fierro 2000), (Alias, Hamzah and Kenn 2007, p.255), (Mecklenburg-County-Government 2012), (United-States-Department-of-Labour-OS&H 2012)

Monitoring Procedure

The Total Suspended Particulate (TSP) measurements were taken using the Thermo pDR-1000AN personalDataRAMTM Particulate Monitor. TSP measurements recorded in mg/m3 (milligram/meter3), were taken during the wet season at twenty one (21) sample sites during the wet season and fifteen (15) sample sites during the dry season, after a log interval of 5 minutes (Thermo-Electron-Corportation 2005).

After the 5-minute interval log time, the real time concentration value, the maximum concentration value and the total weighted average (TWA) concentration in milligrams per cubic meter (mg/m3) were recorded from each sample site. The wind direction and temperature at time of monitoring at each site was recorded. Conversions from milligrams per cubic meter (mg/m3) to micrograms per cubic meter (µg/m3) were done by taking the milligrams per cubic meter (mg/m3) measurements x 1000 (Hedges 2004, p.23). Micrograms per cubic meter (µg/m3) results were then compared to the Mecklenburg County North Carolina Air Quality TSP Standard, as a current TSP limit permissible utilised by North Carolina State and OSHA Permissible Exposure Limits related with the 8 hours monitoring. Quality assurance and quality control (QA/QC) was practiced, were routine parts of the air quality monitoring during the calibration, operation and maintenance of the monitoring equipment.

Results and Discussion

Table 4 show the results of Total Suspended Particulate concentration taken during the wet (twenty-one (21)) and dry season (fifteen (15)) sites around the Rong-An Inc. Forest Concession. Table 4 contains the average concentration, Total Weighted Average (TWA) and maximum concentration of the air quality during the monitoring period.

Table 51: Results of TSP Measurement at Rong-An Inc. Forest Concession.

Sample ID	Coordinates (UTM, 21N)	Time		Data µg/m³			Wind	Humidity (%)	Temp (°C)
		Start	End	TWA	Max. Con	Avg. Con	Speed (m/s)		
		Wet Season							
AQ1	0374930, 0484328	15:25	15:31	48.4	68.9	46.9	0.0	83	30
AQ2	0365426, 0505748	10:08	10:14	42.3	44.6	42.8	0.0	63	33.4
AQ3	0366045, 0505140	10:22	10:28	41.5	43.6	43.6	1.2	55	37
AQ4	0369958, 0503973	11:36	11:42	41.3	42.8	41.2	0.0	74	34
AQ5	0365991, 0503955	12:14	12:20	41.2	42.2	41.6	0.0	73	33
AQ6	0369146, 0496005	13:03	13:09	41.4	44.0	40.8	0.0	70	33.4
AQ7	0363199, 0497061	13:50	13:56	41.0	44.2	41.5	0.0	69	34.9
AQ8	0365991, 0496242	14:26	14:32	41.2	41.8	41.3	0.0	71	34.8
AQ9	0367050, 0501910	15:30	15:36	41.8	43.0	41.6	1.2	72	23
AQ10	0379771, 0485154	09:55	10:01	46.9	47.7	47.2	1.3	91	28.8
AQ11	0379880, 0485426	10:29	10:35	45.0	45.5	45.2	0.0	81	30.4
AQ12	0382036, 0487846	10:50	10:56	44.0	44.5	44.0	0.9	73	31.3

Sample ID	Coordinates (UTM, 21N)	Time		Data µg/m³			Wind	Humidity (%)	Temp (⁰C)
		Start	End	TWA	Max. Con	Avg. Con	Speed (m/s)		
AQ13	0382596, 0488636	12:16	12:22	44.8	45.8	45.1	2.0	79	31.1
AQ14	0366788, 0505676	09:20	09:26	50.5	51.4	50.3	0.0	99	30.6
AQ15	0366483, 0505705	09:35	09:41	47.8	49.3	47.4	0.0	92	32.6
AQ16	0367425, 0508495	10:20	10:26	47.5	53.0	46.6	0.0	89	30.4
AQ17	0389110, 0494045	11:21	11:27	40.0	42.6	41.3	0.0	73	33.4
AQ18	0388100, 0498503	11:41	10:48	42.9	45.3	43.2	0.0	70	34.9
AQ19	0389684, 0503008	11:40	10:46	43.7	48.1	46.9	0.0	69	34.8
AQ20	0391362, 0507494	12:52	10:58	41.3	42.5	41.3	0.0	71	23
AQ21	0390518, 0511991	13:02	13:08	43.6	45.3	43.3	0.0	85	28.8
Dry Season									
AQ1	0371353, 0502020	13:10	13:15	41.2	44.4	41.4	0.0	71	28.9
AQ2	0372259, 0497992	09:24	09:29	42.9	44.3	42.3	0.7	75	25.5
AQ3	0376739, 0496396	11:20	11:25	44.0	48.6	43.1	0.0	76	27.6

Sample ID	Coordinates (UTM, 21N)	Time		Data µg/m³			Wind	Humidity (%)	Temp (⁰C)
		Start	End	TWA	Max. Con	Avg. Con	Speed (m/s)		
AQ4	0373115, 0495007	12:30	12:35	42.2	45.5	42.0	0.0	55	37
AQ5	0371348, 0494991	13:20	13:25	41.4	42.1	41.3	0.0	64	32.9
AQ6	0362066, 0501568	12:54	12:59	42.5	43.3	42.5	0.7	70	28
AQ7	0364465, 0501664	15:24	15:29	42.5	43.3	41.8	0.6	69	28
AQ8	0372253, 0510371	08:57	09:02	48.3	49.9	48.9	0.0	76	25.5
AQ9	0371990, 0508009	13:16	13:21	48.2	49.3	48.1	0.0	86	26.4
AQ10	0371311 0509714	09:46	09:51	46.5	48.8	47.4	0.0	99	26.3
AQ11	0370420 0510131	10:56	11:01	53.4	63.8	52.2	0.0	99	29.2
AQ12	0390963 0503674	11:22	11:27	61.0	80.3	64.3	0.0	95	32.1
AQ13	0391376 0508677	11:52	11:57	53.2	54.8	53.4	0.7	87	30.2
AQ14	0391118 0510259	12:10	12:15	53.9	55.0	52.7	0.0	95	31.5

Sample ID	Coordinates (UTM, 21N)	Time		Data µg/m³			Wind	Humidity (%)	Temp (°C)
		Start	End	TWA	Max. Con	Avg. Con	Speed (m/s)		
AQ15	0390306 0512074	12:35	12:40	51.0	51.3	51.1	0.0	99	31.9

Under clean atmospheric conditions, the TSP level can be as low as 0 – 10 µg/m³. In a very dusty environment, TSP concentration can be as high as 1500 µg/m³ (Alias, Hamzah and Kenn 2007, p.258).

Wet Season: Monitoring showed the TSP levels of TWA and Maximum Concentration (Max. Conc.), a range of 40.0 – 50.5 µg/m³ (TWA) and 41.8 – 68.9 µg/m³ (Max. Conc.), were recorded, during the monitoring period (Table 4). The TWA readings varied among the twenty-one (21) sites, with the highest TWA concentration recorded was 50.5 µg/m³ at site 14. In comparison with the Mecklenburg TSP Air Quality Standard (AQS) 150 µg/m³ 24-hours average, the value recorded at site 14 was under the TSP AQS. TWA levels were also below the limit at all site locations during the monitoring period.

The highest Maximum Concentration was 68.9 µg/m³ at site 1 followed by site 16 (53.0 µg/m³), and site 14 (51.4 µg/m³). The Maximum Concentration is the highest value detected by the sensor during the monitoring time (5 minutes); therefore, this does not represent the average maximum concentration. In comparison with the Mecklenburg TSP Air Quality Standard (AQS) 150 µg/m³ 24-hours average, measurements showed that all twenty-one (21) sites were below the Mecklenburg County TSP AQS as a random reading during the time of monitoring. The average concentration values recorded for Rong-An Inc. Forest Concession were generally below the Mecklenburg County North Carolina TSP Air Quality Standard (AQS) 150 µg/m³ 24-hours average and the readings were also below the TSP limit for the WHO Guidelines.

The Total Suspended Particles (TSP) concentrations measured varied based on TWA and Maximum Concentrations at the 21 sites monitored around the Rong-An Inc. Forest Concession. The TWA, Average and Maximum concentration readings were below the Mecklenburg County North Carolina TSP Air Quality Standard (AQS) 150 µg/m³ 24-hours average. The maximum concentration values recorded was not enough to modify and increase the TWA concentrations in comparison with TSP Air Quality Standard (AQS) 150 µg/m³ 24-hours average. The results reflect TSP values based on the technical capabilities of the equipment *p*DR-1000AN *personal*DataRAM™.

Dry Season: Monitoring showed the TSP levels of TWA and Maximum Concentration (Max. Conc.), a range of 41.2 – 61.0 µg/m³ (TWA) and 42.1 – 80.3 µg/m³ (Max. Conc.), were recorded, during the monitoring period (Table 4). The TWA readings varied among the fifteen (15) sites, with the highest TWA concentration recorded was 61.0 µg/m³ at site 12. In comparison with the Mecklenburg TSP Air Quality Standard (AQS) 150 µg/m³ 24-hours average, the value recorded at site 12 was under the TSP AQS. TWA levels were also below the limit at all site locations during the monitoring period.

The highest Maximum Concentration was 80.3 µg/m³ at site 12 followed by site 11 (63.8 µg/m³), and site 14 (55.0 µg/m³). The Maximum Concentration is the highest value detected by the sensor during the monitoring time (5 minutes); therefore, this does not represent the average maximum concentration. In comparison with the Mecklenburg TSP Air Quality Standard (AQS) 150 µg/m³ 24-hours average, measurements showed that all fifteen (15) sites were below the Mecklenburg County TSP AQS as a random reading during the time of monitoring. The average concentration values recorded from Rong-An Inc. Forest Concession were generally below the Mecklenburg County North Carolina TSP Air Quality Standard (AQS) 150 µg/m³ 24-hours average and the readings were also below the TSP limit for the WHO Guidelines.

The Total Suspended Particles (TSP) concentrations measured varied based on TWA and Maximum Concentrations at the 15 sites monitored around the Rong-An Inc. Forest Concession. The TWA, Average

and Maximum concentration readings were below the Mecklenburg County North Carolina TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average. The maximum concentration values recorded was not enough to modify and increase the TWA concentrations in comparison with TSP Air Quality Standard (AQS) 150 µg/m^3 24-hours average. The results reflect TSP values based on the technical capabilities of the equipment *p*DR-1000AN *personal*DataRAM™.

Both wet and dry season: There was no major impact to air quality within the concession and the area can be considered pristine since activities to affect air quality were limited. There were also no industrial type activities in proximity, as well as activities which generate significant quantities of dust. As a recommendation $PM_{2.5}$ and PM_{10} need to be measured to assure this conclusion. EES is looking forward to collaborating with Environmental Protection Agency to do further monitoring if necessary.

e) Water Quality

Water quality is highly variable over time due to both natural and human factors. Water temperature, photosynthetic activity, and flows vary with season (Brown and Caldwell 2002). Flows, and therefore suspended sediment, can vary daily with rainfall (Brown and Caldwell 2002). Nutrient loads can vary with season, flow and human management (Brown and Caldwell 2002). A comprehensive characterization of natural water quality therefore requires a large amount of data. Water quality data is expensive and time-consuming to acquire, however, so water quality managers usually deal with a large amount of uncertainty (Brown and Caldwell 2002).

Procedure

Surface water samples were collected and analysed using the LabQuest 2 Water Quality Package (which includes an electronic interface and several sensors and probes which test for various water quality parameters) to determine the quality of surface water within the Rong-An Inc. Forest Concession. During the wet season fourteen (14) water samples were collected while during the dry season thirteen (13) water samples were collected and analysed within and around the concession from the Berbice River and several smaller Tributaries located within the Concession.

Surface water samples were analysed twice to have a representative value of the water quality in the general concession area. During the wet season samples were collected and analysed on June 10, 2015, July 08 and 12, 2015, and August 03, 2015, while during the dry season samples were collected and analysed on January 12, 13 and 14, 2016 and February 05, 06 and 07, 2016. Additionally, since activities within the concession area are significantly limited, it could be assumed that the surface water quality would generally have characteristics of natural watercourses in Guyana.

The sample locations were selected at strategic points based on the accessibility to the concession area to provide an indication of the baseline surface water quality. These locations should also become permanent monitoring sites during project implementation, since, if there are any impacts on water quality by the project during operation, the impacts can be detected by testing these locations. Analyses were conducted in the fields. Figure 4 illustrates the sampling practices while Table 5 presents detailed data for surface water sample locations.

Figure 4: Collecting Water Sample for Field Analysis

Table 52: Description of Surface Water Sample Location for Rong-An Inc. Forest Concession

No.	Sample ID	Sample Location	Date Sampled	Time Sampled (h)	Weather Conditions	GPS Readings (UTM, 21N
Wet Season						
1	WQ1	Creek	June 10, 2015	13:56	Rainy	0383411, 0490024
2	WQ2	Creek	June 10, 2015	14:15	Rainy	0384525, 0492521
3	WQ3	Creek	June 10, 2015	14:19	Rainy	0389222, 0494331
4	WQ4	Creek	June 10, 2015	14:23	Rainy	0387817, 0500099
5	WQ5	Creek	June 10, 2015	15:25	Rainy	0391114, 0510278
6	WQ6	Creek	July 08, 2015	09:37	Overcast	0365426, 0505748
7	WQ7	Creek	July 08, 2015	10:15	Overcast	0366045, 0505140
8	WQ8	Creek	July 08, 2015	11:35	Overcast	0370191, 0503955
9	WQ9	Creek	July 12, 2015	09:55	Overcast	0379771, 0485154
10	WQ10	Creek	July 12, 2015	11:00	Overcast	0379880, 0485426
11	WQ11	Creek	July 12, 2015	07:15	Overcast	0382036, 0487846
12	WQ12	Creek	July 12, 2015	08:19	Overcast	0382596, 0488636
13	WQ13	Creek	August 03, 2015	09:20	Overcast	0366788, 0505676
14	WQ14	Berbice R	August 03, 2015	11:35	Overcast	0367551, 0508454
Dry Season						
1	WQ1	Berbice R	January 12, 2016	13:10	Sunny	0371353, 0502020
2	WQ2	Berbice R	January 13, 2016	09:24	Sunny	0372259, 0497992
3	WQ3	Creek	January 13, 2016	11:20	Sunny	0376739, 0496396

4	WQ4	Berbice R	January 13, 2016	12:30	Sunny	0373115, 0495007
5	WQ5	Creek	January 13, 2016	13:20	Sunny	0371348, 0494991
6	WQ6	Creek	January 14, 2016	12:54	Sunny	0362066,0501568
7	WQ7	Creek	January 14, 2016	15:24	Sunny	0364465, 0501664
8	WQ8	Creek	January 14, 2016	16:10	Sunny	0365792, 0504985
9	WQ9	Creek	February 05, 2016	08:57	Sunny	0372253, 0510371
10	WQ10	Creek	February 06, 2016	09:46	Sunny	0371311, 0509714
11	WQ11	Creek	February 07, 2016	11:22	Sunny	0390963, 0503674
12	WQ12	Creek	February 07, 2016	11:52	Sunny	0391376, 0508677
13	WQ13	Creek	February 07, 2016	12:10	Sunny	0391118, 0510259

Surface water quality analysis was performed in the field almost immediately after samples were collected. 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, Turbidity, Total Ions, Conductivity and Dissolved Oxygen (DO) were taken to assess the spatial changes of the quality of water.

Further, in the absence of a national standard on water quality, comparison was made with the Guyana National Bureau of Standards (GNBS) GYS 262:2004 Specification for Drinking Water as well as internationally acceptable limits from the US-EPA, 1985, the WHO Drinking Water Guidelines, 2011, and the World Bank, 1984. These limits are included in Appendix A.

Table 53: Results of Surface Water Quality Analysis for Rong-An Inc. Forest Concession

Sam-ple ID	Coordinates (UTM, 21NN)	Temp (°C) < 40	pH 5.0-9.0	Conductivity (µS/cm) *0-1500*	Turbidity (ntu) 10	DO (mg/L) ≤ 5.0	NO_3 (mg/L) 10	Cl (mg/L) 250	NH_4 (mg/L) 0.2	Ca (mg/L) 15	TDS (ppm) 500
Wet Season											
WQ1	0383411, 0490024	30.8	6.83	50	51.6	5.0	1.9	2.7	0.1	0.4	16
WQ2	0384525, 0492521	30.4	6.72	54	31.3	3.8	1.4	3.3	0.1	0.7	12
WQ3	0389222, 0494331	30.5	5.76	37	31.1	4.5	0.9	2.5	0.2	0.5	20
WQ4	0387817, 0500099	32.1	5.24	48	21.2	4.9	0.2	0.8	0.2	9.9	14
WQ5	0391114, 0510278	31.9	5.44	29	22.3	4.3	0.4	1.1	0.1	9.6	11
WQ6	0365426, 0505748	29.3	6.56	60	43.5	4.1	0.1	2.1	6.3	0.0	26
WQ7	0366045, 0505140	28.3	6.40	42	37.2	3.4	0.4	1.4	6.0	0.0	17
WQ8	0370191, 0503955	27.8	6.28	34	29.5	4.7	2.9	2.3	7.2	0.0	12
WQ9	0379771, 0485154	23.1	8.87	60	23.7	6.8	1.3	0.1	0.2	0.0	15
WQ10	0379880, 0485426	23.9	8.88	58	18.1	6.0	0.4	0.3	5.6	0.0	13
WQ11	0382036, 0487846	24.2	8.93	49	15.6	6.4	0.3	0.2	6.0	0.0	59
WQ12	0382596, 0488636	23.0	8.88	61	30.3	6.3	0.2	0.8	6.1	0.0	14

Sam-ple ID	Coordinates (UTM, 21NN)	Temp (°C) < 40	pH 5.0-9.0	Conductivity (µS/cm) *0-1500*	Turbidity (ntu) 10	DO (mg/L) ≤ 5.0	NO_3 (mg/L) 10	Cl (mg/L) 250	NH_4 (mg/L) 0.2	Ca (mg/L) 15	TDS (ppm) 500
WQ13	0366788, 0505676	30.8	6.27	44	26.2	5.2	1.2	1.0	6.3	0.0	15
WQ14	0367551, 0508454	32.1	6.81	34	29.4	4.7	1.1	1.0	6.0	0.0	13
Dry Season											
WQ1	0371353, 0502020	27.2	7.87	37	26.3	5.5	3.5	1.6	1.4	0.0	9
WQ2	0372259, 0497992	26.8	8.12	28	18.5	5.3	3.7	1.9	1.4	0.0	7
WQ3	0376739, 0496396	26.5	8.12	27	20.4	5.6	3.4	2.3	1.4	0.0	9
WQ4	0373115, 0495007	27.8	7.67	30	24.7	4.6	3.4	1.9	2.1	0.0	10
WQ5	0371348, 0494991	27.4	7.48	25	22.5	6.3	7.4	1.2	5.3	0.0	9
WQ6	0362066, 0501568	26.3	7.39	29	26.7	4.9	2.8	0.3	3.4	0.0	10
WQ7	0364465, 0501664	27.3	7.41	28	25.7	4.7	2.4	0.2	2.6	0.0	10
WQ8	0365792, 0504985	27.6	7.42	28	25.5	4.5	1.9	0.1	5.3	0.0	10
WQ9	0372253, 0510371	26.2	5.63	45	10.4	6.5	4.2	1.5	3.3	0.0	16
WQ10	0371311, 0509714	26.9	5.88	32	4.0	5.8	2.5	0.7	2.5	0.0	9
WQ11	0390963, 0503674	27.2	7.22	28	11.2	4.8	2.9	1.5	2.2	0.0	7

Sam-ple ID	Coordinates (UTM, 21NN)	Temp (°C) < 40	pH 5.0-9.0	Conductivity (µS/cm) *0-1500*	Turbidity (ntu) 10	DO (mg/L) ≤ 5.0	NO_3 (mg/L) 10	Cl (mg/L) 250	NH_4 (mg/L) 0.2	Ca (mg/L) 15	TDS (ppm) 500
WQ12	0391376, 0508677	27.5	7.16	28	10.6	4.6	3.4	0.4	2.8	0.0	9
WQ13	0391118, 0510259	27.1	7.75	26	13.7	4.8	3.7	0.9	3.1	0.0	10

TABLE 7: Results for Oil & Gas, COD			
Sample ID	Coordinates (UTM 21N)	Parameters	
		Oil & Grease (mg/L) <10	COD (mg/L) <250
Wet Season			
WQ6	0365426, 0505748	25.27	70.40
WQ8	0370191, 0503955	61.00	114.40
Dry Season			
WQ3	0376739, 0496396	0.005	ND
WQ4	0373115, 0495007	0.026	ND
WQ6	0362066, 0501568	1.316	24
WQ8	0365792, 0504985	0.014	16
WQ11	0390963, 0503674	ND	ND
WQ12	0391376, 0508677	ND	ND

Key

DO - Dissolved Oxygen NO_3 - Nitrates Cl – Chlorides NH_4 – Ammonium Ca – Calcium ND – Not Detected

TDS – Total Dissolved Solid COD – Chemical Oxygen Demand

Results and Discussion

For the results of the surface water quality analysis conducted for Rong-An Inc. Forest Concession, most of the parameters analysed were within the acceptable range. For the parameters that were analysed the results were as follows:

Water temperature is affected by air temperature, storm water runoff, groundwater inflows, turbidity, and exposure to sunlight. The surface water temperature readings ranged from 23.0 to 32.1 ^{0}C during the wet season and 26.2 to 27.8 ^{0}C during the dry season, these were within the GNBS accepted range of < 40 ^{0}C, which is considered healthy for living organisms. It is expected that human activities within the area should not change water temperatures beyond natural seasonal fluctuations.

pH is a measure of a solution's acidity. In water, small numbers of water molecules (H_2O) will break apart or disassociate into hydrogen ions (H^+) and hydroxide ions (OH^-). Other compounds entering the water may react with these, leaving an imbalance in the numbers of hydrogen and hydroxide ions. When more hydrogen ions react, more hydroxide ions are left in the solution and the water is basic; when more hydroxide ions react, more hydrogen ions are left and the water is acidic (Behar 1997a).

The pH analysis of the surface water samples of the Creeks within the Rong-An Inc. Forest Concession during the wet season ranged from 5.24 to 8.93 pH, and 5.63 to 8.12 pH during the dry season indicating that water in the area is slightly acidic to neutral to slightly alkaline. The pH parameters were within the limits (5.0 – 9.0 pH) GNBS Interim Guidelines for Industrial effluent into the Environment.

Conductivity of the water samples within the concession during the wet season ranged from 29 to 61 µS/cm and 25 to 45 µS/cm during the dry season, these were within the WHO standards for drinking water i.e. 0 to 1500 µS/cm. Distilled water has a conductivity ranging from 0.5 to 3 µS/cm, while most streams range between 50 to 1500 µS/cm. Freshwater streams ideally should have a conductivity between 150 to 500 µS/cm to support diverse aquatic life.

Turbidity is a measure of how particles suspended in water affect water clarity. It is an important indicator of suspended sediment and erosion levels (Behar 1997b). During the wet season the turbidity level of the streams ranged from 15.6 to 51.6 ntu, while during the dry season the turbidity level ranged from 4.0 to 26.7 ntu. Therefore, the turbidity levels within the streams were basically above the accepted 10 ntu GNBS Interim Standards. The levels recorded were higher, probably because turbidity generally increase with distance closer to the bank of a stream or flowing creek. This is expected since the closer the proximity to land, the higher the turbidity level.

Dissolved oxygen **(DO)** is oxygen gas molecules (O_2) present in the water. Plants and animals cannot directly use the oxygen that is part of the water molecule (H_2O), instead depending on dissolved oxygen for respiration. Oxygen enters streams from the surrounding air and as a product of photosynthesis from aquatic plants (Cooke 2014). Some of the Dissolved oxygen readings of the streams were within the WHO accepted standard of ≤ 5.0 mg/L during the wet season for instance WQ1 to WQ8 and WQ14. The levels recorded ranged from 3.4 mg/L to 6.8 mg/L. Readings that were above the WHO standards i.e. WQ9 (6.8 mg/L), WQ10 (6.0 mg/L), WQ11 (6.4 mg/L), WQ12 (6.3 mg/L), and WQ13 (5.2 mg/L). While during the dry season levels recorded ranged from 4.5 mg/L to 6.5 mg/L. Readings that were above the WHO standards i.e. WQ1 (5.5 mg/L), WQ2 (5.3 mg/L), WQ3 (5.6 mg/L), WQ5 (6.3 mg/L), WQ9 (6.5 mg/L), WQ10 (5.8).

Readings above the WHO accepted standard of ≤ 5.0 mg/L were high probably due to the Caimans and Otters present in the streams. Dissolved oxygen levels of 4 – 7 mg/L is considered good for many aquatic animals (Behar 1997b).

Nitrogen is abundant on earth, making up about 80% of our air as N_2 gas. Most plants cannot use it in this form. However, blue-green algae and legumes can convert N_2 gas into nitrate (NO_3^-), which can be used by plants. Plants use nitrate to build protein, and animals that eat plants also use organic nitrogen to build protein. Nitrate ion levels of the water samples during the wet season ranged from 0.1 to 2.9 mg/L, and 1.9 to 7.4 mg/L during the dry season which are within the safe levels for marine organisms (20 ppm) (J.Camargo, Alonso, and Salamanca. 2005; Joksimovic 2010) and were below the GNBS Guidelines and the WHO drinking water standard of 10 mg/L. Concentrations over 10 mg/L will have an effect on the freshwater aquatic environment. 10 mg/L is also the maximum concentration allowed in human drinking water by the U.S. Public Health Service.

Chloride is a salt compound resulting from the combination of the gas chlorine and a metal. Chloride, in the form of the Cl^- ion is one of the major inorganic anions (negative ions) in saltwater and freshwater. Almost all natural waters contain chloride ions. Their concentrations vary considerably according to the mineral content of the earth in any given area. The wet season Chloride ion levels ranged from 0.1 mg/L to 3.3 mg/L, while the dry season Chloride ion levels ranged from 0.1 mg/L to 2.3 mg/L, indicating good quality as they were below the US-EPA Secondary Drinking Water Regulations of 250 mg/L.

Ammonia will react with water to form a weak base. The term ammonia refers to two chemical species which are in equilibrium in water (NH_3, un-ionized and NH_4^+, ionized). When dissolved in water, normal ammonia (NH_3) reacts to form an ionized species called ammonium (NH_4^+). Ammonium ion levels of the streams within the concession during the wet season ranged from 0.1 mg/L to 7.2 mg/L; and 1.4 mg/L to 5.3 mg/L during the dry season these were all above the WHO Guidelines for Drinking Water Quality level of 0.2 mg/L. The levels of ammonia were high due to the presence of animals located near the streams.

Calcium is a major positive ion in natural fresh water. It is widely found in many minerals. Calcium makes up 4.9% of the surface of the earth and 0.07% to 1.7% of the soil. Calcium ion levels recorded during the wet and dry seasons ranged from 0.0 mg/L to 9.9 mg/L respectively indicating good standing with the 15 mg/L US-EPA Standards in rivers. When the water flows through lime, calcium carbonate is dissolved into calcium bicarbonate ($Ca(HCO_3)_2$) which is the main source of calcium ions in water.

Total Dissolved Solids (TDS) is the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water (Yamamura et al.). TDS, which is based on conductivity, is expressed in parts per million (ppm). TDS includes any conductive inorganic elements present other than the pure water molecules (H_2O) and suspended solids (Yamamura et al.). TDS affects everything that consumes, lives in or uses water, from fish and plants to plumbing and laboratories. For people, the lower the TDS level in the water you drink, the more efficiently your body's cells are hydrated. The higher the TDS level in water, the greater the probability of harmful contaminants that can pose health risks or hinder the absorption of water in the body. The TDS levels of the water samples during the wet season ranged from 11 ppm to 59 ppm and 7 ppm to 16 ppm during the dry season, these were all below the U.S. EPA's Maximum Contaminant Level for TDS of 500 ppm.

Oil and Grease (OG)*:* The concentration of dispersed oil and grease (OG) is an important parameter for water quality and safety. OG in water can cause surface films and shoreline deposits leading to environmental degradation, and can induce human health risks when discharged in surface or ground waters (NCDWQ 2006). OG analysis reveals the total concentration of a family of organic compounds including "non-volatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related matter" (NCDWQ 2006).

Oil and grease levels of two water samples during the wet season were 25.27 mg/L (WQ6) and 61.00 mg/L (WQ8) respectively and were above the limits (<10) GNBS Interim Guidelines for Industrial effluent into the Environment, while six (6) water samples taken during the dry season and the levels were 0.025 mg/L (WQ3), 0.026 mg/L (WQ4), 1.316 mg/L (WQ6) and 0.014 mg/L (WQ8). These results were all below the GNBS Interim Guidelines of (<10). Monitoring during the wet season indicated that OG is present in the streams of the Concession and the concentrations were above the GNBS accepted limit. The presence of oil and grease in the water samples could have been due to contamination during travel from the concession to the Guyana Sugar Corporation Inc. laboratory.

COD (Chemical Oxygen Demand)*:* analysis is a measurement of the oxygen-depletion capacity of a water sample contaminated with organic waste matter (MANTECH 2015). Specifically, it measures the equivalent amount of oxygen required to chemically oxidize organic compounds in water (MANTECH 2015). COD levels of two water samples taken during the wet season were 70.40 mg/L (WQ6) and 114.40 mg/L (WQ8), while six (6) water samples were taken during the dry season, and the levels were 24 mg/L (WQ6) and 16 mg/L (WQ8). These results were within the GNBS accepted range of <250 mg/L. Chemical oxygen demand (COD) does not differentiate between biologically available and inert organic matter, and it is a measure of the total quantity of oxygen required to oxidize all organic material into carbon dioxide and water.

The results of the analyses of surface water quality of the Rong-An Inc. Forest Concession indicated that the existing water quality of the area is a characteristic of the water quality for similar types of areas within Guyana. The results also indicated very low levels of contamination. The water quality standards are

attached in Appendix XVI and the results of the water sample analyses from the Guyana Sugar Corporation Inc. are attached in Appendix B.

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Annex XVI: 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	COD	DO	TSS	N as HN3	Total N	P	CN (Tol.)	P04	C1	Surfac-tant	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-able solids				<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; 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;

Sector	pH	Temp.	BOD5	COD	DO	TSS	N as HN3	Total N	P	CN (Tol.)	P04	C1	Surfac-tant	Phenols	Coliform	O &G	Other and/or Comments
																	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; CI: 300; NH4 as N:1.0
Petroleum bulk terminal	5.0-9.0	<40	<50	,250		<100										TPH:<40	Pb: 0.1, Cr GT 0,.1 Cr (+A) 05
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										
Sector	**pH**	**Temp.**	**BOD5**	**COD**	**DO**	**TSS**	**N as HN3**	**Total N**	**P**	**CN (Tol.)**	**P04**	**C1**	**Surfac-tant**	**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	
Sugar factories	5.0-9.0	<40	<250 t.v.<100	<250	>4.0	<250 (t.v.<100	<250 t.v.<100										
Textiles	5.0-9.0			<250	>4.0	<500 (t.v. 100)						300	<0.2 deter-gents	<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	<free 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. Limit taken from India and Sir Lanka.
General environmental guidelines	5.0-9.0	<40	<50	<250		<50 as TSS	<10		<2	<1 Free: 0.1		<Cl :0.2		<0.5	<400 MPN per 100 mls	<10	WB Std: Fluorine: 20; No limits given for metals.

Annex XVII: US EPA Standards and World Health Organisation Guidelines

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
Fecal Coliform (CFU/100ml/day)	800	800
Dissolve Oxygen (mg/L)	< 5	<5

WHO Drinking Water Guidelines

WHO Drinking Water Guidelines	
Parameter	**Guideline**
pH	6.5-8.5
Turbidity (NTU)	<5
Conductivity (µS)	1500
Sulphates (mg/L)	500
Nitrate (mg/L)	10
Total Dissolved Solids (mg/L)	1000
Faecal Coliform (CFU/100ml)	0

Annex XVIII: Notes Extracted from the Minutes prepared by the Education, Information and Training Division, EPA for consultations at Ituni & Kwakwani Respectively on October 28, 2016, re SFEP 2/2011.

1.0 Introduction

The Agency received an Application for Environmental Authorization from Rong –An Inc. on June 04, 2015, for a large-scale logging operation and the operation of a Portable Sawmill within State Forest Exploratory Permit (SFEP): 02/11 (110km – UNAMCO Road, Berbice). The proposed location is the right bank of the Berbice River and left bank of the Corentyne River. A site visit was conducted on June 15, 2015, and in accordance with Part IV Section II of the Environmental Protection Act of 1996, the Company is required to conduct an Environmental Impact Assessment (EIA) for the project.

Rong-An Inc. was incorporated in Guyana under the provisions of the Companies Act of Guyana on September 01, 2006. The Company plans to invest an initial US$20 M in the forestry sector. To this end, it has established an office at Lot A, Block 2, Public Road, Land of Canaan, East Bank Demerara, and has complied with all the necessary requirements for corporate entities. The Company currently employs seventy (70) people.

Because of its application for a forest concession, the Guyana Forestry Commission (GFC) on November 04, 2011, granted the Company a State Forest Exploratory Permit (SFEP) designated 2/2011 for an area of 57,929.60 hectares of forest resources in the upper right bank Berbice River. The SFEP grants the Company the legal authority to:

a) Establish partnerships with other developers in the natural resources sector in the upper Berbice River, including but not limited to loggers, loggers' associations and communities.

b) Collect baseline data on the natural resources and land use respectively within the concession area itself with emphasis on forestry resources.

c) Review the legal, economic and social framework impacting on logging operations in regions 6 and 10 with a view to determining business options for concession area.

d) Estimate the nature and extent of merchantable timber within the concession and the feasibility of carrying out timber harvesting in line with the suite of prescribed forest management parameters. This also includes analysis of the road infrastructure, equipment and skills sets necessary to carry out timber harvesting within the concession area.

e) Based on the foregoing, to present to the EPA, the GFC and other relevant agencies, feasible and practical measures to address effectively any negative impacts that emerge from timber harvesting operations and ancillary works within the concession area or its environs with a view to obtaining an Environmental Permit from the EPA and a forest concession agreement from the GFC.

2.0 Official Delegation

EPA Representatives:

a) Dr. Hansranie Seebaran – Director, Environmental Management Permitting Division
b) Ms. Teijvarti Persaud - SEO (M&F), Environmental Management Permitting Division
c) Ms. Sharmin Joseph – EO II (M&F), Environmental Management Permitting Division
d) Mr. Junior Toney– EO I (M&F), Environmental Management Permitting Division
e) Mr. Mahendra Budhram - EO II (Enforcement), Environmental Management Compliance Division
f) Mr. Zahair Ali - EO II (Wildlife Unit), Biodiversity Management Division
g) Ms. Candacie Brower-Thompson - SEO, Education, Information and Training Division (Chairperson)
h) Ms. Urmila Singh - EA, Environmental Management Permitting Division
i) Mr. Deuel Hughes - EO II, Education, Information and Training Division

Representatives from Company, Rong-An Inc.

a) Mr. Chen Ming – Managing Director
b) Ms. Sara Huang – Administrative Manager
c) Claudia Downer – Administrative Officer
d) Mr. Kevindra Tularam – Forest Manager

Representatives from EIA Consultant Team:

a) Mr. Godfrey Marshall – Consultant form GFC Training School

Representative from GFC

a) Mr. Gavin Agard- Deputy Commissioner
b) Mr. Khemchan Persaud – GFC Officer
c) Mr. Cleavon Barker- GFC Officer

Representative-GGMC

a) Mr. Aditya Persaud – GGMC Officer

Representative: Environmental Assessment Board (EAB) Representative:

a) Ms. Sherlanda Daniels

3.0 Project Description (Provided by Rong-An Inc.)

The Concession Area

The concession area is on the upper right bank Berbice River, within Administrative Region 6. Two other major concessions occur in the general geographic area, Bai Shan Lin to the north and to the south-east, and Variety Woods Limited to the west.

Currently, the area is accessed via the UNAMCO Road. (The Berbice River at that latitude does not support the movement of riverine crafts that can transport logs due to its shallow depth in dry season, the occurrence rock outcrops and waterfalls and extensive sandbars). Prior to accessing the area, no other land use was detected by Rong-An Inc.'s operatives carrying out reconnaissance surveys by air or overland; also, there is no evidence of anyone living in or around the area or even traversing the area. Initial reconnaissance surveys indicate that the entire area contains intact forests.

Project Activities

RONG-An-Inc. is investing US$20 million initially in this project. The tasks to be undertaken on the project (subject to the receipt of a forest concession agreement) may be divided into three categories: offsite administrative issues, timber harvest planning and timber harvesting operations.

4.0 Objectives of Scoping

The scoping of an EIA entails several components, among which are Public Scoping meetings. Sector scoping is carried out by the developer and is facilitated by the EPA with the following objectives:

a) To consult with members of the public, stakeholders and communities about a proposed project.
b) To identify possible impacts there may be from the project and alternatives considered.
c) To identify the important environmental components likely to be affected and issues of conflict between the various stakeholders.

5.0 Presentations and Comments

The Public Scoping at both venues composed three (3) presentations which focused on the EPA's Environmental Authorization and EIA Processes, the Project Description and the Project's EIA Approach and potential impacts.

5.1 EPA's Authorization/EIA Process - EPA

The presentations were delivered by Environmental Officers from the EPA, Mr. Junior Toney and Ms. Sharmein Joseph in Kwakwani and Ituni, respectively. Participants learnt that any project which could have significant impacts on the environment would have to undergo an Environmental Impact Assessment (EIA) study. The steps within this process as outlined in the presentation include screening, scoping (sector and public), conducting the EIA study and reviewing the EIA report and finally deciding to grant/deny Environmental Authorization.

Figure 1: Illustration of presentations by Ms. Sharmein Joseph (EPA), and G. Marshall, FTCI Consultant

5. 2 Project Description – Proponent/Developer

The second presentation, given by Mr. Kevindra Tularam, the Company's representative, featured a detailed description of the proposed project. The project's major focus areas are timber harvesting and timber processing at facilities in Administrative Regions 6 and 10.

5.3 EIA Approach and Potential Impacts - Consultant

Thirdly, in the presentation delivered by Mr. Godfrey Marshall, Consultant, Forestry Training Centre, attendants were made aware of the potential environmental and socio-economic impacts of the project and how these will be mitigated. These include generation of domestic waste, impacts on air quality from dust emissions, change in forest quality, and social issues including squatting and land use conflicts.

6.0 Questions, Comments and Responses

EPA's Authorization/EIA Process -EPA

The opportunity was given for stakeholders (see Figure 2) to raise any matters of concern to them.

Figure 2: Stakeholders at meetings at Ituni (left) and Kwakwani (right)

Under the Authorization and the EIA process, concerns were raised about the Developer receiving comments from residents and ensuring residents are adequately informed about the project and its potential impact on them. Most of the operational concerns were based on the number of locals that would be employed by the Company, and how the Company planned to market its products and be profitable.

Major concerns surrounding environmental impacts focused on air quality due to dust emissions from transportation, while socio-economic concerns raised included how the communities would benefit in terms of employment and social infrastructure, e.g., streetlights, pavement of roads, etc.

1. **Charles Thom - Logger**

Q. How does the Developer receive my comments?

A. Candacie Brower-Thompson, Senior Environmental Officer, EPA

- *When comments are forwarded to the Agency, the Agency then forwards these to the Developer.*

2. **Charles Thom - Logger**

Q. What would allow the company to maintain the ratio of Guyanese to foreigners in terms of employment?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

The company's agreement with the Guyana Forestry Commission stipulates a certain percentage of local employees.

3. **Kurt Simon -Logger**

Q. How can people in interior locations get the documents pertaining to the project?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

Documents can be uplifted at the Agency's office and are at strategic locations in outlying areas, e.g., Guyana Forestry Commission Field Stations.

4. Kurt Simon -Logger

Q. What is the log export policy for the company?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc

-80% of logs will be processed and 20% exported.

5. Desmond Gladstone - Logger

Q. Is the EPA concerned with developmental activities, especially gold mining that occurs in the 'backdam'?

A. Candacie Brower-Thompson, Senior Environmental Officer, EPA

Yes. EPA is the body responsible for comprehensive environmental management countrywide.

6. Patrick Gonsalves - UBFAPA

Q. What plans are in place to manage waste from operations, i.e., sawdust from mill, dust from roads? (Suggestion: company should stagger the trucks to reduce dust).
Residents from local communities directly affected by the project should be present at scoping meetings.

A. Gavin Agard, Commissioner, GFC

- *GFC will consult with the company on the best way forward.*

7. Wade Russell - UBFAPA

Q. How will Rong-An Inc. ensure their products are sold? Will their products compete with products in China? There should be training for locals to produce furniture, for example, for the country to benefit directly (suggestion).

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

- *Rong-An has a retail center in China, which will receive logs from Guyana. Logs will be made to specifications/demand on the market in China. Products from Rong-A will not compete on the local market.*
- Will 20 people run the entire operation?
- *No, the initial number of staff to be hired is 20 but this will increase as the project is implemented.*

8. Aditya Persaud – GGMC Officer

Q. Is there any intention of buying logs from small loggers?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

The company has rental agreements with small loggers and can buy from small loggers once permitted by the GFC.

9. Victor Walker - Logger

Q. Will the finished products be retailed in Guyana?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

The company has a sales outlet in China. No produce from the mill will be sold locally, unless it's necessary or requested by GFC.

10. Michelle Watson - UBFAPA

There needs to be monitoring of operations to ensure the company does not get involved with local loggers (suggestion).

11. Gavin Agard - Assistant Commissioner, GFC

Q. Will the company implement a road toll?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

It's an element being considered to manage the road.

R. **Keon Liverpool - Logger**

Q. How would the community benefit from the project?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

-Direct benefits include maintenance of UNAMCO road, all logs will be purchased from logging association members, rental agreement for persons who do logging through GFC and employment for community members.

S. Larry George - Operator

Q. Can Rong-An do more (in terms of social benefits) for the community, e.g., ambulance, streetlights, etc.?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

- *The company is willing to assist in any way possible.*
- Will Rong-An buy all wood from the community?
- *If the company gets permission from GFC, it will buy wood from community members.*

T. Cliff Wilson - Logger

Q. Would residents be treated fairly in terms of price when selling logs?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

- *Rong-An has an arrangement and intends to uphold the agreement; prices can fluctuate – further discussion is needed.*

U. Anonymous source

Q. Can Clarification of rental agreements need to be done upfront?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

- *Any active member of the logging association is eligible to rent equipment.*

V. Ivor Crossman - Pastor

Q. Is there a possibility from Rong-An to divert and assist with roads in lesser developed areas?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

- *There was a one-time agreement with Ituni to develop roads; further discussions were needed internally at the company and with GFC.*

W. Anonymous source

Q. Why can't measurement of wood be done immediately?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

- *The previous arrangement was a learning experience.*

X. Linden Duncan - Logger

Q. The condition of the UNAMCO road has begun to deteriorate. Is there a provision for the company to maintain the road?

A. Mr. Kevindra Tularam, Forest Manager, Rong-An Inc.

- *Yes!*

7.0 Remarks

The EIA process requires that all comments, questions and recommendations be sent to the company to address. The TOR of the EIA will be refined and agreed upon by the Developer and the EPA. The EPA will await submission of the EIA report which will be reviewed by the EAB, relevant sectors and the public. This review will be for a period of 60 days after which the comments will be compiled and sent to the consultant to address.

8.0 Annexes-Agendas

A. Agenda re meeting at Kwakwani: Venue: Kwakwani Empowerment Centre

Opening comments & introductions)	EPA	10:30h — 10:40h
Objectives of meeting	EPA	10:40h — 10:45h
Environmental Authorizations Process: Presentation	EPA	10:45h — 11:00h
Environmental Authorizations Process: Q&A	EPA	11:00h — 11:05h
Project Description:	Rong-An Inc.	11:05h — 11:25h
Project Description: Q&A	Rong-An Inc.	11:25h — 11:35
Project's EIA Approach Presentation	Mr. Godfrey Marshall and team – Forestry Training Centre Incorporated	11:35h — 11:55h
Project's EIA Approach: Q&A	Mr. Godfrey Marshall and team – Forestry Training Centre Incorporated	11:55 h — 12:10 h
Recap of Q&A	EPA	12:10h — 12:20 h
Next Steps and Closing	EPA	12:20h — 12:30 h

B. Agenda re meeting at Ituni: Venue: ISLA Community Centre, Ituni

Opening comments & introductions	**EPA**	**15:00h — 15:10h**
Objectives of meeting	**EPA**	**15:10h — 15:15h**
Environmental Authorizations Process: Presentation	**EPA**	**15:15h — 15:30h**
Environmental Authorizations Process: Q&A	**EPA**	**15:30h — 15:40h**
Project Description	**Rong-An Inc.**	**15:40h — 16:00h**
Project Description: Q&A	**Rong-An Inc.**	**16:00h — 16:15h**
Project's EIA Approach: Presentation	**Mr. Godfrey Marshall and team – FTCI**	**16:15h — 16:35h**
Project's EIA Approach: Q&A	**Mr. Godfrey Marshall and team –FTCI**	**16:35 h — 16:50h**
Recap of Q&A	**EPA**	**16:50h — 17:00 h**
Next Steps and Closing	**EPA**	**17:00h — 17:10 h**