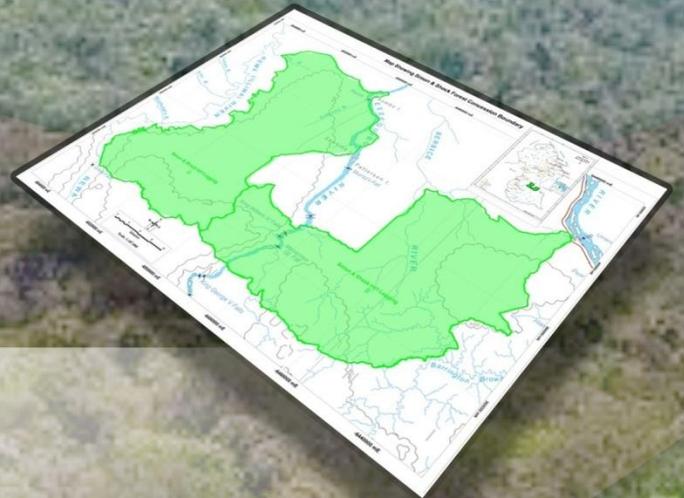


ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

FINAL

SIMON & SHOCK INT'L LOGGING INC.

LOGGING AND SAWMILLING OPERATIONS
Upper Essequibo, Region 9



Environmental Management Consultants

MARCH 2013

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ACRONYMS

AAC	Annual Allowable Cut
ABCTCL	Amalgamated Bean Coffee Trading Company Ltd
AES	Auditory Encounter Surveys
AOP	Annual Operational Plan
BHI	Bina Hill Institute
CI	Conservation International
CITES	Convention on International Trade in Endangered Species
DBH	Diameter at Breast Height
DO	Dissolved Oxygen
EAB	Environmental Assessment Board
EIA	Environmental Impact Assessment
EMC	Environmental Management Consultants
EMP	Environmental Management Plan
EP Act	Environmental Protection Act
ERP	Emergency Response Plan
ERT	Endangered, Rare or Threatened
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Statement
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization
FLEGT	Forest Law Enforcement Governance and Trade Programme
FMLI	Forest Management Level Inventory
FMP	Forest Management Plan
FTC	Forestry Training Center
GFC	Guyana Forestry Commission
GGMC	Guyana Geology and Mines Commission
GoG	Government of Guyana
GLSC	Guyana Lands & Surveys Commission
GNBS	Guyana National Bureau of Standards
GPF	Guyana Police Force
GUYSUCO	Guyana Sugar Corporation Inc.
HSE	Health, Safety and Environment
ITCZ	Inter-Tropical Conveyance Zone
IUCN	International Union for Conservation of Nature
LCDS	Low Carbon Development Strategy
LUP	Land Use Policy
MoNRE	Ministry of Natural Resources and the Environment
MRV	Monitoring, Reporting and Verification System
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
ND	Not Detected
NDS	National Development Strategy
NEAP	National Environmental Action Plan
NFP	National Forest Policy
NGO	Non-Governmental Organisation
NRDDB	North Rupununi District Development Board
NTFP	Non-Timber Forest Products
OH&S	Occupational Health and Safety
OHSA	Occupational Health and Safety Act
PET	Potential Evapo-Transpiration
PPE	Personal Protective Equipment
REDD	Reduced Emissions from Deforestation and Degradation

RIL	Reduced Impact Logging
SFEP	State Forest Exploratory Permit
SFM	Sustainable Forest Management
SIA	Social Impact Assessment
SSILI	Simon & Shock International Logging Inc
ToR	Terms of Reference
TSA	Timber Sales Agreement
TSS	Total Suspended Solids
TDS	Total Dissolved Solids
UECC	Upper Essequibo Conservation Concession
UNECE	United Nations Economic Commission for Europe
VES	Visual Encounter Surveys
VPA	Voluntary Partnership Agreement

EXECUTIVE SUMMARY

There is a growing demand for tropical timber on the world market. Countries such as the United States of America and Europe need a stable supply while Asia's needs are increasing rapidly, especially in China and India. Guyana is endowed with an abundance of natural forest which presents an economic means to assist in the country's development, through the extraction of these resources. As of 2009 approximately 87% of the country land area was covered in forest, amounting to more than 18.5 million hectares and remains one of the most forested countries in the world¹. Given the current and future expected demands, Guyana can earn significant revenues to aid its development. The Government of Guyana (GoG) has recognised this opportunity and has been developing the sector in a progressive manner. However, the GoG has also realised that the country's forest plays a major role in mitigating climate change as well as a reservoir for biodiversity and providing a livelihood for local communities. As such, any extraction of these resources must be done in a sustainable manner. Therefore, the GoG has tasked Guyana Forestry Commission (GFC) with promoting sustainable management of Guyana's forest resources. As part of its mandate, the GFC has been encouraging sustainable forest operations for the promotion of social and economic development while at the same time safeguarding the integrity of forest resources.

Simon & Shock International Logging Inc. (SSILI) has responded to this effort by the GFC by implementing a project based on a sustained yield management programme and to operate in accordance with GFC's Code of Practice for Forest Operations. In this regard, the Company applied to the GFC and was granted a State Forest Exploratory Permit (SFEP) to commence preparatory works which include conducting the necessary studies and preparing the required documentation which are to be submitted to the relevant regulatory agencies for approval. The studies to be conducted include the Forest Inventory, the Environmental and Social Impact Assessment (ESIA) and the preparation of the Forest Management Plan (FMP). Once the GFC requirements are met, the GFC can proceed to issue the Timber Sales Agreement (TSA) to SSILI. In order to obtain the Environmental Authorisation and to commence the ESIA process, SSILI submitted an Application for Environmental Authorization to the Environmental Protection Agency (EPA). The EPA reviewed the application then subsequently, conducted a visit to the project site and formally communicated to the Company that an ESIA must be conducted for the Project before the Environmental Authorisation can be granted. SSILI has contracted Environmental Management Consultants (EMC) to conduct the ESIA. EMC commissioned a multi-disciplinary team of specialists to conduct the ESIA. Several methods and approaches were employed during the conduct of the ESIA including a review of existing information, consultations with communities, consultation with key stakeholders and field surveys. It should be noted that at this time SSILI is seeking Environmental Authorisation for the logging aspect of the operation only since the alignment of the access road and the location of the main processing facilities have not yet been determined. As such, this ESIA only covered the activities to be conducted within the forest concession. Once the location and alignment of these aspects of the project are determined, an Addendum to the ESIA will be prepared to cover these activities.

SSILI Management has more than a decade experience in both forest operations and wood products marketing of tropical timber in India and other Asian countries. The Company's experience in both areas has established and expanded a huge market of wood products for export. The Parent Company currently operates the TSA previously held by Caribbean Resources Ltd. through another local subsidiary Vaitarna Holdings Private Inc.

SSILI plans to utilize the resources of the SSILI concession in a manner which will deliver financial rewards in the most effective and efficient manner without degrading the bio-physical and socio-economic environment, thus ensuring benefits to future generations.

SSILI plans to establish a composite logging and sawmilling operation with associated downstream processing plants and kiln drying facility. Housing for employees along with electricity and potable water supply and other auxiliary facilities will be provided in order to realize the goals of the main beneficiaries

¹ Data Source: Guyana REDD+ Monitoring Reporting and Verification System (MRVS) Interim Measures Report - 2011

and the vision of the Company. Logging will occur within the 391,853 hectares (968,289 acres) concession and all activities will be done in accordance with the requirements of the GFC, including the GFC's Code of Practice for Timber Harvesting Operations. For the first five years, logging will be conducted in the North Rewa and Middle Rewa Compartments of Part A of the concession and all commercially viable blocks will be determined, demarcated and inventoried.

Some primary processing will be done within the Concession utilizing chain saws and a portable mill while a permanent facility will be established outside of the concession to assist with further processing but the location of this facility is not yet determined. The materials will then be transported to Georgetown for shipping to overseas markets.

The forest concession is situated in the Upper Corentyne – Upper Essequibo District, within the forestry belt of Guyana on the right bank of the Rewa River and on both the right and left banks of the Essequibo River, south and southwest of the Sherwood Forests Inc.'s Concession and east, west, & south of the Conservation International's (CI) Concession. There are no Amerindian communities within the concession. The nearest communities are Rewa, Apoteri and Crash Water, which are all situated more than 20km from the Concession's northern and western boundaries. The Concession is divided into two parts; Part A and Part B. Part A consist of 191,660 hectares (473,602 acres) while Part B has an area of 200,193 hectares (494,688 acres). Part A can be accessed via the Rewa and Essequibo Rivers and Part B from the Essequibo River only.

The Project will see a total investment of approximately Eighteen Million, Seven Hundred and Forty Seven Thousand, Two Hundred and Thirty US Dollars (US\$18,747,230) during the first five years (2012 – 2017). This investment will be done in phases. During the pre-harvest phase of the operation, employment by the Company is expected to be in the vicinity of 45 persons. However, this figure will be increased to 320 persons once harvesting and processing activities commence. The majority of these personnel will be Guyanese and, as much as possible, from the communities in close proximity to the Concession.

The construction phase of the project will entail road location survey, block demarcation and the conduct of timber inventory, road, bridges, culverts and drainage construction, building of skid trails and log markets, construction of forest camp and construction of processing facility. The operations phase of the project will involve the felling of logs, extraction and transport of logs to the log yard, transporting of logs by logging trucks to the Base Camp, processing of logs into squares, transporting of logs by logging trucks to the processing facility and downstream processing.

For the SSILI operation, the total area of the Concession is 391,853 ha and it is expected that approximately 78,731 ha (20% of the Concession) can be classified as non – usable forest. This non – usable forest area consists primarily of swamps, waterways, non-productive areas and buffer zones. 14,344 ha is considered liana forest, for a total of 93, 065 ha. A further 13,455 ha (4.5%) of the productive forest of the Concession will be maintained as a Biodiversity Reserve. Thus, this will leave 285,343 ha as the productive forest remaining. Given that no part of the Concession was previously logged, a cutting cycle of sixty (60) years is proposed. For this cutting cycle, the annual allowable cut is calculated to be 95,114 m³ with a monthly allowable cut of 7,926 m³. This would enable an annual harvesting area of 4,756 ha in 48 Blocks.

For the purpose of the ESIA, consideration was given to alternatives to the project. The options considered are the No Project scenario, harvesting of Non-Timber Forest Products (NTFPs) and the location of the primary processing activities.

Currently, there is no land use or activities within the Concession. There are also no Amerindian communities or titled lands within the project area. However, historically, the wider project area including sections of the Concession was used for balata exploitation. Outside of the project area, other economic and developmental activities are limited or non-existent. However, the GFC has recently awarded SFEPs to a few concessionaires north of the general project area. There are no mining activities or properties

within the Concession and the Guyana Geology and Mines Commission (GGMC) indicated that there is currently a moratorium on river mining in the Upper Essequibo and Rupununi Rivers and applications for land prospecting and mining are awaiting a presidential decision. Therefore, there are currently no mining properties within and around the Concession. Adjacent to the SSILI Concession is CI Upper Essequibo Conservation Concession (UECC). The SSILI Concession borders the CI Conservation Concession on the west, south and east.

The soil found throughout the concession is of typical laterite soils which are porous and claylike, containing mainly metal oxides and possessing varying colours based on the concentration of the various metal oxides present. It was found that there were 6 distinct species of soils that existed within the Concession area. These soils include Endoaquults, Kandustoxs, Kandustults, Plinthudults, Ustochrepts and Ustchrepts. The general configuration of Part A of the Concession is mainly flat to undulating and hilly while Part B is mainly hilly and broken hills on both sides of the Essequibo River.

The Concession is drained by 3 major rivers occurring in the area. Most of Part A is drained into the Rewa River on the west while the portion to the east and north east is drained into the Essequibo River. The Rewa River then flows into the Rupununi River, which then flows into the Essequibo River where it forms the Rupununi-Essequibo Triangle at Apoteri. The Essequibo River passes through Part B of the Concession and drains most of the southern and western portion of this area. Additionally, a smaller portion to the east is drained into the Corentyne River.

The project area is characterised by the weather pattern experienced by the rainforest area of south east Guyana. This weather pattern is different from that experienced by the Rupununi Savannahs located to the west of the project area. The climate is strongly influenced by the Inter-Tropical Convergence Zone (ITCZ) which gives rise to two wet and dry seasons. The long wet season usually runs from May to August and the short wet season from December to February. The periods in-between are relatively dry.

A water quality sampling programme was implemented to determine the water quality within and around the concession. The results of the analyses indicated that the existing water quality of the area is typical of the water quality for the similar type of areas within Guyana. The results indicated very low level of contamination.

A biodiversity assessment was also conducted for the concession area and the results confirm that the area contains diverse, pristine forests and other terrestrial habitats, the rivers and aquatic habitats relatively undisturbed with very low levels of contamination, and they harbour an abundant and diverse fish fauna, forests and plant communities are essentially pristine, there is a high vertebrate diversity, particularly of mammals and birds and there are healthy populations of many globally threatened species including giant otter (*Pteronura brasiliensis*), brown-bearded saki monkey (*Chiropotes satanus*) arapaima (*Arapaima gigas*), black caiman (*Melanosuchus niger*), giant armadillo (*Priodontes maximus*), giant anteater (*Myrmecophaga tridactyla*), and giant river turtle (*Podocnemis expansa*)

During the conduct of the ESIA, both national and local level stakeholders were consulted. National level stakeholders, including sector agencies, were consulted at the Sector Agency Meeting organized by the EPA, as well as through interviews. Local level stakeholders, including the communities, were consulted via the Public Scoping Meeting, Village Meetings, and by interviews. These consultations allowed for the stakeholders to have a better understanding of the project, for them to air any concerns they would like to be addressed by the ESIA and to make recommendations for the project implementation.

The relevant national policies, statutory requirements and guidelines that would guide or impact the implementation and operation of this project as well as the key institutions which have regulatory oversight were also identified and discussed.

An impact assessment was conducted to determine the potential impact of the project on the environment. For the potential impacts determined, measures were identified to mitigate and manage each impact. The table below presents a summary of the potential impacts and the mitigation measures.

Table 1: Potential Impact and Mitigation Measures

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
Physical Environment				
Environmental Aspect: Land/Soil				
Land clearing for the construction of the Base Camp, roads, workshop and logmarkets	Const	Removal of vegetation, to facilitate construction of project facilities, thus exposing the soil and rendering it susceptible to erosion	<ul style="list-style-type: none"> ▪ Minimize removal of vegetation and encourage re-vegetation ▪ Landscaping of project sites should be done to reduce sloping ▪ Install drainage system to adequately drain storm water 	Lo, R, LT, Un, M, Insig
Operation of machines	Const/Opr	Compaction of soil from operation of heavy-duty machines	<ul style="list-style-type: none"> ▪ Earthworks should be avoided during periods of heavy rainfall ▪ Designate routes for heavy duty equipment to prevent compaction of soil ▪ Use appropriate machines for all earth works ▪ If ponding is observed it may be necessary to scarify the topsoil 	Lo, Rev, ST, Av, M, Insig
Disposal of solid and liquid waste	Const/Opr	Soil contamination from the improper disposal of waste generated	<ul style="list-style-type: none"> ▪ Implement Waste Management Plan 	Lo, Rev, ST, M, Av, Insig.
Fuel and oil transportation, handling and storage	Const/Opr	Contamination of soil from fuel spills/ waste oil	<ul style="list-style-type: none"> ▪ Ensure fuel and lubricants are stored within a bunded area with an impervious surface ▪ When handling fuel, care should be taken to prevent spillage and leaks ▪ Spill kits should be made available in the event of spillages. ▪ Ensure waste oil is collected and stored in covered containers on a 	Lo, Rev, ST, Av, M, Insig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			bundled and impervious surface	
Environmental Aspect: Water Resources				
Removal of vegetation to facilitate construction of buildings, roads and other facilities	Const	Sedimentation and discoloration of streams due to surface runoff /erosion and reduced interception resulting in deterioration of aquatic life	<ul style="list-style-type: none"> ▪ Implement erosion control measures ▪ Avoid discharge of storm water directly into nearby water course. Discharge should be channeled through vegetative areas which will serve as a natural filter for any sediment contained ▪ Bunding of stockpiles should be considered if storage is required for an extensive period ▪ Establishment of buffer zones around, rivers, creeks and lakes 	Lo,Rev, ST, Av, M, Insig
Construction of bridges and installation of culverts	Const	Possible reduction of stream flow from the installation of bridges and culverts	<ul style="list-style-type: none"> ▪ Construct bridges and culverts in accordance with the GFC's Code of Practice for Timber Harvesting Operations ▪ Temporary water-crossings to be decommissioned after usage to ensure that they do not collapse and block stream flow ▪ Design bridges to allow for the free flow of water, taking into consideration water flow during period of extremely high intensity rainfall ▪ Road culverts should be aligned perpendicular to the road and horizontal to the flow of water 	Lo,Rev, ST, Av, M, Insig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
Disposal of solid and liquid waste	Const/Opr	Contamination of water from improper disposal of waste	<ul style="list-style-type: none"> ▪ No dumping of waste into water bodies ▪ Implement Waste Management Plan 	Lo, Rev, ST, Av, M, Insig
Fuel and oil transportation, handling and storage	Const/Opr	Contamination of water from fuel spills/ waste oil	<ul style="list-style-type: none"> ▪ Locate fuel storage area at least 100m from work areas and 200m from any stream ▪ Ensure fuel and lubricants are stored within a bunded area with an impervious surface ▪ When handling fuel, care should be taken to prevent spillage and leaks ▪ Spill kits should be made available in the event of spillages ▪ Ensure waste oil is collected and stored in covered containers on a bunded and impervious surface 	Ex, Rev, ST, Av, M, Sig
Environmental Aspect: Air Quality				
Operation of processing equipment (chainsaws and portable mill)	Opr	Noise generated from the operation of processing equipment	<ul style="list-style-type: none"> ▪ Provide hearing protection to employees ▪ Noisy equipment such as the portable mill should be sited away from living quarters ▪ Enclose noisy equipment in sound proofing material, if necessary 	Lo, Irr, ST, Un, M, Sig
Operation of heavy-duty machines and generator	Const/Opr	Noise generated from the operation of heavy-duty machines and generator	<ul style="list-style-type: none"> ▪ Provide hearing protection to employees 	Lo, Irr, ST, Un, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<ul style="list-style-type: none"> ▪ Control of noise levels at source should be done via installation of silencers on exhaust system ▪ Noisy activities should not occur in close proximity to the housing areas during the night or on Sundays and Holidays and noisy equipment such as generator should be sited away from living quarters ▪ Enclose noisy equipment in sound proofing material, if necessary 	
Land clearing and transport	Const/Opr	Dust from soil exposure and the traversing of vehicles and logging trucks	<ul style="list-style-type: none"> ▪ Personnel working within dusty environments should be required to use dust masks ▪ Institute a speed limit for vehicles around the Base Camp to reduce the quantity of air borne particulate matter ▪ During dry periods it may be necessary to soak routes traversed by vehicles and equipment, especially in close proximity to the Base Camp 	Lo, Rev, ST, Av, M, Sig
Operation of processing equipment (chainsaws and portable mill)	Opr	Dust from the operation of chainsaws and portable mill	<ul style="list-style-type: none"> ▪ Personnel working within dusty environments should be required to use dust masks ▪ Siting of the processing area at the Base Camp away and downwind of the living quarters ▪ Sawdust should not be allowed to accumulate 	Lo, Rev, ST, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
Disposal of wood waste	Opr	Dust from the improper disposal of wood waste (sawdust)	<ul style="list-style-type: none"> ▪ No open dumping of wood waste should be done ▪ Sawdust should not be allowed to accumulate 	Lo, Rev, ST, Av, M, Sig
Biological Environment				
Environmental Aspect: Flora				
Construction of facilities and roads	Const	Direct loss of vegetation from land clearing	<ul style="list-style-type: none"> ▪ Land clearing and vegetation removal will be restricted to the operational areas and cleared areas not being utilized would be re-vegetated ▪ 4.5% of the concession equivalent to 14,107 hectares of the productive forest will be retained in an undisturbed, pristine state as biodiversity reserves. An additional 78,731 hectares (20% of concession) of in-operable forests on high hills and steep slopes will be retained in an undisturbed state ▪ All logging activities should be done in accordance with the GFC's Code of Practice for Timber Harvesting Operations, including RIL and SFM practices ▪ Comply with the approved silviculture system and logging cycle ▪ The GFC approved Annual Allowable Cut for the operations nor the 20m³ limit per hectare should not be exceeded 	Lo, Rev, LT, Un, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<ul style="list-style-type: none"> ▪ Forward road planning and ground surveys will minimise the area of forest clearance to construct roads ▪ Implement measures to prevent forest fires 	
Harvesting of logs	Opr	Reduction in number of certain species (particularly in commercial and/or keystone tree species)	<ul style="list-style-type: none"> ▪ Keystone, endemic and rare woody plant species and snags will be retained ▪ Comply with the approved silviculture system and logging cycle ▪ The GFC approved Annual Allowable Cut for the operations nor the 20m³ limit per hectare should not be exceeded 	Lo, Rev, LT, Un, M, Sig
Environmental Aspect: Fauna				
Construction of roads, logs ponds, etc. and operational activities	Const	Habitat loss, destruction, fragmentation due to land clearing and noise	<ul style="list-style-type: none"> ▪ A portion of the Concession (24.5% - 92,186 hectares) will remain undisturbed. A minimum of 4.5% of the concession equivalent to 13,455 hectares of the productive forest will be retained in a pristine state as protected biodiversity reserve(s) protecting representative areas of all forest types, with reserves being large enough to maintain viable populations of plants and animals and wide-ranging animal species. An additional estimated 78,731 hectares (20% of concession) of un-usable and in-operable forests on high hills and steep slopes, and swampy areas, will 	Lo, Rev, LT, Un, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<p>be retained in an undisturbed state.</p> <ul style="list-style-type: none"> ▪ Ensure waterways are not blocked so as to allow for the free flow of water to prevent flooding of forested areas ▪ Ensure water quality of streams within and around the Concession is not compromised ▪ Width of roads will be limited and, if possible, canopy cover retained across smaller roads and skid trails to benefit arboreal animals ▪ Vegetation removal should be limited. Care should be taken to minimize the width of deforested areas and, if possible, retain canopy cover above logging roads and trails ▪ Refuges will be created in areas where ERT species are known to exist or are encountered during operations 	
Presence of workforce	Const/Opr	Loss of wildlife from hunting and conflicts with human	<ul style="list-style-type: none"> ▪ Employee education and notification will be implemented to reduce vehicle-wildlife collisions and conflicts ▪ Workers of SSILI would be prohibited from hunting, trapping, killing, harming or capturing of any wildlife ▪ Employee education and notification to be implemented to ensure workers are aware of the need to preserve 	Lo, Rev, LT, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			wildlife and to reduce wildlife/roadway conflicts <ul style="list-style-type: none"> ▪ Warning signs indicating hunting/capturing of wildlife is prohibited would be placed at strategic areas ▪ Any occurrences of wildlife trapping and trading observed will be reported to the EPA and Wildlife Management Authority 	
Socio-economic Environment				
Environmental Aspect: Health and Safety				
Construction and operational activities	Const/Opr	Risk of accidents from the operation of heavy-duty machines, portable mill and chainsaws, logging activities, etc	<ul style="list-style-type: none"> ▪ Ensure workers are properly oriented to the safety and health rules and guidelines ▪ Well equipped first aid kits would be provided at all work sites ▪ Employ a medical personnel (medic) to be stationed at the Base Camp and workers trained in first aid should be present at all campsites ▪ Adequate signage should be erected, especially in hazardous areas ▪ Machines are to be operated by competent, licensed and authorized personnel only and in a manner that does not endanger other employees or the Company's property ▪ The Emergency Response Plan would 	Lo, Irr, LT, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			be made aware to all relevant personnel and the necessary training and resources required should be provided; <ul style="list-style-type: none"> ▪ Protective gears and clothes must be provided to employees and should be worn at all times during operation. 	
Operation of heavy duty equipment	Const/Opr	Exposure to excessive noise from the operation of machines	<ul style="list-style-type: none"> ▪ Use of protective gear by workers ▪ Control noise emission at source 	Lo, Irr, LT, Av, M, Sig
Housing facilities for workers	Const/Opr	Exposure to vector borne diseases	<ul style="list-style-type: none"> ▪ Provide potable water for employees ▪ Conduct periodic fogging to prevent mosquito breeding ▪ Educate workers on relevant diseases and preventable and treatment measures ▪ Providing medical supplies and personnel at Base Camp 	Lo, R, LT, Un, M, Sig
Environmental Aspect: Land Use				
Project implementation	Const/Opr	Land use conflict with other resource users allocated by the State, with traditional resource users and with the CI Conservation Concession and impacts on Guyana's commitments under the LCDS	<ul style="list-style-type: none"> ▪ SSILI to conduct regular monitoring of Concession to determine if there are any illegal activities, including mining and logging, and any evidence of such activities observed will be communicated to the relevant regulatory agencies ▪ SSILI intends notify authorities of any emerging issues and work with public agencies to address same 	Ex, Rev, LT, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<ul style="list-style-type: none"> ▪ SSILI intends to maintain a cordial relationship with CI and frequently engage the NGO on planned activities as it relates to the developmental and operational activities of the Company ▪ The Company will abide by the guidelines set out in Section 10 of the Code of Practice for Timber Harvesting to prevent and resolve conflicts or any other social issues which may emerge ▪ SSILI does not intend to prevent Amerindians from accessing the Concession area ▪ The NRDDDB and the communities would be kept abreast of the development plans of the project would also be consulted by SSILI for advise based on their experiences within the project environment in the planning and implementation of the project 	
Environmental Aspect: Community Values				
Influx of workforce	Const/Opr	Inappropriate interaction with communities, crime, use of alcohol and disagreeable behavior	<ul style="list-style-type: none"> ▪ SSILI will respect the legal, social and ecological integrity of all Amerindian lands ▪ The communities would be kept abreast of the development plans of the project ▪ SSILI to ensure that personnel are 	Ex, Rev, LT, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			properly informed on the correct protocol for interaction with the local communities <ul style="list-style-type: none"> ▪ SSILI to ensure workers interference with the communities is minimal ▪ Drugs and alcohol use by workers within the Concession would be prohibited 	
Environmental Aspect: Employment				
Hiring of workforce	Const/Opr	Increased and long term employment, especially for local communities	<ul style="list-style-type: none"> ▪ Members of the communities to be given priority for employment by SSILI ▪ SSILI will ensure women are included in its workforce ▪ Adequate medical and insurance coverage to be made available to all employees ▪ A rotational system of employment to be implemented ▪ SSILI to work with educational institutions such as the Bina Hill Institute and the Annai Secondary School to identify persons who can be sponsored by the Company to pursue further training in the field of Forestry at institutions such as the Guyana School of Agriculture. 	Ex, Rev, LT, Av, M, Sig (Positive)
Environmental Aspect: Archaeological Resources				
Construction and operational activities	Const/Opr	Possibility of exposing sites of archaeological & anthropological significance with the	<ul style="list-style-type: none"> ▪ If any remains are found all activity in the vicinity will cease immediately 	Lo, Irr, LT, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
		consequences being damage and desecration	<ul style="list-style-type: none"> ▪ The find location will be recorded, and all remains will be left in place ▪ SSILI will make contact with the Walter Roth Museum and the National Trust of Guyana immediately ▪ SSILI will coordinate with the relevant personnel to determine the significance of the findings and assess appropriate mitigative options 	
Environmental Aspect: Security				
Project implementation and development		Robberies, loss of equipment and parts due to the presence of unfavourable elements	<ul style="list-style-type: none"> ▪ SSILI to employ and maintain its own security personnel ▪ SSILI to develop working relationship with the police at Annai ▪ SSILI to conduct in-house training for staff on safety and security procedures ▪ Restrict movement in and out of the Concession to staff and authorized personnel and maintain records of movement of vehicles and personnel ▪ Ensure all communication equipment are adequately maintained 	Ex, Rev, LT, Av, M, Sig

Impact Significance Parameters

Lo – Localised
 ST – Short Term
 Sig. – Significant

Ex – Extensive
 LT – Long Term
 Insig. – Insignificant

Rev – Reversible
 Av. – Avoidable
 M. – Mitigable

Irr. Irreversible
 Un - unavoidable
 UM – Unmitigable

Phases
 Const – Construction
 Opr – Operational

The mitigation measures identified above were included as part of the Environmental Management Plan (EMP) prepared for the project. To complement the EMP, a Monitoring Plan, an Emergency Response Plan (ERP) and a Closure Plan were also prepared. The Monitoring Plan is important in ensuring that the recommended mitigations measures are implemented and, in addition, to determine the effectiveness of the mitigation measures. The Monitoring Plan recommended for the project is outlined below:

Table 2: Monitoring Plan

Parameter	Institution Responsible	Frequency	Location of Monitoring
Physical Environment			
Air Quality <ul style="list-style-type: none"> ▪ Evidence of dust accumulation and suspended particles through visible observation 	SSILI EPA	Daily	Operational areas within the concession including haul roads and Base Camp
Water Quality <ul style="list-style-type: none"> ▪ Temperature (°C35) ▪ pH (6.5-8.5) ▪ Conductivity (us/cm) ▪ Turbidity (ntu 10) ▪ Oils/Grease (mg/L10) ▪ TDS (mg/L 200) ▪ Dissolved Oxygen (≥4.0) 	SSILI EPA	Biannually Annually	The Rewa and Essequibo Rivers as well as creeks within and around the active operational areas in the Concession. Locations will be adjusted based on the progress of activities within the Concession.
Noise <ul style="list-style-type: none"> ▪ Decibel (100 dB during the day and 80 dB during the night) 	SSILI EPA	Biannually Annually	Around Base Camp and active logging compartments
Waste Management <ul style="list-style-type: none"> ▪ Compliance with Waste Mang't Plan ▪ Waste Accumulation ▪ Littering 	SSILI EPA	Weekly Annually	Waste receptacles and disposal and storage areas
Biological Environment			
Flora/Canopy Openings <ul style="list-style-type: none"> ▪ Retention of seed and keystone trees ▪ Biodiversity reserve integrity ▪ Protection of small trees ▪ Forest Damage 	SSILI GFC	Annually	Active logging areas, permanent sample plots and biodiversity reserves within the Concession
Wildlife <ul style="list-style-type: none"> ▪ Hunting ▪ Trapping ▪ Presence and distribution and impacts of logging on ERT 	SSILI	On Observance Annually – Wet and Dry	General Project Area Logged compartments pre- and post-harvesting and

Parameter	Institution Responsible	Frequency	Location of Monitoring
Species		Seasons	undisturbed forest, including biodiversity reserves
Socio-Economic Environment			
Health and Safety <ul style="list-style-type: none"> ▪ Use of protective gear by staff ▪ Condition of fire-fighting stations and equipment ▪ Adequate and appropriate signage for emergencies ▪ Location of Emergency Procedures ▪ In house training to keep employees up to date with various safety procedures ▪ Health conditions of staff, with particular interest to respiratory ailments ▪ Maintenance of a well equipped First Aid Kit 	Ministry of Labour GFC SSILI	Biannually Biannually Daily/Weekly	Entire Operation Areas
Employment and Social Benefits <ul style="list-style-type: none"> ▪ Number of residents employed from the surrounding areas ▪ Number of persons trained ▪ Extent of staff turnover 	SSILI	Annually	Entire Operation
Land Use <ul style="list-style-type: none"> ▪ Illegal land use within and around Concession ▪ Mining activities ▪ Vehicular travel within Concession 	SSILI GFC	Ongoing	Entire Project Area

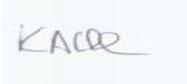
The Health, Safety and Environmental (HSE) Officer will be directly responsible for coordinating the monitoring activities. Most of the potential significant impacts identified which can arise from the implementation of the project can be mitigated. The ESIA has identified mitigation and management actions to be undertaken to minimize adverse environmental and social impacts of the project. It is envisaged that these recommendations will be adhered to by SSILI in its operations and monitored for compliance by the EPA and the GFC as well as by other regulatory institutions.

No significant negative impact is expected on the communities closest to the logging concession. The communities are in excess of 20km from the project site and residents do not use the concession area. However, there are opportunities for the communities to benefit in a meaningful way from the project, especially in the form of employment and capacity building. Once the logging activities are conducted in a manner which is consistent with the GFC's Code of Practice for Timber Harvesting Operations and best practices such as Reduced Impact Logging (RIL) and Sustainable Forest Management, impacts to biodiversity will not be significant and will be temporary and reversible. A significant portion of the

concession will also be spared from logging, consisting of biodiversity reserves, buffers, steep slopes, etc. It is expected that close to 25% of the Concession will not be logged with about 20% can be classified as unusable forest while the Company is expected to identify a biodiversity reserves which would consist of 4.5% of the Concession in representative habitat types that should provide a refuge for wildlife with reserve size taking into account large range species.

The activities proposed by the Company will also not affect the current efforts of CI in maintaining the portion of state forest under its control as a Conservation Concession. In fact, collaboration between SSILI and CI can lead to better resource management and monitoring within the area. The Company would not be allowed to conduct its activities in a manner that is detrimental to the environment given Guyana's efforts to pursue a low carbon development path. As such, the project should not affect the country's commitment to REDD+ and the implementation of EU FLEGT. The implementation of the project is also within the framework of the LCDS and Guyana's agreement with the Norwegian Government.

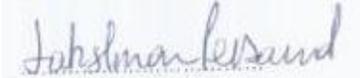
This ESIA Report has examined the project and assessed its potential impacts. The ESIA Team is confident that there is an understanding of the potential impacts envisaged from the implementation of this project and has recommended the required mitigation and management actions that need to be taken. Once there is adherence this project can realize social, economic and ecological benefits which are sustained.

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SECTION ONE

INTRODUCTION

1.1 Background to the Study

There is a growing demand for tropical timber on the world market. Countries such as the United States of America and Europe need a stable supply while Asia's needs are increasing rapidly, especially in China and India. Presently, China is the world's largest tropical timber importer, with imports reaching a peak of 8.3 million m³ in 2007, a 7% increase from 2006². The sustained growth in tropical log imports until 2007 reflected China's high economic growth rate and rising domestic consumption. Due to China's domestic timber shortage, as well as the downstream industry demand, China's timber consumption in the future will grow steadily. Furthermore, India's import of tropical timber in the past ten (10) years has also boomed and is now the second largest tropical timber importing country. Although tropical log imports declined between 2007 and 2008 in most of the major consuming countries, India brought in nearly 2 million m³ in 2008, up from 1.8 million m³ in 2007³. There are several reasons resulting in this increase including a reduction in the domestic timber supply, a high demand for forest products and a reduction of the import tariff which declined from 140% in 1990 to 12.5% in 2006. In addition, India is expected to have a rapid economic growth in the future which will increase the demand for forest products.

On the other hand, Guyana is a country endowed with an abundance of natural forest which presents an economic means to assist in the country's development, through the extraction of these resources. As of 2009 approximately 87% of the country's land area was covered in forest, amounting to more than 18.5 million hectares and remains one of the most forested countries in the world⁴. Given the current and future expected demands, Guyana can capitalise to earn significant revenues to aid its development. The Government of Guyana (GoG) has recognised this opportunity and has been developing the sector in a progressive manner. However, the GoG has also realised that the country's forest plays a major role in mitigating climate change as well as a reservoir for biodiversity and providing a livelihood for local communities. As such, any extraction of these resources must be done in a sustainable manner. Therefore, the GoG has tasked Guyana Forestry Commission (GFC) with promoting sustainable management of Guyana's forest resources. As part of its mandate, the GFC has been encouraging sustainable forest operations for the promotion of social and economic development while at the same time safeguarding the integrity of forest resources.

Simon & Shock International Logging Inc. (SSILI) has responded to this effort by the GFC by implementing a project based on a sustained yield management programme and to operate in accordance with GFC's Code of Practice for Timber Harvesting Operations. In this regard, the Company applied to the GFC and was granted a State Forest Exploratory Permit (SFEP) to commence preparatory works which include conducting the necessary studies and preparing the required documentation which are to be submitted to the relevant regulatory agencies for approval. The studies to be conducted include the Forest Inventory, the Environmental and Social Impact Assessment (ESIA) and the preparation of the Forest Management Plan (FMP). Once the GFC requirements are met, the GFC can proceed to issue the Timber Sales Agreement (TSA) to SSILI.

The concession is located in the Upper Essequibo-Corentyne-North Rupununi District. The main purpose of this logging operation within the concession is to secure raw materials needed for the sawmilling operation and other downstream processing plants in the manufacture of high quality tropical hardwood furniture. The project is designed to produce top quality air and kiln dried & dressed lumber for world class furniture manufacturing and building construction projects. Furthermore, the main goal is to revolutionize the local lumber market by providing dimensional wood stock ready for the production line. The bulk of the production, initially, will be exported to India, other Asian countries and Caribbean Markets.

² Data Source: UNECE/FAO – Forest Products Annual Review 2009

³ Data Sources: UNECE/FAO – Forest Products Annual Review 2009

⁴ Data Source: Guyana REDD+ Monitoring Reporting and Verification System (MRVS) Interim Measures Report - 2011

In order to obtain the Environmental Authorisation and to commence the ESIA process, SSILI submitted an Application for Environmental Authorisation to the Environmental Protection Agency (EPA). The EPA reviewed the application then subsequently, conducted a visit to the project site and formally communicated to the Company that an ESIA must be conducted for the Project before the Environmental Authorisation can be granted. SSILI has contracted Environmental Management Consultants (EMC) to conduct the ESIA.

1.2 ESIA Study

SSILI applied to the EPA in September 2010 for Environmental Authorisation to conduct a logging and sawmilling operation within its concession allocated by the GFC through a SFEP. The EPA visited the site in October 2010 and thereafter determined that the Company would be required to conduct an ESIA which must be approved before Environmental Authorisation can be granted. SSILI appointed EMC as the independent consultant to undertake the ESIA as required by the EPA. A team to conduct the ESIA and a Terms of Reference for the assessment were submitted to the EPA. The Agency, with support from SSILI, then organized a public scoping meeting and a sector agencies meeting to present and discuss the Project. The ESIA Team and the Terms of Reference were then approved by the EPA, after which the ESIA commenced. A Draft ESIA was submitted to the EPA and was reviewed by the EPA and other institutions and stakeholders. Comments were provided on the Draft ESIA. However, SSILI changed its request for Environmental Authorisation to cover the logging operations only since the location for the sawmill and the alignment of the access road are not yet determined. As such, the Terms of Reference for the ESIA was revised to cover this aspect of the project. The ESIA was then revised based on the comments and feedback received. The following is a summary of the key events for the ESIA to date on the project:

<i>September 2010</i>	SSILI applied to EPA for Environmental Authorisation
<i>October 2010</i>	EPA conducted a site visit to the Concession
<i>November 2010</i>	EPA determined that an ESIA was required
<i>January 2011</i>	EPA published 28-day public notice
<i>January 2011</i>	EPA approved the ESIA Team of Consultants
<i>June 30 2011</i>	Public Scoping Meeting held at Annai Benab
<i>July 06 2011</i>	Sector Agencies Meeting held at EPA Boardroom
<i>December 2011</i>	EPA approved ToR
<i>October 2011 to February 2012</i>	Fieldwork conducted
<i>March 2012</i>	Draft ESIA prepared and submitted to EPA
<i>September 2012</i>	EPA and Sector Agencies Comments on Draft ESIA Received
<i>February 2013</i>	EAB Comments on Draft ESIA Received and ToR for ESIA Revised
<i>February 2013</i>	ESIA revised based on comments and recommendations received
<i>March 2013</i>	Revised ESIA submitted to EPA

1.3 ESIA Objectives

The objective of this ESIA is to satisfy the requirements of the Environmental Protection Act for environmental authorization to be granted to SSILI for the proposed logging operations. The objectives and key areas to address were outlined in a Revised Terms of Reference approved by the EPA. A copy of the Terms of Reference is attached as Appendix A. The key objectives of this ESIA study are to:

- Provide a description of the Company, including a background and profile, and a proposed organizational structure for the operation.
- Provide a description of the proposed project, including activities to be conducted.
- Assemble relevant baseline information on the concession area including its geology, soil types, hydrology, climate and water quality.
- Collect biodiversity data for the concession area by reviewing existing data and conducting flora and fauna surveys. Fauna data is to be collected for both the wet and dry seasons and surveys to be conducted during the day and night.
- Collect information on the socio-economic background of the project area. This will require liaising with the appropriate central and regional government agencies, as well as with non-governmental organizations and on-the-ground stakeholders, including local communities.
- Identify the relevant national policies, laws, guidelines, regulations and standards that would define the operating framework of the project. For aspects where national regulations/guidelines are not available, relevant international guidelines such as those of the World Bank and the World Health Organisation will be examined.
- Identify, as far as is possible, and assess the biophysical, socio-economic and cumulative impacts of the project. The potential impacts will be justified by the use of standard impact prediction methods such as an impact prediction matrix.
- Describe alternatives considered in developing the project.
- Prepare an Environmental Management Plan that recommends measures to address those adverse impacts that can be avoided, or reduced to acceptable levels including plans for monitoring and emergency response during the project implementation phase.

1.4 ESIA Team

The ESIA was conducted by a multi-disciplinary team of specialists who were contracted by EMC. The team included EMC personnel as well as specialist consultants. A contribution to the preparation of this report was also made by BJ Management and Associates Inc, a private consultancy firm which was contracted by SSILI to provide forestry related services. The specialists undertook the majority of the baseline study work and also contributed to the impact assessment as shown in the Table below. Furthermore, additional details on the Team Members qualification and experience are outlined in Appendix B.

Table 1-1: ESIA Study Team

Team Members	Company and Position	Role
Khalid Alladin	EMC, Projects Manager, Environmental Management Specialist	ESIA Team Leader Baseline studies, impact analysis and prediction, environmental management planning
Anne-Marie Ford	Independent Consultant, Social and Natural Resources Expert	Baseline studies, impact analysis and prediction
Lakshman Persaud	Independent Consultant, Natural Resources and Social Expert	Baseline studies, social and economic impact assessment
Dr. Francis Clarke	Independent Consultant, Biodiversity Expert - Fauna	Baseline studies and impact assessment, ecology - fauna
Godfrey Marshall	Independent Consultant, Biodiversity Expert - Flora	Baseline studies and impact assessment, ecology, botany - flora

Along with the approved ESIA Team outlined above, the ESIA process was supported by several qualified and experienced personnel who were engaged by EMC to conduct the biodiversity field work and baseline studies. These personnel are listed in Appendix C.

1.5 Scope

SSILI had applied to the EPA for Environmental Authorisation for a logging and sawmilling operation. The Project also included a proposed access road to the concession. However, the location of the processing facility and the alignment of the access road are yet to be determined. As such, a comprehensive assessment could not have been done for these aspects of the Project. In this regard, SSILI requested a change from the EPA for the Environmental Authorisation to be granted for the logging aspect of the operation only. As such, the Terms of Reference was revised and the ESIA focused principally on the logging operation. Once the access to the concession and the location of the processing facilities are determined an Addendum to the ESIA will be prepared covering those aspects.

1.6 Approach and Methodology

The preparation of the ESIA was guided by the Terms of Reference, the EPA Environmental Impact Assessment (EIA) Guidelines (Volumes 1, 2 and 5), the minutes of the public scoping meeting and sector agencies meeting and consultation with key stakeholders. A number of approaches were applied to collect information for the preparation of this ESIA. These include the use of existing information, interviews with key resource persons and institutions, interviews with residents around the study area, and on-site field assessments. Details on these approaches are described throughout the ESIA, and are summarized below:

- 1. Review of Existing Information** – Some amount of existing data and literature are available on the Project and general project area. These documents include the Company Business Plan and Forest Management Plan, other ESIA's conducted by EMC for similar projects within Guyana including CPT Inc. Logging and Sawmilling Operation, reports on Rapid Biodiversity Surveys conducted in close proximity to the Project area, the GFC's Code of Practice for Timber Harvesting Operations, etc. The available documents were reviewed as part of the ESIA preparation.
- 2. Consultations with Communities** – The communities around the wider project area were consulted during the ESIA process. The EPA organized a Public Scoping Meeting in Annai where the communities participated. The issues raised at this meeting guided the finalization of the Terms of Reference for the ESIA. A copy of the minutes of the Public Scoping Meeting is

attached as Appendix D 1. In addition, the communities were consulted by the ESIA Team through public meetings within each community to gather information on any concerns they may have and their recommendations. A record of these consultations is attached as Appendix E.

3. **Consultation with key Stakeholders** – Sector agencies and key stakeholders were consulted to gather their perspectives and recommendations relating to the proposed project. Sector agencies were consulted at a meeting organized by the EPA. The minutes of this meeting is attached as Appendix F. EMC also had engagements with key agencies and institutions. The agencies and institutions consulted and the main issues discussed are outlined in Appendix G.
4. **Field Work** – Field work consisted of biodiversity surveys, surface water analysis and noise monitoring. The objective of the biodiversity monitoring was to gather data on the presence and distribution of floral and faunal species within the concession in order to assess the potential impacts of the proposed project. Surface water monitoring was conducted to determine the baseline water quality within the proposed project environment. Field work also included consultation with communities as described above.

Once the data was collected, it was then analysed, and the potential impacts assessed and the required mitigation measures identified. The steps undertaken in preparing the ESIA are outlined in Figure 1-1.

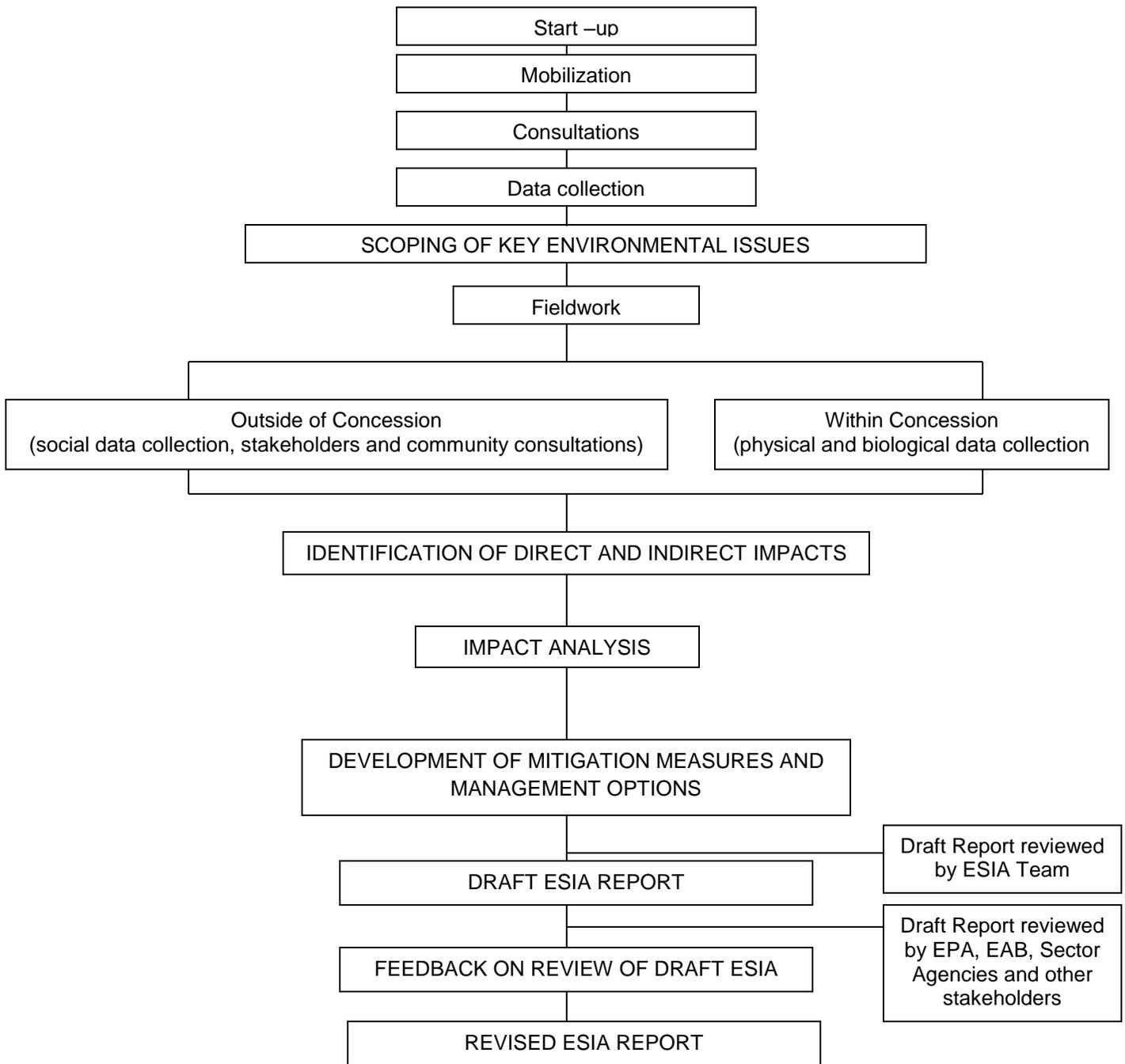


Figure 1-1: Methodology for the ESIA

1.7 Constraints and Limitations to the Study

The ESIA Team encountered several limitations and challenges while conducting the ESIA. However, most of these limitations and challenges were overcome by the use of innovative means and other measures to ensure that a comprehensive ESIA study and report was done for the project. The main limitations encountered during the conduct of the ESIA are discussed below:

Access – Access to and within the Concession was difficult. The concession is very remote and can be accessed only by boat. The time taken to access Part A of the Concession with loaded boats amounted to several of days, especially during the dry season. The team travelled to Kwatamang Landing on the Rupununi River. From there it took two days to reach the first camp site (Rewa A) on the Rewa River, stopping over at Rewa Village to overnight. Access within sections of the concession was also difficult since there are no trails on land and the creeks within the area are seasonal and small, shallow, and blocked with trees. As such, the base camps for the field work had to be established along the banks of the main rivers – Rewa and the Essequibo. It took a day to move from one camp site to another. To access the Essequibo side of Part A of the Concession the team took three days from the furthest campsite (Rewa B) to the closest on the Essequibo (Essequibo A), stopping over at Apoteri.

To get to Part B of the Concession took a day from the furthest campsite in Part A on the Essequibo (Essequibo B) to the first campsite in Part B (Essequibo C). Access to Part B of the Concession was extremely challenging and difficult. This resulted in the Field Team curtailing the biodiversity survey for the dry season in this part of the concession for safety reasons. While the team was travelling to this section, they encountered rapids close to the commencement of the Part B of the concession along the Essequibo River. As a result of the water currents, and the presence of rocks, the first boat which attempted to climb the rapids was sunk. This boat contained personnel, equipment and food items. Fortunately, the skill of the local boat captain and the rescue operation by the other team boats ensured that there were no fatalities or injuries. However, the boat, outboard engine and the equipment were unsalvageable. Given the danger that existed, and coupled with the loss of key communication and survey equipment, it was recommended by the local community members who were part of the team not to continue to attempt access to this Part of the Concession during this period. However, Part B of the Concession was successfully accessed and surveyed by the ESIA Team during the wet season. In addition, some data was available from the Forest Inventory Team which had accessed this Part of the concession in July 2011 and this data was used by the ESIA Team.

Availability of Data – Secondary data relevant to the project area is extremely limited. Very little research work has been done within this area. In some cases when information was available it was not documented. As such, the ESIA Team relied on interviews and engagements with stakeholders and communities to gather important pieces of data. Even weather data relevant to the project area proved a challenge since there is no weather station within or in close proximity.

Location of Supporting Infrastructure and Facilities – As was stated earlier, in addition to logging, the Project also includes a proposed access road to the concession. However, the location of the processing facility and the alignment of the access road are yet to be determined. As such, a comprehensive assessment could not be done at this time for these aspects of the Project. In this regard, it was agreed with the EPA to focus this ESIA study on the logging operations. Once the access to the concession and the location of the processing facilities are determined, an Addendum to the ESIA will be prepared covering these aspects.

SECTION TWO

COMPANY INFORMATION

2.1 Company Profile

The company responsible for the execution of this project is an Indian based company which has a Memorandum of Understanding (MOU) with the GoG and with the original owners of Simon & Shock International Logging Inc. for a total buy-out. This new Company is 100% owned by Dark Forest Furniture Company(S) Pte Ltd. (Singapore). Dark Forest Furniture Company(s) Pte Ltd is a wholly owned subsidiary of Dark Forest Furniture Company India. Furthermore, Dark Forest Furniture Company (India) is an affiliate company of the Coffee Day Group. The ownership of the Company is outlined in the figure below.

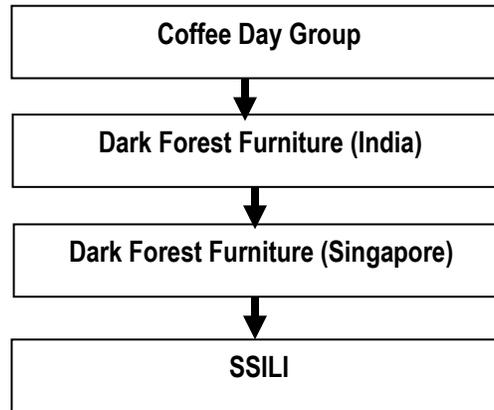


Figure 2-1: Coffee Day Group Overview

The Coffee Day Group is an aggregation of businesses in a variety of consumption and infrastructure sectors. It also owns Amalgamated Bean Coffee Trading Company Limited (ABCTCL), which is the largest integrated coffee company in India. ABCTCL owns plantations, retails coffee through exclusive outlets called Café Coffee Day, and employs over 12,000 people. It owns over 4047 hectares (10,000 acres) of coffee plantations across 20 prime properties located in and around 100 square kilometers in Karnataka State, India. Currently, Café Coffee Day has over 1,350 outlets in 120 cities and all of these cafes are owned and operated by the Company. Café Coffee Day also has outlets in Austria and Pakistan and plans to expand to over 10 countries in the next three years.

Furthermore, the Group owns a modern integrated hardwood milling and manufacturing facility that supplies thousands of pieces of furniture to its Café Coffee Day outlets and to other retail businesses. In addition to its Café Coffee Day franchise, the Group has interests in various infrastructure projects including luxury hotels, villas, highway motels and city retail properties. The Group also has an investment holding company that focuses on technology start ups in India.

Moreover, the Group owns and operates another logging company in Guyana and this Company is Vaitarna Holdings Private Inc. which has taken over the operations of Caribbean Resources Ltd; formerly owned by CLICO.

The local operations will be managed entirely by SSILI, but will seek guidance from time to time from the parent company. SSILI is a Guyana registered corporation with its registration dated September 30, 2010. The contact details for the Company are outlined below:

62 Hadfield & Cross Streets
Werk-En-Rust
Georgetown
Guyana
Telephone Number: 231 4715
Email: chethan@vaitarna.co

2.2 Management Capabilities in the Forestry Sector

SSILI Management has more than a decade experience in both forest operations and wood products marketing of tropical timber in India and other Asian countries. The Company's experience in both fields has established and expanded a huge market of wood products for export. Both the SSILI Team which is being deployed for operations in Guyana as well as other divisions such as Amalgamated Bean Coffee Trading Company Ltd have exposure to timber harvesting and processing of harvested timber. The company owns and manages totally 15,000 acres of coffee plantations in India and the estates are dense with trees of various species. These trees are harvested annually both for furniture manufacturing as well as to undo the excess shade for the coffee plants which grow under the trees.

As was stated before, the parent company currently operates the TSA previously held by Caribbean Resources Ltd. through another local subsidiary Vaitarna Holdings Private Inc. This Company has been operating in Guyana for the last 18 months and the team carries rich experience in the logging industry varying from 5 years for junior level and up to 20 years plus for senior positions.

2.3 Vision and Mission Statement

SSILI will utilize the resources of the concession in a manner which will deliver financial rewards in the most effective and efficient manner and as far as possible without degrading the bio-physical and socio-economic environment, thus ensuring benefits to future generations.

The Directors of the Company are committed to be responsible stewards of the forest resources entrusted to them and have pledged to develop and invest in partnerships that are results oriented and share their deep sense of social, cultural economic and environmental responsibilities in achieving the over-all goal of sustainable forest management.

2.4 Environmental and Forest Management Policy

The Company plans to use conservation and proper management to allow for sustainable and equitable use of the tropical rainforest in Guyana, thus ensuring perpetual ecological, economic and social benefits to its people. Furthermore, the environment, forest ecosystem and watershed will be protected. The Company has identified and calculated the area of the productive and non-productive forests at 313,482 hectares and 78,731 hectares respectively. An area of about 4.5% of the productive forest, equivalent to 14,107 hectares, will be set aside as Biodiversity Reserves, where the principal ecosystem will be maintained in pristine conditions, ensuring characteristics and naturalness with the genetic resources in a dynamic and evolutionary state. These areas will serve as wildlife sanctuaries, bird habitats, wilderness preserves, amenity forest, old growth and conservation areas.

There will be a restriction on Company personnel entering Amerindian Reservation Lands without due permission from the Tshaos responsible for these communities. The communities nearest to the Concession area will be given the priority of employment once the Company commences its forest operations. This will contribute to elevating and improving their living conditions.

Management planning and regulations would ensure that sustainable forest practices are consistently applied. Forest operations will ensure that the damage to the resources, such as wildlife and water and soil disturbance will be minimized for the safety of future generations. Furthermore, sustainability will require forest renewal to reflect the natural species composition and their genetic and ecological diversity of the original forest resource. Also, Watershed areas will be safeguarded and protected while soil erosion, riparian and wildlife habitat loss will be minimized.

It is the objective of the Company to bring about positive changes in the manufacture of wood products by producing high quality sawn/dressed and kiln dried lumber, decreasing waste in production through increased plant efficiency and developing use of waste for manufacturing by-products. On the other hand,

introducing the uses of less known species will also be essential through the Company's research group. Ecological integrity and sustainable forest management will be maintained throughout the forest operations.

Specifically, the Company is committed to:

- Adopting sustainable forest management practices for the purpose of ensuring that all the social, cultural, economic and ecological functions are preserved;
- Promoting the conservation of: biodiversity and its associated values, water resources, soil, unique and fragile ecosystems and landscapes to ensure that the ecological functions and integrity of the forest are maintained;
- Complying with all the Laws of Guyana and the regulations governing operations in the forestry sector;
- Adhering to sound and ethical management, business and industrial practices for the promotion of the forestry sector in Guyana for both domestic and export markets;
- Respecting the integrity and exclusivity of all Amerindian lands legally held by the locals and to allow for indigenous people to pursue their traditional life styles without hindrance;
- Ensuring the concession forested area is solely used for timber production purposes and other prescribed compatible land use; and
- Displaying sensitivity and responsiveness to the needs and rights of all neighboring communities and other stakeholders through consultations, dialogue and dispute resolution procedure.

2.5 Environmental Responsibilities and Organisational Structure

The logging operation will be guided by the parent company, but will have its own management structure. The local operation will be headed by a General Manager. A Health, Safety and Environment (HSE) Officer will be employed and would have the responsibility of ensuring the all the environmental requirements are complied with and the Environmental Management Plan (EMP) prepared for the project is implemented. Furthermore, this person will report directly to the general manger. Environmental management for the project will be complimented and supported by the Environmental Protection Department of the parent company. Below is the Company's Organisations Structure, including the HSE Personnel.

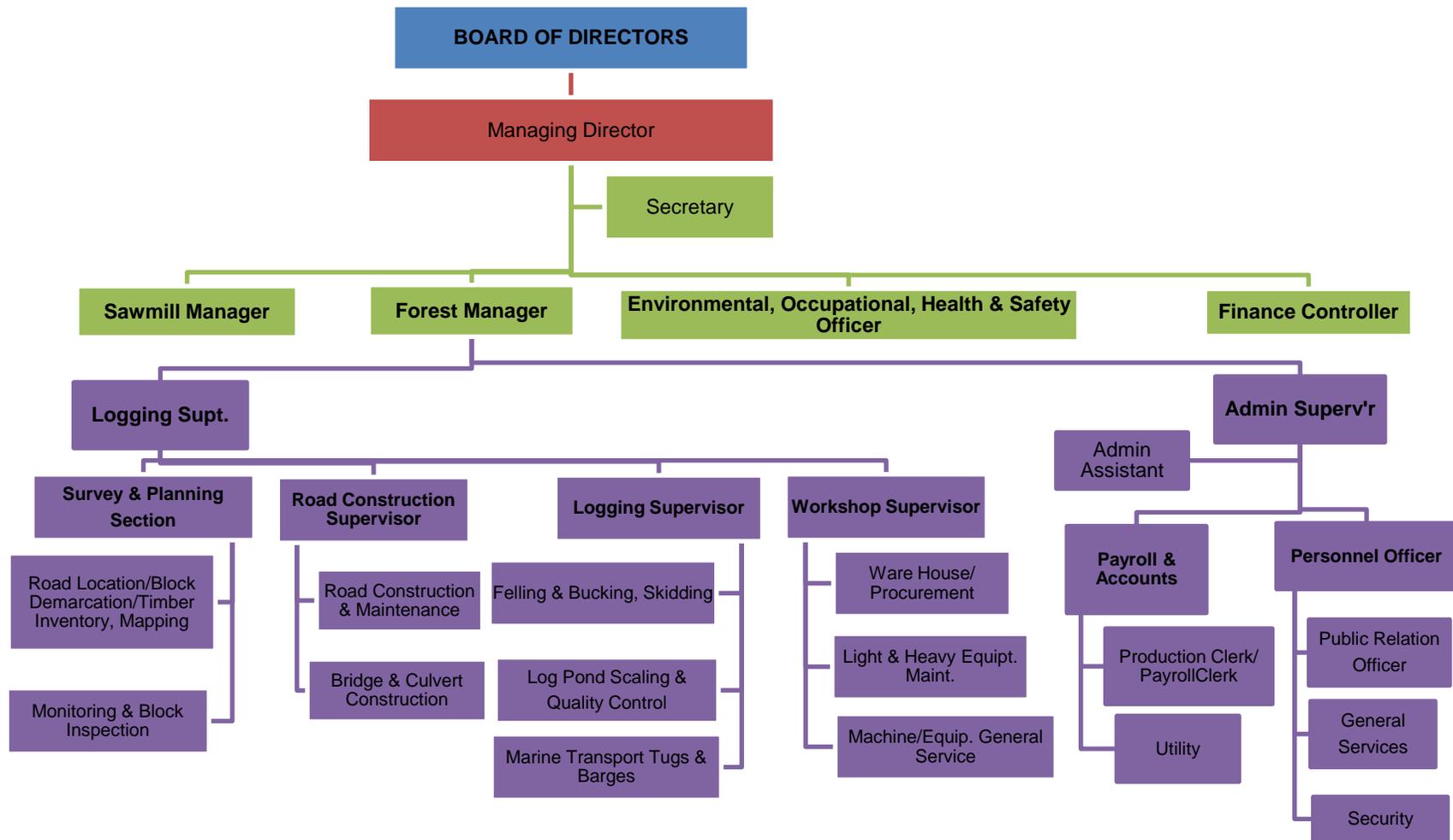


Figure 2.2: SSILI Organisational Structure

SECTION THREE

PROJECT DESCRIPTION

3.1 Project Synopsis

SSILI plans to establish a composite logging and sawmilling operation with associated downstream processing plants and kiln drying facility. Housing for employees along with electricity and potable water supply and other auxiliary facilities will be provided in order to realize the goals of the main beneficiaries and the vision of the Company. The project will be solely financed and managed by the parent Company - Dark Forest Furniture Company. However, at this stage, only the logging operation is being pursued since the details for the processing aspects of the project are still being worked on.

Logging will occur within the 391,853 hectares (968,289 acres) concession and all activities will be done in accordance with the requirements of the GFC, including the Code of Practice for Forest Operations. For the first five years, logging will be conducted in the North Rewa and Middle Rewa Compartments of Part A of the concession and all commercially viable blocks will be determined, demarcated and inventoried. Blocks on higher elevations will be operated during the dry season while the blocks on lower elevations and undulating terrain will be worked during the wet season.

A Base Camp occupying approximately twenty five hectares will be constructed within the North Rewa Compartment of the Concession to support the logging activities. Also, an access route to the Concession which would enable the transportation of lumber and supplies will have to be developed. However, the alignment of this access route is not yet determined.

Some primary processing will be done within the Concession utilizing chain saws and a portable mill while a permanent facility will be established outside of the concession to assist with further processing but the location of this facility is not yet determined. The materials will then be transported to Georgetown for shipping to overseas markets.

3.2 Project Rationale

GoG has tasked GFC with promoting sustainable management of Guyana's forest resources. As part of its mandate, GFC has been encouraging sustainable forest operations for the promotion of social and economic development while at the same time safeguarding the integrity of forest resources. SSILI intends to undertake such a project and to operate in accordance with GFC's Code of Practice for Forest Operations.

The main purpose of this logging operation within the concession is to secure raw materials needed for the sawmilling operation and other downstream processing plants in the manufacture of high quality tropical hardwood furniture. The project is designed to produce top quality air and kiln dried & dressed lumber for world class furniture manufacturing and building construction projects. The main goal is to revolutionize the local lumber market by providing dimensional wood stock ready for the production line. The bulk of the production will be exported to India, other Asian countries and Caribbean Markets in the beginning.

3.3 Project Commencement and Duration

This logging and sawmilling project is viewed as a perpetual development program that will have an initial 25 years life span. Although the initial planning is for 25 years, it is envisaged that the business will be maintained as a viable entity in perpetuity once the sustainability of the forest resources is ensured. The project will commence as soon as the TSA is issued by the GFC, which is dependent on the acceptance of this ESIA by the EPA and the Environmental Assessment Board (EAB). The GFC has already approved SSILI Forest Management Plan (FMP).

The sustainability of this project depends on:

- a) How well sustainable harvesting of the forest can be done in perpetuity without adversely affecting wildlife habitats and maintaining the genetic resources in an evolutionary and dynamic state;

- b) How well end users can be influenced to minimize wastage through measures such as more efficient processing plant, finding saleable products for hardwood peeler species and converting waste generated from harvesting into new composite products for building and furniture industries;
- c) How much resource is utilize to improve the quality and quantity of wood and developing silvicultural guidelines for varied forest types;
- d) The cost of constructing and maintaining roads and drainage channels, while simultaneously ensuring minimum disturbance of the environment and minimal negative impacts on the soil and water balances;
- e) How much of the area can be conserved for other users and, where different users coexist, ensure there is minimum conflict and successfully exhibit the concept of multiple use; and
- f) The implementation of measures to address environmental, economic and social concerns in executing the project.

3.4 Project Status

SSILI has been awarded a SFEP by the GFC to commence the relevant studies and obtain the necessary approvals before a TSA can be issued to the Company for the concession. As part of this process, the Company is required to conduct an ESIA and obtain an Environmental Authorisation from EPA. As such, the Company has commenced the ESIA process by engaging a team of independent consultants as required by the Environmental Protection Act 1996 and the Consultants have prepared a Draft of the ESIA. This draft was revied by the EPA, EAB, Sector Agencies and other stakeholders and, based on the comments provided, the ESIA was revised.

Furthermore, the Company has conducted its management level forest inventory and prepared its FMP which was approved by GFC.

SSILI is also currently evaluating the various options to determine the best alignment for the access to the concession and location of the processing facility.

Operations are planned to commence once the ESIA process is completed and the TSA awarded.

3.5 Concession Information and Location

The project site consists of an area of State Forest of 391,853 hectares (968,290 acres). This area of prime forest was allocated through SFEP 03/2007 which was approved by the GoG and issued by GFC.

The forest concession is situated in the Upper Corentyne – Upper Essequibo District, within the forestry belt of Guyana at approximately 06 degrees and 14 minutes north latitude and 59 degrees and 23 minutes west longitude. The location of the Concession is shown in figure 2-3 below. Also, the technical description of the concession boundaries is attached as Appendix H. The Concession is situated on the right bank of the Rewa River and the right/left banks of the Essequibo River, it is south and southwest of the Sherwood Forrests Inc.'s Concession and east, west, & south of CI's Conservation Concession. There is no Amerindian community within the concession. The nearest communities are Rewa, Apoteri and Crash Water, which are all situated more than 20km from the Concession's northern and western boundaries. The outline of the Concession is shown in figure 2-4.

The Concession is divided into two (2) parts; Part A and Part B. Part A consist of 191,660 hectares (473,602 acres) while Part B has an area of 200,193 hectares (494,688 acres). Part A can be accessed via the Rewa and Essequibo Rivers and Part B from the Essequibo River only.

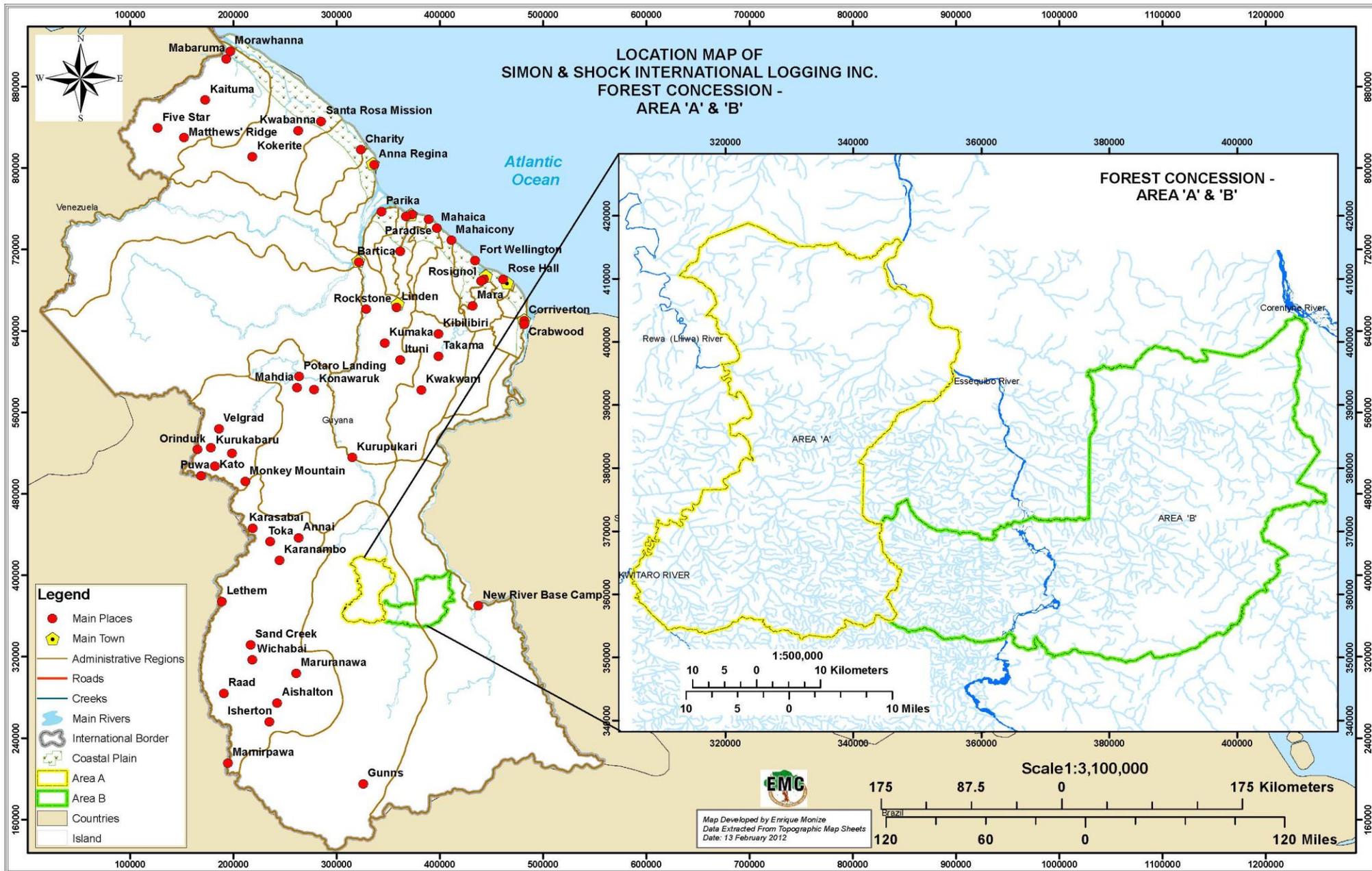


Figure 2-3: Location of SSILI Concession

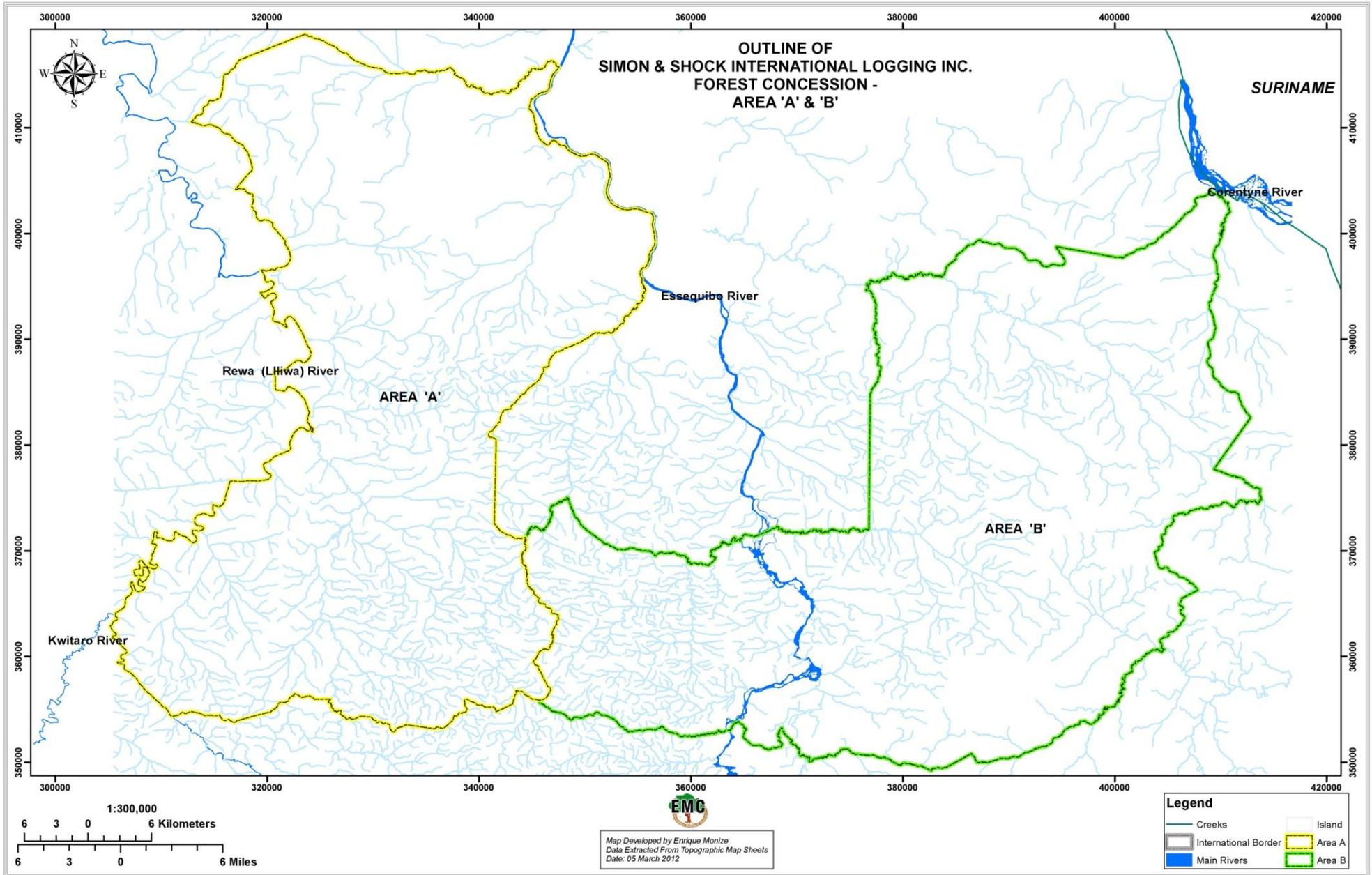


Figure 2-4: Outline of SSILI Concession

3.6 Phases of the Project

The project will be undertaken in two principal phases; the construction phase and the operations phase.

3.6.1 Construction Phase

The construction phase will entail the following activities:

- Road location survey, block demarcation and timber inventory;
- Road, bridges and culverts and drainage construction;
- Building of skid trails and log markets;
- Construction of forest camp; and
- Construction of processing facility.

3.6.1.1 Roads

The Company will have to construct a network of roads to successfully implement the project. The network of roads would include main roads, secondary roads and feeder roads.

Currently there is no road access to the project area. As such, to facilitate the operation, a main road will have to be constructed to the concession. For the moment, the alignment of this main road is yet to be determined. However, two (2) options are currently being considered. The first option is to construct a road from the Annai area to the concession. This road would be approximately 90km in length and would link Part A of the Concession to the Linden – Lethem Road. The other option being considered is to use the former UNAMCO-Itabu Road (135 km) from Kwakwani to the Upper Berbice River area and then construct an extension to this road. The final determination of the alignment will depend on the economic viability and environmental implications. Once the final alignment is determined, an Addendum to the ESIA will be prepared to cover that aspect of the project.

The Company will also have to develop a network of harvesting road within the Concession. Secondary roads will be constructed from the main road to the various compartments within the Concession. Feeder roads will then be constructed from the secondary roads to the logging areas. The construction of these logging roads is discussed further in Section 3.7.5.2.

3.6.1.2 Base Camp

Due to the distance from any significant population, a Base Camp will have to be established within the Concession. The proposed base camp will be located within the North Rewa Compartment of the Concession, occupying an area of approximately 25 hectares. This Base Camp will consist of housing for workers, 1 executive house, 1 guest house, an administrative office, a power generator, water supply, the main workshop, a canteen and warehouse. A building will also be constructed for the GFC. Additionally, the workers, equipment and supplies to support the logging activities will be based at this camp. A playground would also be constructed.

All the administrative and middle management personnel will be based at this location. A small fuel depot will also be located at the camp. The fuel will be stored in metal tanks within a containment berm and will be transported to the logging camp as necessary. Power will be provided by a 150 kVA generator housed in a fully enclosed facility. Water for domestic use will be pumped from a nearby creek. Rain water will be stored in tanks to be utilized during the dry season. It is planned to install telephone and television at this facility.

When the operation is maximised, it is estimated that approximately 100 workers will be housed within the Concession at the Base Camp. Some primary processing will also be conducted at the Base Camp, utilising chain saws and a portable mill. The Base Camp will support the outlying logging camps. An airstrip may be constructed in close proximity to the Base Camp at a later date which would facilitate

easier and faster access, and to cater for emergencies, given the remoteness of the area. A proposed location and conceptual layout of the Base Camp can be found in Appendix L.

A logging camp will be established in the logging areas to support the harvesting operation. This camp will house only felling, skidding and market scaling functions personnel and their reporting authorities. This logging camp will be established within the concession where SSILI targets a set of blocks to harvest. This camp is a mobile camp consisting of skid houses and will move around in the concession from closed blocks to newly targeted set of blocks to harvest.

3.6.1.3 Processing Facility

SSILI plans to operate the Concession to secure raw materials needed for a sawmilling operation and other downstream processing plants in the manufacture of high quality tropical hardwood furniture. The project is designed to produce top quality air and kiln dried & dressed lumber for world class furniture manufacturing and building construction projects. As such, the Company will establish a processing facility in close proximity to the Concession.

It is envisaged that some primary processing will be done within the Concession, utilizing chain saws and a portable mill, to produce squared timber. However, the permanent facility will be established outside of the concession to assist with further processing. The location of this permanent facility is not yet determined and is dependent on the route chosen to access the Concession.

The proposed facility will be established on an approximate area of 25 hectares and would include housing for employees, an administrative building, workshop, fuel storage, warehouse, medical clinic, recreation hall, playground and an airstrip approximately 1 km outside of the complex. This facility will also serve as the main base for the logging operation, through the provision of logistical and other forms of support. The processing facility will include the saw mill and kiln drier.

Once the location of the processing facility is determined, an Addendum to the ESIA will be prepared to address this aspect of the Project, along with the finalised access road alignment.

3.6.2 Operations Phase

The Operations Phase of the project will involve:

- Felling of logs;
- Extraction and transport of logs to the Log Yard;
- Transporting of logs by logging trucks to the Base Camp;
- Processing of logs into squares;
- Transporting of logs by logging trucks to the processing facility; and
- Downstream processing.

SSILI will prepare an Annual Operation Plan (AOP) based on the Five-Year FMP for submission to GFC and for internal use. The AOP is expected to guide the forestry operations throughout the year, in detail, and take into account immediate market opportunities and species production schedule.

This Plan will be based on a detailed operational inventory, which will provide a description of the distribution of forest types at the block level. The Plan is expected to provide estimates for monthly production schedules, species composition and estimates of monthly costs. Additionally, for each area in a compartment a Plan will be prepared before logging operations commence.

The AOP will include planning for:

- Harvesting sequences for blocks by compartments;
- Areas to be harvested;

- Alignments and sequences for construction on individual roads;
- Sequences of inventory for sections and blocks;
- Alignment of skid trails;
- Harvesting sequence within blocks;
- Location of trees to be felled and trees to be retained; and
- Location of creeks, swamps, hills and buffer zones.

Estimates of production for each block and a time schedule for felling and skidding will also be stated in the Plan.

3.7 Principal Activities

The main activities directly relating to the forest operations in both the pre-production and production phases of the project are:

1. Exploratory Inventory;
2. Production Planning;
3. Logging Operations;
4. Transportation; and
5. Processing.

3.7.1 Exploratory Inventory

SSILI has completed the Forest Inventory for the Concession following the inventory methodology and guidelines from GFC. This inventory was conducted by BJ Management and Associates on behalf of SSILI during the period May to August 2011. This inventory also incorporates a rapid appraisal of wildlife conditions and occurrence of non-timber forest products (NTFPs). All commercial trees with 35cm and above Diameter Breast Height (DBH) were enumerated and measured. Separate inventories were conducted for Part A and Part B of the Concession and the field data has been analyzed with the summary results for the entire Concession being displayed in Table 3-1. Also, this data is represented in figure 3.1. These results guided the calculation of the annual allowable cut for the production areas and formed the basis, among others, for the FMP and AOP.

The survey was done via strip lines. The total area surveyed was approximately 2793.96 hectares. All commercial tree species 35cm and above were recorded. The average trees per hectare recorded was 17.81 and the average volume per hectare recorded was 43.11m³.

Table 3-1: Accumulated Timber Stand Stock for Parts A and B of the Concession

Species Code	35 - 44 CMS		45 - 54 CMS		55 & UP CMS		TOTAL		PERT'GE (%)
	Trees	Volume	Trees	Volume	Trees	Volume	Trees	Volumes	Volume
MORA	2700	3328.15	4415	7414.68	10543	34322.76	17658	45065.59	37.42
GRNH	16	18.5	146	171.33	59	200.26	221	390.09	.032
PRPH	99	83.77	134	231.15	338	1145.75	571	1460.67	1.21
BARO	566	728.09	637	1176.53	787	1959.27	1990	3864.19	3.20
KABU	236	269.85	547	720.08	975	3341.99	1758	4331.92	3.6
LOCT	27	29.07	23	42.36	32	117.88	82	189.31	0.20
CRAB	147	162.25	157	281.73	94	231.02	398	675	0.56
DRNA	4	4.24	70	180.29	138	658.61	212	843.14	0.70

Species Code	35 - 44 CMS		45 - 54 CMS		55 & UP CMS		TOTAL		PERT'GE (%)
	Trees	Volume	Trees	Volume	Trees	Volume	Trees	Volumes	Volume
BLWD	170	207.9	404	1142.15	1027	7010.12	1601	8360.17	6.94
SUYA	142	197.86	261	474.28	544	2028.43	947	2700.57	2.24
LIMO	136	157.68	210	380.08	349	972.11	695	1509.87	1.25
MAHO	114	144.98	159	275.33	124	418.94	397	839.25	0.70
HAIR	75	91.12	211	340.06	319	1038.93	605	1470.11	1.22
MAPO	78	94.5	219	330.13	250	797.64	547	1222.27	1.01
SILV	123	143.52	112	201.93	75	245.36	310	590.81	0.50
SIMA	34	65.44	67	157.32	127	454.36	228	677.12	0.56
KKWI	115	148.54	182	311.58	254	956.84	551	1416.96	1.18
SIBA	78	102.61	147	283.76	93	263.3	318	649.67	0.53
WADA	445	540.04	734	1252.23	1429	5589.35	2608	7381.62	6.12
WAMA	1243	1479.47	975	1673.94	653	2108.98	2871	5262.39	4.37
COWD	20	28.28	12	20.54	20	110.18	52	159	0.13
WASH	140	170.22	172	284.22	58	315.29	370	769.73	0.63
BURA	145	188.37	337	625.07	587	2037.8	1069	2851.24	2.37
RECE	3	3.25	22	41.65	47	247.76	72	292.66	0.24
TONKA	24	45.86	31	47.77	50	170.39	105	264.02	0.21
KKRB	189	250.78	283	507.44	243	800.94	715	1559.16	1.30
SURA	10	10.66	8	13.42	36	143.38	54	167.46	0.13
UBUDI	25	43.84	47	86.71	110	491.82	182	622.37	0.52
MOPT	12	13.96	17	32.76	72	360.88	101	407.6	0.33
ANTS	80	141.99	122	200.41	97	282.17	299	624.57	0.51
MANB	45	58.14	103	162.72	252	1180.08	400	1400.94	1.16
DUKA	9	9.9	17	30.57	97	262.08	123	302.55	0.25
TATA	17	23.67	46	68.76	21	50.8	84	143.23	0.11
OTHER S	3187	4069.83	3267	5702.73	5108	12205.92	11562	21978.48	18.24
TOTAL	10,454	13,056.33	14,294	24,865.71	25,008	82,521.69	49,756	120,443.73	100%

3.7.2.1 Species to be Harvested

Notwithstanding the results from the inventory, SSILI intends to harvest all merchantable timber species, including non-traditional species. It is generally believed that 5 major species, Mora, Bulletwood, Wamara, Greenheart and Purpleheart are likely to form the bulk of harvested species from the project area. Although it is likely that the Concession may contain more than 70 commercial species, only about 35 species are currently merchantable. Nevertheless, the Company intends to collaborate with research institutions to explore the possibilities of harvesting lesser known species. The list of merchantable species included in the Forest Management Plan is outlined below:

Table 3-2: Commercial Species to be Harvested

Hardwood		Peeler Species	
Local Name	Scientific Name	Local Name	Scientific Name
1. Crabwood	<i>Carapa guianensis</i>	1. Baromalli	<i>Catostemma commune, altsoni</i>
2. Huruasa	<i>Pithecellobium jupunba</i>	2. Maho	<i>Sterculia pruriens, rugosa</i>
3. Purpleheart	<i>Peltogyne schomburgkiamos</i>	3. Simarupa	<i>Simaruba amara</i>
4. Kabukalli	<i>Goupia glabra</i>	4. Cedar	<i>Cedrela odorata</i>
5. Locust	<i>Hymenaea Sp.</i>	5. Dalli	<i>Virola surinamensis</i>
6. Shibadan	<i>Aspidosperma Sp.</i>	6. Haiawa	<i>Protium 6spp.</i>
7. Tatabu	<i>Diploptropis purpurea</i>	7. Karahoro	<i>Didynopanax norotonii</i>
8. Mora	<i>Mora excelsa; gonggripii</i>	8. Kurokoai	<i>Protium decandrum</i>
9. Mani	<i>Symphonia globilifera</i>	9. Moraballi	<i>Pouteria minutiflora</i>
10. Monkey Pot	<i>Lecythis davisii</i>	10. Kairiballi	<i>Licania spp.</i>
11. Greenheart	<i>Chlorocardium rodiei</i>	11. Soapwood	
12. Washiba	<i>Tabebuia ipe</i>	12. Cow-wood	<i>Bagassa tiliifolia</i>
13. Limonaballi	<i>Chrysophyllum pomiferum</i>	13. Warakairo	<i>Laetia procera</i>
14. Tonkabean	<i>Dipteryx odorata (Aubl.)</i>	14. Futui	<i>Jacaranda copaia</i>
15. Silverballi	<i>Aniba ovalifolia</i>		
16. Wamara	<i>Swartzia leiocalycina</i>		
17. Morabukea	<i>Mora gonggripii</i>		
18. Tauroniro	<i>Humiria balsamifera</i>		
19. Bulletwood	<i>Manilkara bidentata</i>		
20. Arisauroballi			

3.7.2.2 Calculation of the Annual Allowable Cut

SSILI intends to execute its activities while ensuring the forest sustainability and the operation's economic viability. As such, the Company is proposing a sustainable Annual Allowable Cut (ACC). The ACC is the volume of wood that may be harvested under management for one (1) year. It is also the total volume that can be harvested in a given year based on sustained yield principles. Sustained yield is defined as the volume of trees or other benefits that a forest can produce continuously at a given intensity of management. In other words, the volume must be less than expected growth increment for 1 year per hectare.

For the SSILI operation, the total area of the Concession is 391,853 ha and it is expected that approximately 78,731 ha (20% of the Concession) can be classified as non – usable forest. This non – usable forest area consists primarily of swamps, waterways, non-productive areas and buffer zones. 14,344 ha is considered liana forest, for a total of 93, 065 ha. A further 13,455 ha (4.5%) of the productive forest of the Concession will be maintained as a Biodiversity Reserve. Thus, this will leave 285,343 ha as the productive forest remaining. Given that no part of the Concession was previously logged, a cutting cycle of sixty (60) years is proposed. For this cutting cycle, the annual allowable cut is calculated to be 95,114 m³ with a monthly allowable cut of 7,926 m³. This would enable an annual harvesting area of 4,756 ha in 48 Blocks.

3.7.2.3 Forest Inventories

In addition to the exploratory inventory, the Company will be required to conduct management level and pre-harvest inventories. The conduct of these inventories is required by the GFC and will be done in accordance with the established guidelines developed by the Commission.

The Forest Management Level Inventory (FMLI) is a survey to define the productive and unproductive forest and will be used to determine areas for planned harvesting and guide road survey alignments. It will be conducted along projected block boundary lines one to two years prior to the harvesting operation. It would take the form of a stem count of commercially harvested trees by species at a sampling intensity of 2% inventory of harvestable area for the next 5 year period.

Pre-harvest inventories (stock surveys) are surveys conducted in forest areas before timber harvesting to provide useful information on areas about to be harvested, in particular a list of harvestable trees accompanied by a map showing their locations in relation to the hydrology and terrain within the area. This inventory will cover 100% of the area to be harvested and the information collected will be used to develop the tree stock map. This information will be used to plan an efficient and environmentally sensitive harvesting operation and will also determine the level of production.

3.7.2.4 Silvicultural Considerations

SSILI will practice selective harvesting to minimize damage to both the residual trees and the harvested logs. Currently, silviculture work for regeneration, based on experiments done, is too costly an alternative. It is logical to assume that any felling within an area will create gaps in the upper canopy thus encouraging further growth from the lower canopy. This conforms to the best system advocated thus far, which is the restriction of felling up to a minimum girth limit. Felling it is also a form of silvicultural treatment where the larger trees are felled, opening up the canopy, even sparsely, allowing the trees of the second upper tier to gain more light and forge ahead as the next cutting cycle.

The silvicultural system to be employed by the Company involves yield regulation by both size and area. Trees will only be felled if they are on the commercial species list and DBH greater than or equal to 45 cm for hardwood and peeler logs and 35 cm and up for greenheart piles. SSILI will also abide by the cutting cycle agreed upon with the GFC. Currently, the Company is proposing to use a 60 years cycle. However, this can be changed should growth rates be less than expected. SSILI expects to harvest 1/60 of the productive area of the Concession every year and intends to secure a continuous supply of timber over the duration of the Project. It is generally recommended that, for tropical rainforest, harvesting does not take place in the same forest area more than once in any 40 to 60-year period in order to allow the forest to regenerate and for the growing stock to develop into commercial size trees. Therefore, it would be in the Company's best interest to comply with the proposed logging cycle.

3.7.3 Logging Operations

3.7.3.1 Operational Planning

The Concession has 2 parts, Part A and Part B. These parts are further divided into a total of 10 management compartments. The compartment boundaries were selected, where possible, on the basis of natural ground features. Although they vary, the size of the compartments is at a scale that is useful for the logging operation planning over the medium term. Where it is operationally efficient to do so, two or more compartments may also be harvested at the same time. Table 3-3 below outlines the details of the compartments. The description of the compartment boundaries is attached as Appendix I.

Table 3-3: Details of the Concession Compartments

Compartments	Area in Hectares	Area Percentage
Part A		
North Rewa	28,629	15%
Middle Rewa	32,487	17%
South Rewa	48,115	25%
Smyths	40,601	21%
Illiwa	41,828	22%
Part B		
West Essequibo	39,331	20%
East Essequibo	48,531	24%
South Corentyne	36,905	18%
West Corentyne	38,118	19%
East Corentyne	37,308	19%

In addition to the operable compartments, areas that are inoperable have been identified along with the total area of biodiversity reserves where no harvesting activity will take place.

Table 3-4: Inoperable Areas within Concession

Rivers, Creeks, Swamps and Buffer Zone	78,731
Liana Forest	14,334
Biodiversity Area	13,445
TOTAL Inoperable Area	106,510
Net Productive Area	285,343

This Biodiversity Reserve was determined using the criteria established by the GFC and included:

- To represent forest types found within the concession including variation of topography, hydrology and soil type;
- In areas that are unlikely to be disturbed by mining or agricultural activities;
- At the edge of the concession thereby reducing of the harvesting operations on the reserves ; and
- To be a large continuous unit, thus providing robust habitat for the ore fragile disturbance adverse species.



Figure 3-2: Management Compartments of the Concession

3.7.3.2 Block Allocation

Prior to allocation of harvesting blocks to Skidding Teams, a “Notice of Intention” will be delivered to the GFC Ranger Officer for comment and approval. A maximum of 2 Blocks will be allocated to each Skidding Team provided that the team has completed harvesting of the previous block. The final block inspection by the Block Inspector/Logging Supervisor will be done to ensure that all felled merchantable timber has been skidded.

However, there may be circumstances, such as inaccessibility to areas located near low lying access roads, creeks, rivers, and swamps which make it necessary to open new blocks before the previous blocks have been fully harvested. In this case, allocation of new blocks, and monitoring of the process is undertaken by the Production Section (Skidding Supervisor) and the Survey and Planning Section through the recommendation of the Block Inspector assigned. The date of issuance and closure of blocks will be submitted to the GFC Ranger Officer for reference and record keeping purposes.

3.7.3.3 Felling and Bucking

The Skidding Team has the responsibility of planning the felling and bucking operations while the Block Inspector monitors the felling activity to ensure that felling commences at the back of the block. This method should ensure that felled logs are not left behind and that repairs or maintenance required on the main skid trails is minimized. Furthermore, for every tree felled there must be a defined extraction route and both the log and stump will be tagged.

Reduce Impact Logging (RIL) techniques will be employed in all aspects of the logging operation. Directional felling will be employed in all cases to increase safety of workers, maximize usable volume from the tree and to reduce damage to residual trees and the soil. Felling restrictions, such as the prohibition of felling in the vicinity of water courses, which are stated in the GFC’s Code of Practice for Timber Harvesting Operations will be strictly observed. Additionally, felling will not be done within 50 meters of major rivers or creeks. All felling activities will be done in accordance with Section 5.3 of the GFC’s Code of Practice for Timber Harvesting Operations.

3.7.3.4 Skidding

Using the information supplied on the pre-harvest inventory map, the Block Inspector and the Skidding Team Foreman will lay out the skid trails inside the block(s) using red/yellow-flagging tapes for the main and feeder skid trails respectively. Skid trails will be established along ridge tops by bulldozer. During construction, the machine’s blade will be elevated so as to retain a vegetation mat on top of the soil. Skid trails will not meet at an angle greater than 45 degrees so as to minimize damage to soil and trees when skidding logs along the trail. Also, when crossing creeks becomes necessary, poles will be felled into the creek to provide carpet material on which equipment can cross, thus allowing for the free flow of water underneath while being easily removable after skidding operations are complete. The construction of the skid trails will be guided by Section 5.2 of the GFC’s Code of Practice for Timber Harvesting Operations.

Generally, a skidder is capable of negotiating a 25% favourable grade (uphill) when traction is good and 20% slope when traction is poor. When slopes above the safe operational limits of the skidder are encountered, either the area will not be logged or other methods, such as winching will be employed.

3.7.3.5 Log Markets

Log markets will be established along the road, located on top ridges or places with higher elevations to facilitate drainage. Construction of log market will cater for a gently sloping angle on one side to prevent accumulation of water and the necessary drains will be constructed to collect and drain runoff and prevent erosion. This will be done in accordance with Section 4.5 of the GFC’s Code of Practice for Timber Harvesting Operations. The sizes of these markets will allow for safe operation of equipment and be proportional to the volume that will be harvested from the adjacent forest/or block and consideration to the

length of time the logs are likely to remain on the market will also be included. Log market size will not exceed 4,000 square meters. Log markets will be properly planned and located and whenever possible a log market will be established between two skid trails along the access road to minimize soil/canopy clearing. At this location a skidder will be used to sort and stack logs, as well as load the logs onto the trucks.

3.7.3.6 Hauling

Hauling will be employed to minimize the time logs are left at the log markets. Log loading in the forest is accomplished at the log markets with specialized log loaders while hauling to the Base Camp and subsequently to the main processing facility will be done using a fleet of specialized long-bed logging trucks. These logging trucks will have the capacity to haul an average of 30 m³ and 35 m³ of logs per trip respectively. Hauling will be restricted during periods of heavy rainfall in order to minimize damage to the haul roads.

All logs will be hauled once:

1. They are free from fungus and rot;
2. They have a minimum cut length of 6m;
3. The heart is no more than 15% off centre;
4. Buttresses neatly trimmed;
5. The minimum small diameter is 35 cm;
6. The shortest diameter is at least ¾ of the right angle diameter;
7. The log grain spirals no more than 1 cm for each meter in length;
8. There is one bend which is not deeper than 30% of the average diameter; and
9. Radial check, heart shake and other internal defects on the butt and smaller end are less than 10% of the diameter.

3.7.3.7 Scaling and Grading

Log scaling and grading will be undertaken by the Scaling/Grading Section at the log market, located on the Base Camp, before the logs are primarily processed or loaded onto the logging trucks to be transported to the main processing facility. A GFC and SSILI serial number printed on plastic tags will be placed on each log to allow for identification. "S" Hooks and nail plates will also be applied to prevent splitting.

3.7.3.8 Post Harvest

Once harvesting of a block is complete the block will be closed. Prior to the closing of a block, the Block Inspector will complete a written inspection report, assessing the production harvesting report against the inventory report, and a checklist of the impact of harvesting against the GFC's Code of Practice for Timber Harvesting Operations.

However, the block is only closed if the Block Inspector is satisfied with the condition of the block, e.g. all logs have been harvested and creeks cleared. Furthermore, if the Block Inspector decides that additional work is required before the block can be closed, the harvesting team will ensure the block is satisfactorily finished and if the Block Inspector decides that there are other points, which cannot be corrected immediately, e.g. poor felling technique, then this will be reported to the head of the Skidding Team so that the necessary preventative measures can be implemented in the harvesting of the next block.

3.7.4 Processing

As was stated earlier, SSILI plans to operate the Concession to secure raw materials needed for a sawmilling operation and other downstream processing plants in the manufacture of high quality tropical hardwood furniture. The project is designed to produce top quality air and kiln dried & dressed lumber for

world class furniture manufacturing and building construction projects. As such, the Company will conduct both primary and secondary processing.

3.7.4.1 Primary Processing

Some amount of primary processing will be done within the Concession by utilizing chain saws and a portable mill to produce squared timber. This will reduce the volume of material that will be transported to the secondary processing facility. A processing shed will be constructed to facilitate the primary processing at the Base Camp location. Logs from the logging areas will be brought to this facility by logging trucks to be squared, and sometimes, to be processed even further.

3.7.4.2 Secondary Processing

The main processing facility will be established outside of the Concession to carry out the main processing. However, the location of this permanent facility is not yet determined and is dependent on the access route chosen to the Concession.

The proposed processing facility will be established on an approximate area of 25 hectares and would include housing for employees, an administrative building, workshop, fuel storage, warehouse, medical clinic, recreation hall and playground. The processing facility will include the saw mill and kiln drier. Processing equipment to be installed include band saws, rip saws, cross cut saws, planer/ moulder, wood chipper, etc.

Given that the location of the secondary processing facility is not yet decided on, a comprehensive assessment could not be done at this time for this aspect of the Project. Once the location of the processing facility is determined an Addendum to the ESIA will be prepared to cover this aspect of the Project, along with the finalised access road alignment.

3.7.5 Transportation

3.7.5.1 Transportation of Logs

Logs will be hauled out from the felling areas by log trucks to the Base Camp for scaling, grading and segregation. Some logs will be processed into squares at this location. The squared material will then be transported to the main processing facility by logging trucks. However, some logs will also be transported to the main processing facility without any primary processing, depending on the market requirement and the final product.

3.7.5.2 Road Construction and Maintenance

The Company will have to construct a network of roads to successfully implement the project. The network of roads would include main roads, secondary roads and feeder roads.

There is no existing road access to the project area. As such, to facilitate the operation, a main road will have to be constructed to the concession. At present, the alignment of this main road is yet to be determined. Once the final alignment is determined, an Addendum to the ESIA will be prepared to cover that aspect of the project.

Secondary roads will be constructed from the main road to the various compartments within the Concession. Feeder roads will then be constructed from the secondary roads to the logging areas. Once a tree is felled it would be skidded to the log market. From here it would be loaded onto logging trucks utilising the feeder roads, then onto the secondary roads. Initially, the main road will be constructed from the main processing facility to the Base Camp but as logging progresses further into the Concession, this main road will be extended.

Advanced planning and well aligned and properly constructed roads are of great importance in forest operations, as the more logs a truck can carry per load, the cheaper the cost of extraction/transportation per cubic meter of timber will be. Some of the main advantages of good roads include increased hauling loads, higher travelling speed, shorter trip time, lower cost for vehicular repair, and reduced maintenance associated costs and depreciation of vehicles.

Main and secondary roads will be surfaced and compacted with laterite from borrow pits while feeder roads will only be surfaced in areas where low bearing capacity of soil is found thus, allowing log trucks to pass since these roads will only be used for short period of time.

Culverts are to be placed where required for cross drainage and will be constructed of the appropriate materials, e.g., logs, wood or rubberized reinforced corrugated pipe, depending on either the permanent or temporary nature of the installation. Road culverts would be aligned perpendicular to the road and horizontal to the flow of water with an inclination side (sump) of 5% to 10% to avoid flooding of the roadway. Main roads culvert would also be provided with catch basin on both ends where necessary to avoid silting. Culverts would be used where peak flows (runoffs) are not extreme and the depth of fill is not too great. Culvert size/diameter will be adequate to carry stream flow but depends on the size of the area to accommodate the runoff.

Unstable portions of roads will be scraped thoroughly to remove pegasse/ mud and loose soil. Logs will be placed close to each other to avoid misalignment and be covered with suitable filling materials or laterite and immediately compacted. Only durable, non-commercial hardwood species will be used whenever possible to avoid frequent road repair. No work will be done on parts of the road that need filling during heavy rain to avoid surface erosion and sedimentation.

All bridges will be constructed of durable hardwood logs and sawn timber; the size depending on the site and width of rivers or creeks. A stable log bearer cradle (log cribbing) will be set into the earthworks on each side of the river (bridge approaches) as a means to set the log stringers which will then be covered with soil and laterites. An alternative bridge type is one that uses cross pieces on the log stringers and is covered with running boards or transverse boards. The bridges will be perpendicular to the water flow and silt traps will be placed at the four corners.

All road and bridge construction will be governed by the strict guidelines contained in Section 4.1 of the GFC's Code of Practice for Timber Harvesting.

3.8 Equipment, Personnel and Capital Investment

Outlined below are the estimated equipment, personnel and capital requirements for the project as is currently envisaged.

3.8.1 Equipment

In order to support the logging and sawmilling operation, SSILI will have to acquire a fleet of equipment and machinery. A list of the equipment and machinery to be acquired for the logging aspect of the project are outlined in the table below.

Table 3-5: List of equipment and machinery to be used for the logging aspect of the operations

Type of Equipment	Amount of Units
Road Construction & Maintenance	
Bulldozer	4
Dump Truck	5
Motor Grader	2
Compactor/Roller	1
Excavator	2
Logging	
Skidder	8
Bulldozer	4
Chain Saw	16
Hauling/Trucking	
Logging Truck	6
Fuel Truck	2
Water Tank Truck	1
Wheel Log Loader	3
Log Pond	
Crane	1
Wheel Log Loader	1
Chain Saw	3
Portable Mill	1
Transport Vehicle	
Service Jeep	6
Crane Truck	1

3.8.2 Employment Consideration

During the pre-harvest phase of the operation, employment by the Company is expected to be in the vicinity of 45 persons. However, this figure will be increased to 320 persons once harvesting and processing activities commence. The majority of these personnel will be Guyanese and, as much as possible, from the communities in close proximity to the Concession. The human resources will be distributed in the following seven (7) Departments/Sections which are outlined below:

1. Survey & Forestry Planning
2. Production (Felling & Skidding)
3. Road Construction & Maintenance Section
4. Scaling & Quality Control Section (Log-pond)
5. Sawmilling Operations
6. Workshop & Warehouse
7. Administration

The personnel will be involved in both the logging and processing operations.

3.8.3 Capital Investment

The Project will be solely financed by the parent Company of SSILI with a proposed total investment of approximately Eighteen Million, Seven Hundred and Forty Seven Thousand, Two Hundred and Thirty US Dollars (US\$18,747,230) during the first five years (2012 – 2017). This investment will be done in phases.

3.9 Alternatives

After giving consideration to alternatives to the project, the following options have been identified:

1. No Project;
2. Harvesting of NTFPs; and
3. Location of Primary Processing.

(1) No Project

The no project scenario was considered during the preparation of this ESIA. If there is no project, then the area will remain as it. There will be some benefits to this option such as the forest remaining intact, unless allocated for some other use by the Government. Thus, this would result in the avoidance of the potential impacts of the project on the environment and avoidance of potential social conflicts that can arise.

On the other hand, there can also be some negative impacts such as SSILI having to seek an alternative source of materials to support its planned business model. As was indicated earlier, the Company plans to harvest the Concession to secure raw materials needed for a sawmilling operation and other downstream processing plants in the manufacture of high quality tropical hardwood furniture. The project is designed to produce top quality air and kiln dried & dressed lumber for world class furniture manufacturing and building construction projects. If the project does not go ahead, the Company will have to seek another source of material. In addition, there will be a loss of income and revenue for both the Company and GoG. The opportunity for employment that is in excess of 300 persons, with a significant amount coming from the nearby communities, will be lost, along with the potential training and skills development. The transfer of technology, which SSILI intends to bring to Guyana, would also be lost. Therefore, no development whatsoever will occur in the general area.

However, the GFC is promoting sustainable management of Guyana's forest resources. As part of its mandate, GFC has been encouraging sustainable forest operations for the promotion of social and economic development while at the same time safeguarding the integrity of forest resources. This is especially important since there is an increasing demand for wood and wood products both locally and overseas. Therefore, to ensure sustainable utilization, the GFC issues forest concessions to companies and individuals to harvest the forest, while monitoring the activities for compliance with all requirements. The SSILI Concession was allocated as part of this effort by the GFC. Additionally, the project implementation will also have other significant benefits to the communities, the Company, and the country as a whole.

(2) Harvesting of NTFPs

As was recommended by stakeholders during the consultation process, the extraction of NTFPs was considered as an alternative to timber extraction. This was brought up because the Company is experienced in furniture manufacturing and also intends to manufacture furniture from materials extracted from within the Concession. NTFPs found within the Concession which can be used for furniture manufacturing includes nibbi (*Heteropsis spp*) and kufa (*Ciusio spp.*). Also, this option will promote the use of NTFPs, while allowing the timber stock and standing forest to remain. There may also be fewer impacts on the environment.

However, the harvesting of these NTFPs alone cannot sustain the planned investment of the Company and will also not satisfy its current needs. The Company has to secure raw material for a sawmilling operation

and other downstream processing plants to manufacture high quality tropical hardwood furniture. Harvesting of NTFPs only cannot satisfy this need.

Therefore, if the Company should harvest NTFPs, the activities will have to be on a large scale to support its operation and investments. As such, to harvest the NTFPs, the Company will have to establish facilities within the forest, including a base camp and access within the forest. Access to the area will also have to be constructed and a significant workforce would be introduced to the site. In this regard, the impacts to the forest from the harvesting of NTFPs in this area will be similar to the impacts from the harvesting of timber, with less benefits and economic returns.

Despite this, the Company will evaluate the option of harvesting NTFPs and integrating/utilizing these in its furniture manufacturing once the project commences.

(3) Location of Primary Processing

The Company intends to conduct primary processing within the Concession at the Base Camp. Processing will be done utilizing a portable mill and chain saws.

The option was considered to transport the logs directly to the main processing facility to be established. However, it would be more economically feasible to cut the logs into squares at the Base Camp, thus reducing the volume for transportation. This would allow for the more usable material to be transported while the waste and materials which will not be utilised would remain within the forest. Given the distance that needs to be traversed, the fuel consumption as it relates to the material transported would be less and lower road maintenance would also be required.

SECTION FOUR

NATURAL ENVIRONMENT BASELINE CONDITIONS

4.1 Land Use

As was noted in the previous section, SSILI is pursuing a timber extraction project within the Concession allocated by the GFC to the Company. The project site consists of an area of State Forest of approximately 391,853 hectares (968,290 acres) and is located in the Upper Corentyne – Upper Essequibo District on the right bank of the Rewa River and on both banks of the Essequibo River.

Currently, there is no land use or activities within the Concession. There are also no Amerindian communities or titled lands within the project area. There were no immediate past land use within the area as well.

However, historically, the wider project area including sections of the Concession, was used for balata exploitation. The balata (latex of the Bulletwood tree – *Manilkara bidentata*) trade in the Rupununi started on a large scale in the late 1800s when a company called Real Daylight from neighbouring Suriname extended activities into the forested areas of the Rupununi, south eastern Guyana and the North West District. The trade reached its peak in the 1920's following the First World War when total production from the Rupununi was around one million pounds (about 450,000 kg) annually (Baldwin 1946: 44), and a maximum annual production of 1,595,888 lbs, (725,404 kg) was recorded in 1917 (Forte 1995: 2). It was also estimated that the workforce was around 600 people in 1944, half of which were Amerindians, the majority of whom were Wapishana men. (Baldwin 1946: 44). In Guyana, Bookers' Holdings (a subsidiary of Booker Brothers, McConnell & Company, popularly known as Bookers) set up operations in Apoteri in the mid 1900's and established its office at what is now the Apoteri Guest House. Balata production started to decline in the 1940's due to the replacement of balata with synthetic substitutes; the export market collapsed in the 1980's and as a result, the industry rapidly disappeared (Baldwin 1946: 44).

Outside of the project area, other economic and developmental activities are limited or non-existent. The forest around the concession is intact, except for areas closer to communities which were logged for use by residents. These communities include Rewa, Crash Water and Apoteri. However, the GFC has recently awarded SFEPs to a few concessionaires north of the general project area. Currently, the closest existing logging operation is within the Iwokrama Forest in the Sustainable Utilisation Area. Immediately north and northeast of Part A of SSILI Concession is an SFEP awarded to Baishanlin International Forest (SFEP 01/11). However, this company has yet to commence any work on the ground. North of Part B of SSILI Concession is another SFEP awarded to Sherwood Forrest Inc. (SFEP 01/07). This Company is also yet to commence any work on the ground, but is currently in the process of conducting their ESIA study. Further north of these concessions and closer to Apoteri is another SFEP awarded to Variety Woods and Greenheart Limited (SFEP 02/10). The allocation of these areas as forest concessions by the GFC can result in logging being a major land use in the area in the near future. Conversely, the GFC has indicated during the stakeholders consultations for this ESIA that it does not have plans to allocate areas for forestry further south beyond the SSILI Concession. The allocated SFEPs can be observed in figure 4-1.

There are no mining activities or properties within the Concession but mining claim notices were observed along the banks of the Essequibo River in the vicinity of the Concession. There are mining claim notices in the upper reaches of the Rewa River as well⁵. Nevertheless, the GGMC indicated that there is currently a moratorium on river mining in the Upper Essequibo and Rupununi Rivers and applications for land prospecting and mining are awaiting a presidential decision. Therefore, there are currently no mining properties within and around the Concession. However, a Company known as Pharsalus Inc. has an Exploratory Permit for Radio Active Minerals and Rare Earth Elements. The permit covers areas generally north of the Concession, but also includes the northwest section of Part A of SSILI Concession. This area can be observed in figure 4-2. Given the current position on mining within the area by the Government, it is highly unlikely that mining will commence within the wider area in the near future.

There are conservation areas and protected areas around the wider project area. Adjacent to the SSILI Concession is the CI UECC. The SSILI Concession borders the CI Conservation Concession on the west,

⁵ ZSL Report on the Assessment of Biodiversity of the Rewa Head.

south and east. The area is a portion of State Forest awarded to CI in 2002 and CI entered into a thirty-year agreement with the Government to establish a “Conservation Concession” to protect 200,000 acres (81,000 hectares) of intact forest for the purpose of managing the area for conservation rather than timber harvesting. The UECC attempts to protect high biodiversity value forest while still generating revenues for Guyana equivalent to those that would have been obtained from harvesting. Far north of the SSILI Concession is the Iwokrama Rainforest Project Area while far west of the Concession is the recently established Kanuku Mountains Protected Area. The conservation and protected areas in the wider area surrounding the SSILI Concession can be observed in figure 4-3.

There are remnants of a cocoa (*Theobroma cacao*) plantation to the northeast of the SSILI Concession. This is found on the right bank of the Essequibo River, in the vicinity of Primus Inlet, outside the Sherwood Forrest Concession area. Also, in the south western area of that Concession, on right bank of the Essequibo River there are cocoa trees, evidence of either a disused nursery, or a cocoa plantation.⁶

Additionally, there is a low level of eco-tourism within the Rewa River, probably not exceeding 3 trips per year, and consisting mainly of bird watching. There is also a periodic presence within the area by researchers, including the team conducting surveys as part of the Arapaima Management Programme.

⁶ Source: Sherwood Forrest Inc. Draft ESIA

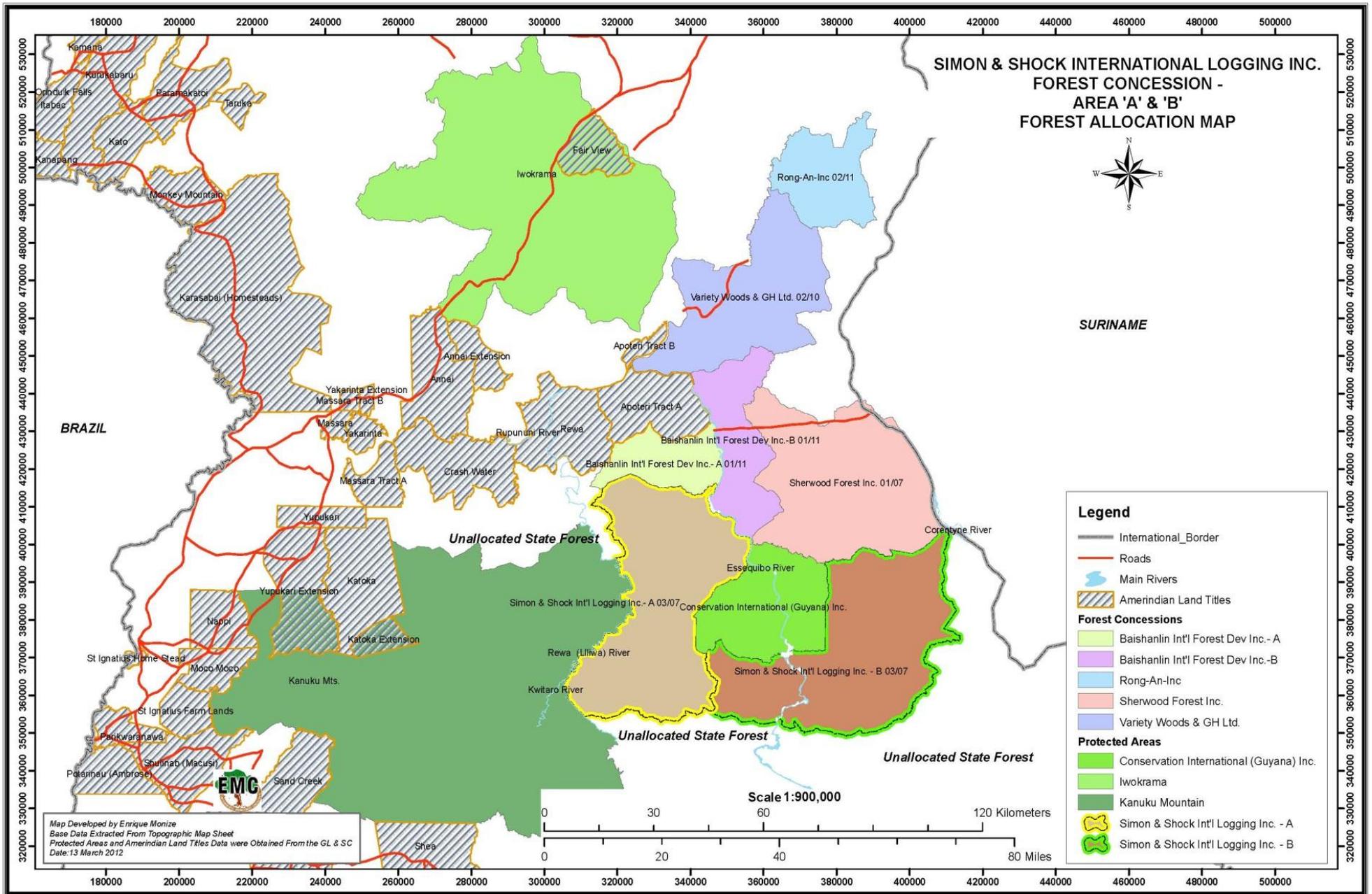


Figure 4-1: Forest Concessions around the SSILI Concession

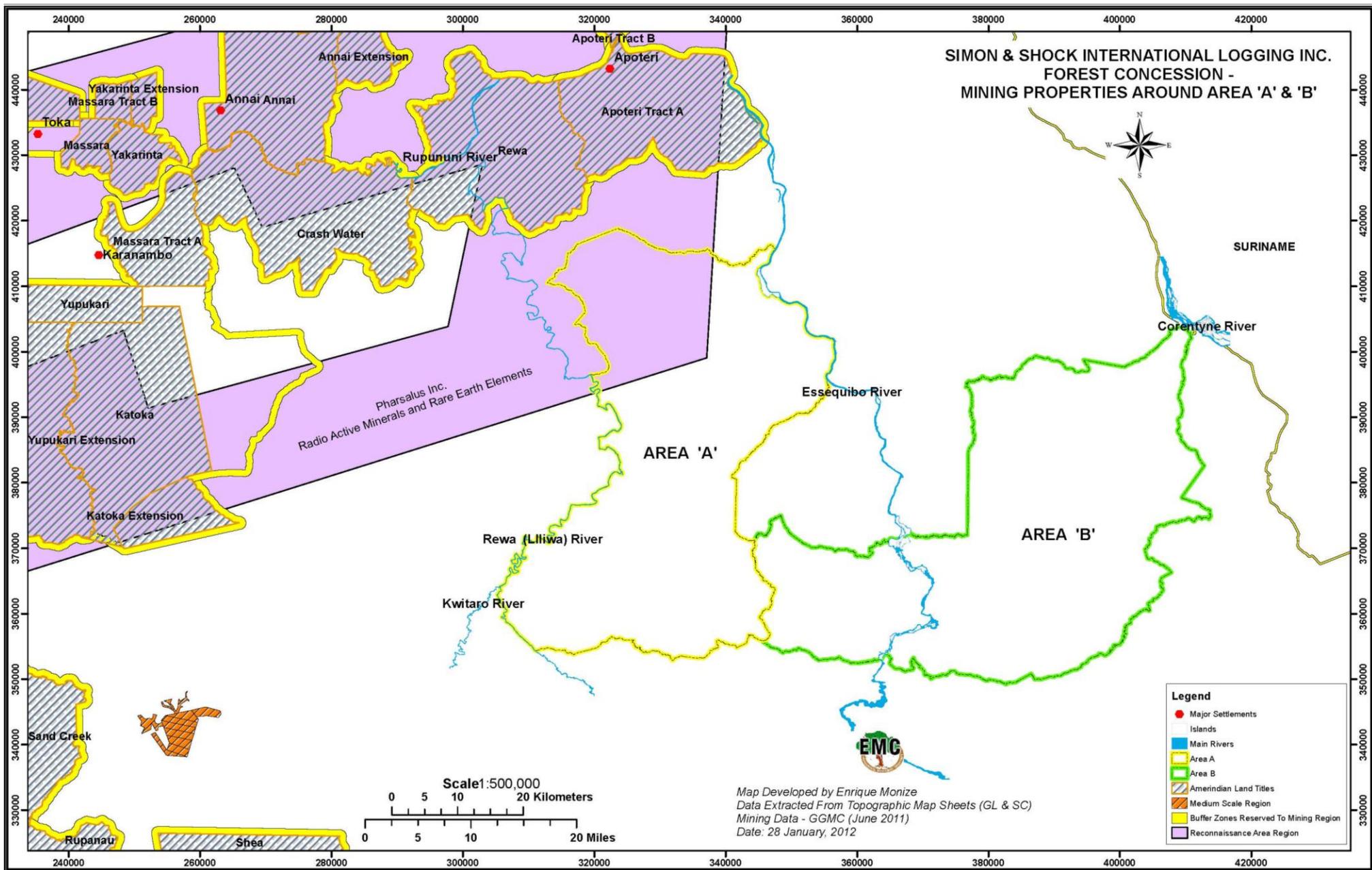


Figure 4-2: Mining Properties within and around the SSILI Concession

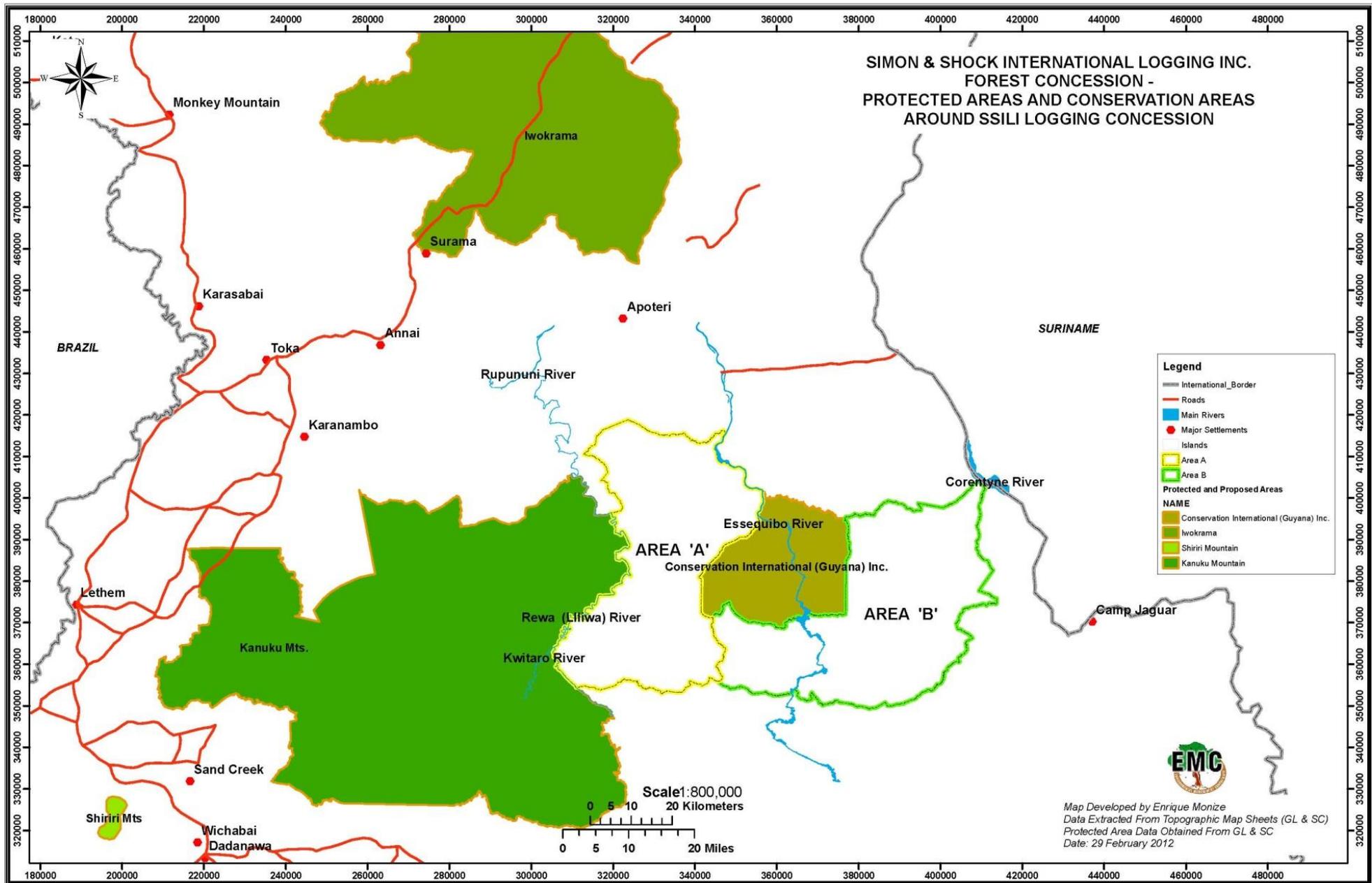


Figure 4-3: Protected and Conservation Areas around the SSILI Concession

4.2 Physical Environment

4.2.1 Geology & Soils

Guyana is located on one of the 3 cratons of the South American Plate which is a 1.7 billion year old Precambrian geological formation. Guyana is divided into 4 distinct natural regions: the Low Coastal Belt, the Hilly Sand and Clay Region, the Interior Savannas and the Forested Highlands. The Forested Highlands are a series of plateaus, flat-topped mountains, and savannas that extend from the white sand belt to the country's southern borders. The SSILI Concession lies within this very region and the soil under this vastly forested area, which accounts for approximately 63% of the Guyana's landmass, is heavily weathered laterite. However, there are distinct soils types that lie within the Concession area which are based on the FAO Soil Classification Study (1966).

The soil found throughout the Concession is of typical laterite soils which are porous and claylike, containing mainly metal oxides and possessing varying colours based on the concentration of the various metal oxides present. However, it must be noted that the top soil is usually dark due to an accumulation of humus but this did not extend very deeply into the soil profile. Furthermore, under the FAO Soil Classification Study, it was found that there were 6 distinct species of soils that existed within the Concession area. These soils include Endoaquults, Kandistoxs, Kandustults, Plinthudults, Ustochrepts and Ustchrepts.

The Endoaquults soils are the Aquults that have endoaquic saturation and do not have a mollic or umbric epipedon. The groundwater fluctuates from a level near the soil surface to below the argillic horizon and is sometimes below a depth of 200 cm. These soils have an epipedon that rests on an argillic horizon without an abrupt textural change if the argillic horizon has moderately low or lower saturated hydraulic conductivity. Also, they do not have a kandic horizon. Furthermore, there is no fragipan or horizon in which plinthite either forms a continuous phase or constitutes one-half or more of the volume within 150 cm of the mineral soil surface. This soil type only occurs in the northern portion of Part A of the SSILI Concession.

Plinthudults are the Udults that have plinthite that either forms a continuous phase in, or constitutes more than half the matrix of, one or more horizons within 150 cm of the mineral soil surface. These are the more or less freely drained Udults that have a large amount of plinthite in the argillic or kandic horizon. There are three (3) pockets of this soil type occurring within Part B of the Concession only.

The Kandustult types are the more or less freely drained Ultisols that have anustic soil moisture regime and a relatively low content of organic carbon. They occur in regions where rainfall is moderately low to high but evapotranspiration exceeds precipitation. Some Ustults have alternating moist and dry periods throughout the growing season and the vegetation commonly consists of forest or savannah plants. This soil types dominates Part A and the northern portion of Part B of the SSILI Concession.

Typical Kandistults do not have, in any layer within 75 cm of the mineral soil surface, redox depletions with a color value and are accompanied by redox concentrations and by aquic conditions. They also have less than 5 percent (by volume) plinthite in all sub-horizons within 150 cm of the mineral soil surface. Furthermore, these soils do not have a sandy or sandy-skeletal particle-size class throughout a layer extending from the mineral soil surface to the top of a kandic horizon at a depth of 50 to 100 cm. This soil type covers most of Part B and the southern portion of Part A of the Concession.

Ustochrepts only occurs in the north western section of Part A of the Concession. Ustchrepts occurs in small pockets in the south of both Part A and B of the Concession.

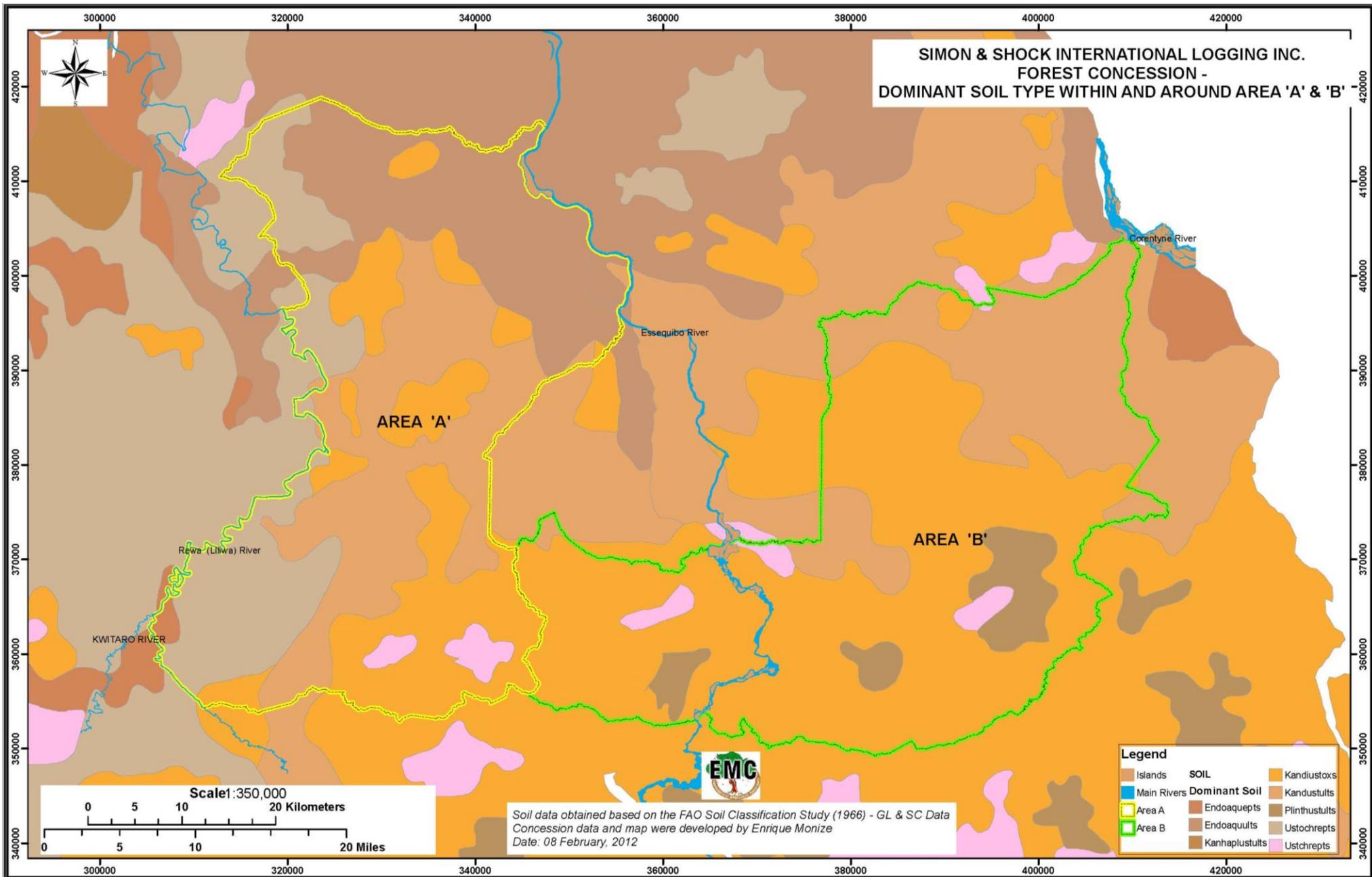


Figure 4-4: Soil Types within and around the Concession

4.2.2 Topography

The general configuration of Part A of the Concession is mainly flat to undulating and hilly. Some parts are gently sloped, sandy and with broken hills mainly in the south-eastern and north western areas. The highest elevation is the isolated hill reaching 425 meters (1,395 feet) located in the southeast portion of Part A and lowest point is 92 meters (300 feet) altitude above the Mean Sea Level (MSL).

Part B is mainly hilly and broken hills on both sides of the Essequibo River. The north-eastern side of the concession towards the Corentyne River is flat to undulating with isolated and lots of individual (broken) hills. The highest elevation within this part reaches meters 290 (950 feet) on the southeast section and lowest point is 119 meters (390 feet) altitude above MSL.

The general topography of the Concession is shown on figure 4-5.

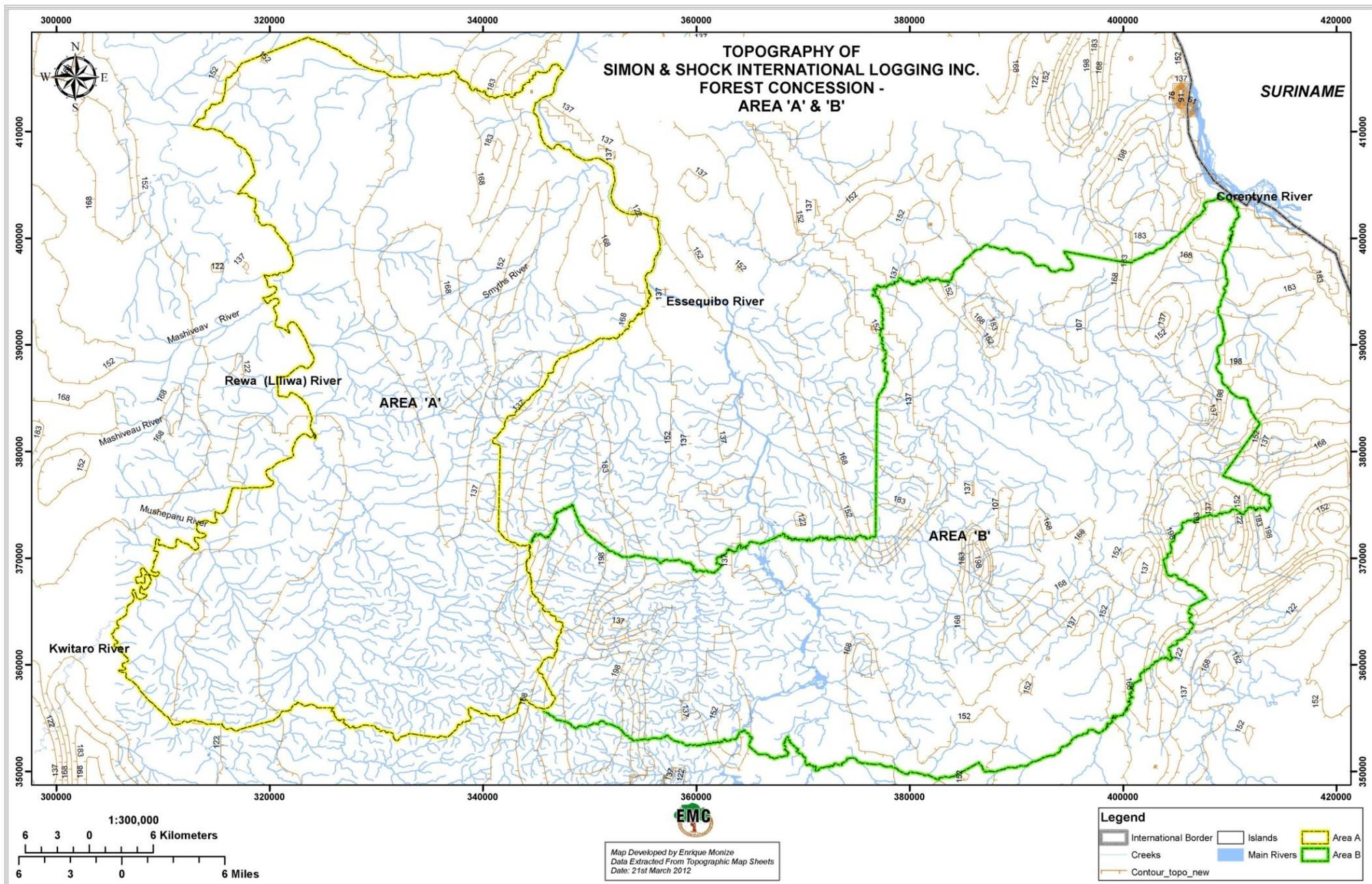


Figure 4-5: Topography of the Concession Area

4.2.3 Hydrology and Drainage

The Concession is drained by 3 major rivers occurring in the area. Most of Part A is drained into the Rewa River, shown in figure 4-7, on the west while the portion to the east and north east is drained into the Essequibo River, shown in figure 4-6. The Rewa River then flows into the Rupununi River, which then flows into the Essequibo River where it forms the Rupununi-Essequibo Triangle at Apoteri. The Essequibo River passes through Part B of the Concession and drains most of the southern and western portion of this area. Additionally, a smaller portion to the east is drained into the Corentyne River.

Drainage into these larger rivers is facilitated by a number of minor rivers and creeks inside the Concession, such as that shown in figure 4-8. These smaller creeks form an intricate drainage pattern that allows for the area to be well drained. This can be observed in figure 4-9. However, some of these creeks are seasonal and are slow to fast flowing with meandering channels. The rivers within and around the concession area, including the Essequibo and Rewa, are characterised by very wide variation in water levels between the dry season and the wet season. Moreover, some of the smaller water bodies dry out completely during the dry season while during the rainy season there can be significant flooding. None of the smaller water bodies within the Concession are navigable as a result of the presence of vegetation and logs, even during the rainy season. In the dry season, it is sometimes difficult and dangerous to access some sections of the Concession, even along the main rivers.



Figure 4-6: Essequibo River bordering the Concession Area



Figure 4-7: Rewa River bordering the Concession Area



Figure 4-8: A small unnamed Creek within Concession Area

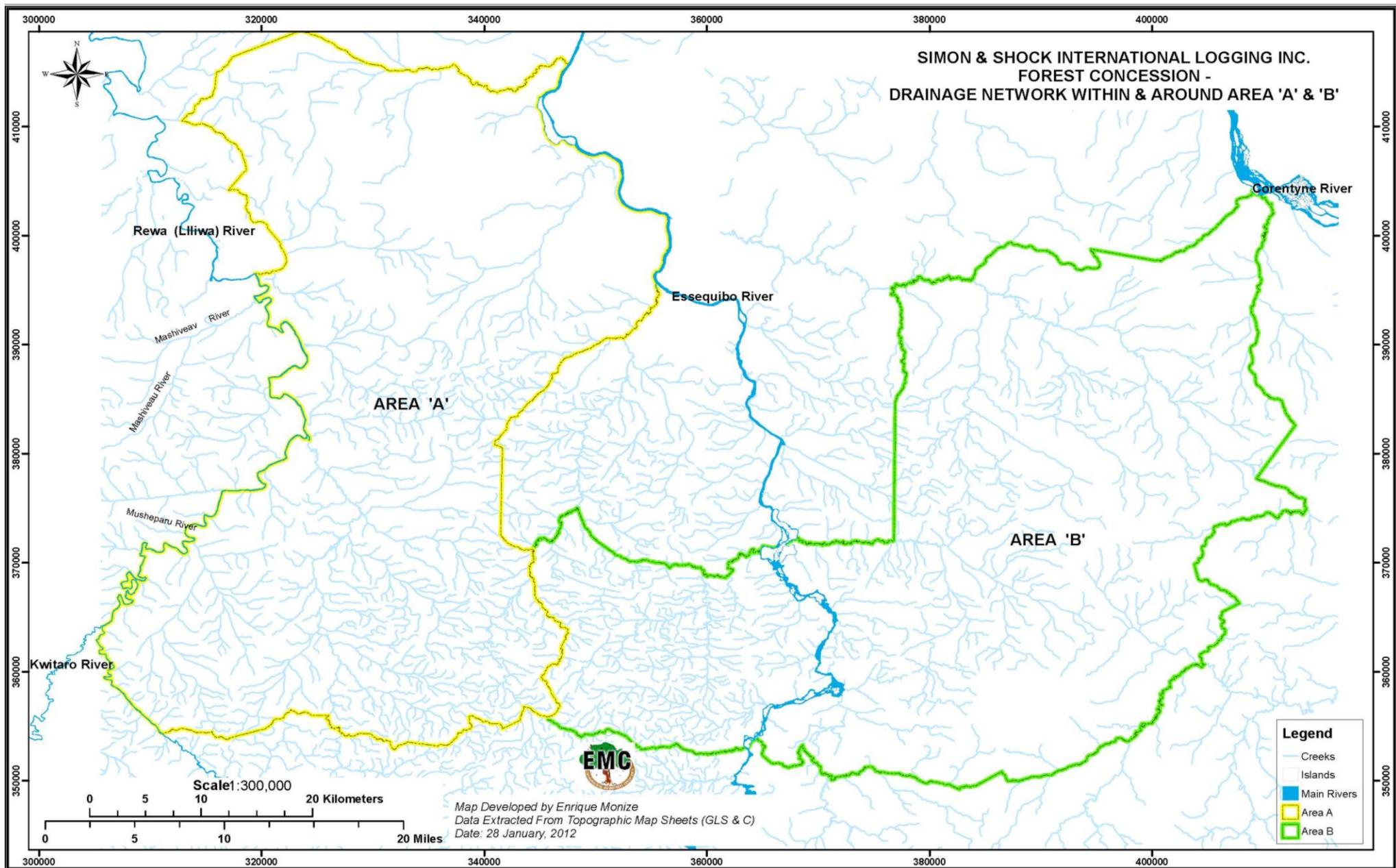


Figure 4-9: Drainage System of the Concession Area

4.2.4 Climate

Weather data for the project area is unavailable since there is no weather station within the Concession, or in close proximity. The closest location where some weather data is available relevant to the Concession is at Apoteri. However, data for this area is only available up to 1979. The project area is characterised by the weather pattern experienced by the rainforest area of south east Guyana. This weather pattern is different from that experienced by the Rupununi Savannahs located to the west of the project area. Hence, weather data from the Rupununi Savannah was not considered as relevant to the Concession area. Data from weather stations located at Kurupukari and Mabura were utilised since these are more relevant to the project area.

The project area experiences a climate similar to most of Guyana, which is strongly influenced by the Inter-Tropical Convergence Zone (ITCZ) which gives rise to two wet and dry seasons. The long wet season usually runs from May to August and the short wet season from December to February. The periods in-between are relatively dry. Mean annual rainfall recorded at Apoteri is approximately 1900mm and at Kurupukari it is approximately 2500mm. Rainfall peaks in the area in the months of June-July and December-January.

The mean annual temperature in the country does not vary much and temperature is closely related to the incoming radiation. Average daily temperature is 25.9 degrees Celsius and the annual variation in average daily temperature is approximately 2 degrees Celsius while the average diurnal variation is about 6 degrees Celsius. The warmest months are September and October while the coolest months are January and February. Periods without rain can sometimes be longer than 10 days.

Relative humidity, which is also closely related to incoming radiation, is high and fairly constant throughout the year. In the early morning, the average is approximately 95%, and then drops by mid-afternoon to an average of approximately 74%.

The dry season periods have lower cloud cover and thus have higher sunshine hours. The average sunshine amounts to 45% of the total daytime. Annual Potential Evapotranspiration (PET) amounts to 1350 – 1500 mm.

It should be noted that, during the stakeholders' consultations, the Hydromet Division of the Ministry of Agriculture indicated that they have no immediate plans to erect a weather station in the vicinity of the project area. As such, Hydromet requested that SSILI acquire a mini weather station to be established onsite. Hydromet has indicated that they would be willing to assist with the installation of the weather station and training if required.

4.2.5 Noise Conditions

The existing sound environment throughout the Concession is characterized almost completely by sounds of nature. As was stated before, the project area is undeveloped lands with no communities, land use or nearby roads. However, there is some noise from the infrequent movement of boats equipped with outboard engines traversing the Rewa and Essequibo Rivers.

Noise levels recorded at various points within both Part A and Part B of the Concession never exceeded 50 decibels.

4.2.6 Air Quality

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. As such, there are no air quality data for the project area. However, the air quality within the project area can be considered pristine since activities to affect air quality are limited. There are no industrial type activities in close proximity, as well as activities which generate significant quantities of dust.

4.2.7 Water Quality

Surface water samples were collected from water bodies within and around the Concession. Samples were collected from the Essequibo River, the Rewa River and from streams flowing into these rivers from the Concession. The locations where the samples were collected are described in the table below and are identified on the figure 4-10 as the SW locations. A total of eleven (11) points were sampled. These locations were chosen since, if there are any impacts on water quality by the project during operation, the impacts can be detected by testing these locations. As such, it was important to confirm the background quality of water. Also, data from the analysis conducted for these areas provided a better understanding of the water quality within the general project area.

Table 4-1: Description of Surface Water Sample Locations

No.	Sample ID	Location Description	Coordinates
1.	SW1	Essequibo River between Pambo Island and Smyths Creek along Part A of the Concession	21N 0348280 UTM 0408367
2.	SW2	Mouth of left bank tributary of the Essequibo River forming border between CI's and SSILI's Concessions	21N 0355372 UTM 0395545
3.	SW3	Essequibo River within CI's Conservation Concession	21N 0364200 UTM 0386314
4.	SW4	Essequibo River in the vicinity of the commencement of Part B of SSILI's Concession	21N 0368099 UTM 0372330
5.	SW5	Rewa River downstream of the SSILI's Concession	21N 0309947 UTM 0408225
6.	SW6	Upstream of right bank tributary of Rewa River which forms a portion of the border of the Concession	21N 0320994 UTM 0396000
7.	SW7	Mouth of small creek on the right bank of the Rewa River within the Concession	21N 0323577 UTM 0390069
8.	SW8	Mouth of the Neong, right bank tributary of the Rewa River	21N 0324301 UTM 0381248
9.	SW9	Rewa River within the Concession	21N 0318182 UTM 0376655
10.	SW10	Mouth of small creek on the right bank of the Rewa River within the Concession	21N 0313865 UTM 0371953
11.	SW11	Rewa River upstream	21N 0313800 UTM 0371925

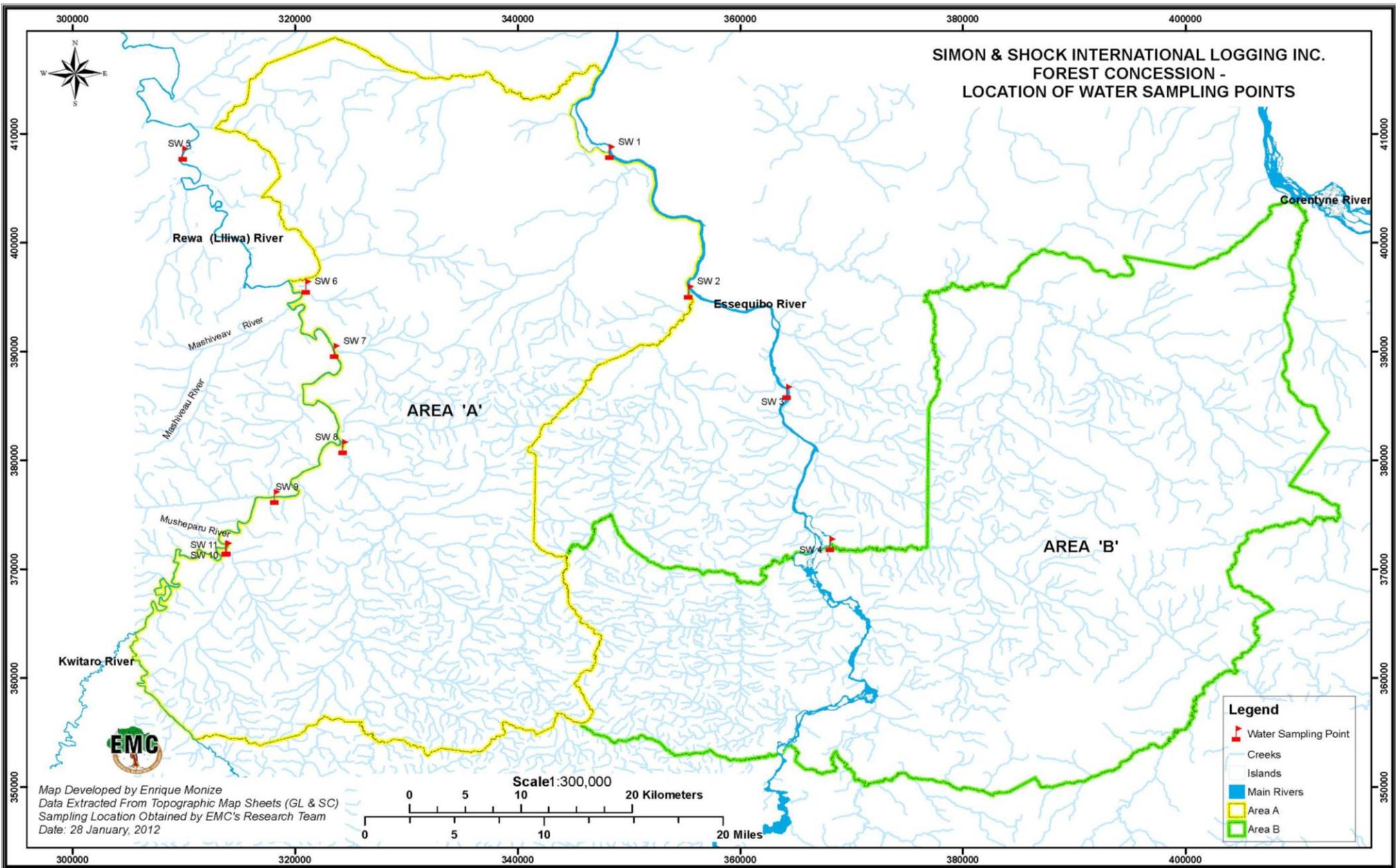


Figure 4-10: Water Sample Locations

Each of the eleven points was sampled twice, once within the dry season and once within the wet season. The surveys were conducted in October 2011 (dry season) and February 2012 (wet season). Analyses were conducted in the fields, as shown in figure 4-11, and at a laboratory. The details of the sampling for both seasons are outlined in the table below. One of the sample locations can be observed in figure 4-12.

Table 4-2: Summary of Water Sampling Exercise

Sample ID	Dry Season			Wet Season		
	Date Sampled	Time Sampled	Weather Conditions	Date Sampled	Time Sampled	Weather Condition
SW1	Oct 18, 2011	12:55hrs	Cloudy	Feb 18, 2012	07:45hrs	Overcast
SW2	Oct 18, 2011	13:40hrs	Cloudy	Feb 15, 2012	11:15hrs	Overcast
SW3	Oct 18, 2011	14:50hrs	Cloudy	Feb 15, 2012	10:00hrs	Overcast
SW4	Oct 18, 2011	16:15hrs	Cloudy	Feb 15, 2012	09:00hrs	Overcast
SW 5	Oct 19, 2011	13:15hrs	Cloudy	Feb 01, 2012	18:00hrs	Rainy
SW 6	Oct 19, 2011	15:10hrs	Cloudy	Feb 02, 2012	10:30hrs	Overcast
SW 7	Oct 20, 2011	07:50hrs	Cloudy	Feb 02, 2012	11:20hrs	Overcast
SW 8	Oct 20, 2011	08:50hrs	Cloudy	Feb 02, 2012	12:10hrs	Overcast
SW 9	Oct 20, 2011	09:20hrs	Cloudy	Feb 02, 2012	13:05hrs	Overcast
SW 10	Oct 20, 2011	10:00hrs	Sunny	Feb 02, 2012	13:40hrs	Overcast
SW 11	Oct 20, 2011	10:10hrs	Sunny	Feb 02, 2012	13:30hrs	Overcast



Figure 4-11 Conducting Field Analysis of Water Quality



Figure 4-12: Conducting Field Analysis of Water Quality

Table 4-3: Results of the October 2011 (Dry Season) Water Quality Analysis

Sample ID	Parameters													
	pH (6.5-8.5)	Temp (oC)	EC _w (µs/cm)	TDS (mg/L) 200	Turbidity (ntu) 10	SO ₄ ²⁻ (mg/l) 200	DO (mg/L) ≥5.0	NO ₃ ⁻ – N (mg/L) 100	TSS (mg/L)	O&G (mg/L)	Al (mg/L) 0.2	Cu (mg/L) 1.5	Fe (mg/L) 1.0	Zn (mg/L) 15
SW1	6.94	28.5	53.7	23.8	5.05	0.17	1.36	N/A	ND	ND	0.11	ND	0.21	0.004
SW2	7.02	28.7	46.8	28.9	6.09	0.39	1.52	N/A	ND	ND	0.13	ND	0.40	0.01
SW3	7.15	28.3	69.6	48.7	4.67	1.00	0.47	N/A	ND	ND	0.12	ND	0.28	0.01
SW4	7.4	28.5	28.1	27.0	5.38	0.52	0.96	N/A	ND	ND	0.14	ND	0.32	0.01
SW 5	7.01	30.8	76.1	46.7	16.5	0.09	1.24	N/A	1	ND	0.47	ND	0.60	0.01
SW 6	6.12	28.7	51.5	34.3	12.4	0.26	0.88	N/A	1	ND	ND	ND	0.61	0.01
SW 7	7.02	27.1	75.9	47.1	10.4	0.52	1.67	N/A	ND	ND	0.49	ND	0.59	0.01
SW 8	6.52	27.7	52.0	34.5	12.0	0.87	1.76	N/A	1	ND	0.35	ND	0.60	0.01
SW 9	6.78	28.8	48.7	37.6	15.8	0.78	0.90	N/A	ND	ND	0.51	ND	0.62	0.01
SW 10	5.29	27.3	31.5	18.4	15.8	1.15	1.32	N/A	ND	ND	ND	ND	0.47	0.01
SW 11	6.80	29.2	37.6	23.3	15.7	0.43	1.10	N/A	ND	ND	0.45	ND	0.71	0.01

Table 4-4: Results of the February 2012 (Wet Season) Water Quality Analysis

Sample ID	Parameters													
	pH (6.5-8.5)	Temp (oC)	EC _w (µs/cm)	TDS (mg/L) 200	Turbidity (ntu) 10	SO ₄ ²⁻ (mg/l) 200	DO (mg/L) ≥5.0	NO ₃ ⁻ – N (mg/L) 100	TSS (mg/L)	O&G (mg/L)	Al (mg/L) 0.2	Cu (mg/L) 1.5	Fe (mg/L) 1.0	Zn (mg/L) 15
SW1	6.64	26.6	7.6	5.8	9.50	ND	9.33	0.20	ND	ND	1.55	0.37	ND	0.001
SW2	6.20	29.1	47.7	18.6	8.05	ND	9.21	0.24	ND	ND	1.75	0.39	ND	0.001
SW3	6.55	27.2	13.8	7.0	9.26	ND	8.87	0.30	ND	ND	2.10	0.32	ND	0.001
SW4	6.99	26.7	18.1	5.3	7.75	ND	9.11	0.24	ND	ND	2.34	0.27	ND	ND
SW 5	6.80	25.7	82.4	54.1	23.3	0.54	9.24	Nil	ND	0.056	0.72	0.06	0.40	0.02
SW 6	6.41	25.5	53.6	37.3	26.2	0.25	8.17	Nil	ND	0.032	ND	0.07	0.08	0.02
SW 7	6.16	26.9	36.5	36.6	10.1	1.15	8.56	Nil	ND	0.016	0.44	0.08	0.52	0.02
SW 8	6.11	27.2	37.4	35.2	12.6	1.08	6.33	Nil	ND	0.061	ND	0.08	0.53	0.02
SW 9	6.40	29.5	55.6	33.9	19.5	1.69	9.64	Nil	ND	0.032	0.12	0.09	0.28	0.02
SW 10	5.64	26.9	18.2	12.8	11.3	0.84	6.37	Nil	ND	ND	0.87	0.08	0.30	0.02
SW 11	6.49	29.7	49.2	38.8	19.2	1.04	8.49	Nil	ND	0.011	0.26	0.09	0.26	0.02

Key

EC_w - Conductivity TDS - Total Dissolved Solids O&G - Oil & Grease SO₄²⁻ – Sulphates Fe – Iron Cu – Copper Zn – Zinc
 NO₃⁻ – N- Nitrates TSS - Total Suspended Solids DO - Dissolved Oxygen Al – Aluminum ND –Not Detected N/A – Not Applicable

Water sampling and analysis was done twice to allow for a good understanding of the water quality in the general project area. Sampling was done in October 2011 and February 2012 to coincide with the dry and wet seasons. Since activities within the area are severely limited, it was suspected that the water quality would have characteristics of natural waterways in Guyana.

The samples collected were analyzed for several parameters which are important and generally used to determine the quality of water such as pH, turbidity, total metals, conductivity, total suspended solids, dissolved oxygen, total dissolved solids, sulphates, nitrates and oil and grease. In the absence of a national standard on background water quality, comparison was made with the GNBS GYS 262:2004 Specification for Drinking Water and internationally acceptable limits from the United States Environmental Protection Agency, 1985 and the World Bank, 1984. These limits are included in the results table. Some analyses were done in the fields while the remainder done at the GUYSUCO Laboratory. Turbidity, pH, temperature, conductivity and total dissolved solids were analysed in the fields.

For the analysis conducted in October 2011 (dry season) most of the parameters analysed were within the acceptable range. No oil and grease and copper were detected. Total suspended solids was only detected at three (3) of the locations, but were well within the acceptable limits. The turbidity level in the Essequibo River was within the expected range. However, the levels recorded in the Rewa River were slightly elevated. This is maybe as a result of the different soil type within this area. Dissolved oxygen was a bit on the low end in both areas during the dry season exercise. The levels recorded did not exceed 2 mg/L. Dissolved oxygen levels of 1-2 mg/L for prolonged periods can present a problem for aquatic life. However, from the analysis done during the wet season, the results were within the acceptable range. DO level is influenced by diffusion from the surrounding air, by aeration due to movement, as a waste product of photosynthesis and from organic matter decomposition. All the other parameters were within the acceptable range. It should also be noted that the laboratory did not perform the analysis for nitrates as requested by the ESIA Team due to the unavailability of materials and malfunctioning of equipment. A letter is attached in Appendix J confirming this.

For the analysis conducted in February 2012 (wet season) most of the parameters analysed were also within the acceptable range. No total suspended solids were detected in any of the water bodies. Nitrates analysis was conducted this time, however, no nitrates was detected in the Rewa River. No sulphates were detected in the Essequibo River. Minor levels of oil and grease and copper were detected during this exercise in the Rewa River, as compared to none for all water bodies during the first survey. The turbidity level in the Essequibo River was again within the expected range, but slightly elevated as compared to the first survey. Furthermore, the turbidity levels recorded in the Rewa River were still slightly higher than the levels recorded in the Essequibo River. Dissolved oxygen levels also increased from the first survey and were now within the acceptable range. Total dissolved solids levels for most locations dropped slightly during this exercise. All the other parameters were within the acceptable range.

The results of the analyses indicated that the existing water quality of the area is typical of the water quality for the similar type of areas within Guyana. The results indicated very low level of contamination. Additionally, the results from the two sampling exercises, despite some minor differences, were very similar. The only concern was the low dissolved oxygen levels recorded during the dry season. However, the levels improved during the wet season. The water quality analyses certificates are attached in Appendix J.

Other Water Quality Data

In addition to the main water sampling and analysis conducted for the concession area and described above, water quality data was also collected from the areas where fish surveys were executed. Twelve such locations were surveyed, both on the Essequibo and Rewa Rivers, as well as smaller streams flowing into these rivers. The locations where the sampling was conducted are described in the table below and are identified on the figure 4-13. As was stated above, a total of 12 points were surveyed during both the dry season and wet season surveys, however, during each survey, only 10 points were

actually sampled. This was as a result of some of the streams being dry, or access to the points proving to be difficult due to low water levels.

Table 4-5: Description of Fish Survey Locations

Sampling ID	Location	Coordinates	Stream Width (m)	Stream Depth (m)
<i>Rewa</i>				
RA1	Main channel of Rewa River near campsite Rewa A	21N 0320363 UTM 0394819	70	3.0
RA2	Creek feeding into Rewa River near campsite Rewa A	21N 0321236 UTM 0396326	40	3.0
RB1	Large creek (fishing pond) that empties into Rewa River	21N 0324331 UTM 0381217	25	3.90
RB2	Small creek that forms a swamp before emptying into RB1	21N 0324324 UTM 0381588	10	<1
RB3	Main channel of Rewa River near campsite Rewa B	21N 0323368 UTM 0381710	70	3.20
<i>Essequibo</i>				
EA1	Creek feeding into Essequibo River	21N 0352700 UTM 0402672	4	<1
EA2	Near mouth of Coco Creek	21N 0357130 UTM 00400733	50	2.0
EA3	Main channel of Essequibo River between Coco Creek to campsite A	21N 0352713 UTM 0402844	295	3.85
EB1	Smyth's Creek next to campsite Essequibo B	21N 0355410 UTM 0395289	40	1.75
EB2	Main channel of Essequibo River near campsite Essequibo B	21N 0355575 UTM 0396729	245	6.0
EC1	Main channel of Essequibo River near campsite C	21N 0367704 UTM 0367850	310	5.80
EC2	Creek feeding into Essequibo River near campsite D	21N0368289 UTM 0366423	10	2.90

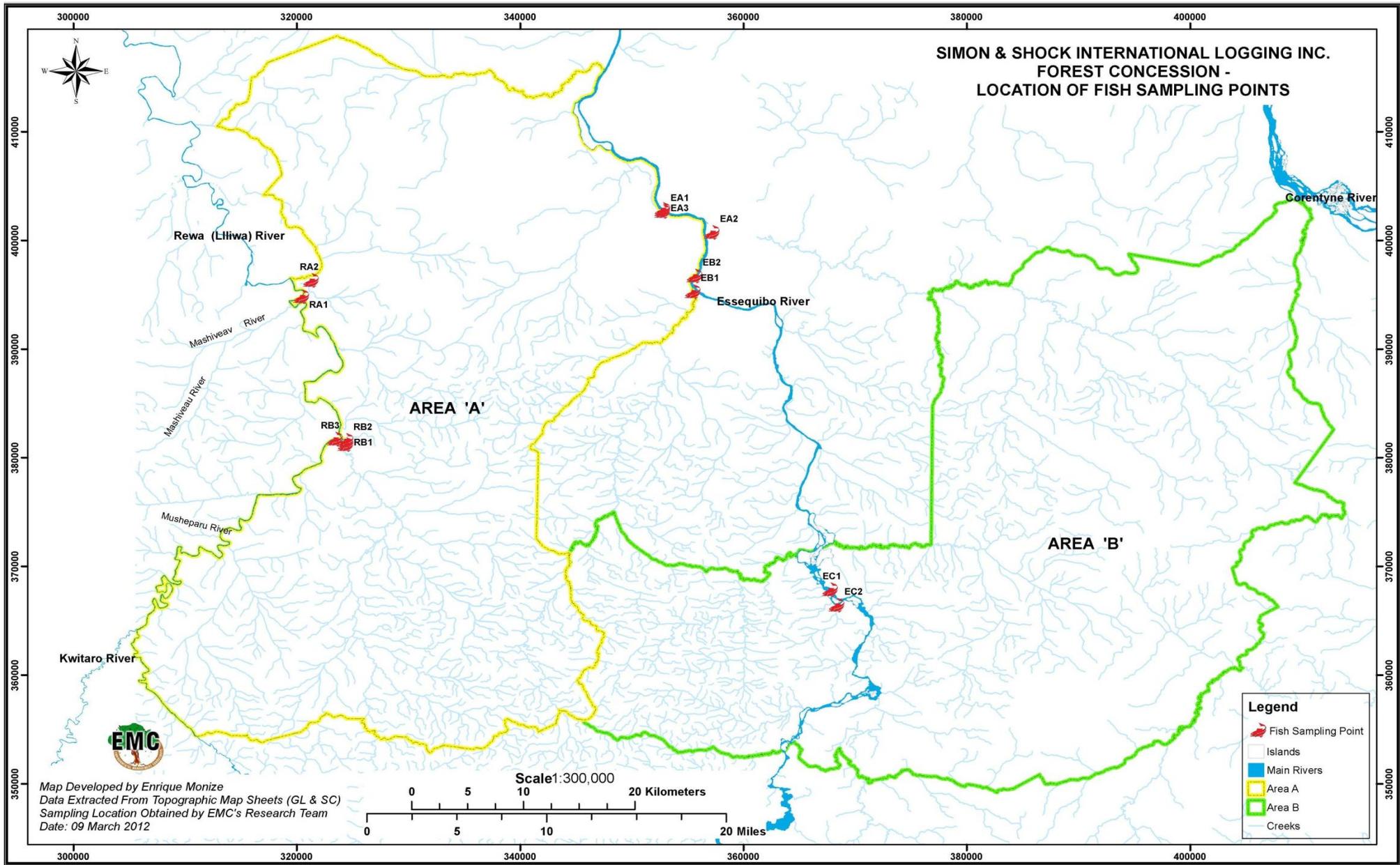


Figure 4-13: Fish Surveys Locations

The surveys were conducted in October 2011 (dry season) and February 2012 (wet season) and the analyses were conducted in the fields utilizing portable water testing kits. The results of the water quality analyses are presented in the table below:

Table 4-6: Results of the October 2011 (Dry Season) Water Quality Analysis at Fishing Sites

Sampling ID	Date Sampled	Parameters				
		pH (6.5-8.5)	Total Dissolved Solids (mg/L) 200	Conductivity (µS cm-1)	Turbidity (ntu)	Temperature (°C)
RA1	Oct 19, 2011	6.12	34.3	51.5	12.4	No results Available
RA2	No results available					
RB1	Oct 23, 2011	6.29	17.2	24.6	18.7	
RB2	Oct 23, 2011	5.77	17.2	73.2	3.98	
RB3	Oct 23, 2011	6.71	28.3	41.1	30.4	
EA1	Oct 27, 2011	5.22	22.4	23.3	9.98	
EA2	Oct 27, 2011	6.34	55.7	76.2	13.6	
EA3	Oct 27, 2011	6.56	31.9	45.3	6.84	
EB1	Oct 30, 2011	6.53	25.0	40.3	10.0	
EB2	Oct 30, 2011	6.60	24.2	32.7	5.93	
EC1	No access to site					
EC2	No access to site					

Table 4-7: Results of the February 2012 (Wet Season) Water Quality Analysis at Fishing Sites

Sampling ID	Date Sampled	Parameters				
		pH (6.5-8.5)	Total Dissolved Solids (mg/L) 200	Conductivity (µS cm-1)	Turbidity (ntu)	Temperature (oC)
RA1	Feb 03, 2012	6.51	143	210	17.7	29.1
RA2	Feb 03, 2012	6.30	56.4	76.0	15.6	29.3
RB1	Feb 05, 2012	5.69	87.8	39.5	11.7	25.7
RB2	Dry					
RB3	Feb 05, 2012	6.42	24.5	35.2	11.7	29.3
EA1	Dry					
EA2	Feb 17, 2012	5.80	15.9	18.5	25.7	27.0
EA3	Feb 17, 2012	7.20	6.5	9.5	10.1	27.5
EB1	Feb 09, 2012	6.24	33.3	98.9	15.8	26.2
EB2	Feb 09, 2012	6.72	35.3	71.9	8.40	28.5
EC1	Feb 14, 2012	6.64	7.7	12.5	7.40	29.4
EC2	Feb 14, 2012	6.78	7.5	10.7	6.69	27.5

The samples collected were tested for several parameters, which were analysed in the field by way of portable water quality testing kits and include pH, turbidity, conductivity, total dissolved solids, and temperature. The results obtained from the analyses conducted at the fish sampling sites were similar to those obtained from the points tested for the water quality assessment. Furthermore, since activities within the area are severely limited, the water quality results obtained reflected characteristics of natural waterways in Guyana.

The pH level remained constant at all the locations and well within the expected range. Total dissolved solids levels were also below the acceptable limit. It was observed that, during the wet season survey, the total dissolved solids levels recorded in the Rewa River were slightly higher than those recorded in the Essequibo River. The turbidity level in both rivers was within the expected range. However, the levels recorded at some points in the Rewa River were slightly more elevated than those recorded in the Essequibo River, and are consistent with the results from the water quality assessment conducted. Conductivity levels were also within the acceptable range.

In 1934 Carter categorized the rivers found in Guyana as either black water (acidic, with high carbon dioxide and low oxygen content) or white water (turbid, with low carbon dioxide, high silica, and low acidity). The Essequibo has high sediment loads and can be considered a white water. However the upper Essequibo is considerably darker than the lower Essequibo (Watkins et al. 2004). The Rewa River is considered as a white water river because of its high sediment load. Nevertheless, Sioli (1950) classified the Essequibo and Rewa rivers as White Water Rivers. The difference in the classification of these rivers may be as a result of time of the year or season in which the surveys were carried.

4.3 Biological Environment

4.3.1 Introduction

GoG has tasked GFC with promoting sustainable management of Guyana's forest resources. As part of its mandate, GFC has been encouraging sustainable forest operations for the promotion of social and economic development while at the same time safeguarding the integrity of forest resources. SSILI has responded to this effort by GFC to implement a project in the Upper Essequibo-Corentyne-North Rupununi District based on a 'sustained yield management programme of logging and to operate in accordance with GFC's Code of Practice for Forest Operations. The Company intends to adopt best-practice approaches in its operations which could eventually lead to forest certification

The Company has conducted a 2% timber inventory of the concession and has produced a 5-Year Management Plan for its timber harvesting operations. Logging will occur within the 391,853 hectares (968,289 acres) concession. All activities will be done in accordance with the requirements of the GFC, including the Code of Practice for Forest Operations. The Company aims to maintain and safeguard forest biodiversity and other uses and values to minimize adverse social and environmental impact of its forest operations under GFC Guidelines. The company aims to adopt best-practice approaches and RIL, in its forest management operations which could eventually lead to forest certification.

The Company has contracted EMC to prepare an ESIA. This ESIA will be informed by biodiversity and social surveys undertaken by EMC. Two Rapid Biodiversity Surveys, each of two to three weeks duration, were conducted to fulfill these requirements⁷. This section reports on the findings from the biodiversity survey exercises that took place from 17th October to 1st November, 2011, and 31st January to 19th February, 2012, in which the EMC team inventoried the animals and plants of the Concession and identified endangered, rare and threatened species at six sites within the Concession. Impact on biodiversity, ERT species, mitigation, effects-monitoring, and recommendations for additional research are presented in other sections of the document.

4.3.2 Study Area and Main Methods

The project site consists of an area of State Forest of 391,853 hectares (968,289 acres). The Concession comprised primarily of mixed forests and is situated on undulating, hilly and flat terrain, with few steep slopes and well-drained sandy clay loam. The forest comprises of species such as *Mora (Mora excelsa;*

⁷ Guyana has two (2) wet seasons and two (2) dry seasons, the dry season months have an average of more than 150 mm of rain per month. The long wet season occurs from May to August, and a short wet season from December to February. The months are drier in March and April, with October being the driest month.

gonggripii), Greenheart (*Chlorocardium rodiei*), Baromalli (*Catostemma commune, altsoni*), Purpleheart (*Peltogyne schomburgkiamos*), Locust (*Hymenaea Sp.*), Wamara (*Swartzia leiocalycina*), Tatabu (*Diplotropis purpurea*), Bulletwood (*Humiria balsamifera*), Crabwood (*Carapa guianensis*), Black Kakaralli (*Eschweilera subglandulosa*) and Wallaba (*Eperua falcate*). However, *Mora* represents the highest volume and is regarded as the dominant specie of the Upper Berbice and Upper Essequibo areas.

The Essequibo River flows through a portion of the concession while the Rewa and Corentyne Rivers form sections of its boundary. There are several small streams inside the concession and some creeks are seasonal and are slow to fast flowing with meandering channels forming scroll complexes, oxbow lakes, swamps, back swamps and small ponds. There are several lakes on both banks of the Rewa River. The Concession is south of the Sherwood Forrests Inc.'s Concession and east, west, & south of CI Conservation Concession⁸.

Some information on the biodiversity of the region is available from Rapid Assessment Programme (RAP⁹) field surveys undertaken by CI in the Kanuku Mountains. In 1993, CI conducted a three-week rapid biodiversity assessment of the Western Kanuku and the Rewa River. They followed this with a two-week biodiversity assessment of the Eastern Kanuku Mountains, Lower Kwitaro and Rewa River in 2001. The team surveyed the plants, birds, mammals (non-volant and bats), and fish, and beetles occurring in lowland rainforest. The plants, fish, amphibians, reptiles, birds and mammals of Iwokrama forest have been well-documented during these surveys.

Study area

The study area is defined as the forests and ecosystems where exploratory timber inventories were conducted by BJ Management and Associates for SSILI in May - August 2011. Six sites were selected and surveyed by the forest inventory team - four sites along the Essequibo River and two sites along the Rewa River and tributaries. Sites were selected so as to survey the major forest types present, to maximise survey coverage of the concession and to utilize the forest inventory campsites and transects. Where present, transect lines 2 m wide and around 4 to 6 km in length established by forest inventory teams (i.e. light brush clearing) in June-July 2011 was used. The locations of the sampling sites, including the land transects and fishing sites, are shown in the figures below.

⁸ In July 2002, Conservation International and the Government of Guyana entered into an agreement that protects 200,000 acres of pristine forest for biodiversity conservation in the upper Essequibo River watershed.

⁹ The RAP approach was developed by CI and is a simple, very rapid method that is based on assembling a multidisciplinary team of experts who carry out field surveys and immediately write up their list-orientated results with conservation recommendations based on the area's biological diversity, its degree of endemism, the uniqueness of its ecosystems, and its risk of extinction on a national and global scale.

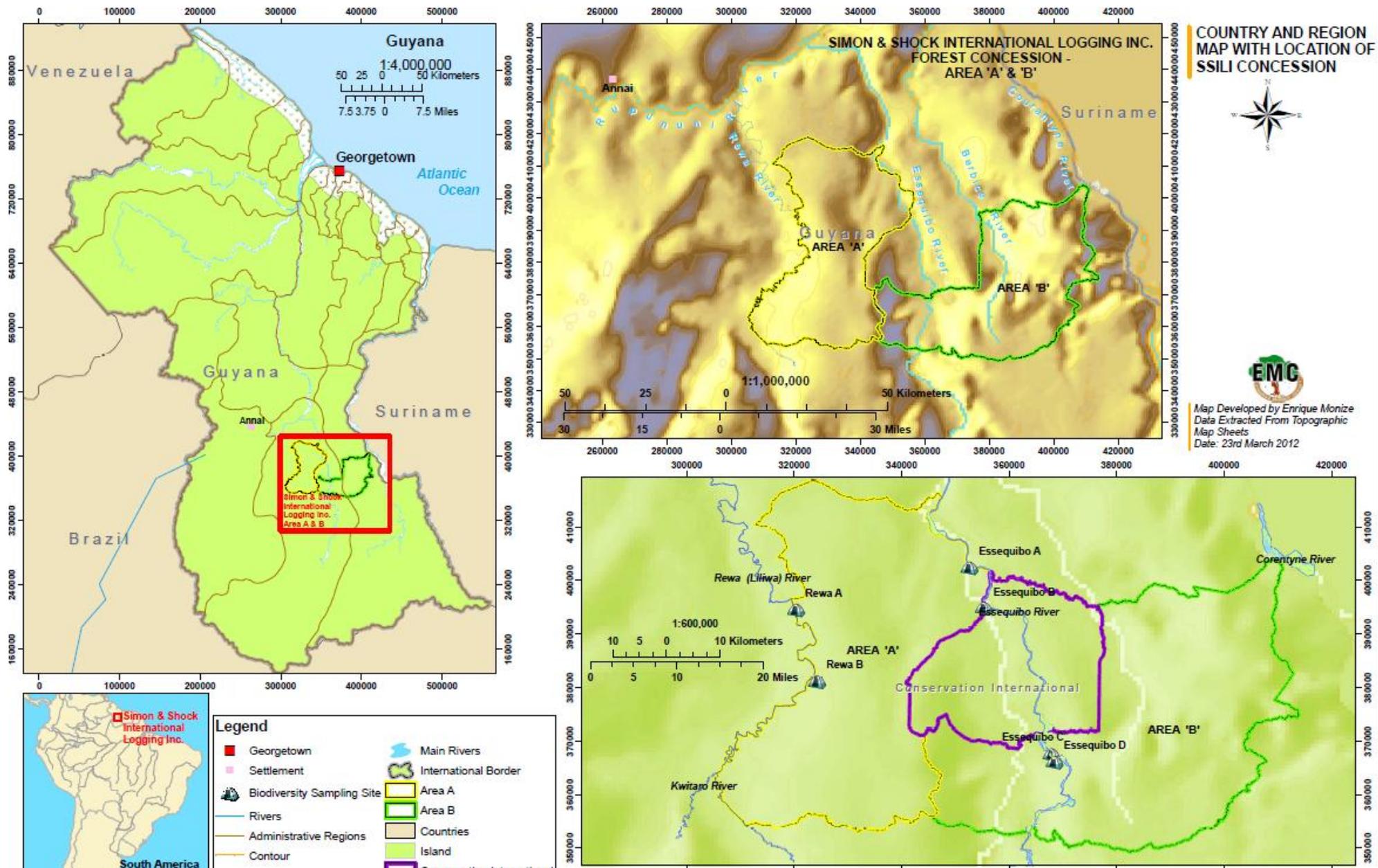


Figure 4-14: Sampling locations with respect to region, country, and CI Conservation Concession

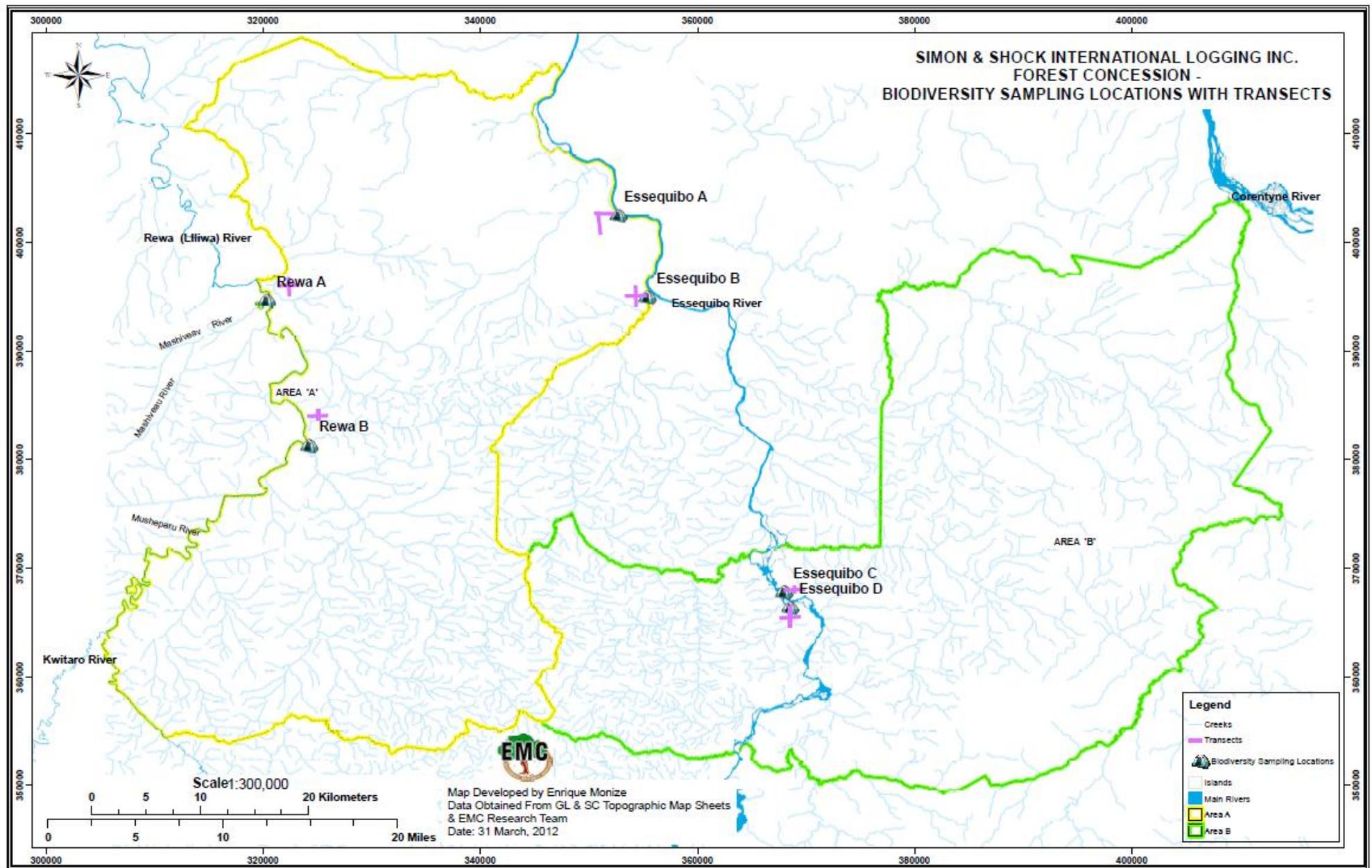


Figure 4-15: Location of study sites and transects

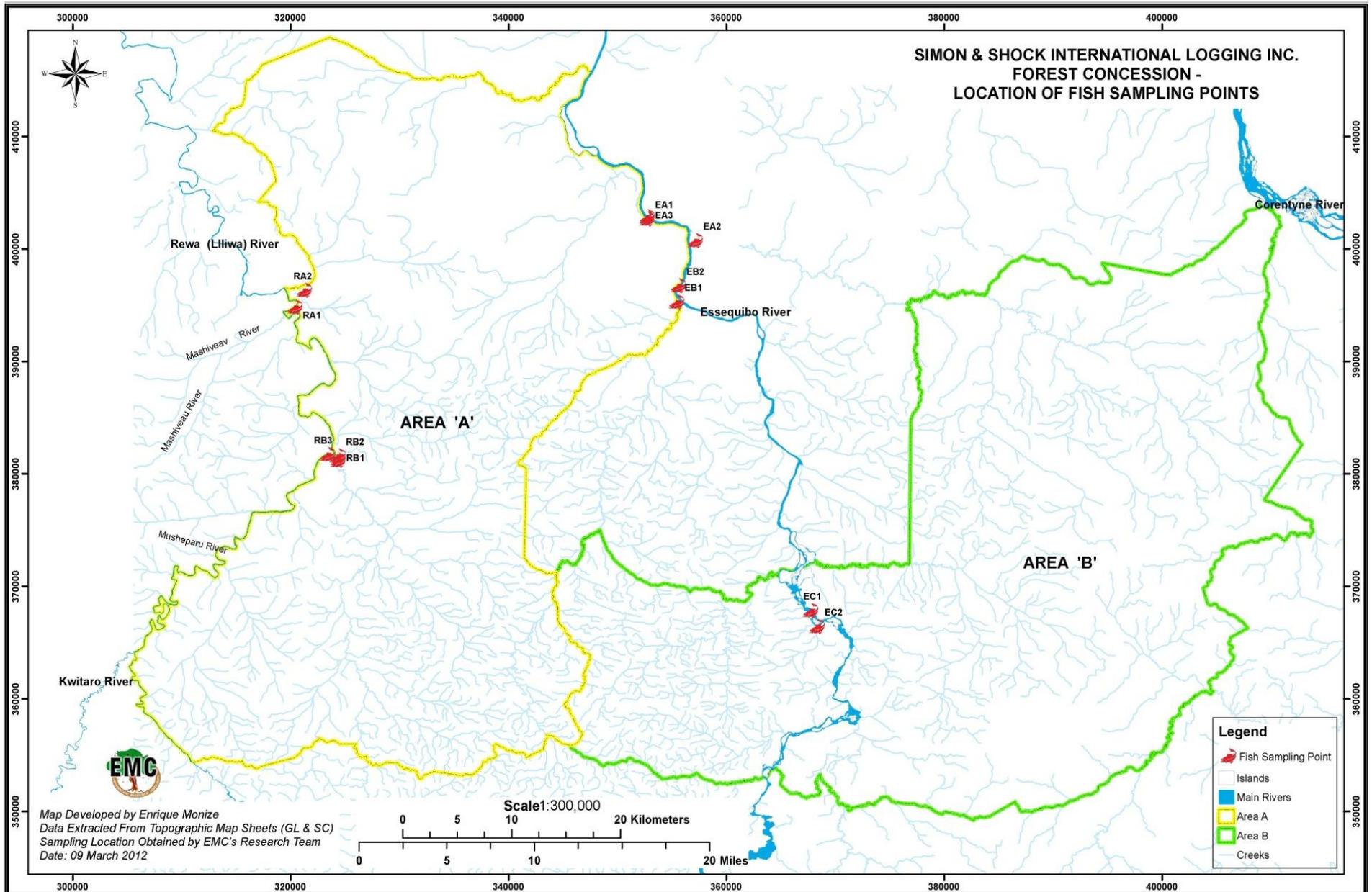


Figure 4-16: Location of fishing points within the SSILI Forest Concession

The ESIA flora survey team established additional transects to obtain a quantitative description of community composition and structure. Visual Encounter Surveys (VES) and Auditory Encounter Surveys (AES) at Transects and Timed Searches were undertaken to survey amphibians, reptiles, birds, and non-flying mammals. Both daytime and night surveys were conducted to detect mammals, reptiles and amphibians. Leaf-Litter Plots and Patch Sampling was undertaken to detect rare and small leaf litter-dwelling amphibians and reptiles. Point Counts were used to survey highly visible or vocal birds; whereas mist nets were set in the forest understory to capture birds and bats. Butterflies were sampled at transects with fruit traps and invertebrates opportunistically sampled to compile a list of invertebrate species. The aquatic environment and the wildlife of rivers, river banks and riparian vegetation were surveyed by boat transect surveys along the sections of the Essequibo and Rewa Rivers and tributaries that flow through the concession. Finally, the fish fauna and river water quality (pH, temperature, conductivity and turbidity) was sampled at twelve locations in the Rewa and Essequibo River systems.

4.3.3 Summary of Results

Number of species

Plants: 136 species

Invertebrates: 88 distinct types/species

Fish: 121 species

Amphibians: 34 anuran species

Reptiles: 28 species

Birds: 224 species

Mammals: 57 species (34 non-volant, 23 bats)

4.3.3.1 Plants

The Forest Concession is part of a vast pristine forest wilderness that stretches across the Guiana Shield. Guyana and the surrounding frontier forest of the Guiana Shield contain approximately 8,000 documented plant species of which 50% are considered endemic to the region. The vegetation surveys documented 136 individual species representing 48 plant families. The dominant forest types encountered and surveyed were Mixed Forest on flat or gently rolling terrain and Mora Forest along rivers. These forests were dominated by species in the families: Lecythidaceae, Chrysobalanaceae, Meliaceae, Sapotaceae, Fabaceae, Caesalpiniaceae, Apocynaceae, Euphorbiaceae, Annonaceae, and Violaceae. The following were especially abundant at all sites: Mora (*Mora excelsa*), Wamara (*Swartzia leicocalycina*), Baromalli (*Catostemma commune*), Yari-Yari (*Duguetia* spp), and Black Kakaralli (*Eschweilera subglandulosa*). In addition to these canopy-forming species; a diverse array of vines, lianas and shrubs dominated the forest understory. The concession likely contains thousands of plants species as this huge concession includes a diversity of habitats, a varied topography and specie-rich plant communities that combine Guianan Shield and Amazon elements. The forest is essentially pristine. The only visible trace of human disturbance was in the form of slashes on the bark of Balata trees (*Manilkara* sp.) exploited until the 1960s for their latex.

4.3.3.2 Fish

The Concession is drained by the Rewa River and Essequibo River systems. Fish are key components of Amazonian rain forest ecosystems. The main channels as well small creeks of the Rewa and Essequibo River Systems were sampled. A total of 121 species of fish from 27 families were documented. The dominant fish families in terms of number of species were the characidae, pimelodidae, cichlidae, and the anostomidae. Fish of the family Characidae were especially abundant. Notable records are *Aphyocharax erythrurus*, *Crenicichla wallacii* and *Nannostomus harrisoni* that are endemic to Guyana. Among the many large-sized food fishes recorded, the arapaima (*Arapaima gigas*) was the most notable species. This species is being managed in the area through a plan which was developed specifically for this CITES Appendix II listed fish. In 2002, the Iwokrama International Centre, the Department of Fisheries, the Mamiraua Sustainable Development Reserve in Brazil and the North Rupununi District Development Board developed a programme which focused on the effective management of the Arapaima population

and consisted of stock assessments and community outreach and include a full stock count at the beginning of the dry season, population analysis to determine whether the population is growing, determining the number of individuals to be harvested based on the population count and monitoring information and harvesting numbers are shared between fishermen, fish are harvested and sold.

Although indigenous communities fish the river systems, the aquatic habitats did not seem to be disturbed to any large extent, based on the results of the fish surveys conducted, and water quality sampling indicates that existing water quality of the area is typical of the water quality for similar type of areas within Guyana, with very low levels of contamination. Although surveys recorded a very large number of fish species, it is still only approximately a quarter of the actual species of freshwater fishes that occur in Guyana. More sampling, especially of small-sized species, should be undertaken to maximise inventory completeness. The rivers were found to be very close to being in pristine condition and the fish fauna is diverse and abundant. This combination of high fish diversity and abundance, pristine and extensive river systems, and an absence of large human settlements, make the Concession an important biodiversity area whose rivers and aquatic fauna must be protected and safeguard Guyana's rich biological diversity.

4.3.3.3 Amphibians and Reptiles

Surveys of forest and rivers recorded 34 amphibian species, comprising six families. All were anurans (frogs). Biogeographically, all frogs recorded are widespread throughout Guyana and the wider Amazonian region. None can be considered as threatened. Twenty-eight reptile (28) species representing six families were documented. The concession appears to have apparently healthy populations of reptiles that are threatened elsewhere in the region, including black caiman (*Melanosuchus niger*), yellow-footed tortoise (*Chelonoidis denticulata*), yellow-spotted river turtle (*Podocnemus unifilis*) and South American river turtle (*Podocnemis expansa*). Turtles and tortoises are often vulnerable to hunting and over collection.

4.3.3.4 Birds

Visual Encounter Surveys and Point Counts conducted in forests and along the rivers were the main methods used to survey the avifauna. Surveys documented 224 species including several species with limited geographical ranges and one rare raptor species, the Ornate Hawk-Eagle (*Spizaetus ornatus*). The most diverse bird families were antbirds (Thamnophilidae) followed by tyrant flycatchers (Tyrannidae), parrots (Psittacidae), woodcreepers (Dendrocolaptidae), woodpeckers (Picidae), and hummingbirds (Trochilidae). The forests and river systems are characterised by a rich diversity and abundance of bird species, including several species which may be endemic to the Guiana Shield. The ornate hawk eagle, and all psitticines, toucans, cracids and trumpeters occurring in the Concession can be regarded as endangered, rare or threatened in the region. This combination of high bird diversity, pristine and extensive rain forests and riverine systems, and an absence of large human settlements make the concession an important biodiversity area that must be managed in a sustainable manner to protect and safeguard Guyana's rich bird diversity.

4.3.3.5 Bats

Using direct observation, tracks and sound identification, mist netting, and interviews with field guides, the presence of 57 mammal species was documented. Bats, with 23 species recorded from four families, accounting for more than one third of the mammalian species documented. Notable captures were Schmidt's big-eared bat (*Micronycteris schmidtorum*) and the Bartica bat (*Glyphonycteris daviesi*) which may be rare, though the ecology of these species, like other bats, is poorly known. It is likely that the bat species diversity of the forest concession may be considerable and approach the diversity of other species-rich sites in the Guianas such as Iwokrama Forest and the Kanuku Mountains. This high species diversity and abundance coupled with the roles of bats as dispersers and pollinators, suggests they have a significant effect on forest dynamics.

4.3.3.6 Non-volant Mammals

Surveys determined the presence of 34 species of non-volant (non-flying) mammals. Findings indicate that the forest concession has a full, biologically rich array of non-volant mammals, including all eight of Guyana's primate species, apparently healthy populations of large carnivores, such as jaguar, margay and puma; as well as many mammals that are threatened elsewhere in the region including lowland tapir (*Tapirus terrestris*), giant anteater (*Myrmecophaga tridactyla*), giant armadillo (*Priodontes maximus*), giant otter (*Pteronura brasiliensis*), brown-bearded saki monkey (*Chiropotes satanus*), and spider monkey (*Ateles paniscus*). Low human population density, cultural practices, and the remoteness of the area, results in low hunting pressure, and apparently healthy populations of many large mammals threatened elsewhere in the region

4.3.3.7 Butterflies and other Invertebrates

Guyana's butterfly diversity is not as well understood as in other tropical forests in South America. A complete list for of all butterfly families or species within Guyana does not exist, though it is estimated that around 1,100 species may occur. A total of 1,062 observations of butterflies were made, with 14 sub-families and 88 distinct types of butterflies documented. The most dominant families included the Lycaenidae and the Nymphalidae: the Morphinae and Satyrinae were the most common sub-families. Butterflies belonging to the Pieridae (sub-family: Coliadinae), the Hesperidae and the Nymphalidae (sub-family: Danainae) were least common. Considerable more survey effort is required to produce relatively complete and accurate species lists of butterflies. Potentially the forest concession is home to hundreds of species. Other invertebrates were opportunistically sampled. Approximately 21 invertebrate orders were documented. None of the butterfly species or other invertebrates recorded can be considered as endemic, endangered, rare or threatened.

4.3.4 ERT Species/ Conservation Elements

Surveys documented a number of taxa that can be considered as ERT species (Table 1). ERT species are **E**ndangered species (e.g. IUCN Red Listed as critically endangered, endangered or vulnerable), **R**are species (endemics, locally rare, and species which may not be globally threatened and listed under the above IUCN categories but are **T**hreatened in the region or likely to become threatened within the concession by management activities e.g. logging.

Notable animal species recorded include three endemic fishes that can be considered as ERT species: *Aphyocharax erythrurus*, *Crenicichla wallacii*, and *Nannostomus harrisoni*. The only CITES listed fish documented is *Arapaima gigas*. It is a CITES Appendix II listed species. The Arapaima is protected in Guyana by the Fisheries Regulations under the Fisheries Act of 1953. However, despite legal protection, this species continued to be over-exploited, and, in 2002, the Iwokrama International Centre, the Department of Fisheries, the Mamiraua Sustainable Development Reserve in Brazil and the North Rupununi District Development Board developed a programme which focused on the effective management of the Arapaima population. The Arapaima Management Plan is based on a similar successful system in Brazil which relies on determining the number of individuals to be harvested based on the annual stock assessments, and involves community outreach. The Management Plan was approved by Government of Guyana in 2007, as part of the Fisheries Act and a programme was implemented to monitor arapaima population in the rivers in the Rupununi area, including the Rewa and Upper Essequibo.

Biogeographically, all amphibian species recorded within this survey are widespread and abundant within Guyana. No ERT species of amphibians were recorded. Some species of poison arrow frogs (Dendrobatidae) are collected for the pet trade e.g. the genera *Epipedobates*, *Allobates*, and *Ammerga*. Poison arrow frogs are CITES Appendix II/III listed, regulating their trade.

ERT reptiles recorded included black caiman, yellow-footed tortoise, South American river turtle, yellow-spotted river turtle, and the grooved side-neck turtle. The IUCN Red List of Threatened species lists the

yellow-footed tortoise and the yellow-spotted river turtle as Vulnerable. The black caiman and the South American river turtle are listed as IUCN Lower Risk/Conservation Dependent. All species are CITES listed, regulating their international trade. Tortoises and turtles are food sources for local people and other indigenous communities in the region. The yellow-footed tortoise is still commonly encountered in Guyana; whereas elsewhere in the region they have been unsustainably harvested for their meat and are less frequently encountered.

A number of birds were documented that can be regarded as ERT species. All psitticines and toucans are listed as CITES Appendix II species. Large under-storey birds such as cracids (Cracidae) and Trumpeters (Psophiidae) are sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up forest for logging. Elsewhere in the Guianas they have been decimated by unrestricted hunting. The ornate hawk eagle can be considered as locally rare, though this species has a large geographical distribution and cannot be considered threatened.

No ERT bats were documented, though Schmidt's big-eared bat¹⁰ (*Micronycteris schmidtorum*) and the Bartica (*Micronycteris daviesi*) bat are apparently rare. However, the sensitivity of gleaning animalivores (bats that glean prey from surfaces) to forest disturbances and logging is well documented. Species in the genera *Micronycteris*, *Tonatia*, and other phyllostominae bats, may be adversely affected by logging. The concession is home to many large non-volant mammals that can be regarded as ERT species. The IUCN Red List categorises the brown-bearded saki monkey (*Chiropotes satanas*) as Critically Endangered, the giant otter (*Pteronura brasiliensis*) as Endangered, the lowland tapir (*Tapirus terrestris*), black spider-monkey (*Ateles paniscus*), giant anteater (*Myrmecophaga tridactyla*), and giant armadillo (*Priodontes maximus*) as Vulnerable. The margay (*Leopardus wiedii*) and jaguar (*Panthera onca*) are listed as Near Threatened. The ocelot (*Leopardus pardalis*) is a CITES Appendix I listed species and all primate species are CITES Appendix II. The golden-handed tamarin (*Saguinus midas*) has a limited distribution in the Guianan Shield. The brown-bearded saki monkey, black spider monkey, lowland tapir, giant anteater, giant armadillo, giant otter and black spider monkey are threatened by habitat loss compounded by hunting. Jaguar and margay are affected by habitat loss and fragmentation and by persecution as they come into conflicts with humans and their livestock. Primate populations are vulnerable to collection for the pet trade.

¹⁰ *M. schmidtorum* may have a limited distribution in Guyana.

Table 4-8: ERT Species documented

Scientific Name	Common Name	ERT Status ¹¹	Potential Impact of Logging
Mammals			
<i>Pteronura brasiliensis</i>	Giant otter	IUCN Red listed as Endangered ¹²	<p>Identified impacts to populations in region: known to be threatened by multiple anthropogenic influences arising from increased colonization of tropical lowland rainforests. Illegal harvesting for pelts continues in some regions, but otters are also killed by logging workers who blame Otters for depleting local fish resources. Sensitive to increased sedimentation of rivers arising from logging. Increased sedimentation of rivers arising from logging may deplete their fish prey.</p> <p>Project activities potentially impacting species: dogs kept by workers may attack otters and transmit canine distemper that kills otters.</p> <p>Land clearing for the construction of the Base Camp, roads, workshop and log markets or removal of vegetation to facilitate construction of buildings, roads and other facilities or the construction of bridges and installation of culverts results in sedimentation of otter aquatic habitat damaging their habitat and depleting their fish prey.</p> <p>Improper disposal of solid and liquid waste or improper fuel and oil transportation, handling and storage may result in contamination of otter habitat and depletion of their fish prey.</p> <p>Presence of workforce results in disturbance to otters feeding and breeding due to increased boat use on rivers.</p>
<i>Myrmecophaga tridactyla</i>	Giant anteater	IUCN Red listed as Vulnerable ¹³	<p>Identified impacts to populations in region: sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up areas for timber extraction. Vulnerable to hunting because of low reproductive rates.</p>

¹¹ CITES Appendix I - includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances; CITES Appendix II - includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.

¹² <http://www.iucnredlist.org/apps/redlist/details/18711/0> - March 27, 2012

¹³ <http://www.iucnredlist.org/apps/redlist/details/14224/0> - March 27, 2012

Scientific Name	Common Name	ERT Status ¹¹	Potential Impact of Logging
			<p>Animals are sometimes killed on logging roads or by dogs.</p> <p>Project activities potentially impacting species: Presence of workforce leads to hunting and collisions with vehicles.</p> <p>Noise generated from the operation of processing equipment, heavy-duty equipment and generators results in movement of individuals from home ranges.</p>
<i>Priodontes maximus</i>	Giant armadillo	IUCN Red listed as Vulnerable ¹⁴	<p>Identified impacts to populations in region: this species is naturally rare and threatened by hunting for meat (generally for subsistence). Potentially sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up areas for timber extraction.</p> <p>Project activities potentially impacting species: Presence of workforce leads to hunting and collisions with vehicles.</p> <p>Noise generated from the operation of processing equipment, heavy-duty equipment and generators results in movement of individuals from home ranges.</p>
<i>Tapirus terrestris</i>	Lowland tapir	IUCN Red listed as Vulnerable ¹⁵	<p>Identified impacts to populations in region: sensitive to an increase in hunting pressure that often arises around logging camps and when access roads are constructed to open up areas for timber extraction. Vulnerable to hunting because of low reproductive rates.</p> <p>Project activities potentially impacting species: presence of workforce leads to hunting and collisions with vehicles.</p> <p>Noise generated from the operation of processing equipment, heavy-duty equipment and generators results in displacement of individuals.</p>
<i>Panthera onca</i>	Jaguar	IUCN Red List - Near Threatened ¹⁶	<p>Identified impacts to populations in region: increased conflict with humans when areas opened up for timber</p>

¹⁴ <http://www.iucnredlist.org/apps/redlist/details/18144/0> - March 27, 2012

¹⁵ <http://www.iucnredlist.org/apps/redlist/details/21474/0> - March 27, 2012

¹⁶ <http://www.iucnredlist.org/apps/redlist/details/15953/0> - February 28, 2012

Scientific Name	Common Name	ERT Status ¹¹	Potential Impact of Logging
			<p>extraction. Jaguar may be killed.</p> <p>Project activities potentially impacting species: presence of workforce leads to collisions with vehicles and wildlife-human conflicts and large cats invariably being killed. Noise generated from the operation of processing equipment, heavy-duty equipment and generators results in displacement of individuals.</p>
<i>Chiropotes satanas</i>	Brown-bearded saki	IUCN Red listed - Critically Endangered ¹⁷	<p>Identified impacts to populations in region: potentially affected by forest fragmentation and clearing.</p> <p>Project activities potentially impacting species: land clearing for the construction of the Base Camp, roads, workshop and log markets or removal of vegetation to facilitate construction of buildings, or harvesting logs and other operational activities results in the loss and fragmentation of forest habitat.</p> <p>Noise generated from the operation of processing equipment, heavy-duty equipment and generators results in displacement of individuals.</p>
<i>Ateles paniscus</i>	Black spider monkey	IUCN Red Listed - Vulnerable ¹⁸	<p>Identified impacts to populations: Potentially affected by forest fragmentation and clearing. Vulnerable to hunting because of low reproductive rates. Vulnerable to forest fragmentation due to requirement for 'intact' forest with closed canopy.</p> <p>Project activities potentially impacting species: land clearing for the construction of the Base Camp, roads, workshop and log markets or removal of vegetation to facilitate construction of buildings, or harvesting logs and other operational activities results in the loss and fragmentation of forest habitat.</p> <p>Noise generated from the operation of processing equipment, heavy-duty equipment and generators results in</p>

¹⁷ <http://www.iucnredlist.org/apps/redlist/details/39956/0> - February 28, 2012

¹⁸ <http://www.iucnredlist.org/apps/redlist/details/2283/0> - February 28, 2012

Scientific Name	Common Name	ERT Status ¹¹	Potential Impact of Logging
			displacement of individuals.
<i>Saguinus midas</i>	Golden-handed tamarin monkey	Ecologically rare and restricted geographical range in the Guianas	<p>Identified impacts to populations: Potentially impacted by wildlife trade when areas opened up for timber extraction.</p> <p>Project activities potentially impacting species: presence of workforce leads to wildlife trade in primates.</p> <p>Noise generated from the operation of processing equipment, heavy-duty equipment and generators results in displacement of individuals.</p>
<i>Glyphonycters, Tonatia, Micronycteris spp.</i>	Phyllostomine bats		<p>Identified impacts to populations: Some evidence they are sensitive to some systems of selective logging and other forest disturbances.</p> <p>Project activities potentially impacting species: land clearing for the construction of the Base Camp, roads, workshop and log markets or removal of vegetation to facilitate construction of buildings, or harvesting logs and other operational activities results in the loss of suitable forest habitat for phyllostomine bats.</p>
Birds			
Psittacines	Parrots, Macaws	Potentially Threatened by over-collecting	<p>Identified impacts to populations: Potentially impacted by wildlife trade when areas opened up for timber extraction. Elsewhere in the region unsustainably collected for the pet trade.</p> <p>Project activities potentially impacting species: presence of workforce leads to wildlife trade in toucans.</p>
Ramphastidae	Toucans and Toucanettes	Potentially Threatened by over-collecting	
Psophiidae	Trumpeters	Potentially Threatened by hunting	<p>Identified impacts to populations: Sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up areas for timber extraction. Elsewhere in the region unsustainably harvested for meat.</p> <p>Project activities potentially impacting species: presence of workforce leads to hunting.</p>
Cracidae (Cracids)	Curasows and Guans	Potentially Threatened by	<p>Identified impacts to populations: Sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up areas for timber extraction.</p>

Scientific Name	Common Name	ERT Status ¹⁹	Potential Impact of Logging
		hunting	Elsewhere in the region unsustainably harvested for meat. Project activities potentially impacting species: presence of workforce leads to hunting.
Reptiles			
<i>Chelonoidis denticulata</i>	Yellow- or Red-footed tortoise	IUCN Red Listed as Vulnerable ¹⁹ . CITES Appendix II	Identified impacts to populations: Sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up forest for logging and mining. Elsewhere in the region unsustainably harvested for meat. Project activities potentially impacting species: presence of workforce leads to hunting.
<i>Podocnemis unifilis</i>	Yellow-spotted river turtle	IUCN Vulnerable, CITES Appendix II	Identified impacts to populations: Sensitive to an increase in hunting pressure that may arise with increased human population in concession. Project activities potentially impacting species: presence of workforce leads to hunting. Land clearing for the construction of the Base Camp, roads, workshop and log markets or removal of vegetation to facilitate construction of buildings, roads and other facilities or the construction of bridges and installation of culverts results in sedimentation of turtle aquatic habitat and depletion of prey. Improper disposal of solid and liquid waste or improper fuel and oil transportation, handling and storage may result in contamination of turtle aquatic habitat and depletion of prey.
<i>Podocnemis expansa</i>	Giant South American turtle	IUCN Lower Risk/conservation dependent, CITES Appendix II	Identified impacts to populations: Sensitive to an increase in hunting pressure that may arise with increased human population in concession. Project activities potentially impacting species: presence of workforce leads to hunting.

¹⁹ <http://www.iucnredlist.org/apps/redlist/details/9008/0> - March 27, 2012

Scientific Name	Common Name	ERT Status ¹¹	Potential Impact of Logging
			Land clearing for the construction of the Base Camp, roads, workshop and log markets or removal of vegetation to facilitate construction of buildings, roads and other facilities or the construction of bridges and installation of culverts results in sedimentation of turtle aquatic habitat and depletion of prey. Improper disposal of solid and liquid waste or improper fuel and oil transportation, handling and storage may result in contamination of turtle aquatic habitat and depletion of prey.
<i>Melanosuchus niger</i>	Black caiman	IUCN Lower Risk/conservation dependent ²⁰ , CITES Appendix I	Identified impacts to populations: Sensitive to hunting pressure that may arise with increased human population in concession. Project activities potentially impacting species: presence of workforce leads to hunting.
<i>Platemys platycephala</i>	Grooved side-neck turtle	CITES Appendix I	Identified impacts to populations: Populations potentially impacted by increased collection for wildlife trade that may arise following increase in human population and use of concession following construction of access roads and logging camps.
<i>Caiman crocodilus</i>	Spectacle caiman	CITES Appendix II	
<i>Eunectes murinus</i>	Green anaconda	CITES Appendix II	
<i>Corallus caninus</i>	Emerald tree boa	CITES Appendix II	
<i>Paleosuchus trigonatus</i>	Schneider's dwarf caiman	CITES Appendix II/III	
Amphibians			
Dendrobatidae <i>Epipedobates</i> spp. <i>Allobates</i> spp. <i>Ameerega</i> spp.	Poison arrow frogs	CITES Appendix II/III	Identified impacts to populations: Populations potentially impacted by increased collection for wildlife trade that may arise following increase in human population and use of concession following construction of access roads and logging camps Project activities potentially impacting species: presence of workforce leads to wildlife-trade in amphibians.
Fish			
<i>Nannostomus harrisoni</i>		Endemic	Identified impacts to populations: Not known. Potentially impacted by increased sedimentation of rivers arising from
<i>Crenicichla wallacii</i>		Endemic	

²⁰ <http://www.iucnredlist.org/apps/redlist/details/13053/0> - March 27, 2012

Scientific Name	Common Name	ERT Status ¹¹	Potential Impact of Logging
<i>Nannostomus harrisoni</i>		Endemic	<p>some logging operations.</p> <p>Project activities potentially impacting species: land clearing for the construction of the Base Camp, roads, workshop and log markets or removal of vegetation to facilitate construction of buildings, roads and other facilities or the construction of bridges and installation of culverts results in sedimentation of water-bodies.</p> <p>Improper disposal of solid and liquid waste or improper fuel and oil transportation, handling and storage may result in contamination of aquatic habitat.</p>
<i>Arapaima gigas.</i>	Arapaima	CITES Appendix II	<p>Identified impacts to populations: Overfishing arising from an increase in human population in concession.</p> <p>Project activities potentially impacting species: presence of workforce leads to unsustainable fishing of Arapaima.</p>

4.3.5 General Findings of the Assessment

The general findings of the biological assessment are:

- diverse, pristine forests and other terrestrial habitats, from swamp forest and low-lying mono-dominant Mora Forest to Mixed Forest on flat, undulating to hilly terrain, to rivers, seasonal creeks, oxbow lakes, small ponds.
- rivers and aquatic habitats are relatively undisturbed, with very low levels of contamination, and they harbour an abundant and diverse fish fauna. Larger species are important protein sources for the indigenous peoples of the region.
- forests and plant communities are essentially pristine. The only visible trace of human disturbance was in the form of slashes on the bark of Balata trees (*Manilkara* sp.) exploited until the 1960s for their latex. Forests exhibit a high tree species richness that combine Guianan Shield and Amazon elements
- a high vertebrate diversity, particularly of mammals and birds
- healthy populations of many globally threatened species including giant otter (*Pteronura brasiliensis*), brown-bearded saki monkey (*Chiropotes satanus*) arapaima (*Arapaima gigas*), black caiman (*Melanosuchus niger*), giant armadillo (*Priodontes maximus*), giant anteater (*Myrmecophaga tridactyla*), and giant river turtle (*Podocnemis expansa*)

The results from these biodiversity assessments confirm that the SSILI forest concession contains a rich biodiversity.

SECTION FIVE

SOCIO-ECONOMIC ENVIRONMENT BASELINE CONDITIONS

5.1 Demographic and Socio Economic Conditions

The SSILI Concession is generally located in the Rupununi area. The Rupununi represents a unique combination of resources – natural and cultural that extends from the Essequibo River to the Brazilian border. This area includes an extensive natural savannah which covers approximately 13,000 km² (5000 square miles) of grasslands, swamp lands and rainforest and is divided into North and South Savannah by the Kanuku Mountains. The savannah, the mountains and surrounding forests are further divided by the Rupununi River.

Petroglyphs²¹ provide compelling evidence of human inhabitation in the Rupununi as far back as 7,000 years ago and there is also substantial evidence of the Amerindians in the North Rupununi approximately 3,500 years ago.

Currently, three main Indigenous Peoples live in the flat, alternatively dry and flooded savannah – the Makushi mainly in the North and the Wapishana and Wai Wai in the South. The rest of the population includes “coastlanders” who have settled in the communities including Lethem; and descendants of the Europeans who settled in the area in the late nineteenth century for cattle ranching. The people of the Rupununi are mainly subsistence farmers, craftsmen, fishermen and “hunter-gatherers” (CI-Guyana, 2010).

The largest villages are Annai and Aishalton and Lethem is the largest “town²².” Lethem is considered the administrative centre of the Rupununi Region and has a hospital, a police station, an army camp, a telecommunication station, schools, guesthouses, restaurants and stores.

There are no communities within or in close proximity to the Concession. The closest communities to the Concession are Apoteri, Rewa, Crash Water and Annai. No of these communities are within 20km of the SSILI Concession. The location of these communities in relation to the Concession is shown on Figure 5-1. The closest community to the Concession is Rewa, which is approximately 24km from the Concession’s northern boundary.

²¹ Petroglyphs (also called rock engravings) are [pictogram](#) and [logogram images](#) created by removing part of a [rock](#) surface by incising, picking, carving, and abrading.

²² Lethem has not officially been declared a town, it is a rapidly growing community that is considered the administrative centre for Region 9 and serves as the gateway to and from Brazil.

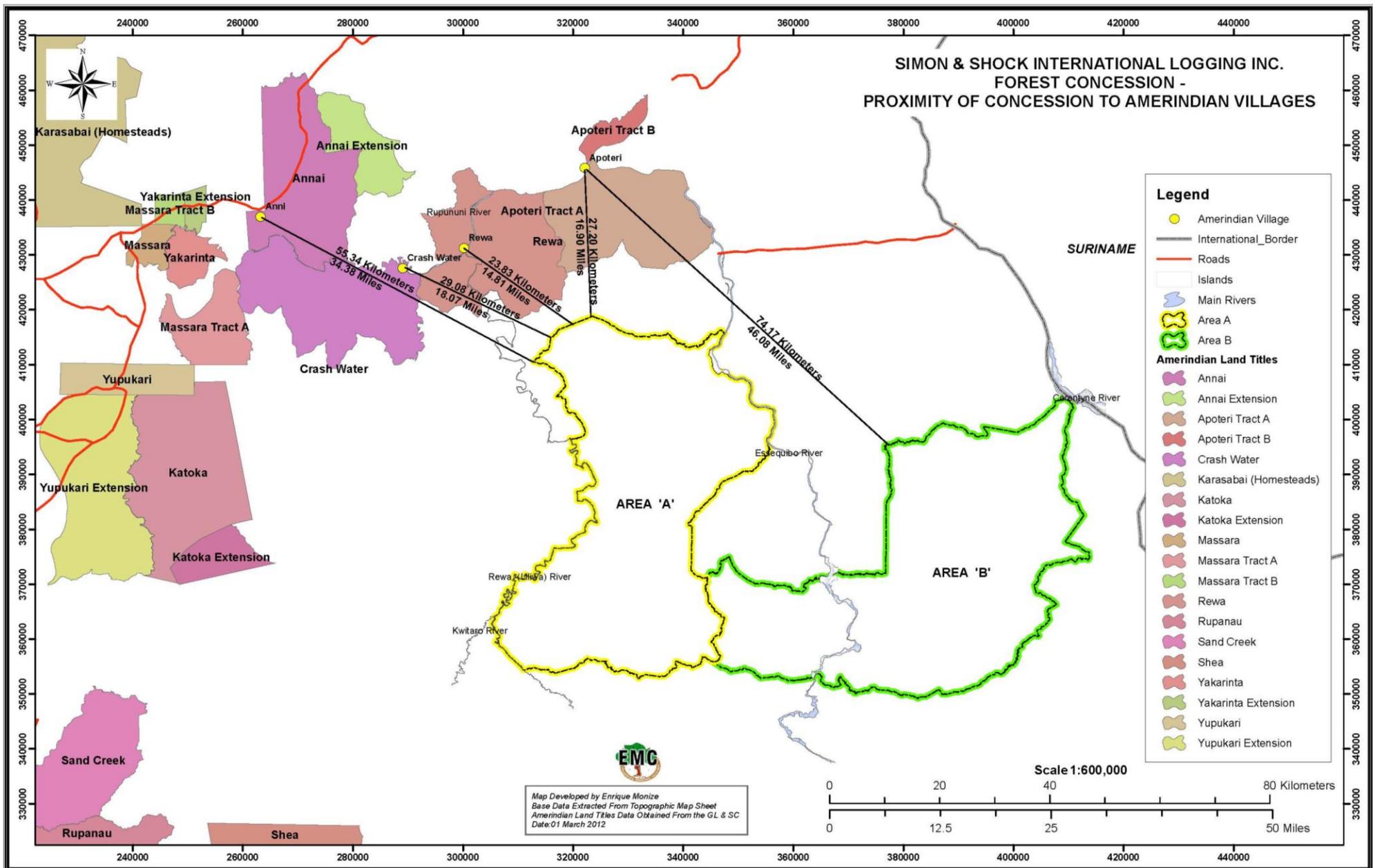


Figure 5-1: Location of Communities in relation to SSILI Concession

5.1.1 Apoteri

The village of Apoteri is located approximately 113km from Annai at the confluence of the Essequibo and Rupununi Rivers. It was founded in the 1940's by immigrants who moved to the area to work at the Guyana Balata Company. The production of balata (natural latex) was once a significant business in Guyana, most of which took place in the foothills of the Kanuku Mountains. However, subsequently, then, the balata economy weakened due to competition from plastic materials and as a result the community suffered an economic decline.

Apoteri is home to two hundred and seventy persons in forty-nine households (2011), the majority of whom are Wapishana and Makushi. The village is also home to East Indian and mixed race persons. The population would have decreased from 290 persons in 2002 as reported in the Social Impact Assessment (SIA) conducted by CI.

The education level in Apoteri; like most of the Rupununi; is relatively low in comparison with the coast of Guyana. In 2010, one hundred and twenty-eight residents possessed a secondary school education, an increase from ninety-eight persons in 2002.²³ Apoteri currently has one nursery school with a volunteer teacher and one primary school with seventy-one students (38 boys and 33 girls) and four teachers, two male and two female.

Health care in Apoteri is very basic, the community is equipped with a Health Centre and a community health worker and trained malaria technician. There is a sub-district hospital in Annai and the nearest hospital is in Lethem.

Communication is conducted via email and high frequency radio (5300 Hz), there is also a community radio station – Radio Paiwomak. Radio Paiwomak serves the communities in the North Rupununi by providing access to news and current affairs, educational and training programmes and village information.

Apoteri is also one of the few communities that have functioning airstrips; however this is used only for special charters and emergencies. Transportation to and from Apoteri is mainly by road and river.

Apoteri has a few small shops and many of the residents produce crabwood oil, cassava bread, farine, cassava casareep and dried fish for sale. The village also has a small church and a tourism centre, which can house up to sixteen persons in modest accommodation. The tourism centre is equipped with a kitchen and powered by a portable generator; it also has running water, shower and a flush toilet. CI's Ranger Station is situated next door to the tourism centre and provides email access for the community.

5.1.2 Rewa

Rewa is a small village located on the right bank of the Rupununi River at the confluence of the Rupununi and Rewa Rivers. It is approximately 80km from Annai and is surrounded by rainforest, mountains and ox-bow lakes. The village is accessible by boat from Kwatamang Landing (about 3km from Annai).

Rewa was founded in 1959, has legal title to 44,791 ha of land and is home to approximately two hundred and eighty persons increasing from one hundred and seventy eight in 2002. The current population forms a total of fifty-three households (2011). The villagers are predominantly Macushi with a few Wapishana and Patamona families who practice mainly traditional activities such as subsistence farming, fishing and hunting.

Rewa has two schools, one nursery school with one teacher and twenty-two students (15 boys and 7 girls) and one primary school with four teachers (2 male and 2 female). The primary school has fifty students – twenty-five boys and twenty-five girls. The nearest secondary school is located in Annai.

²³ Draft Sherwood Forest EIA (2010)

Rewa, like many of the other communities in the North Rupununi, has very basic health care; it is equipped with a community health centre and has one community health worker and a trained malaria technician.

Communication is conducted via solar –powered High Frequency Radio (5300 Hz). There is also one community radio station – Radio Paiwomak. Radio Paiwomak is an efficient way to provide the communities with access to news, current affairs and community information. On the other hand, there is no email access or telephone service in the community.

Additionally, the community has a fledgling eco-tourism business which was started in 2005 with the construction of an Eco Lodge. The Rewa Eco-Lodge is situated on the river bank overlooking the Rewa River and consists of three benabs, the largest of which is the kitchen and dining area. The other benabs each contain two bedrooms and a large patio with hammocks for relaxing.

5.1.3 Crash Water

Crash Water is a comparatively new village; it was originally a farm site that developed into a village. It was officially founded in 1998 and is located on the right bank of the Rupununi River, approximately nine 14km from Annai. The name Crash Water is derived from the Makushi word “*Kulashe-Wata*” (*Kulashe* is the name of a bird that is common in the area and *Wata* meaning site/place.)

This community is home to two hundred and ten persons, mainly Makushi, in thirty-nine households increasing from a total of one hundred and eighty one persons in 2002. The current population consists of one hundred and nine males and one hundred and one females.

Educational levels are comparatively lower than those of the coast; there is one nursery school with five female students and one primary school with fifty-eight students – thirty-six boys and twenty-two girls. There are three teachers – two males and one female.

Health care is also very basic in Crash Water; there is one community health centre with a trained medic, the nearest hospital is in Lethem and there is a sub-district hospital in Annai.

Communication is conducted via solar –powered High Frequency Radio (5300 Hz). Information is also passed on via the community radio station – Radio Paiwomak. Radio Paiwomak provides the communities with access to news, current affairs and community information.

5.1.4 Annai Sub District

The traditional village of Annai, usually referred to as Annai Central, is the administrative hub for the Annai Sub-District which includes a number of satellite villages including Wowetta, Rupertee, Kwatamang and Surama. According to a 2006 census, the five villages of Annai district have a combined population of one thousand, five hundred persons with a total land area of 188,000 km².

Annai is located approximately 2km south of the Linden-Lethem Road, nestled in the foothills of the Pakaraima Mountains, close to the Rupununi River. The village has legal title to 65,141 ha of land and is home to approximately four hundred and fifty persons, the majority of which are Makushi and Wapishana. (April, 2010)

Surama is a small Makushi community, which was officially started in 1974. It is approximately 29km from Annai and is home to roughly three hundred residents (April 2010). The village is set in a relatively small patch of savannah, surrounded by rainforest and the foothills of the Pakaraima Mountain Range.

Wowetta has a population of about 230 persons, mainly Makushi and Arawak peoples. It is surrounded by the Pakaraima and Makarapan Mountains.

Rupertee is about 2.5km away from Annai; it is home to roughly two hundred and forty Makushi people.

Kwatamang is a small Makushi village located between Annai Village and the Rupununi River.

Annai village has an administrative office, nursery, primary and secondary schools, a sub-district hospital, police station, Guyana Elections Commission office, Regional Democratic Council (RDC) Sub Office, Teachers Quarters, Regional Guest House, Anglican Training Centre, sewing center, market and craft center.

All the communities in the Annai District have solar powered High Frequency Radios (5300 Hz); communication is further enhanced by telephones at the Bina Hill Institute (BHI) and the Government Compound. Internet access is also available at Bina Hill, Rock View Lodge and in Surama Village. Bina Hill Institute is home to Radio Paiwomak as well; the community radio station which provides the surrounding communities with news, current events and community information.

Annai District has the entire gamut of educational institutions ranging from nursery to tertiary education. There are five nursery schools, four primary schools, one secondary school and the Bina Hill Institute which provides specialized programmes such as Wildlife Management, Forestry, Computer Science, Agriculture and other skills and leadership programmes.

Health Care in Annai is better than many of the neighbouring communities since the village is equipped with a District Hospital whilst the satellite communities have only community health centres. Furthermore, Annai has a medic, a dentist, a nurse, trained malaria technician and a mid-wife. Malaria, water-borne diseases and acute diarrhoea disease were the most commonly reported health concerns.

The community has the benefit of a functioning airstrip which receives daily scheduled flights, however most bulk goods are transported by truck using the nearby Linden-Lethem road.

5.2.1 Stakeholders Consultation Programme

During the conduct of the ESIA, consultations were held with all relevant stakeholders, including the communities, Government agencies and NGOs. Prior to the consultations an analysis was done in order to identify the relevant stakeholders and to generate knowledge that would aid in understanding their behaviours, intentions, interrelations, agendas, interests, and concerns regarding the proposed development. The stakeholders identified to be consulted with on the project were from the local and national levels.

The local stakeholders identified were the communities closest to the SSILI Concession. The communities of Apoteri, Rewa, Crash Water and the villages of the Annai District (Wowetta, Rupertee, Kwatamang, Annai Central and Surama) were all identified and consulted during the ESIA process.

National level stakeholders included the institutions and organisations with direct management responsibility over the resource sectors and the developmental process. Some organisations in this stakeholder group can also be considered as "local" in the sense of having a direct management impact at the local level. The national stakeholders for this proposed project and who participated in the consultations included Government Ministries and Agencies, NGOs, and the private sector.

5.2.2 Stakeholders Involvement

The stakeholder engagement process employed a participatory approach in its interactions with local and national stakeholders. This participatory approach included the following types of engagement:

- Dissemination of information in summary form of the proposed project;

- Distribution of the Terms of Reference for the ESIA study to stakeholders in order to allow for full disclosure of tasks specific to the completion of the ESIA and to allow for inclusion of any additional areas to be covered;
- Public consultations which comprised of:
 - (1) Meetings with principal national and regional agencies/institutions whose management responsibilities relate to various aspects of the project;
 - (2) A social survey that covers the local stakeholders in the communities of the North Rupununi and gathers socioeconomic data on the state of the population;
 - (3) Interviews with residents in the stakeholder communities to determine their traditional and current use of lands in the titled areas and, if possible, that of the project area for hunting, fishing, forestry, etc.; and
 - (4) Consultations with the stakeholder communities to gather their concerns and support for the project while documenting all issues arising in the process relating to the proposed development.

The basic aims of the involvement of the defined stakeholders were to:

- define the scope of the proposed project;
- discuss the potential impacts of the proposed project;
- identify possible alternatives (if any) and mitigation measures;
- identify contentious issues and a possible forum to resolve them;
- gather baseline data on the primary stakeholder communities;
- gather from the stakeholders information on resource use by local people or others within the project site, and
- establish accountability and create a greater sense of ownership by local people during the proposed project implementation.

As was indicated above, stakeholders were consulted utilising different methods and most were consulted more than once during the ESIA process.

5.2.3 National Level Stakeholders

The national level stakeholders were consulted twice during the ESIA process. The first consultation was in the form of a Sector Scoping Meeting prior to finalizing the Terms of Reference for the EIA. The second consultation was done via one to one interviews.

5.2.3.1 Multi Stakeholder Sector Scoping Meeting

A multi stakeholder sector scoping meeting, involving key sector agencies, was held on July 06, 2011 at the EPA's Boardroom. This meeting was held prior to finalizing the Terms of Reference for the ESIA so as to make any input or addition relating to areas to be addressed by the study. National stakeholders with responsibility for resource management, conservation, human and social issues were present at the meeting. The key issues raised by participants were:

- ESIA should highlight possible impacts to landscape management, REDD, and the LCDS;
- Roads built on wetlands will require an ESIA which must highlight possible impacts;
- Inquired of any plans for value added products and use of NTFPs;
- Water quality must be monitored to ensure standards are maintained;
- Housing of staff, food storage and solid/liquid waste management must follow the required regulations;
- Areas which have good archaeological sites must be identified and protected;
- Encourages the use of Reduced Impact Logging in coordination with integrated land use management plans and in collaboration with neighbouring stakeholders; and

- The road will have significant impacts on the local communities and these should be identified early in the project and mitigated where possible also alternative options must be presented in the study.

The minutes of this meeting is attached as Appendix F, which outlines in more detail the issues raised by the stakeholders.

5.2.3.2 Multi Stakeholder Sector Scoping Meeting

In addition to the Sector Scoping Meeting, national level stakeholders were interviewed individually in order to gather their response at the agency/organisation level. Institutions already involved in the process were also interviewed in order to gather additional information while providing the stakeholder with the opportunity to address any issue that was not previously raised. The stakeholders consulted during this exercise are outlined below:

- Environmental Protection Agency (EPA)
- Guyana Forestry Commission (GFC)
- Guyana Geology & Mines Commission (GGMC)
- Ministry of Amerindian Affairs (MoAA)
- Ministry of Local Government & Regional Development (MoLGRD)
- Ministry of Public Works and Communication (MPWC)
- Regional Democratic Council Region 9
- Wildlife Division
- Hydromet Division
- National Agricultural and Research Institute (NARI)
- Iwokrama
- Conservation International –Guyana (CI)
- North Rupununi District Development Board (NRDDB)
- Bina Hill Institute (BHI)
- Forest Producers Association (FPA)
- Sherwood Forrest Inc.
- World Wildlife Fund (WWF)

Several key questions were put to the stakeholders regarding the project and project area, and development of the region. In addition, the stakeholders were free to raise any issue they deemed relevant to the development. The results of the discussions were documented and presented in the ESIA. A summary of the national level stakeholders' consultation is included as Appendix G. Below are the main points of discussion raised by the national level stakeholders during the consultations:

- The ESIA must be strong in addressing potential and real negative impacts, particularly the social impacts, thereby increasing the social good of the project to society and the environment;
- The operations must have a strong education and awareness component, learning from the examples of Iwokrama, NRDDB and CI in order to properly educate its employees and reduce the risks associated with these kinds of developments;
- All artifacts or sacred sites must be documented and a comprehensive approach developed to map such findings as guided by local knowledge including the adaptation of a Chance Find Procedure in the Operations Protocol;
- The Company must engage its employees in current issues such as HIV/AIDS, tuberculosis and malaria prevention and treatment and should not encourage the use of alcohol and absenteeism;

- The Company must regularly conduct or sponsor professional training for the residents of the stakeholder communities in order to have a qualified pool of available labour;
- The Company must be willing to coordinate with leaders of communities in conservation, in order to build its workers capacity in environmental best practices thereby reducing its carbon footprint and supporting the conservation initiatives of its neighbours, particularly CI;
- The Company must recognise the importance of local knowledge in guiding its location, road alignment and day to day operations;
- The project must be aware of the costs of fuel associated with moving waste wood to the various locations. In order for the company to be competitive, it must develop a realistic wood processing strategy and have the most suitable equipment to transport its produce;
- The Company must be cognisant of local markets and make its produce available for Guyanese to benefit from their resources if they so choose;
- The Company should invest in a mini weather station in order to have data on the local weather which can be critical to operational planning at the ground level;
- The Company should join the FPA in order to benefit from decades of experience and technical expertise;
- The Company's operations will be a success as long as its timber stock assessments are accurate to feed the Operations Plan guiding the production and avoiding unnecessary waste of resources;
- The Company should follow RIL guidelines and practices since this would ensure impacts to the environment are significantly reduced;
- The project can contribute significantly to employment within the region and also assist in developing the area: and
- The Company should collaborate with other stakeholders within the area to ensure the resources are managed in an integrated manner and to learn from experience and existing operational protocols.

Generally, the national level stakeholders believed that the project can be implemented successfully. It was indicated that the project should not impact negatively on the environment once it complies with the requirements of regulatory agencies as well as established best practices for the sector. Furthermore, the company would need to collaborate with all stakeholders, including communities and neighbouring concessionaires to ensure the resources are efficiently managed and negative impacts are minimized. The main positive impact identified for the area is employment for the residents of communities, which is currently needed.

5.2.4 Local Level Stakeholders

The local level stakeholders were also consulted twice during the ESIA process. The first consultation was in the form of a Public Scoping Meeting prior to finalising the Terms of Reference for the EIA. The second consultation was done via community consultations and one to one interviews.

5.2.4.1 Public Scoping Meeting

A public scoping meeting was held at the Annai Benab, Annai Village, North Rupununi on June 30, 2011. The exercise was conducted by the EPA and facilitated by SSILI. The EPA, Government representatives,

the Consultants Team, and SSILI made presentations on the ESIA process and the project. After the presentations the floor was open to the stakeholders to pose their questions and raise their concerns which they may want to be addressed by the EISIA. The key issues raised by the community were:

- Access to the concession by road may require that it pass through community lands;
- Solid and liquid waste management needs to be properly addressed in the pristine environment of the Upper Essequibo;
- The oil company (Takutu Oil and Gas Company) which plans to conduct exploratory works in the general area and SSILI should collaborate and seek to use one road in the area thereby reducing possible environmental and social impacts to the communities;
- Concerns regarding the possibility of intrusions by outsiders into community lands and illegal harvesting of resources due to access provided by the road;
- Recommended that the ESIA Team and the developer work with the NRDDDB in order to benefit from the rich experience and representation of the organisation;
- Inquiry regarding the nature of capacity building and on the job training for communities;
- Request that the study indicate how the company plans to integrate in its management plan the issues of conservation, biodiversity corridors, ecosystem services, REDD+ and the LCDS;
- Request for the NRDDDB to be provided with monthly updates on the progress which can be shared with the communities via Radio Paiwomak;
- Inquiry regarding the possibility of NTFPs being made available for community members to access at collection points and the opportunity for the company to make furniture from these materials; and
- Request for more information on the availability of jobs for the community including jobs for women.

These issues raised guided the EPA in finalising and approving the Terms of Reference for the study and also provided ideas for the design of the research methodology for the social survey. The minutes of this public scoping meeting is attached as Appendix D 1.

5.2.4.2 Community Consultations/Surveys

As part of the stakeholders engagement exercise for the ESIA consultations and more interface discussions was done with the communities closer to the proposed project area in an attempt to capture concerns holistically regarding the Project. As such, the communities of the North Rupununi were identified to be consulted. A two member team from EMC led the village consultations with adequate support from Mr. Brian Allicock, the Community Development Officer (CDO) of the Ministry of Amerindian Affairs. Mr. Allicock attended the meetings at Crash Water, Rewa and Apoteri Villages and provided valuable support during these consultations, addressing in like manner, other concerns raised by the villagers which were sometimes not related to the proposed development.

The stakeholder engagement process included the disclosure of relevant project information including information on the company, description of the project area, proposed project activities and facilities and possible impacts at the local and national levels. This allowed the residents of the communities to have a better understanding of the project and the project area and allowed them to raise any concerns they may have of the project which should be addressed in the ESIA. At the same time, a socio-economic study was conducted primarily focusing on the gathering of data in order to assess possible impacts of the proposed development on the natural and social environment. The study included:

- a. Community baseline analysis;
- b. Assessment of selected socioeconomic indicators for the stakeholder communities; and
- c. Assessment of the frequency of stakeholder interaction with and use of the project site.

This section presents a summary of the findings of the consultations with the communities. The communities consulted are Apoteri, Rewa, Crash Water, Annai, Wowetta, Kwatamang, Rupertee, and Surama. Consultations were held in Apoteri, Rewa, Crash Water and Annai. Residents of Wowetta,

Kwatamang, Rupertee, and Surama were involved in the consultations at Annai. Community consultations included a meeting with the residents of the villages, as well as one on one interviews with selected residents. These consultations were conducted during September 2011. A record of the consultations and more details on the findings is included as Appendix E.

Data were collected in the communities to update the socio-economic profile of the communities and the residents' views and concerns regarding the project. This was to provide the Consultants with updated information on the communities and also to provide an opportunity for the residents to identify issues of interest/concern. The survey also afforded the communities an opportunity to offer possible recommendations for the proposed project development. Additionally, this survey formed a critical part of the process of community involvement in the proposed project. Figure 5-2 is a photo of the interview being conducted with a resident of Crash Water.



Figure 5-2: Interviews being conducted at Crash Water

5.2.4.2.1 Socio-economic Environment

This section provides a description of the socioeconomic situation and environment within the project area based on the findings of the community consultations.

Natural Resources Usage

Residents of the stakeholders' communities have indicated that they utilise the natural resources within the area as detailed in Table 5-1. Most, if not all of the resources utilised are sourced from within the Titled Lands of each community. There are many points of usage for each community within their own lands. It was indicated during the consultations that residents do not venture to areas within the SSIL Concession area to gather resources given the distance of the Concession from the communities. It was also noted that resource extraction is at a minimum and fishing/hunting areas closest to the project site are at the Rewa Village. Rewa also conduct tours using the Rewa River and would have raised its concerns about the possible negative impacts of the operations on its tours.

The use of these resources is mainly for subsistence purposes, with some limited amount of income generation activities. The trees in the surrounding forest are used for the provision of building materials since most of the buildings are constructed using wood or wood related products. However, in recent

times, the housing type has changed significantly to more permanent dwellings located in proximity to the social amenities. This change in the type of housing has fuelled the increase in the local demand for clay bricks and, as such, a small amount of sand and clays are used by the villagers.

Communal wells are equipped with hand pumps making fresh ground water accessible to residents. In Crash Water and the villages of Annai District, there are solar powered water pumps that fill water tanks and water is then distributed via a small network to a few homes, the school and other administrative buildings. Villagers also collect rainwater or use raw water from the nearby streams.

Fishing and hunting are done at a subsistence basis; rare surplus catch is sold within the community. Measures will be incorporated in the proposed project design to ensure that all water bodies within or near the project area are protected from contamination. These measures are outlined in Section 8. During the fieldwork, no wildlife trapper was encountered, nor was there any evidence of commercial trapping or hunting activities in the wider area.

Table 5-1: Natural Resources Usage

Natural Resource	Utilisation
Forests: Greenheart, purpleheart, kakaballi, duka, wallaba, mora, kariballi, sand baromalli, white kakralli, bulletwood, silverballi, etc	Construction lumber, boat building, fuel/fire wood, fencing, and occasional sale within the communities and Lethem
Forests: Ite Palm, Nibbi, Kufa, capadula, monkey pot, fruits, roots, etc	Housing materials, furniture, hunting tools, and food, drink, etc
Clay (soils)	Brick making, housing materials
Agricultural Lands	Farming: cassava, bananas, plantain, yams, corn, coconuts, peppers, green vegetables, etc
Water from the Rewa, Rupununi and Essequibo Rivers and numerous creeks	Transportation, drinking, cooking, washing, bathing and swimming, fish rearing, etc
Fishes: Arapaima, numerous species of catfish, hassar, patwah, huri, sunfish, lukanani, pacu etc	Mainly for daily food with surplus sold locally to earn a small income
Animals: Labba, deer, wild cow, wild hog, agouti, turtles Birds: Marred, Powis and Waracabra	Food supply as the season permits with surplus sold or traded locally

Main Economic Activities

The dominant economic activities identified by the community members were mining, logging, tourism, government services, fishing and farming. Many of the males are employed in the logging and mining industries in other parts of the country and have to be away from their homes for long periods. Mining also contributes to the decline in health as males are frequently infected with malaria which can be transferred at the village level. The villages are also vigilant regarding the spread of STIs associated with the mining industry.

Government services account for a major segment of the population as Annai is a Regional Sub District for the RDC Region 9. Employment at the schools, hospital, medical posts, police force, RDC, and other government services attract almost one hundred individuals from the stakeholder communities.

Private enterprises such as Iwokrama, Rock View Eco-Lodge, Karanambo Ranch and other ecotourism entities employ full time and seasonal workers. In addition, these businesses often buy fresh fish and vegetables from the local people contributing to the village economy.

Farming and gathering are undertaken at a subsistence level in the stakeholder communities. Surplus produce from farming is usually sold within the local community. Nuts produced for sale are taken to

Lethem or Georgetown where markets are more easily accessible. Cashew nuts are also gathered for sale by community women.

A small market exists for local craft which is supplied by various stakeholder communities. Crafts are either sold to the businesses or sold to tourists directly. Furthermore, a few members provide crafts to the Ministry of Amerindian Affairs and other markets in Georgetown. During the Amerindian Heritage celebrations, a large amount of crafts, food and beverages are made for sale in the communities and in Georgetown.

Table 5-2: Estimated Monthly Income by type of Employment

Employment by Households	Household Income	Employment Type	Stakeholder Households
Limited Employment	<\$10,000	Pensioners, unemployed, and subsistence farmers	86%
Part Time Employment	<\$20,000	Peasant farmers & craft/forest produce	
Single Income Household	<\$40,000	Skilled Staff or formally employed labourers	
Double Income Household	<\$75,000	Teachers, health workers, operators	4%
Technical Staff	<100,000	Project staff, business men, operators	10%
Miners	<120,000	Mining attracts the young men whose income vary greatly but can be quite substantial on the average	

Table 5-2 reveals that few families have access to a significant income with the greater percentage of families being very poor with very low to subsistence levels of household incomes. The greater proportion of the households is not employed and earns approximately G\$ 40,000 or less per month and therefore, have very low spending power. Many of these stakeholders cultivate their farms and small kitchen gardens in which they grow some vegetables thus supplement their food budget. Some residents also keep chickens and small ruminants which provide additional meat or income from sales.

The men who earn the highest pay for their efforts are reported to often return home almost empty handed. Alcoholism combined with frequenting prostitutes whilst in the mining camps, often reduces the incomes to a pittance. The situation is made worst when the worker is struck by malaria and cannot get the required treatment due to unavailability of medication locally or lack of funds to seek treatment in Georgetown. Many miners have reportedly died of malaria from the communities.

Cultural and Archaeological Resources

Historically, the area is considered to be the territory of the Taurama and more recently the Wai Wais, Caribs, Macushi and Wapashiana people²⁴. Studies have shown the presence of historic people along the Essequibo River. The project area is marked by the distinct seasonal flooding of the wetlands. The highland area remains virtually unexplored and may have scattered cultural artifacts based on the presence of cultural sites along the Essequibo River. A Chance Find Procedure is included in the Environmental Management Plan in the event that any such site is uncovered.

During the consultations, the residents of the communities indicated that they do not use the SSILI Concession area for cultural or religious purposes, nor are they aware of any site of archaeological importance.

²⁴ CI (2002): *Social Impact Assessment for the proposed Conservation Concession Area in Guyana's Rupununi Region*

Social Infrastructure / Facilities of Community

The following facilities are located within the communities:

- Bina Hill Institute
- Annai Secondary School
- Annai District Hospital
- Nursery and Primary Schools in every community
- Churches of various Christian denominations in every community
- Community playgrounds and sports facilities
- Community Health Center staffed with Community Health Worker. Malaria Worker and/or Medic.

These communities are vibrant social networks allowing for the dissemination of information, facilitation of trade and maintenance of social relations. Networks are facilitated by the churches, schools, sport facilities and cultural programs. Weddings, parties and other celebrations help to maintain an order of community cohesion. It is critical that the Company supports these institutions and cultural programs in order to foster a developmental environment from which many skilled and educated youths will emerge.

Community Groups / Associations

At the time of the social survey, residents of the community identified the following community groups and institutions, whose actual level of functionality remains indeterminate yet critical to the villages:

- North Rupununi District Development Board
- Bina Hill Institute
- Village Councils
- Community Development Groups.
- Community Environmental Groups/Wildlife Clubs
- Ecotourism Business Organisations
- Community Tourism Ventures
- Women's Development Organisation

Central to the development of the villages is the leadership initiatives from the NRDDDB, technical training provided by BHI and financing or business opportunities made possible by the local businesses providing mainly ecotourism or related services. Women are seen as being critical to the process and are organised at the village and district levels often taking up the challenges of leadership roles in various projects and institutions.

At the community level, each community is managed by a Village Council, headed by a Toshao and served by several councilors who represent the interest of the residents.

5.2.4.2.2 Community Awareness and Perception of the Project

This section summarises the perceptions, awareness and concerns of the communities regarding the proposed SSILI project.

Awareness of the Project

Residents who participated in the community consultations and household surveys indicated that they were aware of the proposed project. The community consultations were conducted following the Public Scoping Meeting at Annai. The communities would have received feedback from their Toshaos and other representatives who attended the meeting. During the community consultations, a full disclosure of the project details was made by the ESIA Team at each stakeholder engagement.

Additional project information was provided in response to queries and questions. Residents also requested regular updates on the project via the NRDDDB which could then be filtered to the villages through the Toshias, or shared with residents via Radio Paiwomak. It was recommended that the developer work in close coordination with the NRDDDB in providing the residents with more information, thereby allowing for all opportunities related to the project be known to the local communities.

Project Benefits

Participants in the interviews and the community consultations felt that their community would benefit from this project in many ways. Potential benefits identified are:

- Creation of employment opportunities at the project site, and at Annai;
- Improved social relations as employment opportunities are available within or in close proximity to the communities;
- Business sponsorship of community members to study at BHI or Georgetown;
- Intake of work study students thereby providing access to professional capacity building and possible employment for graduates from the communities;
- Creation of new business opportunities as community members are employed and the cash economy expands;
- Overall development of the Annai District and the three communities of the Rupununi River closer to the project area;
- Improved communications to the communities with investment in infrastructure;
- Improved access to the Rewa and Apoteri villages by the use of an all weather road;
- Development of technical and administrative skills of the stakeholders; and
- Improved standard of living.

SSILI will contribute to the overall improvement of the local communities in the area and the economy of Guyana. Infrastructure will improve and increases in employment will contribute to improving the standard of living. The Company will build a modern processing facility requiring a highly trained workforce to operate.

The number of residents in the community that can qualify for training and employment is small and the number of women who will be seeking employment is also expected to be smaller. Women are employed mainly as service providers with the current employers in the area.

SSILI has pledged to give preference to hiring persons within the community first and will only go outside to source skills, which are not locally available. Where it is practical and achievable, the skills sets of community members will be upgraded through training to equip these individuals with the skills they need to seek improved employment opportunities. Specifically, in the case of availability of jobs for women, there will be no gender bias in hiring policies and women will be eligible to apply for any position for which they feel qualified.

Issues of Community Interest / Concern

The communities raised a number of issues as outlined in table 5-4. In addition to the issues raised during the community consultations, the stakeholder questionnaire was able to capture supplementary information on resource usage of the communities. The major issue for the communities related to employment, which was seen as a positive benefit although many were concerned as to who exactly will be employed and under what conditions. It was also believed that the increase dependency on a cash economy will render stakeholders less reliant on traditional means of survival.

Community members were confident that there is a pool of skilled workers already existing in the villages that can be employed. Furthermore, they wanted to be involved in additional training and expected to have their women folks employed in technical and skilled positions, and not just as cooks or maids. Additionally, it is expected that the infrastructure created by the company will boost the communities'

communication and improve their interactions at additional forums. This will also help to build the community's image and foster pride in their cultural heritage.

Moreover, the cash economy boosted by the numerous jobs created by the investment will have a macro effect in the village economy and in the region. There will be spinoff jobs created as more persons are employed by the company. Service providers and food producers will be in demand as persons have more money but less time to farm, etc. However, the communities stakeholders were worried about the impact of alcoholism, based on experience, as their families who have additional income are exposed to alcohol. They demanded that the company allow no alcohol on its premises and that the village councils permit no shops in close proximity to the operations.

Workers will bring to their communities the practices learnt at the site. The company must act within its best capacity to ensure that they are not exposed to harmful practices at the site which can be transferred to their homes. A rigid education and awareness program to combat these social negatives must be part of the overall work program.

Table 5-3: Community Perception of Project Benefits

Issues	Concern of Community			
	Apoteri	Rewa	CW	Annai Dist.
Employment/job opportunities	+	+	+	+
Increase in amount and level of trained personnel	+	+	+	+
Increased social networking and community relations	+	+	+	+
Improved community image and pride	+	+	+	+
Local Business Expansion in community	+	+	+	+
Improved monitoring of community resources	+			+
Increased access to villages by additional road network	x	x	x	x
Increase in alcoholism and substance abuse	x	x	x	x
Cultural shift as a result of cash economy	x	x	x	x
Increased incidence of viruses and diseases	x	x	x	x

+ Positive of the benefits to their community x Concerned about the possible impacts

Table 5-4: Community Concerns over the Proposed Project

Issue Raised	Possible Impact	
	Possible Positive Impact	Possible Negative Impact
Increased household incomes	Households have more disposable incomes stimulating growth and development	Households become more dependent on the cash economy and shifts from traditional ways
Public Health and Safety	Community have access and can respond to health and safety matters	Community exposed to risks associated with the operations
Increased river traffic	Nil	Disruption of river ecosystems and increased risk of river accidents
Increased road traffic	Community can benefit as service providers	Increased risk to road accidents
Increased Noise	Nil	Possibility of increased community fatigue

Issue Raised	Possible Impact	
	Possible Positive Impact	Possible Negative Impact
Dust/Air Quality	Nil	Possible increase in respiratory issues
Increased accessibility to areas	Resource extraction fuels a regional developmental drive boosting economy	Uncontrolled development creates major environmental and social issues in the region
Intrusion upon existing settlement or resources utilised by local people	Nil	Community people may lose resources to outsiders
Short term loss of livelihood	Nil	Not expected
Unplanned settlement/influx of people to area	Technical & skilled personnel settle in the area	Uncontrolled development creates major environmental and social issues in the region
Solid waste disposal	Nil	EPA & GFC has regulations governing waste disposal
Lumber/Furniture for local market	Stakeholders have access to more products	Small business face increasing competition

SECTION SIX

POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK

6.1 Introduction

This Section describes the relevant national policies, statutory requirements and guidelines that would guide or impact the implementation and operation of this project as well as the key institutions which have regulatory oversight. These policies, strategies and legislation provide the operational framework for the proposed logging operation of SSILI and are summarised in Table 6-1.

Table 6.1: Policies, Strategies and Legislation relevant to SSILI Operation

Policies, Strategies & Plans	
	Constitution of Guyana 1980
	National Environmental Action Plan 2001 - 2005
	National Development Strategy 2001 - 2010
	National Land Use Policy 2000
	Reducing Emissions from Deforestation and Degradation (REDD+) Framework and Low Carbon Development Strategy 2010
	Forest Law Enforcement Governance and Trade Programme (EU FLEGT) 2012
	National Forest Policy 2011
	National Forest Plan 2011
Legislation	
	Environmental Protection Act 1996
	Environment Protection (Water Quality) Regulations 2000
	Environment Protection (Air Quality) Regulations 2000
	Environment Protection (Hazardous Wastes) Regulations 2000
	Environment Protection (Noise Management) Regulations 2000
	Forest Act 2009
	Occupational Health & Safety Act 1997
	Amerindian Act 2006
	Labour Act 1942
Institutional Framework	
	Ministry of Natural Resources & Environment
	Environmental Protection Agency
	Guyana Forestry Commission

6.2 Policies, Strategies and Plans

6.2.1 Constitution of Guyana

The 1980 Constitution of Guyana, Chapter II outlines the principles for the political, economic and social system. Specifically, Articles 2:25 and 2:36 of the Constitution provides the base for a national environmental policy and emphasizes these as key principles for the functioning of Guyana’s social and economic systems.

Article 2:25 of the Constitution states that “every citizen has a duty to participate in activities to improve the environment and protect the health of the nation”. And Article 2:36 states that “in the interest of the present and future generations the state will protect rational use of its flora and fauna and will take all appropriate measures to conserve and improve the environment”.

6.2.2 National Environmental Action Plan

The National Environmental Action Plan (NEAP) (1994) was one of the first efforts towards integrated environmental planning and outlines the focus of GoG as it relates to environmental management. The plan presented a 12-point approach reflecting sound principles of environmental management and the model of sustainable development. An Action Programme covering a 3-year period was identified to address priority environmental issues.

The NEAP was revised and updated and a second NEAP (2001-2005) was prepared as a continuation of the first document. This revised action plan sets out the “*environmental development strategy for Guyana for five years*” covering the period (2001 – 2005) and “*a framework for integrating cross-sectoral environmental concerns in the broader context of the country’s economic and social development programme*”. NEAP (2001-2005) outlines a further commitment to sustainable development and a thematic approach to environmental protection. The implementation strategy for NEAP (2001-2005) involves the identification of programme areas according to sectors and cross-sectors and tools and actions for implementation.

6.2.3 National Development Strategy (2001-2010)

The National Development Strategy (NDS) prepared by the GoG sets out the primary development policy framework for Guyana. Section 18 describes Guyana’s natural resources sector specifically examining issues and constraints within the sector and plans for improvement, demonstrating the country’s policy commitment to environmental management and sustainable development. Specifically, attention has been given to monitoring and enforcement and actions to improve environmental management practices. These are most applicable to the productive sectors, in general, and specific to activities within the forest sector, for example logging operations such as proposed by SSILI. Further, the NDS covers aspects related to the promotion of cross-sectoral coordination and integration for environment and natural resources management across the sectors.

6.2.4 National Land Use Policy

A draft National Land Use Policy (LUP) 2005 has been prepared by the Guyana Lands and Surveys Commission (GLSC). The draft policy aims to streamline land use planning and to create conditions necessary to achieve types of land uses which are sustainable, socially desirable and environmentally compatible on State lands. It provides the framework for coordination among land uses, as well as, facilitates integration of land use and the preparation of a National Land Use Plan.

The GLSC aims to also prepare regional plans for specific Administrative Regions of Guyana. To-date the Commission has prepared two Regional Land Use Plans: (i) Region 6 – East Berbice Regional Land Use Plan; and (ii) Region 9 – Rupununi Sub Region 1. Additionally, Corridor Land Use Plans for the Lethem to Linden and Linden to Soesdyke road corridors have been prepared.

6.2.5 Reducing Emissions from Deforestation and Degradation (REDD+) Framework and Low Carbon Development Strategy

Guyana presented its position on Avoided Deforestation in 2008 after conducting a study that examined the economic value of Guyana’s forests to the nation and to the rest of the world and positioned this against the potential revenue from avoided deforestation. It further considered the main implications for designing an effective mechanism to reduce emissions from deforestation and degradation (REDD).

Building on the aforementioned study Guyana in 2009, presented its vision and plan that the forest can be protected and maintained in an effort to reduce global carbon emissions while at the same time attracting resources for development that would put Guyana onto a low carbon growth path. This vision and plan is presented in the Low Carbon Development Strategy (LCDS). The LCDS has three main components: (i) investment in low carbon economic infrastructure; (ii) investment and employment in low carbon

economic sectors; and (ii) investment in communities and human capital. It provides the framework to transform Guyana's current economy to that of a "low carbon economy" while addressing issues related to climate change.

With Guyana's forest cover approximately 85% of the country, containing an estimated 5Gt CO₂ in above ground biomass and cover approximately 18.39 million hectares (GFC 2010²⁵), the contribution to the global effort to mitigate climate change is significant (LCDS, 2010). The LCDS therefore, includes a strong commitment to Reducing Emissions from Deforestation and forest Degradation, including conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+). Being the first country in the world to attempt national scale action on REDD+ the Government of Guyana through GFC is consistently developing its efforts to reduce deforestation and forest degradation and in particular through the application of sustainable forests management in the logging industry. Sustainable Forest Management (SFM) aims to improve the management of forest, especially, through efficient planning. SMF is a large component of Guyana's REDD+ framework and a central part of GFC's mandate and work. The LCDS notes that the GFC manages and regulates the activities of forest concessions to ensure that strict sustainable forest management rules and guidelines are implemented and that forest legislation is implemented effectively by operators (LCDS 2010). Logging companies such as SSILI are expected to complete comprehensive forest management and annual planning which includes forest inventory, and are required to comply with detailed control procedures and legality assurance measures and log tracking. The Government's policy is to support companies operating in Guyana to generate substantially more value from the limited portion of the forest (46% of the state forest estate²⁶) where sustainable forest harvesting is appropriate (LCDS 2010; MoNRE 2012).

A national system to monitor [measure] report and verify (MRV) emissions or removals of carbon from the forest sector is currently being developed by the GFC. The MRV-system will provide the basis for reporting in accordance with the principles and procedures agreed to by the Government of Guyana in relation to reducing emissions from deforestation and forest degradation.

As part of Guyana's low carbon economic and REDD+ framework, forestry activities will continue to be highly regulated to ensure compliance with national requirements and international best practice. While this strategic direction does not impose any new legislation or regulations for the forestry sector, operators such as SSILI are required to comply with existing legislation, as identified in this Section, and their corresponding standards and guidelines to enable the effective functioning of country's MRVS and REDD+ scheme.

6.2.6 Forest Law Enforcement Governance and Trade Programme (FLEGT)

Forest Law Enforcement Governance and Trade Programme (FLEGT) is a programme area jointly agreed between the Governments of Guyana and Norway and expressed in the Memorandum of Understanding (MoU) and Joint Concept Note²⁷ in 2009. Since that time Guyana has made efforts to engage national stakeholders at all levels on forest monitoring, legality assessment and FLEGT and to garner feedback. These activities aimed to better understand, and analyse the FLEGT Programme in particular, its application in Guyana and to allow for stakeholder participation and engagement prior a decision to pursue FLEGT²⁸. Subsequently the Government of Guyana formally expressed its interest to the European Union (EU) and the Government of Norway to join FLEGT and to negotiate a Voluntary Partnership Agreement (VPA) which will help to ensure that only timber verified to be legal under Guyanese law could be exported to the EU.

Voluntary Partnership Agreements (VPAs) are bilateral agreements between the European Union and timber exporting countries such as Guyana, which aims to guarantee that the wood exported to the EU is

²⁵ Guyana Forestry Commission (GFC) 2010. Readiness Preparation Proposal (RPP) (draft); Ministry of Natural Resources & Environment (2012) www.nre.gov.gy

²⁶ Ministry of Natural Resources and Environment, (2012): www.nre.gov.gy

²⁷ www.nre.gov.gy

²⁸ Often referred to as EU-FLEGT since this programme is Europe's response to address the issues surrounding illegal logging.

from legal sources and to support partner countries in improving their own regulation and governance of the sector²⁹.

Operators within the forest sector such as SSILI will be required to adhere to stronger regulations and standards as a result of strengthened of forest governance and trade systems under this programme.

6.2.7 National Forest Policy (2011)

The National Forest Policy Statement approved in 1997 has been reviewed and revised through a national consultative process to reflect recent developments at the national level, in particular, Guyana's commitment under the UNFCCC to establish a national REDD+ framework and implementation of its LCDS. Guyana's revised National Forest Policy Statement has been approved by the GoG in 2011 and it aims overall to ensure the *"conservation, protection, management and utilization of the nation's forest resources while ensuring that the productive capacity of the forests for both goods and services is maintained or enhanced"* (NFP 2011).

The specific objectives of the policy are to:

1. Promote sustainable and efficient forest activities, which utilize the broad range of forest resources and contribute to national development while allowing fair returns to local and foreign entrepreneurs;
2. Achieve improved sustainable forest resource yields while ensuring the conservation of ecosystems, biodiversity, and the environment;
3. Ensure watershed protection and rehabilitation: prevent and arrest the erosion of soils and the degradation of forests, grazing lands, soil and water; promote natural regeneration, afforestation and reforestation; and protect the forest against fire, pests and other hazards;
4. Identify and quantify environmental services to generate forest incentives for national development; and
5. Ensure watershed protection and rehabilitation: prevent an arrest the erosion of soils and the degradation of forests, grazing and reforestation; and protect the forest against fire, pests and other hazards.

The revised NFP addresses the country's national and global responsibility for the sustainable management of the forest and recognizes the critical role of forests in maintaining the ecosystems and life supporting services. Moreover, it provides the overarching framework to define SSILI logging operation and principles to ensure effective forest management.

6.2.8 National Forest Plan (2011)

The National Forest Plan has been revised and approved in 2011 through a national consultative process. This revised forest plan provides the framework for improving the management of Guyana's forestry sector and compliance with national legislation governing the sector. Moreover, the plan has been aligned with the National Forest Policy (2011), and national development plans such as the LCDS and REDD+ framework. The National Forest Plan is divided into eleven programmes which follow the key areas of action identified in the National Forest Policy Statement (NFP 2011).

²⁹ <http://www.euflegt.efi.int/portal/>

6.3 Legislation

6.3.1 Environmental Protection Act

Environmental protection and management is governed by the Environmental Protection Act (EP Act) 1996. The act is the first comprehensive environmental legislation in Guyana and provides for the establishment of the EPA. The Act provides for *“the management, conservation, protection and improvement of the environment, the prevention and/or control of pollution, the assessment of the impact of economic development on the environment, the sustainable use of natural resources and for matters incidental thereto connected therewith”*(EP Act 1996). Under the Act the EPA is mandated to coordinate environmental management and outlines the legal process for undertaking sustainable and effective management of the natural environment.

Part IV of the EP Act 1996 stipulates the process governing ESIA's and these requirements were further adumbrated in the Environmental Impact Assessment Guidelines as elaborated below. The Act requires that an ESIA be conducted prior to authorization of any project, which may significantly affect the environment. The EP Act mandates the EPA to execute the following functions relating to environmental assessment:

- *To take steps, as are necessary, for the effective management of the natural environment so as to ensure conservation, protection and sustainable use of natural resources;*
- *To promote the participation of members of the public in the process of integrating environmental concerns in planning for development on a sustainable basis;*
- *To ensure that any development activity which may cause an adverse effect on the natural environment be assessed before such activity commenced and that such adverse effect be taken into account in deciding whether or not such activity should be authorized; and*
- *To provide first development consent regarding any development project.*

SSILI had applied to the EPA for Environmental Authorisation for the logging operation since it is a project included under the Fourth Schedule of the EP Act which lists the projects requiring Environmental Authorisation. The EPA, in accordance with Part IV of the EP Act, has determined that, for a project such as the logging operation proposed by SSILI, an ESIA is a mandatory requirement before the issuance of an environmental authorization.

Brief overview of the ESIA Process

The EP Act outlines the EIA process to be followed for any project that may significantly impact the environment to the extent of requiring an ESIA to be completed. The EPA has developed EIA Guidelines which further details the process. The EIA process commences with the submission of a project application for environmental authorization to the EPA. The EPA requires specific information and these include a project summary, design and size of the project, potential environmental impacts [positive and negative] etc. The EPA screens the application and makes a determination whether an ESIA is required or not and then notify the proponent. The proponent is also required to submit a draft terms of reference and team of consultants to undertake the study to the EPA and the Agency subsequently publishes a notice in the print media. The public is given 28 days to submit any written comments/concerns related to the project and its effect on their environment. These submissions detail questions and matters which members of the public may consider relevant to the deliberations of the ESIA.

A public scoping meeting is also held to present the proposed project and to garner additional comments/concerns from the public, thus, aiding the EPA with the finalization of the terms of reference. The EPA submits the terms of reference to the developer and the consultants for the preparation of the environmental and social impact statement (ESIS).

During the environmental impact assessment process the consultants are required to conduct field studies to collect baseline information and to consult members of the public, interested bodies and organizations to gather secondary information. All the data are collected and a written report – the ESIS – is prepared and submitted to the EPA for evaluation and recommendations.

Upon receipt of the ESIS the EPA publishes a notice in the daily print media informing the public that the EIS has been prepared and is available for review within a timeframe of 60-days. EPA also engages relevant sector agencies and, as necessary, other relevant institutions to review the document to ensure their concerns have been addressed. The Environmental Assessment Board (EAB) as stipulated by the EP Act 1996 18 (2) (b), and through the EPA, determines the need for a public hearing to allow the consultants to present the project findings and to provide another opportunity for members of the public to contribute towards designing the environmental management framework for the proposed project by raising environmental concerns related to the project.

The EAB is a body which provides an independent contribution to the development and finalization of the EIA process and makes recommendations which uphold the principles of the EP Act. In order to carry out its functions, the EAB is involved in the EIA process from the point of scoping, through public hearings and finally to establish conditions for the issuance of an Environmental Permit. The EAB evaluates the EIS and recommends to the EPA whether it should be accepted and the terms and conditions of its acceptance which are reasonably necessary to protect human health and the environment.

The EPA then takes into account the recommendations of the EAB, sector agencies, comments of the public and its own review, and decides whether or not the project should be approved. For approved projects, the EPA issues an Environmental Permit with the terms and conditions necessary to effectively manage the environment.

The timelines for SSILI logging project within the framework of the ESIA process are outlined in Section 1.2.

The Act also requires measures to be implemented to prevent environmental pollution. Within this context, SSILI is therefore expected to carry out its logging operations in an environmental sound manner to prevent and avoid environmental pollution. Part V Section 19 (1) specifically states that *“A person shall not (a) Undertake an activity that causes or is likely to cause pollution of the environment unless the person takes all reasonable and practicable measures to prevent or minimize any resulting adverse effect; (b) Discharge or cause or permit the entry into the environment of any contaminant in any amount, concentration or level in excess of that prescribed by the regulations or stipulated by an environmental authorization.”* In general, the Act ultimately aims toward improvement of environmental quality through the management, conservation and protection of resources and the sustainable use of [natural] resources. Therefore, in cases where the project impacts are unavoidable SSILI is expected to minimize the extent of impacts on the environment through the application of mitigation measures as outlined in Section 8.

6.3.2 Environmental Protection Regulations

The Environmental Protection Regulations, made under the EP Act (1996), were gazetted in 2000. These regulations govern Water Quality, Noise, Air Quality and Hazardous Wastes Management and are aimed at preventing pollution by regulating discharges and emissions. These pollution management regulations will regulate and control the activities of SSILI forest operations during the construction and operational phases. The Environmental Protection Regulations also include the Authorisation Regulations which outlines the permitting requirements for new and existing projects.

6.3.2.1 Environmental Protection (Water Quality) Regulations 2000

These regulations require registration and environmental authorization by any person whose construction, installation, operation, modification or extension of any facility cause the discharge of effluents. They cover parameter limits of effluent discharges, new sources of effluent discharges, fees for registration and environmental authorization, sampling points, records and reports and general provisions for the registration of water effluent, biological integrity, spills or accidental discharges and standard methods of analysis. Guidelines on the discharge of effluents and disposal of sludge are detailed in these regulations. The Guyana National Bureau of Standards (GNBS) has established Interim Effluent Discharge Standards which have been adopted by the EPA. The Standard sets out discharge limits that are applicable to this project and must be adhered to by SSILI.

6.3.2.2 Environmental Protection (Air Quality) Regulations 2000

These regulations require the registration and environmental authorization by persons with facilities that emit air pollution from any process into the atmosphere. Elements related to parameter limits on air contaminants and emission samplings are also stated in the regulations. The list of air contaminants for which parameter limits are to be set by the Agency are also detailed in the regulations. No air quality standards have been developed for forest operations to date. However, for an operation of this nature, the impact on the surrounding air quality is expected to be minimal and localized, especially, in the absence of surrounding communities.

6.3.2.3 Environmental Protection (Noise Management) Regulations 2000

Operators executing various activities that cause or emit noise above a required threshold are required to apply to the Agency for an environmental authorization. The GNBS 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 GNBS were identified as follows: Residential, Institutional, Educational, Industrial, Commercial, Construction, Transportation and Recreational. The EPA has in collaboration with the GNBS developed noise standards which stipulate level of:

- 60 decibels during the night for residential areas
- 75 decibels during the day for residential areas
- 80 decibels during the night for industrial areas
- 100 decibels during the day for industrial areas
- 75 decibels during the night for construction activities
- 90 decibels during the day for construction activities

SSILI must ensure its activities are executed, during the construction and operational phases, with minimal effect on workers and the environment. Therefore SSILI must ensure adherence to the noise standards and implement measures where necessary to protect the environment and workers health and safety in keeping with the environmental protection noise management regulations.

6.3.2.4 Environmental Protection (Hazardous Wastes Management) Regulations 2000

The Environmental Protection (Hazardous Wastes Management) Regulations require that any person operating a facility that generates, treats, stores, disposes or transport hazardous waste must notify the EPA and apply for an authorisation. The Regulation also outlines the provision for reporting, emergency preparedness plan, list of hazardous characteristics and hazardous waste to be controlled. Some amount of hazardous wastes will be generated during the construction and operation of SSILI logging operations, such as waste oil, used tyres, chemicals etc. SSILI, in keeping with these regulations must collaborate with the EPA to find the most appropriate methods for the handling, storage and disposal of hazardous wastes generated during the operations.

6.3.3 Forest Act 2009

The Forest Act (2009) authorizes GFC to address issues within Guyana's State Forest. Under the Act the GFC is allowed, among other things, to grant leases, TSA, and permit individuals and companies to harvest/extract timber from defined tracts of State Forest, as well as, to regulate harvesting, transport and marketing and exports of timber. The Act also outlines the ownership of forest produce, offences and legal proceeding under the Act, and penalties that may arise as a result.

The Act provides a framework within the forest sector to address in particular sustainable forest management of state forests and the permitting process to be followed to obtain forest concessions. Part 4 of the Act details specific provisions for the regulation of forest operations and activities related to forest produce and quality control of value-added forest produce respectively. The Forest Act also sets out stringent provisions for the GFC for monitoring and enforcement and thus, stronger requirements on forest operations such as SSILI. The Company will be required to adhere to these provisions as established in the Forest Act.

Further, specific reference has been made in the Act to (i) conserve biological diversity (ii) protect specific trees and plants (iii) conserve soil and water resources and (iv) protect forests against degradation, fires, pests and disease. The Act makes provision for the GFC, in collaboration with the EPA, to set aside areas for conservation and protection if these are found within state forests.

Moreover, implementation of the Code of Practice (CoP) for Timber Harvesting, has been legalized under this Act and thus, the 4.5% of forest to be set aside by concessionaires, as recommended by the CoP in blocks exceeding 1000ha, is a mandatory requirement of which SSI Inc. will be required to follow.

6.3.3.1 Code of Practice for Timber Harvesting

The Code of Practice (CoP) for Timber Harvesting second edition (November 2002) sets out the guidelines and standards that will allow Guyana's forests to be harvested sustainably and with minimal adverse impact on the forest environment. It was first developed in 1994, based on the FAO Model Code and the first edition was extensively reviewed and revised in 2001. The CoP provides the basis for ensuring that a continuing economic return can be obtained from forests in the long term and is designed to balance commercial considerations with protection of environmental and social values. The COP applies to all logging operation agreements, including TSAs, Wood Cutting Leases (WCLs) and State Forest Permits (SFPs) and specific to the logging operation.

The Forest Act 2009 Part 4, Section 35 makes provision for Commission to develop and adopt Codes of Practices for the sustainable management of forest operations and activities related to forest produce. Therefore, the provisions in this Code are now legally binding under the Forest Act 2009, thus, making compliance of the Code mandatory for SSILI. These mandatory requirements include but are not limited to the preparation of the FMP and AOP, which must be prepared in accordance with the Code.

Some provisions in the CoP can contribute towards a reduction of environmental impacts associated with the construction and operation of the SSI Inc. logging operations and these are related to the post harvest activities, operational hygiene, camp hygiene and health and safety.

The Code, however, does not cover the utilization of non-timber forest products or forest management for other purpose such as eco-tourism or 'conservation concessions', though Codes for the harvest of selected non-timber species such as Kufa, Nibi and Manicole, have been developed.

6.3.3.2 The Forest Management Plan Guidelines, 1999

The GFC has developed FMP Guidelines which provides a comprehensive basis for strategic and operational planning. All plans for forest operations are prepared in accordance with this guideline, the

Code of Practice for Timber Harvesting and, where relevant, the Codes of Practice for Kufa, Nibi and Manicole Harvesting.

6.3.4 Occupational Safety and Health Act

This Occupational Safety and Health Act (OS&HA), 1997 deals with the regulation and registration of workplaces and the occupational health and safety of workers. It gives authorization for OH&S inspectors to enter and inspect workplaces.

Under this Act the employer has a responsibility to establish a joint workplace safety committee consisting of four (4) persons. When the workplace has more than fifty (50) persons, the committee should consist of six (6) persons of which at least half the numbers should be workers who do not exercise managerial functions and should be selected by the workers themselves. The employer can select the remaining members from managerial staff of the committee. Workplace safety and health representatives must be selected by non-managerial workers and not by any person who exercises a managerial function. If however, workers are unionized, the majority may agree that their trade unions can select the safety and health representative(s).

This Act requires SSILI to publicly display an abstract of the Act, and specific sections addressing various issues related to employees' health and safety. SSILI is also required under the OS&HA to ensure workers are protected and a safe work space created.

6.3.5 Amerindian Act

The Amerindian Act 2006 guarantees the cultural and economic rights of the Amerindian people, and provides for the administration of Amerindian communities. The land rights of the Amerindians are also addressed by the Act. Under this Act the recognition of Amerindian land rights is probably the most significant. Amerindians will now be granted lands under the State Lands Act which is "*absolute and forever*". The older version of the Amerindian Act (prior to 2006) had a number of restrictions on the lands granted, including one which states that the Minister can increase or decrease the land granted at any time. The Minister was not required to have any consultations with the community. That restriction has now been removed. This would mean that no operations can be carried out by the developer without the prior consultation with the communities involved.

Importantly, under this Act (2006) Amerindians will now be able to lease their land. However, to ensure that the communities always maintain the majority of their titled land, they will only have the authority to lease up to 10% of the titled area.

Under the Amerindian Act (2006), communities will maintain their exclusive rights over the forest resources on their titled land. Furthermore, the Act makes provisions for the communities to seek the assistance of GFC, if necessary, inclusive of the need to inventorize their forest stock. Another important aspect of the Act is that it requires persons, inclusive of the developer, desirous of conducting commercial forestry operations to abide with the GFC regulations. This is a very important provision since many communities have had problems with agreements of this nature.

There are no communities within or in close proximity to the concession to be affected by SSILI operations, as was indicated in Section 5.

6.3.6 Labour Act

The Labour Act of 1942 specifies the conditions that an employer must observe in the contracting employees. For example Part V specifies that the entire wages of the employee must be paid as money and not otherwise. However, in occupations where it is customary to make partial payment of allowances in the form of food, toiletries, housing etc. these are acceptable and not considered illegal, if both the employer and employee are agreed on such terms.

Wages should be payable either weekly, fortnightly or monthly, except otherwise agreed. SSILI, as part of its corporate responsibility, has to comply with the provisions stipulated in the Labour Act throughout its operations to ensure safe and satisfying conditions for employees.

6.3.7 Other Relevant Laws

In addition to the aforementioned sections detailing the legislative framework within which SSILI seeks an environmental permit and TSA, Table 6-2 below outlines briefly other relevant (existing) legislation applicable to the project and may govern some aspects of environmental and social matters related to the forestry operation.

Table 6-2: Other relevant legislations

Agency / Ministry	Responsibility	Relevant Law
Wildlife Management Authority	Wildlife Trade and Protection	Draft Conservation of Wildlife Bill (1992) Wild Birds Protection Act Chap 71:01
Ministry of Labour	Labour Relations Occupational Health and Safety	Employment of Young Persons and Children Act
Ministry of Culture, Youth and Sports Walter Roth Museum of Anthropology	Anthropological and archaeological research and publication	Cultural Heritage Act, 1993
Guyana Energy Agency (GEA)	The GEA through the Legal and Licensing Division Is responsible for enforcing the Laws/Regulations governing all activities involving petroleum and petroleum products in Guyana.	Petroleum and Petroleum Products Regulations 2004 made under the Guyana Energy Agency Act 1997

6.4 Institutional Framework

The Ministry of Natural Resources and Environment created by GoG in 2011 has responsibilities for forestry, mining, environmental management, wildlife, protected areas, land use and planning and coordination. The Ministry has the responsibility for the following institutions/agencies: GFC, GGMC, Guyana Gold Board, GLSC, EPA, Wildlife Management Authority, National Parks Commission and Protected Areas Commission which allows for greater coordination among the natural resources agencies.

Additionally, there are a number of other key Ministries and Government Agencies which will have some oversight regarding the proposed logging operation by SSILI. These include the Ministry of Health, Ministry of Labour, Ministry of Amerindian Affairs and the Guyana Energy Agency.

Specifically, the roles and functions of the two (2) key institutions responsible for the issuance of SSILI's Timber Sales Agreement and management of its ESIA process are highlighted below:

6.4.1 Environmental Protection Agency

The EPA was established under the EP Act of 1996. The Agency is governed by a Board of Directors, and falls under the direct supervision of the Minister of Natural Resources and Environment. In Sec. 4 (1) (a), of the Act, 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”*. The Act gives the Agency the overall responsibility to:

- *Take necessary steps for effective management of the natural environment to ensure conservation, protection and sustainable use of its natural resources;*
- *Ensure that any developmental activity, which may cause an adverse effect on the natural environment, is assessed before such activity is commenced;*
- *Coordinate and maintain a programme for the conservation of biological diversity and its sustainable use; and*
- *Coordinate the establishment of national parks and protected areas system and a wildlife protection management programme.*

In order to fulfill the responsibilities as stipulated by the Act the EPA is required to implement several principles of environmental management. These principles are:

- The “polluter pays principle” which states the polluter should bear the cost of measures to reduce pollution;
- The “precautionary principle”, where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation;
- The “strict liability” legal principle: any person who contravenes this Act or regulations shall be liable to the penalties prescribed thereafter;
- The “avoidance” principle: it is preferable to avoid environmental damage, as it can be impossible or more expensive to repair rather than prevent damage;
- The “state of technology” principle: measures protecting the environment are restricted by what is technologically feasible and as technology improves, the improved technology should be used to prevent and repair environmental damage.

The EPA, as mandated by the EP Act and through its environmental authorization process, is required to ensure Companies such as SSILI implement its project in a manner to maintain high environmental management standards and practices and to prevent environmental pollution. The EPA through its Environmental Management Division will monitor the performance of this operation to ensure compliance with its environmental authorization, mitigation measures as outlined in Section 8 of this ESIA and the environmental protection legislation. Within this context, SSILI is therefore expected to carry out its logging operations in an environmental sound manner to prevent and avoid environmental pollution.

6.4.2 Guyana Forestry Commission

GFC falls under the purview of the Ministry of Natural Resources and Environment. The Forest Act 2009 mandates the GFC with the overall management of Guyana's State Forests. Approximately 85% of Guyana's forest cover is classified as State Forest and is under the jurisdiction of the GFC. The activities of all forest operators are guided by the requirements of the GFC through the Forest Act 2009 and its regulations, and codes of practice, therefore SSILI will be required to adhere to the GFC's requirements. The Guyana Forestry Commission Act 2007 repeals the 1979 Act and provides for the GFC to fulfill its objective *“to encourage the development and growth of forestry in Guyana on a sustainable basis”*. The

Act stipulates the functions and responsibilities of the GFC and establishes a board of directors appointed by the subject Minister to govern the Commission.

The Commission has the responsibility to advise the subject Minister on issues relating to forest policy, forestry laws and regulations. The work of the Commission is guided by the governing legislation, the forest policy and NFP. In particular, the NFP outlines the operational aspects related to the forest sector and guidance for the GFC to develop and implement forest protection and conservation strategies, oversees forest research and provides support and guidance to forest education and training.

The GFC is the institution responsible for the granting of a lease for utilization of a portion of state forest in keeping with activities mandated by the Commission and stipulating the manner in which the land should be used, operated, as well as carry out any subsequent monitoring and assessment activities.

SSILI has applied to the GFC to utilize a portion of Guyana's state forest to harvest/extract timber. Once approval is granted in the form of a TSA, SSILI will be required to meet the requirements as stipulated by the GFC in particular those as described in Section 6.3.3. Through its Forest Monitoring Division the GFC will monitor this project to ensure SSILI remains compliant. The Forest Monitoring Division is responsible for enforcing of the TSA, forest legislation, regulations and codes of practices, and the monitoring and control of the environmental and social impact on SSILI's logging concessions in collaboration with the EPA. It is expected that the GFC will have a Forest Officer based within the SSILI Concession.

SECTION SEVEN

IMPACT ASSESSMENT

7.1 Introduction

Section 3 of this ESIA report provided a description of the project activities whilst Section 4 and Section 5 described the natural and socio-economic environment, respectively, in and around the project area. This section assesses the potential impacts of the project on the environment based on the proposed activities of the project and the characteristics of the project environment. The primary aim is to identify the magnitude and other dimensions of predicted change on the environment resulting from the implementation of the project, using the situation without the project or action as a point of reference. Impacts are assessed based on the social, ecological and physical information provided, taking into account the current status of the project and its activities and impacts arising during the construction and operational phases of the project.

Direct impacts are characterised as those that affect the physical, biological and socio-economic environment. A brief description is provided for each impact, as well as an analysis of its significance. Where appropriate, consideration is also given to *indirect (secondary) impacts*, defined as impacts that occur later in time or further removed in distance from direct impacts. Additionally, consideration is also given to *cumulative impacts*. Cumulative impacts are defined as environmental impacts resulting from incremental effects of an activity when added to other past, present and reasonably foreseeable future activities, regardless of what entities undertake such other actions.

In order to assess the nature of the impacts, it is essential to have a clearly defined starting point. For this study, the starting point is interpreted as the 'present situation' of the project where the project is already conceptualised and the project area has been identified. The project area is very much intact, with very little activities in the area previously. At this stage, the location of the main processing facility and the alignment of the access road are not yet determined. As such, these were not considered in this impact assessment. An addendum to this ESIA will be prepared once the locations are finalised.

The potential impacts are described based on the physical, biological and socio-economic effects during the construction and operational phases of the project. The significance of the impact is based on the degree and duration, high probability of occurrence and its effect on sensitive receptors. Significance is determined by:

- Magnitude and extent;
- Reversibility;
- Longevity; and
- Probability of occurrence.

The impacts identified in this section are based on normal operating conditions. Sections 8, 9 & 10 take into account management and response measures that must be in place to address impacts arising from the project including unplanned activities such as accidents and other emergencies. Mitigation measures were identified to prevent, minimise and manage the adverse potential environmental effects of the proposed project.

7.2 Activities of the Project

7.2.1 Mobilisation and Construction Activities

The main construction activities that will take place on site as part of the development include:

1. Mobilising personnel and equipment;
2. Construction of access roads;
3. Construction of the Base Camp;
4. Construction of main and secondary roads to logging compartments/blocks;
5. Pre-harvest inventory;
6. Mapping and laying out of skid-trails; and

7. Establishing log markets for temporary stockpiling of logs.

7.2.2 Operational Activities

1. Felling and extraction of trees;
2. Transporting logs by truck to Base Camp;
3. Storage of logs in log pond at Base Camp;
4. Primary processing of logs at Base Camp; and
5. Loading of logs onto trucks and transporting logs to main processing facility.

7.3 Potential Impacts

The potential exists to directly and/or indirectly affect the environment during both the construction and operation phases of the project. The activities associated with these phases of the project are outlined above. However, the potential impacts are both positive and negative in nature and were determined based on stakeholders' consultations, community consultations, consultation with the EPA, ESIA's for similar projects in Guyana, the Consultants Team experience and professional judgment, etc. This section of the report discusses and analyses these impacts in detail. A summary matrix of the severity and extent of each impact is also included.

7.3.1 Impacts on the Physical Environment

7.3.1.1 Soils

Potential Impact

The total area of the SSILI Concession is 391,853 hectares (968,289 acres). The Concession is divided into two (2) parts; Part A and Part B. Part A consist of 191,660 hectares (473,602 acres) while Part B has an area of 200,193 hectares (494,688 acres). The forest found within this area is intact since activities which could have affected the forest were extremely limited in the past.

Forests provide a buffer to filter water and to hold soil in place. They sustain water and soil resources through the recycling of nutrients. Some clearing of forest will be done during the implementation of the project. However, it is estimated that less than 1% of the concession area will be cleared of vegetation. Most of the potential impacts associated with soil/land will take place during the construction phase to prepare the area for the logging and primary processing activities.

The Base Camp will be located within the North Rewa Compartment of the concession to support the harvesting, transportation and primary processing teams (*see Appendix L*). The area to be cleared for construction of the Base Camp is approximately 25 hectares. In addition, logging camps will also be constructed once logging activities proceed further away from the Base Camp. To facilitate harvesting, secondary and feeder roads will have to be constructed, as well as log markets. Land preparation activities will include land clearing, cutting, excavation and grading. The possible impacts to soil/land that may arise from the project are:

- Soil disturbance as a result of the construction of project facilities, roads, skid trails, and log ponds;
- Erosion from surface runoff due to vegetation removal;
- Compaction of soil from operation of heavy-duty machines;
- Contamination of soil from fuel spills/ waste oil;
- Improper disposal of solid and liquid waste from forest camp and housing facility; and
- Loss of soil fertility.

Analysis

Some vegetation removal is essential for a project of this nature and is unavoidable. However, vegetation removal will be limited to the operational areas to prepare the camp facilities, workshops, log market, workers housing facility, primary processing area and roads. All land clearing activities will have to be done in accordance with the GFC's Code of Practice for Timber Harvesting Operations.

Soil Disturbance and Erosion

Land clearing and vegetation removal will expose the soil to the elements of the weather and this increases the potential for the exposed soil to lose moisture and become dry, thereby, increasing its susceptibility to erosion. This can lead to significant erosion of the exposed areas such as the log ponds, road networks, housing facilities and processing area during periods of heavy rainfall. Therefore, implementing adequate mitigation measures will be necessary to minimise the extent of erosion and thus, reducing its significance. Proper drainage systems will be installed in accordance with the Code of Practice for Timber Harvesting to minimise this effect. Also, the main areas to be cleared are generally flat, thus allowing percolation of surface water into the soil. Furthermore, the impact is localised, can be mitigated and is insignificant. As such, implementing mitigation measures will help to reduce the extent of soil erosion.

Soil Compaction

Heavy equipment and machinery such as skidders, log trucks, bulldozers, etc. will be used during construction, harvesting and transportation. Machinery traversing continuously on the roads, skid trails, long pond area and around housing facilities can result in soil compaction beyond the ability of the soil to allow for permeation. As a consequence, ponding may become an issue after heavy rainfall and continuous compaction may affect the regenerative ability of vegetation. Due to this, it is necessary to use designated routes for machines and vehicles movement, which should also be restricted to operational areas.

Soil Contamination from Fuel and Lubricant Spills

Improper management of fuel and waste oil, as well as lack of care during handling can cause spills resulting in soil contamination. It is therefore essential to implement stringent measures to reduce risks and prevent accidents and spills, given the high level of significance associated with this impact. The level of permeability of this soil type can also compound the impact. Fuel and waste oil, if not properly managed, can spill thereby contaminating the soil. While the impact will be localised and significant, implementing mitigation measures will reduce the risks associated with storage of these substances.

Two fuel trucks of capacity 15,000 liters each will transport fuel from Georgetown Sol Guyana depot once in every 10 days to the Base Camp. Diesel will be stored in two tanks of 25,000 liters capacity and 2,000 liters capacity for gasoline. The fuel will be supplied to the logging camp when required via 1000 liters fuel holders with 10 holders at a time on each of the Bedford Model M trucks of the company. The fuel will be stored in metal tanks within a containment berm with a capacity of in excess of 25,000 liters.

Lubricants will be transported from Georgetown using 2 Bedford Model M trucks of the company once a month in the drum packaging as received by the lubricant suppliers and will be stored in the lubricants warehouse at the Base Camp.

Waste oil will be stored in drums within a containment berm in the workshop area. Storage of fuel and oil within containment berms will reduce the risk of soil contamination from spillages from the tanks. Spill kits would be provided onsite to assist in any clean up that may be necessary as a result of accidents and leaks. Workers will be trained in the proper handling of fuel during transport and refueling exercises.

Soil Contamination from Improper Waste Disposal

The improper management of solid and liquid waste can result in soil contamination and affect soil quality. Solid waste, if not managed properly can be strewn around the camp sites and housing area where contaminants can be easily leached into to soil. Further, this type of practice regarding the disposal of solid waste may tend to attract animals to the site, foraging for food. Therefore, during both the

construction and operational phases, care must be taken to properly manage solid waste and all workers must dispose of any solid material generated in keeping with the procedures outlined in Section 8.3.1.6. Liquid waste, including sewerage and waste water can also affect soil quality. Septic tanks will be used at the Base Camp. Pit latrines used at the logging camps and will follow the procedures as outlined in Section 8.3.1.6. Waste water will be released from the housing facility and camps into a soak-away system.

Loss of Soil Fertility

The high soil permeability increases the risk associated with leaching of soil nutrients. The soil type in this area contains very little nutrients and removal of vegetation will expose the soil to direct rainfall, hence, increasing the potential for further nutrient leaching. As a consequence, top-soil nutrients may be easily leached, thus rendering it unsuitable for future vegetative growth. In addition, contaminants impacting the soil can release harmful constituents and if leached can affect the soil quality.

7.3.1.2 Water

Potential Impact

The Concession is drained by three (3) major rivers occurring in the area. Most of Part A is drained into the Rewa River on the west while the portion to the east and north east is drained into the Essequibo River. The Rewa River then flows into the Rupununi River, which then flows into the Essequibo River. Additionally, the Essequibo River passes through Part B of the Concession and drains most of the southern and western portion of this area. There is also a smaller portion to the east which is drained into the Corentyne River. Drainage into these larger rivers is facilitated by a number of minor rivers and creeks inside the Concession which form an intricate drainage pattern that allows for the area to be well drained. The quality of these surface water bodies can be affected due to threats as listed below from activities during both the construction and operation phases. Since the proposed project is a logging operation which will not conduct any activity below the surface, no potential impacts to ground water flow or quality is anticipated.

- Contamination of surrounding water bodies from fuel/oil/lubricants spills;
- Sedimentation and discoloration due to surface runoff into streams from construction activities and operation areas: culverts, bridges & roads, Base Camp, log pond, etc.;
- Possible reduction of stream flow from the installation of bridges and culverts; and
- Improper solid and liquid waste disposal.

Analysis

Water Contamination from Fuel/Lubricants and Chemical Spills

Long term storage of fuel, chemicals, lubricants and waste oil will be required to support a project of this nature. This will be done at both the Base Camp and logging camps. These substances, if not managed properly, can spill resulting in contamination of surface water. Once spills occur, the substance can be transported through surface run-off into the surrounding creeks and rivers. These incidents, while localised, can affect large areas for an extensive period. It is therefore necessary to implement measures to prevent this occurrence, especially in highly porous soils. Fuel will be transported from Georgetown and stored at the Base Camp in metal tanks within a containment berm in a manner described in Section 7.3.1.1. There is also the possibility of fuel being spilled while transporting from Georgetown to the Base Camp. This can occur as a result of improper handling or an accident/incident.

The trucks will be equipped with spill kits to respond to any spillages which may occur. Personnel involved in the transport of fuel will be trained on the proper procedure for handling and transfer, as well as emergency response. Fire extinguishers will also be available on the trucks. Waste oil will be stored in drums within a containment berm in the workshop area. Storage of fuel and oil within containment will reduce the risk of soil contamination from spillages from the tanks. With adequate care, especially during

the re-fueling exercises and transporting of fuel, unnecessary spills can be avoided, thus reducing the associated impacts. Spills kits will be made available onsite.

Contamination can also occur from spillage of chemicals used in the operation. However, it is not yet determined if any chemicals will be used during the operation. Only if the operations accumulate large stocks of logs and lumber at the forest will chemicals be used to prevent pests and borers, thus preserving the quality of the products. In this case, the quantity is expected to be minimal and adequate handling and storage measures would be implemented to prevent contamination.

The site to be used for the establishment of the Base Camp will be carefully selected to ensure it is not susceptible to flooding. As such, this will negate the possibility of contamination as a result of flooding.

Impacts from Erosion/Sedimentation

Land clearing and vegetation removal increase the probability of solid materials being washed into surface water bodies. Materials can also be washed away from stockpiles for road construction, etc. During periods of heavy rainfall materials become suspended in surface runoff and are transported into water ways and lead to increased turbidity of the water bodies, thus eventually resulting in sedimentation and discolouration. Such events are short term, localised and reversible once adequate measures are in place to reduce the amount of solid materials transported via surface run-off. Construction of the bridges, culverts and road networks may impact the small creeks found in the area. However, the impact will be short term, localised and insignificant. In addition, very little vegetation removal or land clearing will be done throughout the life of the project. This thereby limits the potential for erosion and sedimentation to only the operational sites, Base Camp, log markets, roads and skid trails. Runoff from the Base Camp and log markets may be filtered by surrounding vegetation which would serve to trap any sediment in the runoff before it enters any surface water body thus reducing the potential for water contamination. Moreover, exposed areas that are not utilised will be reclaimed with vegetation over time, hence, reducing the areas susceptible to erosion. Roadside drains will be constructed to drain water from the roads and into a sump which will be installed to capture any solids before the drains enter into any waterways. This will be done in accordance with the Code of Practice for Timber Harvesting.

Some sections of the Concession are flooded on a seasonal basis and this situation will not allow for a proper harvesting and transporting operation. If activities are to occur in these flooded areas, it could result in damage to the soil and thus affecting the water quality. As such, the Company needs to conduct most of its field operation during the dry season.

Disruption of Water Flow

Construction of bridges and culverts can disrupt or reduce the flow of water bodies. Most of the creeks within the Concession are small and also seasonal. No major water bodies will be bridged within the Concession. Bridges and culverts will be designed to allow for the free flow of water, taking into consideration water flow during period of extremely high intensity rainfall. Culverts and bridges are to be placed where required for cross drainage and will be constructed of the appropriate materials, e.g., logs, wood or rubberized reinforced corrugated pipe, depending on either the permanent or temporary nature of the installation. Road culverts would be aligned perpendicular to the road and horizontal to the flow of water with an inclination side (sump) of 5% to 10% to avoid flooding of the roadway. Main roads culvert would also be provided with catch basin on both ends where necessary to avoid silting. Culverts would be used where peak flows (runoffs) are not extreme and the depth of fill is not too great. Culvert size/diameter will be adequate to carry stream flow but depends on the size of the area to accommodate the runoff.

Water Contamination from Improper Waste Disposal

Improper management of solid and liquid waste can affect water quality. Solid waste can often end up in water bodies as a result of direct dumping which can lead to contamination and blockage. Water quality can be affected by contaminants found in the surface run-off from waste disposal areas. However, solid waste from SSILI logging operations is expected to be minimal and confined to domestic type waste from the kitchen and housing areas. Some oily waste will also be generated from the workshop. If this waste is

not properly managed, it can find itself in water bodies resulting in contamination. Additionally, waste water from kitchen and bathroom/toilets and washing of vehicles can also end up in water courses if not properly managed. Cleared vegetation and harvesting debris will remain within the forest. As such, there is minimal possibility of it getting into water ways. A waste management plan has been developed for the operation and is discussed in Section 8.3.1.6. The implementation of this plan will ensure that any waste generated is properly managed and minimises the possibility of water contamination.

7.3.1.3 Air Quality

Potential Impact

The potential exists during both the construction and operational phases of the project for the local air quality to be impacted. These impacts, however, will be short term, localised and insignificant. The following potential impacts to air quality may arise as a result of the project:

- Dust from land clearing associated with construction activities and material stockpiles for road construction;
- Dust from the movement of equipment, machinery and raw materials to/from the Concession;
- Dust from the primary processing of wood and the improper disposal of wood waste; and
- Fumes from the operation of machinery and equipment and clearing affecting micro climate.

Analysis

Dust from Land Clearing and Movement of Vehicles

The air quality within the project area can be considered pristine since activities to affect air quality are limited. There are no industrial type activities in close proximity, as well as activities which generate significant quantities of dust. Constant movement of vehicles/machines on site and land clearing activities, in particular, during the dry periods can generate significant amount of dust. Stockpiled material can also become airborne due to heavy winds resulting in an increased level of particulate matter within the local air zone for workers. In general, the extent of air borne particulate matter will be localised, short term and insignificant once preventative and mitigative actions are taken. Logging trucks and other vehicles traversing the road and trails, especially during the dry season, will tend to generate significant amount of dust. However, as was previously indicated, there are no residents within a 20 km radius of the Concession. Nevertheless, dust suppression and control measures will be employed to eliminate, or reduce further, the very low risk of the development of lung impregnated disease by employees exposed to dust. Workers will be exposed to dust being blown into the eyes and causing eye irritation and conjunctivitis. Dust suppression measures would include soaking of surfaces and enclosures while employees will be equipped with the necessary personal protective equipment (PPE).

Dust from Wood Processing Activities

Dust can be generated from the operation of wood processing equipment such as the portable mill and chainsaws to be used in the primary processing at the Base Camp. Therefore, measures must be implemented to prevent or reduce the impact of dust on the environment, in general, and risks to workers in particular. Workers exposed to dust over lengthy periods will be at risk of developing acute to chronic lung disease and irritants to the eyes which may cause conjunctivitis. Wood waste, if not properly disposed, can also result in the generation of dust during dry conditions. The primary processing area will be sited away from the housing and other operational areas to reduce the nuisance to workers.

Effects on Micro Climate

The project has some potential to affect the micro climate of the area. Significant changes in precipitation are direct and immediate when the forest cover is removed. Changes in transpiration result in a greater intensity of tropical rainfall, enhancing both run-off and erosion, even if the total amount of rainfall remains unchanged. Forest loss can also make rainfall more erratic, thus lengthening dry periods. However, with selective logging being practiced, this impact is not expected to be significant. In addition, heavy duty equipment and the operation of the generators will generate fumes which may also have some effect in

the micro climate of the project area although, given the scale of the activities, this impact is negligible.

7.4.1.4 Noise

Potential Impact

Noise will be generated by the operation mainly from the use of heavy duty equipment and machinery.

Analysis

Noise levels above the alert threshold of 86 decibels and hazard threshold of 95 decibels will be produced from heavy-duty equipment and machinery. Exposure to noise levels above the internationally accepted level of 90 decibels³⁰ can cause noise induced hearing loss. Noise levels above the tolerable threshold of 72 decibels can result in fatigue, tiredness, low morale and decreased productivity.

Heavy duty equipment usually generates significant levels of noise. Noise levels from logging activities are not anticipated to have a widespread effect since the noise generated should be localised to logging sites, log market and log ponds and for a short duration. Within the forest, noise will be generated by chainsaws and machinery during the felling and skidding of logs. At the Base Camp, a generator will be used to provide power and this will also generate high levels of noise, as well as the portable mill to be utilized for primary processing of logs.

However, there are no immediate communities in close proximity to the Concession that would be affected by noise. Nevertheless, measures would be implemented to reduce noise levels to that recommended by the GNBS Guidelines for Noise Emission into the Environment. The limit prescribed in the GNBS Standard for industrial operations is 100dB during the day and 80dB during the night at the property boundary or fifteen (15) meters from the source, whichever is closer. During the construction phase the levels are 90dB during the day and 75dB during the night. Measures will include equipment enclosures and installation of mufflers. Careful siting of the noisy equipment and generators away from the campsite will reduce the nuisance to workers. Moreover, workers will be equipped with the necessary PPE such as ear muffs. Noise levels will also be monitored on a periodic basis (*see Monitoring Plan – Section 9*).

7.3.2 Impacts to the Biological Environment

Potential Impact

The impact of the project on the biodiversity within the concession area is not expected to be significant once SSILI complies with the relevant regulations, guidelines and best practices. However, if these are not complied with the following potential impacts may occur:

- Loss of pristine ecosystems and habitats from land clearing;
- Reduction in number of certain species (particularly in commercial and/or keystone tree species);
- Increase in number and size of canopy openings favouring regeneration of fast-growing pioneer species, leading to long-term changes in species' composition;
- Invasive Species and Introduced Diseases;
- Loss of Wildlife Trees, Keystone and Endemic Plants;
- Increased Sedimentation of Watercourses, Reduction in Water Quality, Decline in Aquatic Fauna;
- Road Construction and Operation Fragments Forest;
- Risk of Commercial Hunting and Wildlife Trade;

³⁰ 90 dB is the level recommended for eight hours exposure to avoid hearing loss by a number of national and international institutions worldwide including the Ontario Regulation 488/01 under the Occupational Health and Safety Act.

- Wildlife-Human Conflicts;
- Increased Risk of Wildfires; and
- Risk of Chemical Contamination of Natural Environment.

Analysis

Loss of pristine ecosystems and habitats from land clearing

The flora within the Concession is intact and can be considered pristine, with the only evidence of disturbance being the use of the Bulletwood tree (*Manilkara bidentata*) for balata exploitation. As such, the logging operation will have an effect on pristine ecosystems and habitats, especially from land clearance during the construction phase to build facilities and roads. Most of the impact is expected to occur during the construction phase as a result of land clearing and direct land take. Land will be cleared for the construction of the Base Camp, log yards, logging roads, etc. An area consisting of 25 ha will be cleared within the North Rewa Compartment for the construction of the Base Camp while clearing will also be done for secondary and feeder roads construction and log yards. The removal of vegetation will result in a direct loss of floral species within that area and may also have an effect on the micro climate.

The Company will endeavour to conserve unique and fragile ecosystems and landscapes to ensure that the ecological functions and integrity of the forest are maintained. Land clearing and vegetation removal will be restricted to the operational areas. The Company will reserve at least 4.5% of the concession, which is equivalent to 13,445 hectares of the productive forest in an undisturbed, pristine state as “biodiversity reserves.” Biodiversity reserves will conserve the necessary ecosystems and habitats for plants and animals that are adversely affected by forest disturbances, as well as animals with large ranges or plants with slow dispersal. Buffer zones will also be observed along the perimeters of biodiversity reserves to provide effective refuge for disturbance-sensitive native fauna and flora. Furthermore, it is estimated that an additional 78,731 hectares (20% of concession) of in-operable forests on high hills and steep slopes will be retained in an undisturbed state. A further 14,334 hectares is considered liana forest. Therefore, out of the total area of the concession of 391,853 ha, only 285,343 ha will be considered for harvesting. This would result in SSILI retaining a minimum of 24.5% of the concession as undisturbed forest, a minimum of 4.5% of the productive forest (13,445 hectares) being set aside as protected biodiversity reserves and the remaining undisturbed forest to consist of non-usable forest and forest in-operable areas. This will allow for the vegetation of these areas to remain intact. In selecting the location of biodiversity reserves, the areas selected will be representative of forest types and habitats found throughout the concession, including variations in topography, soil type, and hydrology. Rare and Threatened habitats (regionally, nationally, globally) will be included in reserves, if found to occur. Reserves will be large, continuous units, thus providing sufficient area to support viable populations of species. Reserves and creating refuges will be implemented in areas where ERT species are known to exist or are encountered during operations. This will facilitate movements of wide-ranging animals such as spider monkey (*Ateles paniscus*) and brown-bearded saki monkey (*Chiropotes satanas*), and the migrations of plant and animal species over various time scales – daily, annual, or over many generations.

To safeguard the concession from illegal logging, land clearance and squatting, it is the intention of the company to monitor and inspect the concession boundaries as well as work on strategies to eradicate or to stop illegal or prohibited activities if there should be any.

For cleared areas not being utilized it is recommended that these areas be re-vegetated. No special measures are likely to be needed to promote the establishment of vegetation although some local amelioration may be required to promote rapid growth where low permeable material are on the surface. Re-vegetation should establish native plants, particularly as the presence of invasive or non-native vegetation may impact the long term sustainability of vegetative cover. In some cases, non-weed plants that have shown an aptitude for colonising disturbed sites adjacent to native vegetation, are likely to be useful for rehabilitation.

Species Loss, Changes in Species Composition and Forest Structure

The project will alter habitats and it is expected there will be minimal localized extirpation of animals in the logged compartments. During the construction phase as well as during logging operations, there can be expected animal movements/migration away from disturbed areas. Furthermore, timber harvesting of commercial species of timber will change forest structure, creating gaps in the upper canopy thus encouraging further growth from the lower canopy. Increase in number and size of canopy openings favours regeneration of fast-growing pioneer species.

The extent that logging operations affects biodiversity depends principally on the frequency and the intensity of timber extraction and the silvicultural methods employed. Further, to a large extent, the significance of the impact of the logging operations on biodiversity will depend on the silvicultural system and logging practices to be adopted by SSILI. This is detailed in Section 3.7.2.4. SSILI is expected to adopt an approach of harvesting by blocks – 100ha square blocks whereby trees are selectively logged after which the block is closed to further activity for a period of 60 years to allow recovery and regeneration. A reduction in the number of commercial species would be expected but the long-term effect during the period of block closure is not expected to be significant once the minimum size restrictions are enforced and the directional felling principles of RIL are followed to protect smaller trees and other vegetation. Greenheart may be an exception.

Some species may benefit at the expense of others, resulting in changes in species compositions. For some plants and animal species, the effects are likely to be of short-term duration and reversible if logged forest compartments are closed and allowed to regenerate. For some species, such as Greenheart, following logging, regeneration and timber growth of individuals may require at least 60 years. Even with careful planning and when RIL is practiced, logging can affect the complex and rich biodiversity of forests through excessive damage to residual stands, destruction of other plant and tree species and the creaming-off of species which are the most valuable for timber. Logging will inevitably lead to a shift in species composition.

Establishment of biodiversity reserves will help mitigate impact on species sensitive to forest disturbances and will protect intact areas of all commercial forests. Animal movements/migration away from disturbed areas is not expected to be permanent and will be localized. Many extirpated species should eventually re-colonise this regenerated logged-over forest. There is some uncertainty as to the impact of RIL in the concession on some threatened primate species, and under-storey forest-dependent bat and birds. Spider monkeys *Ateles* spp. are especially sensitive to logging and forest fragmentation, as they (1) are large-bodied, specialized frugivores that require large areas to subsist, (2) are often the preferred targets for local hunters (but not in Guyana), (3) have slow reproductive cycles, and (4) have large ranges and rarely move between adjacent forest fragments. Some haul roads can present formidable obstacles to movement of the spider monkey which very much a canopy species, rarely venturing to the understory or ground.

GFC has stringent guidelines as it regards biodiversity protection within forestry concessions and as part of operations and the Company will comply with the GFC's Code of Practice for Timber Harvesting Operations. In addition, the Company will implement RIL techniques with girth limits for target tree species and with a harvesting cycle of around 40-60 years³¹. In addition, the GFC further limits the amount of trees which can be harvested within a block. Guyana can extract 40m³ of timber per hectare from productive forest areas based on inventories from leading concessionaires, which also indicated that marketable species may be as high as 69-79m³ per hectare³². However, GFC has restricted harvesting to 20m³ per hectare. Further, even though the GFC allows 20m³ of logs to be harvested per hectare, the average for the last five years for the country is between 5-8m³, well below the limit. Selective logging with girth limits for target timber species will help minimise gaps in the canopy in logged compartments.

³¹ Based on the findings of Tropenbos-Guyana Research Program in Mabura Hill, the cycle length has been set at 40 to 60 years.

³² Source: LCDS (2010) Appendix III: Economic Value to the Nation Methodology

Given the timber extraction methods and the scale of the logging operations proposed, it is predicted that the impacts on many species will not be highly significant and will be temporary and reversible in forest regeneration time scales. Following logging, closure of the forest blocks and compartments will be strictly enforced so that the forest can recover and regenerate naturally to as close its natural state as possible. Many extirpated species should eventually re-colonise this regenerated logged-over forest. Canopy cover will be retained above sections of logging roads to facilitate movements of spider monkeys, brown-bearded saki monkeys, and other arboreal animals. Forest Impact Monitoring of fauna, especially of ERT species, will be considered to determine the presence and distribution of animals in logged-over forest will be undertaken to determine the impact of harvesting regimes on fauna.

Risk of Invasive Species and Introduced Diseases

The introduction of other species of plants, such as vegetables and fruits, can occur from the disposal of seeds within the project area or by planting by workers. Invasive species may also tend to grow on cleared areas which are not utilized. Invasive plants such as congo pump (*Cecropia juranyiana*) may affect forest structure and composition. Diseases may kill wildlife. Giant otter are vulnerable to canine and feline distemper introduced by dogs (Duplaix *et al.* 2008).

The Company will minimize the likelihood of forest degradation through disease and invasive species. It will consult, if necessary, with national agencies in Guyana, such as the National Agricultural Research Extension Institute, the GFC, the EPA, the Ministry of Agriculture, and the University of Guyana to evaluate the present and potential risk from pests and diseases in the Forest, as well as to determine monitoring, protection and suppression measures.

Loss of Wildlife Trees, Keystone and Endemic Plants

Silvicultural practices must consider that certain plants and landscape features are critical to support animals. Endemic and rare plants, 'wildlife trees' and keystone species - trees that produce large fruit crops that sustain animals when other food sources are scarce - may be important for animals. Snags (dead and dying trees) and over-mature trees often contain cavities that form important roost sites for bats and critical habitat for bats and other wildlife will be retained during logging operations. Other keystone trees that produce fruit will be retained.

Post-liberation thinning in logged forest, felling over-mature and dead standing trees (snags) to liberate smaller trees of commercial value from competition, will be wherever possible, avoided as snags and over-mature trees often contain cavities that form important roost sites for bats and critical habitat for wildlife. Fruiting trees important for wildlife will not be felled. Keystone, endemic and rare woody plant species will be retained. Where such species are encountered during harvesting operations, they will be marked for retention during logging. Small scale refuge around the individual or population will be created, in accordance with GFC required practices in conservation zones. Similar measures would be taken if rare species of non-woody. Felling of Bulletwood (*Manilkara bidentata*), Manicole (*Euterpe oleracea*), and other palms, will be restricted, recognising the economic and cultural importance of NTFPs. However, special permission can be granted by the GFC whenever these species have to be felled such as in clearing for roadways. Also, the GFC's Code of Practice for Timber Harvesting Operations restricts trees to be felled at 10m apart, limiting the number of trees to be felled in a block. In cases where keystone species are present there has to be more than 5 trees per ha of a species before any is allowed to be felled. Biodiversity reserves and in-operable forest areas will also help conserve endemic and rare plants.

Sedimentation, Reduction in Water Quality, Decline in Aquatic Fauna

Increased turbidity and sedimentation of creeks can also affect the feeding regimes of aquatic animals. In some cases logging debris may find its way into the streams and rivers and cause a decline in water quality. Changes to watercourses and surface runoff factors, resulting from harvesting operations, are likely. The construction of roads and skid trails is likely to lead to more erosion than the cutting of trees. Erosion of soils could increase the quantity of soil moved in storm runoff into watercourses, thereby hindering biological growth by restricting light penetration; depleting oxygen levels, destroying spawning

beds and impacting fish abundance and diversity, and, in turn, the top ecosystem predators, such as the endangered giant otter and black caiman. If the spawning grounds of fish that migrate to the wetlands are damaged, there could be consequences on fish populations in the Rupununi.

The Company will operate according to GFC's guidelines on erosion control and the anticipated residual effects are predicted to be acceptable under normal circumstances. Rigorous monitoring of operations will minimize the risk of erosion and sedimentation of rivers. Additionally, logging will be excluded from wetland areas and GFC guidelines and precautions for wetlands will be followed. The Company is committed to the implementation of GFC's Code of Practice for Timber Harvesting Operations on the establishment of buffer zones around, rivers, creeks and lakes.

Roads and Forest Fragmentation

Within the concession, the company will build an approximate 127 km of road where 32 km will be Main Road and 95 km will represent Secondary & Feeder Roads respectively over the next five year period.

Road construction results in a reduction in the area of forest and wildlife habitats. There is the potential for flooding of forest by the blockage of stream and rivers as a result of road construction. This can destroy the vegetation on the affected areas. Roads also present obstacles to movement or distribution of some animals. The black spider monkey is very much a canopy species, rarely venturing to the understory or ground. As such, movements of local social groups may be constrained by logging road construction and their territories fragmented if the canopy cover above the road is removed since individuals will not be able to move easily between forests fragments.

Traffic along roads can affect wildlife directly, by collision, or indirectly, by disturbance. Jaguars, peccaries and tapir actively use small roads and are known to have been killed in Guyana through collision with vehicles. Animal species not adapted for rapid movement on the ground across open spaces are particularly vulnerable e.g. sloths. Human-wildlife conflicts often increase during road construction and operation.

Care will be taken to minimize the area of forest cleared to construct main roads, feeder roads, and skid trails. The GFC's Code of Practice for Timber Harvesting Operations will be followed to help mitigate the effect of roads. Forward road planning and ground surveys will minimize the area of forest clearance. The Company aims to undertake operations with the least amount of exposed surface. The width of roads and vegetation removal will be limited and, if possible, canopy cover retained across smaller roads and skid trails to benefit arboreal animals, such as spider monkeys. Feeder roads and skid trails will be in short service only before being closed. The potential for flooding of forest by the blockage of stream and rivers as a result of road construction will be mitigated by installing of culverts and bridges. As such, this impact is not envisaged. Employee education and notification will be implemented to reduce vehicle-wildlife collisions and conflicts. Roads are not always detrimental to species. In central Guyana, some animals, such as tapir, have been observed to use the open space and exploit that abundance of non-forest plants on road verges.

Risk from Commercial Hunting and Wildlife Trade

The main threat to wildlife is expected to be from hunting by workers. This impact can be long term and significant if measures are not implemented to control and to prevent illegal hunting and trapping. Increased access to the concession arising from road construction and logging operations may lead to commercial hunting, over-fishing, and unsustainable collection of animals and non-timber forest products (NTFPs). Populations of some animals are especially at risk from an increase in hunting pressure or from collection for the pet trade, pressures that often arise when main and feeder roads are constructed and new logging compartments opened up for timber extraction. Many mammals have low and inconsistent reproductive rates and the loss of a fraction of the population can result in a dangerously decline in population. The collection of mammal, reptiles and amphibians for the pet trade may also result in a decline in species populations. A decline in key animal species (e.g. seed dispersers) is likely, in turn, to result in unwanted changes in forest dynamics.

Measures will be enacted to prevent hunting by workers and no firearms will be allowed in the concession. Signs will be placed at the entry to the concession and along access roads stating that possession of firearms and commercial hunting and trade in wildlife is prohibited. Posters/signs in staff accommodation/offices will also warn against hunting and collection of species for pet trade. Education and awareness sessions will help educate Company staff on wildlife conservation and protection. The Company will conduct regular patrols/inspections. Main roads, feeder roads, skid trails and forest compartments will only be accessed by staff. Although the Company cannot prevent people from using roads and newly exploited forest areas for commercial hunting, wildlife trade, and illegally extracting timber and NTFPs, it will report any such activities to the relevant authorities. SSILI will collaborate with other existing concessionaires to the north (Baishanlin International Forest and Sherwood Forrest Inc.), as well as with the Amerindian communities and CI to monitor any illegal activities within the wider area, including the hunting/trapping of wildlife.

Wildlife-Human Conflicts

Increased wildlife-human conflicts may occur when uninhabited areas are opened up for timber extraction. Jaguar and other large predators may be killed when encountered by humans.

The Company will educate staff to mitigate wildlife-human conflicts. Firearms will not be allowed. Killing of large cats for protection of forest camps is unnecessary and will be discouraged.

Wildfires

Forest fires can contribute to the destruction of the vegetation within the Concession. Most of the destruction from forest fires that have recently raged out of control across the world and especially in the Amazon region is widely acknowledged to have been either started by and/or exacerbated by logging and agricultural development companies. Opening up of the canopy by harvesting trees will result in greater light penetration to the lower forest strata and drying of the forest interior. Dry conditions, and the slash left behind after logging, can lead to a greater incidence of wildfires in logged forests. Any dead plant material can be fuel for wildfires. Fires can be started deliberately or by accident. Accidental fires can result from activities of workers such as disposal of lighted cigarettes. There is the potential of the fire to spread on the surrounding forest; given the area can be fire prone during the dry season. With climatic change, if patterns of rainfall are altered, forests can become dangerously dry for longer periods. Forest fire can have a devastating effect on the physical, biological and social environment particularly if extensive and prolonged. .

A fire management system will be implemented including prevention and response measures, and is discussed in Section 8.3.2.1 and in Section 10. Workers will be specifically instructed and warned to avoid setting fires in the forest and roadside where dry dead trees/wood has accumulated and the vegetation could be dry.

Risk of Chemical Contamination of Natural Environment

Hazardous chemicals include preservatives, herbicides and pesticides. Chemical spills or discharges may pollute the environment affecting organisms.

No chemical pesticides, herbicides, or preservatives will be used in the timber harvesting operation. In the event that chemicals are used in other operations, they will not be discharged into watercourses. All chemicals used for spraying will be submitted for approval by the Guyana Forestry Commission (GFC) and comply with the environmental requirements.

7.3.3 Impacts to the Socio-Economic Environment

7.3.3.1 Land Use and Other Conflicts

Impact

The SSILI Concession falls within an area of State Forest that has been identified by GoG for forest resources utilization and, at the same time, can be identified and allocated for other uses such as mineral extraction and agriculture. There are titled Amerindian communities nearby and the Concession is also adjacent to a Conservation Concession managed by CI. Guyana has also adopted a low carbon development path and is trying to seek compensation for ecological services by maintaining the country's forest. This can present a challenge in the absence of land use plans and land use coordination and can result in:

- Land use conflict with other resource users allocated by the State;
- Land use conflict with traditional resource users;
- Conflict with the CI Conservation Concession activities; and
- Impacts on Guyana's commitments under the LCDS.

Analysis

Conflict with other Resource Users

Conflicting land use is a concern in many regions of Guyana where state forests have been allocated for forest operations and where sub-surface rights have been given to miners. The land tenure system in Guyana for State Lands allows for multiple land use, also including agriculture. As such, the same parcel of land can be allocated to forestry, mining and agriculture. However, mining has precedence over forestry and can occur on lands allocated for logging. In this regard, an agreement has to be worked out with the forestry operator, giving the concessionaire an opportunity to remove the merchantable timber. This agreement will have to be facilitated by the relevant regulatory bodies (GFC and GGMC) since it's not an issue which should be left to be addressed on the ground by individual operators in isolation since both parties would have legal rights for their respective activities. Nevertheless, no such conflict is expected within the project area, especially in the near future. There are no mining activities or properties currently within the Concession and GGMC has indicated that there is a moratorium on river mining in the Upper Essequibo and Rupununi Rivers and applications for land prospecting and mining are awaiting a presidential decision. Only a company known as Pharsalus Inc. has an Exploratory Permit for Radioactive Minerals and Rare Earth Elements in a portion of the Northern Section of Part A of SSILI Concession and they are yet to commence any activities on the ground. Given the current position on mining within the area by the Government, it is highly unlikely that mining will commence within the wider area in the near future. The regional government has indicated that they do not have any development plans for the area and there are no agricultural leases issued for lands in this vicinity. Therefore, the possibility for land use conflict to occur is very minimal. SSILI will conduct regular monitoring of the Concession to determine if there are any illegal activities, including mining and logging, and any evidence of such activities observed will be communicated to the relevant regulatory agencies.

Conflict with Traditional Resources Users

The communities of Rewa, Crash Water and Apoteri are the closest communities to the project site. The residents of these communities would fish and hunt for food and would seasonally collect NTFPs including kufa and nibi which are used to make items such as baskets and mattapee and medicinal plants from the forest. The communities all have titled lands within which they conduct these activities. During the consultations with the communities, they have all indicated that they do not travel as far up river as the SSILI Concession area, given the distance, to conduct any of these activities. They also indicated that they have no sacred sites within the Concession area. As such, no potential conflict with traditional uses is foreseen at this time. In fact, the establishing of the Concession may even allow for the residents of these communities to sustainably utilize the resources of the project area, such as NTFPs, given the

possibility of faster and easier access. SSILI does not intend to prevent Amerindians from accessing the Concession area.

Conflict with the CI Conservation Concession

Adjacent to the SSILI Concession is the CI's Upper Essequibo Conservation Concession (UECC). The SSILI Concession borders the CI Conservation Concession on the west, south and east. The area is a portion of State Forest awarded to CI in 2002 and CI entered into a thirty-year agreement with the Government to establish a "Conservation Concession" to protect 200,000 acres (81,000 hectares) of intact forest for the purpose of managing the area for conservation rather than timber harvesting. The UECC attempts to protect high biodiversity value forest while still try to generate some revenues. It is not foreseen that the logging activities conducted by SSILI will have any effect on the forest within the CI's Conservation Concession, nor its objective which it to maintain the forest and biodiversity within the portion of State Forest allocated to the NGO. Given the proposed project activities, no residual environmental and social effects are predicted for the logging operation. Even the biodiversity within areas being harvested will not be significantly affected. There are no activities to be conducted which would cause any environmental effect that can spread beyond the Concession boundaries. As such, it can be concluded that the forest, including the biodiversity, within the CI's Conservation Concession will not be affected by the project. Nevertheless, SSILI intends to maintain a cordial relationship with CI and frequently engage the NGO on planned activities as it relates to the developmental and operational activities of the Company. SSILI also intends to establish a mechanism with CI to facilitate effective monitoring of the wider project area, especially as it relates to any unplanned or illegal activities.

Impacts on Guyana's commitments under the LCDS

As was stated before, Guyana is pursuing a low carbon development path and has since develop and is implementing a low carbon development strategy. This includes the adoption of a REDD+ framework. In addition, Guyana has committed to maintaining its forest carbon stock in return for payments for pursuing this low carbon development option through an agreement with the Norwegian government. Given these initiatives, the Country has committed to maintain a significant amount of its forest. Sustainable Forest Management and RIL practices within the State Forest has allowed for most of the forest to remain intact, despite active logging activities. SFM is a large component of Guyana's REDD+ framework and a central part of GFC's mandate and work. The LCDS notes that the GFC manages and regulates the activities of forest concessions to ensure that strict sustainable forest management rules and guidelines are implemented and that forest legislation is implemented effectively by operators (LCDS 2010). Logging companies such as SSILI are expected to complete comprehensive forest management and annual planning which includes forest inventory, and are required to comply with detailed control procedures, legality assurance measures and log tracking. The Government's policy is to support companies operating in Guyana to generate substantially more value from the limited portion of the forest (46% of the state forest estate³³) where sustainable forest harvesting is appropriate (LCDS 2010; MoNRE 2012). Moreover, the LCDS promotes sustainable logging and recommends improved processing technology. The LCDS states that "*new investment in processing activities in Guyana would facilitate even greater production of higher-value wood products that meet international standards for export and could bring new capabilities in waste minimization and recovery, as well as market linkages to enhance export value of processed products*". By implementing this project, SSILI will ensure such initiatives are established, given its proposed state-of-the-art processing facility to be established and market opportunities the Company already has access to.

In addition, a national system to monitor [measure] report and verify (MRV) emissions or removals of carbon from the forest sector is currently being developed by the GFC. The MRV-system will provide the basis for reporting in accordance with the principles and procedures agreed to by the Government of Guyana in relation to reducing emissions from deforestation and forest degradation.

Furthermore, Guyana has signed on to the EU FLEGT and will set up a Voluntary Partnership Agreement (VPA) which will help to ensure that only timber verified to be legal under Guyanese law could be

³³ Ministry of Natural Resources and Environment, (2012): www.nre.gov.gy

exported to the EU. VPAs are bilateral agreements between the EU and timber exporting countries such as Guyana, which aims to guarantee that the wood exported to the EU is from legal sources and to support partner countries in improving their own regulation and governance of the sector³⁴. Operators within the forest sector such as SSILI will be required to adhere to stronger regulations and standards as a result of strengthened forest governance and trade systems under this programme.

The GFC has indicated that, by allocating this intact area for logging to SSILI, it was certain that the logging activities will not affect Guyana's commitment to maintaining its forest cover under the LCDS, nor affect the obligations under the agreement with the Norwegian Government. The GFC indicated that, based on the amount of State Forest allocated as forest concessions, it is expected that approximately 1.5 million cubic meters of timber to be legally harvested annually, given the approved Annual Allowable Cut (AAC). However, the current annual production is only around 400,000m³. The maximum amount SSILI can harvest from its concession annually is 95,114 m³ based on its approved cutting cycle and ACC. As such, Guyana will continue to be well within the limit of the amount of timber which can be harvested legally from allocated concessions annually.

7.3.3.2 Health and Safety

Potential Impact

Workers health and safety can be impacted during the implementation of the project. The major impacts are:

- Risk of accidents from the operation of heavy-duty machines, portable mill and chainsaws, logging activities, etc;
- Exposure to excessive noise and fumes from the operation of machines; and
- Exposure to vector borne diseases.

Analysis

Risks of Accidents and Effects to Health from Project Activities

Workers health and safety is always a major concern in logging operations since workers are usually exposed to conditions that can result in serious accidents, to the extent where some can be fatal. Risks to workers' health and safety include accidents using heavy equipment and machines, excessive exposure to noisy equipment, inhalation of fumes, and improper use of equipment. The aforementioned impacts could be exacerbated given the remoteness of the Concession and the distance of the proposed Base Camp and logging activities from health care facilities. The associated impacts however, while significant, are short term and can be avoided and mitigated, thereby reducing the risks.

To adequately address health and safety issues over the long term adequate systems must be in place to reduce the risks to workers' health and safety, in particular, from accidents using heavy equipment and machines, excessive exposure to noisy equipment, inhalation of fumes, and improper use of equipment. The health and safety measures outlined in Section 8.3.3.2 must be complied with. In addition, if there is an accident, the procedures outlined in the Emergency Response Plan (Section 10) should be followed. Personal Protective Equipment (PPE) should be provided and workers should be mandated to wear it so as to prevent/minimize any injury that could occur. Hard hats, ear plugs, respirators and safety boots are all necessary for this type of operation. Furthermore, SSILI plans to install communication equipment and make a vehicle available to deal with emergency situation. Medical personnel at least at the level of a Medic will also be employed by the Company to respond to medical requirements. Additionally, the Company plans to construct an airstrip in the future to facilitate medivac, if required.

³⁴ <http://www.euflegt.efi.int/portal/>

Exposure to Diseases

Since there are no permanent communities within or in close proximity to the SSILI Concession, workers employed will be sourced from the villages of the North Rupununi including the villages of Annai, Crash Water, Apoteri and Rewa. Some skilled workers will also be sourced from the coastal areas. The workers from the coastal areas will be required to become acclimatized to working conditions in the forest and, during this transition phase, may be susceptible to diseases if care is not taken. Moreover, there is the possibility for the introduction of communicable diseases from workers to workers who will be housed at the same camp sites. However, this situation is not expected to be significant. The absence of permanent communities in close proximity to the Concession limits employees' social interaction, thus, reduces the risk of sexually transmitted diseases. Nevertheless, the Company will engage its employees on pertinent diseases such as HIV/AIDS, tuberculosis and malaria, especially regarding prevention and treatment.

The communities recommended that up-to-date tropical medicines should be procured from Brazil. This can be done through the assistance of the Medic of Annai who provided examples of cases where the only available treatment for many [chronic] conditions experienced in this region are from Brazil.

7.3.3.3 Community Values

Impact

Community and social values can be compromised by the establishment of the Base Camp. Crime, use of alcohol and disagreeable behavior by workers are all problems that can arise.

Analysis

As was stated before, workers that will be employed to support the logging activities will be sourced from communities around the project area as well as from the Coast. The introduction of these workers together at the campsite has the potential to create some social concerns. There is the potential for an increase in criminal activities, and abuse of alcohol as a result of additional income. In addition, since the workers will be housed at the same campsite there is the potential for conflicts through disagreements. SSILI will develop a policy outlining measures workers would need to comply with to prevent such occurrences. Alcohol and drugs will be prohibited from the site, as was recommended by all the communities consulted. Recreational activities such as sports will also be promoted by the Company and workers will be allowed to go home on a turn-around basis. Every effort must be made by the company to ensure that it does not promote alcoholism or absenteeism amongst its male workforce. Absenteeism often leads to broken homes which destroy the very communities that were to be developed.

It is important that the communities be kept abreast on the project. The communities should be informed of any major development plans by SSILI. The Company will recruit someone to serve as a community liaison. The company would also need to work closely with the NRDDDB, given the vast experience of this body in working in the wider project environment. The experience of NRDDDB would be valuable to the company in the planning and implementation of the project, especially as it relates to the involvement of the communities.

The cash economy boosted by the numerous jobs created through the project will have a macro effect on the village economy in the region. There will be spinoff jobs created as more persons are employed by the company. However, this can result in the increased dependency on a cash economy which can render communities less reliant on traditional means of survival.

7.3.3.4 Employment

Impact

The project will result in an increase in employment in the wider project area. This positive impact is highly anticipated by the majority of the stakeholders consulted, especially at the community level.

Analysis

During the pre-harvest phase of the operation, employment by the Company is expected to be in the vicinity of 45 persons. However, this figure will be increased to 320 persons once harvesting and processing activities commence. The majority of these personnel will be Guyanese and, as much as possible, from the communities in close proximity to the Concession.

Preference will be given to persons in communities close by to the project, which are those from the North Rupununi including Annai, Crash Water, Rewa and Apoteri. This provides an opportunity for these individuals, many of whom are employed in subsistence activities. This will result in an increase income for the persons employed which will result in increased spending power. This in turn should improve the local economy of these areas. Furthermore, workers from these areas will be trained by the Company to do skilled jobs directly related to the operations. Workers will also be required for unskilled jobs such as porters, security guards, cleaners, etc. During the consultations with the communities, the residents indicated that they would welcome such an initiative, especially since there is currently a lack of economic activities and employment opportunities within or near the community.

Employing persons from the nearby communities will ensure that the workers remain close to home and can be present home more often rather than having to seek alternative employment far removed from home, such as in the mining areas. This would allow these individuals to make a more meaningful contribution towards the development of their communities as well as improved social relations as employment opportunities are available within or in close proximity to the communities.

The Company is willing to sponsor students from the area who are eager to pursue further training in the field of Forestry at institutions such as the Guyana School of Agriculture. Students graduating from the Bina Hill Institute and the Annai Secondary School will be considered. SSILI will also consider the intake of work study students, thereby providing access to professional capacity building.

The communities requested that SSILI should consider employing women in its operation, especially in technical areas rather than as maids or cooks. However, it should be noted that the number of residents in the community that can qualify for training and employment is small and the number of women who will be seeking employment is expected to be smaller.

SSILI will have to be cognizant of the fact that labour supply from these areas is extremely mobile as workers often seek more lucrative employment in the gold mining areas. In addition to the higher income, Amerindians are being employed by the mining sector as they are more comfortable with the informal arrangements and partial freedom this type of employment provides as against a more formal employment system for a forestry operation. This problem is faced by other forestry operations, including Iwokrama, and is a concern highlighted by the Forest Producers Association. Villagers are also constantly on the move to other areas such as Brazil and Georgetown. This usually results in a high staff turnover for such operations and can significantly affect the company, especially when resources are expended to train personnel who would then leave soon after.

Persons from the coastal areas such as skilled personnel will also have the opportunity to be employed.

A rotational system of employment would be implemented which would serve as an appropriate “turn-around”. This would allow workers to spend a fixed time in the forest and then a fixed period at home.

7.3.3.5 Archaeological Resources

Impact

Historically, the area is considered to be the territory of the Taurama and more recently the Wai Wais, Caribs, Macushi and Wapashiana people. Studies have shown the presence of historic people along the

Essequibo River. Artifacts present within the project areas can become damaged or lost as a result of the project activities.

Analysis

The general project area may have been occupied or utilized by Amerindians and other early settlers for a number of years. This includes the ancestors of residents from the communities from the Rupununi area as well as other individuals involved in other activities such as exploration, fishing and hunting. The project area is marked by the distinct seasonal flooding of the wetlands. The highland area also remains virtually unexplored and may have scattered cultural artifacts based on the presence of cultural sites along the Essequibo River. Due to this, there may be the possibility of finding some form of artifacts within the area. If unnoticed, activities such as land clearing can easily damage these materials. Artifacts can include:

- Stone, bone, or wooden tools found on site. Stone tools may include formed implements, such as arrow heads, or scatters of flaked stone;
- Buried hearths are often represented by localized dense concentrations of charcoal and/or ash and fire cracked rock, other buried sites in caves may have rock paintings or carvings along with other artifacts;
- Trees with culturally modified bark resulting from bark stripping are generally the most common form of culturally modified trees;
- Burial sites may take several different forms. Generally burial sites are good indicators for the presence of artifacts and may include any of the following: rectangular depressions on the ground surface, rectangular mounds of soil or rock piles, human remains (i.e., bones); and ashes (resulting from cremation);
- Stone cairns may also be present in this area. They are characterized by organized piles of stones that may range in size from small circular rock piles to larger organized rock piles; and
- Rock carvings, which are particular to water ways, but these are not specifically restricted to riverain sites alone and can be found on high ground.

The above will be communicated to workers during training exercises to ensure they are aware of what archaeological resources consist of so they can adequately identify any find in the field. A chance/find procedure has been developed and included as part of the EMP (Section 8.33.3) in the event that any artifact or archaeological site is discovered.

7.3.3.6 Security

Impact

With the establishment of a new operation there will be the propensity for the presence of unfavourable elements to be found and threaten the integrity and safety of the operations. In particular, the security can be of a concern regarding equipment, machinery, spares and parts for machinery. Absence of adequate security can result in robberies, loss of equipment and lowering of morale of workers which can affect productivity.

Analysis

The project site is very remote and there is no police presence in the vicinity. The closest police station is located at Annai. Given the remoteness and inaccessibility of the project area, there is a risk of compromising the security of the operation. When the road is constructed, SSILI plans to erect and

maintain checkpoints. In addition, it is not expected that the Company will have large cash reserves on hand.

Table 7-1 outlines the potential impacts from construction and operational activities and their significance.

Table 7-1: Impact Analysis Matrix

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
Physical Environment				
Environmental Aspect: Land/Soil				
Land clearing for the construction of the Base Camp, roads, workshop and logmarkets	Const	Removal of vegetation, to facilitate construction of project facilities, thus exposing the soil and rendering it susceptible to erosion	<ul style="list-style-type: none"> ▪ Minimize removal of vegetation and encourage re-vegetation ▪ Landscaping of project sites should be done to reduce sloping ▪ Install drainage system to adequately drain storm water 	Lo, R, LT, Un, M, Insig
Operation of machines	Const/Opr	Compaction of soil from operation of heavy-duty machines	<ul style="list-style-type: none"> ▪ Earthworks should be avoided during periods of heavy rainfall ▪ Designate routes for heavy duty equipment to prevent compaction of soil ▪ Use appropriate machines for all earth works ▪ If ponding is observed it may be necessary to scarify the topsoil 	Lo, Rev, ST, Av, M, Insig
Disposal of solid and liquid waste	Const/Opr	Soil contamination from the improper disposal of waste generated	<ul style="list-style-type: none"> ▪ Implement Waste Management Plan 	Lo, Rev, ST, M, Av, Insig.
Fuel and oil transportation, handling and storage	Const/Opr	Contamination of soil from fuel spills/ waste oil	<ul style="list-style-type: none"> ▪ Ensure fuel and lubricants are stored within a bunded area with an impervious surface ▪ When handling fuel, care should be taken to prevent spillage and leaks ▪ Spill kits should be made available in the event of spillages. ▪ Ensure waste oil is collected and stored in covered containers on a bunded and impervious surface 	Lo, Rev, ST, Av, M, Insig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
Environmental Aspect: Water Resources				
Removal of vegetation to facilitate construction of buildings, roads and other facilities	Const	Sedimentation and discoloration of streams due to surface runoff /erosion and reduced interception resulting in degradation of aquatic habitat	<ul style="list-style-type: none"> ▪ Implement erosion control measures ▪ Avoid discharge of storm water directly into nearby water course. Discharge should be channeled through vegetative areas which will serve as a natural filter for any sediment contained ▪ Bunding of stockpiles should be considered if storage is required for an extensive period ▪ Establishment of buffer zones around, rivers, creeks and lakes 	Lo,Rev, ST, Av, M, Insig
Construction of bridges and installation of culverts	Const	Possible reduction of stream flow from the installation of bridges and culverts	<ul style="list-style-type: none"> ▪ Construct bridges and culverts in accordance with the GFC's Code of Practice for Timber Harvesting Operations ▪ Temporary water-crossings to be decommissioned after usage to ensure that they do not collapse and block stream flow ▪ Design bridges to allow for the free flow of water, taking into consideration water flow during period of extremely high intensity rainfall ▪ Road culverts should be aligned perpendicular to the road and horizontal to the flow of water 	Lo,Rev, ST, Av, M, Insig
Disposal of solid and liquid waste	Const/Opr	Contamination of water resources from improper disposal of waste	<ul style="list-style-type: none"> ▪ No dumping of waste into water bodies ▪ Implement Waste Management Plan 	Lo, Rev, ST, Av, M, Insig
Fuel and oil transportation, handling and storage	Const/Opr	Contamination of water resources from fuel spills/ waste oil	<ul style="list-style-type: none"> ▪ Locate fuel storage area at least 100m from work areas and 200m from any stream 	Ex, Rev, ST, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<ul style="list-style-type: none"> ▪ Ensure fuel and lubricants are stored within a bunded area with an impervious surface ▪ When handling fuel, care should be taken to prevent spillage and leaks ▪ Spill kits should be made available in the event of spillages ▪ Ensure waste oil is collected and stored in covered containers on a bunded and impervious surface 	
Environmental Aspect: Air Quality				
Operation of processing equipment (chainsaws and portable mill)	Opr	Noise generated from the operation of processing equipment	<ul style="list-style-type: none"> ▪ Provide hearing protection to employees ▪ Noisy equipment such as the portable mill should be sited away from living quarters ▪ Enclose noisy equipment in sound proofing material, if necessary 	Lo, Irr, ST, Un, M, Sig
Operation of heavy-duty machines and generator	Const/Opr	Noise generated from the operation of heavy-duty machines and generator	<ul style="list-style-type: none"> ▪ Provide hearing protection to employees ▪ Control of noise levels at source should be done via installation of silencers on exhaust system ▪ Noisy activities should not occur in close proximity to the housing areas during the night or on Sundays and Holidays and noisy equipment such as generator should be sited away from living quarters ▪ Enclose noisy equipment in sound proofing material, if necessary 	Lo, Irr, ST, Un, M, Sig
Land clearing and transport	Const/Opr	Dust from soil exposure and the traversing of vehicles and logging trucks	<ul style="list-style-type: none"> ▪ Personnel working within dusty environments should be required to use dust masks 	Lo, Rev, ST, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<ul style="list-style-type: none"> ▪ Institute a speed limit for vehicles around the Base Camp to reduce the quantity of air borne particulate matter ▪ During dry periods it may be necessary to soak routes traversed by vehicles and equipment, especially in close proximity to the Base Camp 	
Operation of processing equipment (chainsaws and portable mill)	Opr	Dust from the operation of chainsaws and portable mill	<ul style="list-style-type: none"> ▪ Personnel working within dusty environments should be required to use dust masks ▪ Siting of the processing area at the Base Camp away and downwind of the living quarters ▪ Sawdust should not be allowed to accumulate 	Lo, Rev, ST, Av, M, Sig
Disposal of wood waste	Opr	Dust from the improper disposal of wood waste (sawdust)	<ul style="list-style-type: none"> ▪ No open dumping of wood waste should be done ▪ Sawdust should not be allowed to accumulate 	Lo, Rev, ST, Av, M, Sig
Biological Environment				
Environmental Aspect: Flora				
Construction of facilities and roads	Const	Direct loss of vegetation from land clearing	<ul style="list-style-type: none"> ▪ Land clearing and vegetation removal will be restricted to the operational areas and cleared areas not being utilized would be re-vegetated ▪ 4.5% of the concession equivalent to 14,107 hectares of the productive forest will be retained in an undisturbed, pristine state as biodiversity reserves. An additional 78,731 hectares (20% of concession) of in-operable forests on high hills and steep slopes will be retained in an undisturbed state 	Lo, Rev, LT, Un, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<ul style="list-style-type: none"> ▪ All logging activities should be done in accordance with the GFC's Code of Practice for Timber Harvesting Operations, including RIL and SFM practices ▪ Comply with the approved silviculture system and logging cycle ▪ The GFC approved Annual Allowable Cut for the operations nor the 20m³ limit per hectare should not be exceeded ▪ Forward road planning and ground surveys will minimise the area of forest clearance to construct roads ▪ Implement measures to prevent forest fires 	
Harvesting of logs	Opr	Reduction in number of certain species (particularly in commercial and/or keystone tree species)	<ul style="list-style-type: none"> ▪ Keystone, endemic and rare woody plant species and snags will be retained ▪ Comply with the approved silviculture system and logging cycle ▪ The GFC approved Annual Allowable Cut for the operations nor the 20m³ limit per hectare should not be exceeded 	Lo, Rev, LT, Un, M, Sig
Environmental Aspect: Fauna				
Construction of roads, logs ponds, etc. and operational activities	Const	Habitat loss, destruction, fragmentation due to land clearing and noise	<ul style="list-style-type: none"> ▪ A portion of the Concession (24.5% - 92,186 hectares) will remain undisturbed. A minimum of 4.5% of the concession equivalent to 13,455 hectares of the productive forest will be retained in a pristine state as protected biodiversity reserve(s) protecting representative areas of all forest types, with reserves being large 	Lo, Rev, LT, Un, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<p>enough to maintain viable populations of plants and animals and wide-ranging animal species. An additional estimated 78,731 hectares (20% of concession) of un-usable and inoperable forests on high hills and steep slopes, and swampy areas, will be retained in an undisturbed state.</p> <ul style="list-style-type: none"> ▪ Ensure waterways are not blocked so as to allow for the free flow of water to prevent flooding of forested areas ▪ Ensure water quality of streams within and around the Concession is not compromised ▪ Width of roads will be limited and, if possible, canopy cover retained across smaller roads and skid trails to benefit arboreal animals ▪ Vegetation removal should be limited. Care should be taken to minimize the width of deforested areas and, if possible, retain canopy cover above logging roads and trails ▪ Refuges will be created in areas where ERT species are known to exist or are encountered during operations 	
Presence of workforce	Const/Opr	Loss of wildlife from hunting and conflicts with human	<ul style="list-style-type: none"> ▪ Employee education and notification will be implemented to reduce vehicle-wildlife collisions and conflicts ▪ Workers of SSILI would be prohibited from hunting, trapping, killing, harming or capturing of any wildlife ▪ Employee education and notification to be implemented to ensure workers are aware of the need to preserve 	Lo, Rev, LT, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			wildlife and to reduce wildlife/roadway conflicts <ul style="list-style-type: none"> ▪ Warning signs indicating hunting/capturing of wildlife is prohibited would be placed at strategic areas ▪ Any occurrences of wildlife trapping and trading observed will be reported to the EPA and Wildlife Management Authority 	
Socio-economic Environment				
Environmental Aspect: Health and Safety				
Construction and operational activities	Const/Opr	Risk of accidents from the operation of heavy-duty machines, portable mill and chainsaws, logging activities, etc	<ul style="list-style-type: none"> ▪ Ensure workers are properly oriented to the safety and health rules and guidelines ▪ Well equipped first aid kits would be provided at all work sites ▪ Employ a medical personnel (medic) to be stationed at the Base Camp and workers trained in first aid should be present at all campsites ▪ Adequate signage should be erected, especially in hazardous areas ▪ Machines are to be operated by competent, licensed and authorized personnel only and in a manner that does not endanger other employees or the Company's property ▪ The Emergency Response Plan would be made aware to all relevant personnel and the necessary training and resources required should be provided; ▪ Protective gears and clothes must be provided to employees and should be worn at all times during operation. 	Lo, Irr, LT, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
Operation of heavy duty equipment	Const/Opr	Exposure to excessive noise from the operation of machines	<ul style="list-style-type: none"> ▪ Use of protective gear by workers ▪ Control noise emission at source 	Lo, Irr, LT, Av, M, Sig
Housing facilities for workers	Const/Opr	Exposure to vector borne diseases	<ul style="list-style-type: none"> ▪ Provide potable water for employees ▪ Conduct periodic fogging to prevent mosquito breeding ▪ Educate workers on relevant diseases and preventable and treatment measures ▪ Providing medical supplies and personnel at Base Camp 	Lo, R, LT, Un, M, Sig
Environmental Aspect: Land Use				
Project implementation	Const/Opr	Land use conflict with other resource users allocated by the State, with traditional resource users and with the CI Conservation Concession and impacts on Guyana's commitments under the LCDS	<ul style="list-style-type: none"> ▪ SSILI to conduct regular monitoring of Concession to determine if there are any illegal activities, including mining and logging, and any evidence of such activities observed will be communicated to the relevant regulatory agencies ▪ SSILI intends notify authorities of any emerging issues and work with public agencies to address same ▪ SSILI intends to maintain a cordial relationship with CI and frequently engage the NGO on planned activities as it relates to the developmental and operational activities of the Company ▪ The Company will abide by the guidelines set out in Section 10 of the Code of Practice for Timber Harvesting to prevent and resolve conflicts or any other social issues which may emerge ▪ SSILI does not intend to prevent Amerindians from accessing the Concession area 	Ex, Rev, LT, Av, M, Sig

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			<ul style="list-style-type: none"> ▪ The NRDDDB and the communities would be kept abreast of the development plans of the project would also be consulted by SSILI for advise based on their experiences within the project environment in the planning and implementation of the project 	
Environmental Aspect: Community Values				
Influx of workforce	Const/Opr	Inappropriate interaction with communities, crime, use of alcohol and disagreeable behavior	<ul style="list-style-type: none"> ▪ SSILI will respect the legal, social and ecological integrity of all Amerindian lands ▪ The communities would be kept abreast of the development plans of the project ▪ SSILI to ensure that personnel are properly informed on the correct protocol for interaction with the local communities ▪ SSILI to ensure workers interference with the communities is minimal ▪ Drugs and alcohol use by workers within the Concession would be prohibited 	Ex, Rev, LT, Av, M, Sig
Environmental Aspect: Employment				
Hiring of workforce	Const/Opr	Increased and long term employment, especially for local communities	<ul style="list-style-type: none"> ▪ Members of the communities to be given priority for employment by SSILI ▪ SSILI will ensure women are included in its workforce ▪ Adequate medical and insurance coverage to be made available to all employees ▪ A rotational system of employment to be implemented ▪ SSILI to work with educational 	Ex, Rev, LT, Av, M, Sig (Positive)

Activities	Phase	Potential Environmental Impacts	Recommended Mitigation Measures	Impact Significance after Mitigation
			institutions such as the Bina Hill Institute and the Annai Secondary School to identify persons who can be sponsored by the Company to pursue further training in the field of Forestry at institutions such as the Guyana School of Agriculture.	
Environmental Aspect: Archaeological Resources				
Construction and operational activities	Const/Opr	Possibility of exposing sites of archaeological & anthropological significance with the consequences being damage and desecration	<ul style="list-style-type: none"> ▪ If any remains are found all activity in the vicinity will cease immediately ▪ The find location will be recorded, and all remains will be left in place ▪ SSILI will make contact with the Walter Roth Museum and the National Trust of Guyana immediately ▪ SSILI will coordinate with the relevant personnel to determine the significance of the findings and assess appropriate mitigative options 	Lo, Irr, LT, Av, M, Sig
Environmental Aspect: Security				
Project implementation and development		Robberies, loss of equipment and parts due to the presence of unfavourable elements	<ul style="list-style-type: none"> ▪ SSILI to employ and maintain its own security personnel ▪ SSILI to develop working relationship with the police at Annai ▪ SSILI to conduct in-house training for staff on safety and security procedures ▪ Restrict movement in and out of the Concession to staff and authorized personnel and maintain records of movement of vehicles and personnel ▪ Ensure all communication equipment are adequately maintained 	Ex, Rev, LT, Av, M, Sig

Impact Significance Parameters

Lo – Localised	Ex – Extensive	Rev – Reversible	Irr Irreversible
ST – Short Term	LT – Long Term	Av. – Avoidable	Un - unavoidable
Sig – Significant	Insig. – Insignificant	M. – Mitigable	UM – Unmitigable

Phases

Const – Construction

Opr – Operational

7.4 Potential Impacts of Project Alternatives

As was stated in Section 3, three (3) alternatives to the project were considered. The options identified are:

1. No Project;
2. Harvesting of NTFPs; and
3. Location of Primary Processing.

The potential impacts each of the alternatives considered were also assessed and are discussed below.

7.4.1 No Project

If there is no project, then the area will remain as is. There will be some benefits to this option such as the forest remaining intact, unless allocated for some other use by the Government. Thus, this would result in the avoidance of the potential impacts of the project on the environment and avoidance of potential social conflicts that can arise.

On the other hand, there can also be some negative impacts such as SSILI having to seek an alternative source of materials to support its planned business model. As was indicated earlier, the Company plans to harvest the Concession to secure raw materials needed for a sawmilling operation and other downstream processing plants in the manufacture of high quality tropical hardwood furniture. The project is designed to produce top quality air and kiln dried & dressed lumber for world class furniture manufacturing and building construction projects. If the project does not go ahead, the Company will have to seek another source of material. Therefore, there will be a loss of income and revenue for both the Company and the Government of Guyana. The opportunity for employment that is in excess of 300 persons, with a significant amount coming from the nearby communities, will be lost, along with the potential training and skills development. The transfer of technology, which SSILI intends to bring to Guyana, would also be lost. Thus, no development whatsoever will occur in the general area.

However, the GFC is promoting sustainable management of Guyana's forest resources. As part of its mandate, GFC has been encouraging sustainable forest operations for the promotion of social and economic development while at the same time safeguarding the integrity of forest resources. This is especially important since there is an increasing demand for wood and wood products both locally and overseas. Moreover, to ensure sustainable utilization, the GFC issues forest concessions to companies and individuals to harvest the forest, while monitoring the activities for compliance with all requirements. The SSILI Concession was allocated as part of this effort by the GFC. Additionally, the project implementation will also have other significant benefits to the communities, the Company, and the country as a whole.

7.4.2 Harvesting of NTFPs

The extraction of NTFPs was considered as another alternative to the timber extraction proposed by SSILI, given that the parent company is involved and is experienced in furniture manufacturing and since SSILI also intends to manufacture furniture from materials extracted from within the

Concession. NTFPs found within the Concession which can be used for furniture manufacturing includes nibbi (*Heteropsis spp*) and kufa (*Ciusio spp.*). Also, this option will promote the use of NTFPs, while allowing the timber stock and standing forest to remain. There may also be fewer impacts on the environment.

However, the harvesting of these NTFPs alone cannot sustain the planned investment of the Company and will not satisfy its current needs. The Company has to secure raw material for a sawmilling operation and other downstream processing plants to manufacture high quality tropical hardwood furniture. Harvesting of NTFPs only cannot satisfy this need.

Therefore, if the Company should harvest NTFPs, the activities will have to be on a large scale to support its operation and investments. As such, to harvest the NTFPs, the Company will have to establish facilities within the forest, including a base camp and access within the forest. Access to the area will also have to be constructed and a significant workforce would be introduced to the site. In this regard, the impacts to the forest from the harvesting of NTFPs in this area will be similar to the impacts associated with the harvesting of timber, with less benefits and economic returns.

It should be noted that, during the community consultations, the communities closer to the project area indicated that they would harvest NTFPs such as nibbi and kufa on a seasonal basis, to use for domestic production of baskets and mattapee. Due to this, they requested that if access is available, the residents should be given priority to remove these materials from areas to be logged within the Concession. Based on this request, if SSILI should concentrate on the harvesting of NTFPs only, this will deny the local residents the opportunity to benefit from harvesting of these materials within the project area, which would now be possible as a result of the increase in access.

7.4.3 Location of Primary Processing

The Company intends to conduct primary processing within the Concession at the Base Camp. Processing will be done utilizing a portable mill and chain saws.

The option was considered to transport the logs directly to the main processing facility to be established. However, it would be more economically feasible to cut the logs into squares at the Base Camp, thus reducing the volume for transportation. This would allow for the more usable materials to be transported while the waste and materials which will not be utilised to remain within the forest. Given the distance that needs to be traversed, the fuel consumption, as it relates to the material transported, would be less, resulting in less emission to the air. Lower road maintenance would also be required. Primary processing of logs within the forest would allow for more process-related waste generated, including wood ends, barks and saw dust to remain in the forest, rather than being generated at the main processing facility and requiring disposal at that location.

7.5 Cumulative Impacts

A cumulative impact occurs when the net effects from a project (effects minus mitigation measures) are added to other past, present and reasonably foreseeable future environmental net effects from other actions. From a public perspective, cumulative impacts are often more important than the incremental effects from individual projects and, although a single project could prove to have significant effects on human or ecological health, the greater concern is the significance of effects from all activities occurring within the relevant spatial and temporal boundaries. Cumulative impacts are primarily focused on the actual effects that a project will have on human and ecological health.

In order to assess the cumulative effects associated with the SSILI logging project, it is necessary to identify which key activities associated with the proposed project are likely to interact with surrounding past, current or future activities. These activities are identified in Section 7.2.

To effectively assess the potential cumulative effects caused by the proposed SSILI logging project, the following was considered in project areas:

- past projects and activities;
- existing projects and activities; and
- reasonably foreseeable projects and activities.

7.5.1 Potential Interactions with Past Activities

As was stated previously, the Concession area is more or less intact. The only known land use was balata exploitation in some parts of the Concession. The balata (latex of the Bulletwood tree – *Manilkara bidentata*) trade in the Rupununi commenced on a large scale in the late 1800s but started to decline in the 1940's due to the replacement of balata with synthetic substitutes; the export market collapsed in the 1980's and as a result, the industry rapidly disappeared (Baldwin 1946: 44). During field activities and community consultations it was determined that some areas of the Concession were utilized during this trade to exploit balata. However, there is no evidence of this trade within the Concession, except for trees which had markings from the balata exploitation. As such, it can be concluded that there was no residual or long term impact of this trade on the environment in the project area.

In addition, there has been no previous mining activity within the Concession. Residents from the villages indicated that, although they would harvest NTFPs seasonally, as well as fish and hunt, they would not venture far up river to the Concession area.

As such, there are no known effects from activities in the vicinity of the property that are likely to interact cumulatively with activities proposed by SSILI.

7.5.2 Potential Interactions with Existing/Current Activities

In the past, activities within the project area were extremely limited. However, there are currently no activities within the Concession area. There are no mining activities or properties within the Concession but mining claim notices were observed along the banks of the Essequibo River in the vicinity of the Concession. Nonetheless, GGMC indicated that there is currently a moratorium on river mining in the Upper Essequibo and Rupununi Rivers and applications for land prospecting and mining are awaiting a presidential decision. Therefore, there are currently no legal mining properties within and around the Concession although, a company known as Pharsalus Inc. has an Exploratory Permit for Radio Active Minerals and Rare Earth Elements, but has no operation on the ground within the Concession.

As was discussed earlier, no residual environmental and social effects are predicted for the logging operation, with the proposed mitigation measures in place. Since there are no current activities, no cumulative effects are anticipated, or possible.

7.5.3 Potential Interactions with Future Activities

There are no known planned projects for the Concession area. The only known activity which can occur legally is the exploration for radioactive and rare earth elements in the northern portion of Part A of the SSILI Concession. However, it is not anticipated that this activity will have any significant environmental impact. At this point in time, SSILI is not aware of any viable mineral occurrences/commodities e.g. gold or diamonds, that exist in these areas and there are no development plans registered with any government agency responsible for the area. Mining

activities are not likely in the immediate future, given the Government's decisions. On this basis, it is concluded that there are no planned activities that would interact with the proposed project to cause a cumulative environmental/social effect within the Concession.

North of the Concession area the GFC has issued SFEPs to two Companies, Baishanlin International Forest (SFEP 01/11) and Sherwood Forrest Inc. (SFEP 01/07). These companies are yet to commence any work on the ground. When logging commences in these areas in the future, it would contribute overall to increase logging being conducted at any one time within the wider area. However, this should not present an environmental problem as no residual environmental and social effects are predicted to occur as a result of the project, especially since all logging activities are highly regulated and are done under strict guidelines to ensure sustainable utilization and proper environmental management.

SECTION EIGHT

**ENVIRONMENTAL MANAGEMENT
PLAN**

8.1 Introduction

The activities to be conducted for the implementation of this project, during both the construction and operational phases, must be done in compliance with the legislation and guidelines outlined in Section 6. In particular, compliance with the Environmental Permit, GFC's Code of Practice for Timber Harvesting Operations, principles of RIL and sustainable forest management (SFM) guidelines. In this regard, this EMP has been prepared to guide the project's activities. The EMP identifies activities to be undertaken in an effort to mitigate the principal adverse effects of the project. The Plan describes the way in which the main environmental impacts of the project can be managed, and prescribes appropriate mitigation measures to be adopted during the construction and operational life of the project. These impacts are identified and discussed in Section 7. All logging related activities will be conducted in accordance with the Code of Practice for Timber Harvesting, which prescribes practical measures to be complied with. As such, this EMP seeks to complement the Code of Practice and present some additional measures.

The objectives of the EMP are to:

- Set out measures and strategies to address the environmental issues related to the construction and operational activities of the project.
- Formulate a monitoring plan to ensure that the activities are executed in accordance with the environmental requirements and to identify the impacts of the project with a view to implementing any necessary further action to minimize negative impacts.

To complement this EMP, a Monitoring Plan and an ERP have been developed and are outlined in the following sections.

This EMP is complemented by the Plans listed below and which are outlined in the subsequent Sections:

- Monitoring Plan
- Emergency Response Plan
- Closure Plan

8.2 Responsibility

SSILI has a social and environmental responsibility to implement this EMP along with all other environmental requirements, including those outlined in the Environmental Permit. A HSE Officer will be hired to coordinate environmental management efforts and implement the EMP. In addition, the Forest Manager will have the overall day-to-day responsibility for ensuring the forest operation is in compliance with the requisite environmental and forest legislation, guidelines and standards.

8.3 Impact Mitigation

Mitigation measures are identified to prevent, minimize and manage the adverse environmental impacts discussed in Section 7. These measures are outlined below and pertain to both the construction and operational phases of the project.

8.3.1 Physical Environment

8.3.1.1 Erosion, Sedimentation & Compaction

During the construction and operational phases of the project, there will be some activities which will affect the soil, as was discussed in Section 7.3.1.1. These activities are part of the standard

operating procedure for any forest harvesting operation of this size, and will contribute mainly to soil erosion, compaction and sedimentation. Though these impacts are limited and restricted to certain operational areas, only the GFC, as part of its forest planning and monitoring framework, has developed guidelines such as the Code of Practice for Timber Harvesting to ensure that these impacts are minimized. Practical measures to prevent the impacts to soil are outlined in the Code of Practice for Timber Harvesting in Sections 3.2 (slopes), 4.1 (road construction, 4.2 (drainage), 4.3 (road maintenance), 4.4 (watercourse crossings), 4.5 (log markets), 4.6 (burrow pits), 5.2 (skid trails construction), 5.8 (weather condition limitations) and 6.0 (post harvesting). These measures will be complied with. In addition to the measures prescribed in the Code of Practice the following will also be implemented:

- Minimize removal of vegetation to operational areas or to areas where is absolutely necessary;
- Encourage re-vegetation in areas where possible to prevent soil exposure;
- Landscaping of project sites should be done to reduce sloping;
- Construct a drainage system to adequately drain storm water;
- Avoid discharging of storm water runoff directly into nearby water course. This discharge can be channeled through the vegetative area which will serve as a natural filter for any sediment contained;
- Use the appropriate and most suitable machines/equipment for all earth works;
- Designate routes for heavy duty equipment to prevent compaction of soil;
- If ponding is observed due to compaction, it may be necessary to scarify the topsoil;
- Consider the weather pattern before initiating major earthworks. Earthworks should be avoided during periods of heavy rainfall. Restrict the use of heavy duty equipment and hauling trucks on roads during periods of heavy rainfall;
- Conduct most of the field activities during the dry season to avoid having to deal with flooded conditions which usually occur during the wet season;
- Locate, operate and decommission burrow pits in accordance with GFC guidelines; and
- Bunding of stockpiles should be considered if storage is required for an extensive period.

8.3.1.2 Noise

Noise is not expected to be a significant environmental impact from the operation, especially since there is an absence of permanent settlements in and around the SSILI Concession. However, there is still the need to implement measures to prevent and minimize noise, especially as it relates to impacts to workers and wildlife. The limit prescribed in the GNBS Standard for industrial operations is 100dB during the day and 80dB during the night at the property boundary or fifteen meters from the source, whichever is closer. During the construction phase the levels are 90dB during the day and 75dB during the night. Compliance with these limits is necessary to ensure the impacts on the environment and human health, particularly for workers, are reduced. Therefore, the following measures must be implemented to reduce the impacts of noise:

- Provide hearing protection to employees exposed to high noise levels: ear muffs for employees in the workshop and processing area and earplugs for employees who operate heavy duty machines;
- Control of noise levels at source should be done via installation of silencers on exhaust system of generators;
- Noisy activities should not occur in close proximity to the housing areas during the night or on Sundays and Holidays;
- Noisy equipment such as generator and the portable mill should be sited away from living quarters;
- Enclose noisy equipment in sound proofing material, if necessary;
- Ensure that machinery and equipment are working efficiently and have installed the required muffler devices; and
- Warning signs should be erected in areas of high noise levels instructing employees to wear earmuffs or earplugs as required.

8.3.1.3 Dust

As with noise, dust is also not expected to be a significant environmental impact from the operation, especially since there is an absence of permanent settlements in and around the SSILI Concession. Nevertheless, there is still the need to implement measures to prevent and minimize dust levels, especially as it relates to impacts to workers. Airborne particulate matter, as discussed in section 7.3.1.3, can result from the execution of project activities. The associated impacts, even though localized, must be mitigated to reduce the effect on the environment. Thus, the following measures must be implemented to reduce the impacts on noise and dust:

- Personnel working within dusty environments should be required to use dust masks;
- Siting of the processing area at the Base Camp away and downwind of the living quarters;
- Institute a speed limit for vehicles around the Base Camp to reduce the quantity of airborne particulate matter;
- During dry periods it may be necessary to soak routes traversed by vehicles and equipment, especially in close proximity to the Base Camp;
- No open dumping of wood waste should be done; and
- Sawdust should not be allowed to accumulate.

8.3.1.4 Fuel, Lubricants and Chemicals Contamination

During the construction and operational phases, special consideration for the transportation, handling and storage of fuel, lubricants and wood treatment chemicals must be given as these are classified as hazardous substances. To reduce the risks on the environment and human health, preventative actions must be taken and/or mitigative measures implemented. Measures are outlined in the GFC's Code of Practice for Timber Harvesting Operations to ensure fuel, lubricants and chemicals are properly managed. These measures are outlined in the Code of Practice in Sections 7.1 (workshop facilities), 7.2 (field servicing and maintenance), 7.3 (fuel, oil

and hazardous chemicals handling and storage), 7.4 (waste management) and 9.6 (hazardous chemicals). In addition to these measures, it is necessary to implement the following measures to reduce the impacts on the environment, in general, and in particular, contamination of soil and water from accidents and/or spills. If a spill does occur, measures are outlined in the ERP to respond adequately.

- Designate a site away from waterways, the main thoroughfare, housing and the general working area to store fuel. The designated area will be at least 100 m from work areas and 200 m from any stream;
- Ensure fuel and lubricants are stored within a bunded area with an impervious surface. The secondary containment should have the capacity of 110% of the largest storage tank. The tanks should be stored above ground and covered by a shed to prevent rainwater accumulation in the containment;
- The fuel storage tanks should be regularly monitored for leaks;
- When handling fuel, care should be taken to prevent spillage and leaks, especially during off loading and refueling. All nozzles and hoses should be properly secured and stored away to avoid spills and/or accidents;
- During the filling/refilling process drip pans can be placed under the fuel/vehicle to prevent any possible contamination and subsequent run off of fuel due to leaks;
- Regular maintenance should be conducted to ensure proper functioning of machines, equipment and vehicles to avoid unnecessary leaks;
- Ensure necessary preventative measures such as adequate signage, fire extinguishers and/or sand buckets are placed in and around the fuel storage area. The type of fuel stored in tanks should be indicated and the signage should include 'No Smoking' and 'Highly Flammable';
- Spill kits should be made available in the event of spillages. The kits should be placed in strategic locations that are accessible to key personnel including drivers, security officers, and health and safety officer. Workers, mechanics and other staff should be trained in the proper use of these kits through the executions of drills. All fuel transport trucks should be equipped with spill kits. Spill kits should contain sorbents with high absorbing capacity (up to 300 litres). The absorbent material should be in the form of booms, pillows and pads and the kits should include a pair of PVC gloves, a disposal bag and operating instructions;
- The flooring of the workshop area should be impervious to prevent contamination;
- Ensure waste oil is collected and stored in covered containers on a bunded and impervious surface. Waste oil drained from vehicles and machinery will be collected by pans and transferred to storage drums located in the designated area. Options for disposal are further described in the Waste Management Section;
- If any chemicals are to be used to treat wood and wood products, these should be stored in a well ventilated room with an impervious surface and on shelves. Avoid siting the storage area next to water ways and housing area. Material Safety Data Sheets (MSDS) should be made available for all chemicals used. The MSDS should also be submitted to the EPA and the Pesticide and Toxic Chemical Control Board;

- Any known hazards and health risks associated with the use/handling/disposal of or exposure to such chemicals should be clearly stated, and workers using such chemicals should be adequately trained on the proper handling procedures; and
- Establish and maintain a register of all hazardous materials and chemical at the operation.

8.3.1.5 Water Resources

Water contamination can result from the implementation of various activities during the construction and operational phases of the project. Measures to protect water resources are included in various sections of this EMP, as well as in various sections of the Code of Practice for Timber Harvesting (Sections 3.3, 4.2, 4.4, 7.0, 8.0, etc. To reduce the associated impacts on the water resources, the following measures should be implemented:

- Implement measures outlined in Section 8.3.1.5 to ensure erosion and sedimentation is prevented/minimized;
- Ensure adequate drainage around the Base Camp and other facilities;
- Ensure fuel and other chemicals are managed and stored as recommended in Section 8.3.1.4;
- Ensure workshop area is covered so as to prevent storm water/runoff being contaminated;
- Ensure grey water from the washroom/kitchen is discharged via a soak away system. Sewage waste should be disposed of via septic tanks. These measures ensure waste water is treated before being discharged into the environment;
- No dumping of solid waste into water bodies should be allowed. All waste should be managed as outlined in Section 8.3.1.6;
- Restrict logging within buffer zones along all waterways;
- Conduct most of the field activities during the dry season to avoid having to deal with flooded conditions which usually occur during the wet season;
- Construct bridges and culverts of durable hardwood logs and sawn timber and their exact location and construction should be in accordance with the GFC's Code of Practice for Timber Harvesting Operations. In particular, care should be taken to ensure that downstream sedimentation during construction is minimized and temporary water-crossings are to be decommissioned after their period of 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; and
- Road culverts should be aligned perpendicular to the road and horizontal to the flow of water with an inclination side (sump) of 5% to 10% to avoid flooding of the roadway. Main roads culvert should be provided with catch basin on both ends where necessary to avoid silting.

8.3.1.6 Waste Management

The project will generate waste which, if not managed properly, can result in soil and water contamination, contribute to ill health, and affect the aesthetic of the area.

Waste piles often present an eye sore and can affect the aesthetic of any environment. The improper disposal of waste, especially kitchen and food waste can result in mal-odour and attraction of vermin. Waste to be generated includes domestic garbage which usually consists of a mix of bottles, bags, cans, boxes, styrofoam, plant residues, excess food and old clothing and paper.

Liquid waste will also be generated including sewage waste and waste water from bathing and washing.

Hazardous waste to be generated includes used batteries, waste oil, filters, oil containers and contaminated soils.

The different waste types require different disposal methods. The following table outlines the various types of waste that will be generated and their recommended disposal method.

Table 8-1: Waste types and recommended disposal methods

Waste Category	Waste Type	Disposal Method
Liquid Waste	Sewage	Liquid waste will be generated from the housing facility. Sewage will be disposed of via septic tanks. Septic tanks would be constructed in accordance with the GNBS Code of Practice for the Design and Construction of Septic Tanks and Associated Secondary Treatment and Disposal Systems. During the construction phase when Pit Latrines may be utilized, these should be constructed in accordance to the Public Health Ordinance of 1953.
	Waste Water from Kitchen/Bathing Facilities	Wastewater from these facilities should be channeled through a trap to capture the solid particles and fats. The water should then be drained into a soak away system. The traps should be cleaned regular and the materials recovered should be buried.
Solid Waste	Construction Waste	Construction waste includes materials remaining from the construction of culverts, bridges and roads, Base Camp, etc. This material will be sorted and reused as much as possible.
	Kitchen Waste	Kitchen waste should be buried in pits. Pits should be covered on a regular basis to avoid mal-odour and attraction to animals/vermin. Burial of waste should not be done within 100 metres from water courses. Separate bins will be placed within the kitchen and eating areas to collect food waste.
	Other Solid Waste	This includes waste such as paper and cardboard from the office buildings and stores, empty plastic bottles, cans, etc. These wastes will be collected via bins placed at strategic points around the operation to be used by workers. The bins will be emptied on a regular basis. If significant quantities of these waste are

Waste Category	Waste Type	Disposal Method
		<p>produce consideration will be given to accumulation and recycling.</p> <p>Scrap metals will be scavenged by the operations. Excess metal will be sold to scrap metal dealers.</p> <p>A separate pit from that used for food waste will be dug to bury solid waste. This pit would be located in excess of 200m from watercourses and will be covered when full.</p>
Wood Waste from Processing	Sawdust and Bark	This waste should not be allowed to accumulate in significant quantities and can be used for landfilling or even road maintenance. Any excess sawdust should be burned in a control manner in the pit located away from vegetation.
	Wood Ends and Strips	This waste should be used for other purposes such as construction or further processed into downstream valuable commodities and can be given to the Amerindian communities for this purpose.
Hazardous Waste	Waste Oil	Waste oil generated should be collected and stored in covered containers in an area as described in Section 8.3.1.4 until a suitable/approved disposal method is found. Significant quantities of waste oil should be removed from within the concession to a suitable location to minimize the potential for spillages/contamination within the forest.
	Used Batteries	Used batteries should not be disposed in the environment. These batteries should be collected and returned to the suppliers to be shipped for recycling or if significant quantities are generated SSILI can explore the possibility of selling directly.
	Used filters, oily rags,	The quantity of oily waste to be generated would be minimal and can be burned in small quantities in the burning pit.

8.3.2 Biological Environment

8.3.2.1 Flora

Some of the vegetation within the Concession will be cleared to facilitate the construction of roads, log ponds, and the Base Camp. Commercial species will also be removed from the forest as part of the harvesting operation. Only a small portion of the Concession will be cleared though, as discussed in Section 7.3.2.1. Although this impact is unavoidable, the following measures would be implemented to prevent and reduce any impacts of the project on the vegetation within the SSILI Concession:

- Land clearing and vegetation removal will be restricted to the operational areas;
- Previously cleared areas not being utilized such as log ponds, feeder roads, etc, should be re-vegetated using native species;
- Ensure that a portion of the Concession 4.5% equivalent to 13,455 hectares of the productive forest is retained in an undisturbed, pristine state as biodiversity reserves;

- Buffer zones will be observed along the perimeters of biodiversity reserves;
- An additional 78,731 hectares (20% of concession) of in-operable forests on high hills and steep slopes and 14,344 hectares of Liana Forest for a total of 93, 065 hectares will be retained in an undisturbed state;
- Refuges will be created in areas where ERT species are known to exist or are encountered during operations;
- All logging activities should be done in accordance with the GFC's Code of Practice for Timber Harvesting Operations, including RIL and SFM practices;
- Comply with the approved silviculture system and logging cycle;
- The GFC approved Annual Allowable Cut for the operations nor the 20m³ limit per hectare should not be exceeded;
- Keystone, endemic and rare woody plant species and snags will be retained;
- Ensure waterways are not block so as to allow for the free flow of water to prevent flooding of forested areas;
- Implement erosion control measures;
- Logging will be excluded from wetland areas;
- Establishment of buffer zones around, rivers, creeks and lakes;
- Forward road planning and ground surveys will minimise the area of forest clearance to construct roads;
- Potential for flooding of forest by the blockage of stream and rivers as a result of road construction will be mitigated by installing of culverts and bridges;
- Implement measures to prevent forest fires such as no open or uncontrolled burning of waste, no disposal of lighted cigarettes by workers, etc.;
- Burning of waste should be prohibited close to forested areas;
- All equipment and machinery must be adequately maintained to ensure peak performance and reduce the risk of accidental fires resulting from electrical short circuits and sparks; and
- Fire extinguishers should be installed at highly visible key locations throughout the site. All mobile machines should be equipped with chemical fire extinguishers and the following specific activities should be conducted by SSILL:
 1. Orientation of staff on fire response procedures and conduct fire drills;
 2. Installation of firefighting equipment;
 3. Training of all staff in effective fire fighting techniques and the use of firefighting equipment;
 4. Ensure that fire response procedures are posted in public places and all personnel are aware of them;
 5. Adequately maintain firefighting equipment;
 6. In case of fire, ensure that all camps and areas of work are evacuated;

7. Ensure all mechanisms are in place to deal with injured or physically challenged workers/employees;
8. Head count / roll call at fire emergency assembly point; and
9. Management of the evacuation exercise and emergency procedures.

8.3.2.2 Fauna

The SSILI Concession and its surrounding areas are noted to contain rich biodiversity, including fauna, as was outlined in Section 4.3. These include some species which are considered rare, threatened and endangered in other parts of the world. However, minimal impact to the wildlife of the Concession is anticipated given that the forest will largely remain intact, and activities will occur only in one compartment at any given time. Nevertheless, the following actions would be implemented to prevent and reduce any such impacts:

- Ensure a portion of the Concession (24.5% - 92,186 hectares) remain undisturbed. A minimum of 4.5% of the concession equivalent to 13,455 hectares of the productive forest be retained in a pristine state as protected biodiversity reserve(s) protecting representative areas of all forest types, with reserves being large enough to maintain viable populations of plants and animals and wide-ranging animal species. An additional estimated 78,731 hectares (20% of concession) of un-usable and in-operable forests on high hills and steep slopes, and swampy areas, to be retained in an undisturbed state;
- Ensure waterways are not blocked so as to allow for the free flow of water to prevent flooding of forested areas;
- Ensure water quality of streams within and around the Concession is not compromised. Maintain a 100m buffer between the operational areas and waterways;
- Width of roads will be limited and, if possible, canopy cover retained across smaller roads and skid trails to benefit arboreal animals especially spider monkey (*Ateles paniscus*) and brown-bearded saki monkey (*Chiropotes satanas*);
- Feeder roads and skid trails will be in short service only before being closed;
- Vegetation removal should be limited. Care should be taken to minimize the width of deforested areas and, if possible, retain canopy cover above logging roads and trails;
- Workers of SSILI would be prohibited from hunting, trapping, killing, harming or capturing of any wildlife;
- Employee education and notification can be implemented to ensure workers are aware of the need to preserve wildlife and to reduce wildlife/roadway conflicts;
- Warning signs indicating hunting/capturing of wildlife is prohibited would be placed at strategic areas;
- Any occurrences of wildlife hunting, trapping and trading observed will be reported to the EPA and Wildlife Management Authority;
- SSILI workers would act as concession guards by monitoring the area for illegal activities;
- Checkpoints will be placed along the road at strategic points to monitor and control access to the Concession area; and

- SSILI will collaborate with other existing concessionaires to the north (Baishanlin International Forest and Sherwood Forrest Inc.), as well as with the Amerindian communities and CI to monitor any illegal activities within the wider area, including the hunting/trapping of wildlife. A formal mechanism should be established amongst these stakeholders to ensure this monitoring is implemented and is effective;
- It is recommended that SSILI retain an ecologist as a Biodiversity Monitoring Manager to oversee planning and location of biodiversity reserves, to advise on biodiversity conservation issues, liaise with other conservation stakeholders, and undertake Forest impact monitoring on fauna, especially of ERT species and species sensitive to logging such spider monkey (*Ateles paniscus*).

8.3.3 Socio-economic Environment

8.3.3.1 Land Use and Other Conflicts

As was discussed in Section 7.3.3.1 the potential for significant conflicts to arise as a result of the implementation of the project is minimal, given that the project would not generate significant environmental impacts, that there are no other resources users (legally and illegally) within the Concession and there are no Amerindian Titled Lands bordering the Concession, nor the area is being used by Amerindians for traditional purposes. No new land use is expected within the area given that there is currently a moratorium on mining within the area and the GFC does not expect to grant areas further south of the Concession for logging purposes. Any major conflict from the project may arise as a result of the construction of the access road to the Concession. However, this issue will be addressed by the EIA Addendum to be prepared for the road once the alignment is finalized. Nevertheless, the following measures will be implemented by SSILI to ensure conflicts do not arise as a result of the implementation of the project, and any conflict which may develop is settled amicably:

- SSILI will conduct regular monitoring of the Concession to determine if there are any illegal activities, including mining and logging, and any evidence of such activities observed will be communicated to the relevant regulatory agencies;
- SSILI intends notify authorities of any emerging issues and work with public agencies such as the GFC, GGMC, Police, Ministry of Health, Ministry of Amerindian Affairs, Ministry of Local Government and Regional Development to address these issues;
- SSILI intends to maintain a cordial relationship with CI and frequently engage the NGO on planned activities as it relates to the developmental and operational activities of the Company. SSILI also intends to establish a mechanism with CI to facilitate effective monitoring of the wider project area, especially as it relates to any unplanned or illegal activities;
- The Company will abide by the guidelines set out in Section 10 of the Code of Practice for Timber Harvesting to prevent and resolve conflicts or any other social issues which may emerge;
- SSILI does not intend to prevent Amerindians from accessing the Concession area and the Company will respect the legal, social and ecological integrity to all Amerindian lands;
- The NRDDDB and the communities would be kept abreast of the development plans of the project once the plans are finalized. The NRDDDB as well as the communities would be consulted by SSILI for advise based on their experiences within the project environment in the planning and implementation of the project;

- Once the project is being implemented the Company will recruit someone to serve as the communities' liaison. This person will meet with the communities often to inform them about the progress of activities and to address any grievances which may arise; and
- It is recommended that a committee be established comprising of the resources users within the wider area to ensure proper management and coordination. This committee should include SSILI, CI, the communities of Rewa, Apoteri and Crash Water, and other concessionaires (Sherwood Forrests and Baishanlin International Forest) and should focus on integrated resource management and monitoring. Other areas for coordination and collaboration which should be considered are security, medical emergency, communications and transport.

8.3.3.2 Health and Safety

As was stated earlier, a HSE Officer will be hired. This person will, in addition to environmental matters, be responsible for ensuring sound occupational health and safety provisions and practices at the operation. SSILI intends to comply with all the requirements to ensure a safe and healthy work environment and will abide by the measures outlined in Section 9 of the Code of Practice for Timber Harvesting. In addition to these measures, the following OH&S measures must be implemented to reduce the impacts on workers during the construction and operational phases of the project:

- Establish and OH&S Committee to ensure compliance with the OH&S Act of 1997;
- Ensure safety rules, guidelines and the OH&S Act are posted at strategic locations;
- Ensure workers are properly oriented to the safety and health rules and guidelines;
- Well equipped first aid kits should be provided at all work sites;
- Employ a medical personnel (medic) to be stationed at the Base Camp and workers trained in first aid should be present at all campsites;
- Adequate signage should be erected, especially in hazardous areas;
- MSDS sheets should be made available for any chemicals used;
- Machines are to be operated by competent, licensed and authorized personnel only and in a manner that does not endanger other employees or the Company's property;
- The Emergency Response Plan (Section 10) should be made aware to all relevant personnel and the necessary training and resources required should be provided;
- Provide potable water for employees. The OHS Committee will have the responsibility of looking into issues of food safety and the provision of safe drinking water;
- Conduct periodic fogging to prevent mosquito breeding;
- Protective gear and clothes must be provided to employees and should be worn at all times during operation. Gear to be provided should include safety vest, hard hats, respirators, gloves and safety boots where necessary. Rain coats should also be provided; and

- Employees are required to wear safety equipment and protective clothing provided by the SSILI in designated areas as and when directed by Management. The appropriate gears recommended are outlined in the table below:

Table 8-2: Hazards and the suggested Personal Protective Equipment (PPE)

Objective	Workplace Hazard	Suggested PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety Glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and over head power cords.	Plastic Helmets with top and side impact protection.
Hearing protection	Noise, ultra-sound.	Hearing protectors (ear plugs or ear muffs).
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids.	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals.
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors.	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists, vapors and gases). Single or multi-gas personal monitors, if available.
	Oxygen deficiency	Portable or supplied air (fixed lines). On-site rescue equipment.
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration	Insulating clothing, body suits, aprons etc. of appropriate materials.

Source: The World Bank Environmental, Health and Safety (EHS) Guidelines

8.3.3.3 Archaeological Resources

Research conducted to date indicates that there are no sites of archaeological or anthropological importance within the SSILI Concession. Therefore, the likelihood of unearthing artifacts of archaeological and anthropological significance within the project area is quite low. However, in the event of such occurrence the following steps should be taken:

- All activity in the vicinity of the remains will cease immediately;
- The find location will be recorded, and all remains will be left in place;
- SSILI will make contact with the Walter Roth Museum and the National Trust of Guyana immediately;

- The company will coordinate with the relevant personnel to determine the significance of the findings and assess appropriate mitigative options;
- If the significance of the remains is judged to be sufficient enough to warrant further action which cannot be avoided, the Company, in coordination with the National Trust of Guyana and the Walter Roth Museum, will determine the appropriate course of such action. Relocation of the artifact for preservation and security reasons may be determined as an appropriate action;
- In the case of human remains, the appropriate authority will be contacted. In addition, a coroner and/or physical anthropologist may be involved if the remains are classified as an artifact. Options for removal and burial will be considered if the location must be disturbed; and
- The National Trust of Guyana will inform SSILI of when work may recommence in the area.

8.3.3.4 Community Values, Involvement and Employment

It is important for the Company to maintain a good relationship with the communities to ensure conflicts and disputes do not arise and to have a smooth working relationship. The communities closest to the Concession are those from the North Rupununi including Annai, Crash Water, Rewa and Apoteri. Some measures to be implemented to allow for a good relationship with the communities are outlined below:

- SSILI will respect the legal, social and ecological integrity of all Amerindian lands;
- The communities should be kept abreast of the development plans of the project once the plans are finalized;
- SSILI must ensure that its personnel are properly informed on the correct protocol for interaction with the local communities;
- Once the project is being implemented someone from the Company should be identified to serve as the communities' liaison. This person will meet with the communities often to inform them about the progress of activities and to address any grievances which may arise;
- The Company will abide by the guidelines set out in Section 10 of the Code of Practice for Timber Harvesting to prevent and resolve conflicts or any other social issues which may emerge;
- SSILI should ensure workers interface with the communities is minimal;
- Drugs and alcohol use by workers within the Concession should be prohibited;
- Members of the communities should be given priority for employment by SSILI;
- SSILI should consider the hiring of women in its operation;
- Adequate medical and insurance coverage should be made available to all employees;
- A rotational system of employment (turn-around) should be considered;

- SSILI should work with educational institutions such as the BHI and the Annai Secondary School to identify persons who can be sponsored by the Company to pursue further training in the field of Forestry at institutions such as the Guyana School of Agriculture. This should be done through a formal scholarship programme; and
- The Company should, as much as possible, source produce such as foodstuff from local communities to assist in improving the village economy.

8.3.3.5 Security

In opening up of the area and the introduction of economic activities, there may be the potential to attract criminal activities. In addition to criminal activities, with increased access, there is the likelihood of other illegal activities such as illegal mining and wildlife trapping and hunting. Given the remoteness of the area, criminal activities may be curtailed. Nevertheless, to safeguard workers and the Company's property the following actions should be taken:

- SSILI should employ and maintain its own security personnel who are to be trained and armed;
- The Company should develop a working relationship with the police at Annai;
- Conduct in-house training for staff on safety and security procedures and emergency response;
- Restrict movement in and out of the Concession to staff and authorized personnel and maintain records of movement of vehicles and personnel;
- Ensure all communication equipment are adequately maintained;
- Ensure field operations have radio communication equipment; and
- Establish regular call times with field operations.

8.4 Training

For effective implementation of the mitigation measures and for a safe and healthy work environment, it is important that training be provided to workers. SSILI will pursue a policy of employing a multi-skilled workforce. In-house and external training will be a priority to ensure safety, environment conservation, quality control and efficient production. Trainers from the Forestry Training Centre (FTC) will be invited at least twice per year to conduct training in RIL other techniques for better production recovery to avoid splits, heart (fiber) pull of timber and at the same time to minimize forest residual damage. The Company will conduct periodic training for its workforce in theory and actual field practice. It will be mandatory of applicants for jobs, especially operators and mechanics, to pass the qualifying test and have the necessary license and experience before being employed by the Company. The Company, in developing a strong education and awareness programme, will seek to integrate the lessons learned from institutions such as Iwokrama, NRDDDB and CI in order to properly educate its employees and reduce the risks associated with these kinds of developments.

Any new employee will undergo an orientation programme to ensure he/she fully understands the job requirements and employment conditions. This training will include health and safety requirements and practices.

In addition, training will be done in environmental management to ensure workers are aware of the requirements of the environmental management plan and their role and responsibilities. This training will also include emergency response procedures and covering the areas of fire, accidents and fuel spills. This training will be done as part of site induction procedure and will include, but would not be limited to the following:

- SSILI environmental requirements and environmental management measures;
- Workers role and responsibilities in environmental management;
- The need for maintaining natural vegetation. The preservation of vegetation will be included in the planning of activities such as movement of earth moving machinery and fire prevention control;
- The need to be alert for the presence of native fauna on the roads, particularly at night;
- The Company's 'No Hunting Policy' for workers;
- Importance of archaeological sites;
- Occupational safety and health measures and the use of PPE;
- Emergency response measures; and
- SSILI social responsibilities.

SECTION NINE

MONITORING PLAN AND MITIGATION COSTS

9.1 Monitoring Plan

The success of the mitigation efforts and the need for corrective action will depend on the results of the monitoring programme. Based on the principal issues and impacts identified during this study, as well as the recommended mitigation measures, a number of parameters will be monitored during the implementation of the project. This Monitoring Plan identifies a number of parameters to be monitored, along with, the frequency and location where such monitoring will take place. Based on the principal issues and impacts identified, the following plan for monitoring will be adopted:

Table 9-1: Monitoring Strategy

Parameter	Institution Responsible	Frequency	Location of Monitoring
Physical Environment			
Weather <ul style="list-style-type: none"> ▪ Rainfall ▪ Temperature ▪ Humidity ▪ Wind ▪ Pressure 	SSILI EPA	Daily	At the Base Camp
Air Quality <ul style="list-style-type: none"> ▪ Evidence of dust accumulation and suspended particles through visible observation 	SSILI	Daily	Operational areas within the concession including haul roads and Base Camp
Water Quality <ul style="list-style-type: none"> ▪ Temperature (°C35) ▪ pH (6.5-8.5) ▪ Conductivity (us/cm) ▪ Turbidity (ntu 10) ▪ Oils/Grease (mg/L10) ▪ TDS (mg/L 200) ▪ Dissolved Oxygen (≥4.0) 	SSILI EPA	Biannually Annually	The Rewa and Essequibo Rivers as well as creeks within and around the active operational areas in the Concession. Locations will be adjusted based on the progress of activities within the Concession.
Noise <ul style="list-style-type: none"> ▪ Decibel (100 dB during the day and 80 dB during the night) 	SSILI EPA	Biannually Annually	Around Base Camp and active logging compartments
Waste Management <ul style="list-style-type: none"> ▪ Compliance with Waste Mang't Plan ▪ Waste Accumulation ▪ Littering 	SSILI EPA	Weekly Annually	Waste receptacles and disposal and storage areas

Parameter	Institution Responsible	Frequency	Location of Monitoring
Biological Environment			
Flora/Canopy Openings <ul style="list-style-type: none"> ▪ Retention of seed and keystone trees ▪ Biodiversity reserve integrity ▪ Protection of small trees ▪ Forest Damage 	SSILI GFC	Annually	Active logging areas, permanent sample plots and biodiversity reserves within the Concession
Wildlife <ul style="list-style-type: none"> ▪ Hunting ▪ Trapping ▪ Presence and distribution and impacts of logging on ERT Species 	SSILI	On Observance Annually – Wet and Dry Seasons	General Project Area Logged compartments pre- and post-harvesting and undisturbed forest, including biodiversity reserves
Socio-Economic Environment			
Health and Safety <ul style="list-style-type: none"> ▪ Use of protective gear by staff ▪ Condition of fire-fighting stations and equipment ▪ Adequate and appropriate signage for emergencies ▪ Location of Emergency Procedures ▪ In house training to keep employees up to date with various safety procedures ▪ Health conditions of staff, with particular interest to respiratory ailments ▪ Maintenance of a well equipped First Aid Kit 	Ministry of Labour GFC SSILI	Biannually Biannually Daily/Weekly	Entire Operation Areas
Employment and Social Benefits <ul style="list-style-type: none"> ▪ Number of residents employed from the surrounding areas ▪ Number of persons trained ▪ Extent of staff turnover 	SSILI	Annually	Entire Operation
Land Use <ul style="list-style-type: none"> ▪ Illegal land use within and 			

Parameter	Institution Responsible	Frequency	Location of Monitoring
around Concession <ul style="list-style-type: none"> ▪ Mining activities ▪ Vehicular travel within Concession 	SSILI GFC	Ongoing	Entire Project Area

It should be noted that the collection of weather data was included in the monitoring plan at a request by Hydromet during the stakeholders' consultations. Hydromet indicated that they have no immediate plans to erect a weather station in the vicinity of the project area. As such, Hydromet requested that SSILI acquire a mini weather station to be established onsite. Hydromet has indicated that they would be willing to assist with the installation of the weather station and training if required.

The HSE Officer will be directly responsible for coordinating the monitoring activities and this individual will also liaise with the Forest Manager. The HSE Officer will report on his findings to the Occupational Health and Safety Committee at its monthly meeting and any serious non-compliances and matters that need to be addressed urgently will be brought to the attention of the General Manager immediately.

Monitoring records will be kept by the Company on-site and made available to EPA or other regulatory Authorities upon request. Monitoring results, which exceed national standards, will be immediately reported to EPA. Monitoring reports will also be submitted to the EPA as required.

It should be noted that for monitoring activities to be conducted by regulatory bodies such as the EPA, GFC and the Ministry of Labour, the Company is expected to facilitate these exercises by providing transportation and accommodation and making key staff available. However, the cost associated with sampling, testing and analysis is expected to be borne by the agencies.

It is also expected that the GFC will have stationed on the Concession a Forest Officer. This is a standard practice for TSAs. The personnel will be available to monitor the operations on an ongoing basis and report to the GFC.

This Monitoring Plan has focus on environmental parameters and health and safety requirements to be monitored. In addition, there will be a routine schedule for equipment monitoring and maintenance in keeping with equipment and machinery design standards and specification and manufacturers recommendations. However, different machinery and equipment will have different maintenance schedule. Fuel storage area will also be monitored on a weekly basis to detect leaks but these tanks will be elevated so any leak that occurs will be detected immediately.

9.2 Mitigation and Monitoring Costs

Table 9-2 below provides an indicative annual budget of estimated costs for mitigation and monitoring activities for the first year of operation. SSILI will maintain this annual budgetary allocation and at the end of each year revise the budget based on the previous year's experiences and price/cost changes. It is expected that some of these costs, which are indicated in US dollars, may already be catered for from other operational budget lines.

Table 9-2: Annual Budget for Mitigation and Monitoring

	Action(s)	Equipment/ Personnel/ Activities	Annual Cost (US\$)	Time Frame/ Frequency
Personnel	Hire personnel responsible for health, safety and environment	HSE Officer	20,000	Annually
Waste Management	Collection and disposal of garbage	Bins and garbage receptacles	2,000	Year 1
	Replacing and/or rehabilitating waste receptacles and general waste management	Disposal of Waste	1,000	Monthly
	Construction of liquid waste disposal facilities	Septic Tanks and Soak-away	5,000	Year 1
Water Quality Monitoring	Water quality tests such as pH, Temperature, Turbidity, Oils/Grease, DO, TDS, etc.	Samples collected and outsourced to Labs for analysis	2,000	Biannually
		Acquisition of testing equipment	3,000	Year 1
	Prevention of contamination	Building of berm, around the fuel storage tank, and impervious surface in workshop.	5,000	Year 1
Health and Safety	First Aid Kits	Acquisition of First Aid Kits	1,000	Annually
	Protective gear for workers e.g. gloves, overalls, hard hats, safety boots and ear muffs.	Acquisition of protective gears	8,000	Monthly
	Warning signs within key buildings and work site areas	Sign making	1,000	Annually
Security	Establishing and operating Checkpoints	Hire personnel to monitor checkpoints	20,000	Annually
		Construction of checkpoints	5,000	Month 1

	Action(s)	Equipment/ Personnel/ Activities	Annual Cost (US\$)	Time Frame/ Frequency
Emergency Response Equipment	Fire Extinguishers and Spill Kits	Acquisition and installation of extinguishers and spill kits	2,000	Month 1
	Communication equipment	Acquiring and installing radio-set	1,000	
Noise Pollution	Maintenance of generators	Personnel and supplies	5,000	Biannually
	Routine maintenance of equipment and machinery, with particular interest in the muffler devices	Personnel and supplies	9,000	Biannually
	Monitoring	Monitoring of noise levels using noise meter	1,000	Biannually
Weather Data	Collection of weather data.	Mini Weather Station	500	Year 1
		Installation and Training	1500	Year 1
		Collection and maintaining data	1000	Annually
Biodiversity	Monitoring of ERT Species	Personnel and resources	25,000	Annually
Training	Training of personnel e.g. in First Aid, environmental monitoring, fire safety and emergency evacuation.	Resources, personnel, materials, etc.	3,000	Annually
Incidentals and Emergencies	Response needed in event of accidents and emergencies.	Materials and personnel (depends on type/scale of incident or emergency)	10,000	Annually
TOTAL			US\$132,000	

SECTION TEN

EMERGENCY RESPONSE PLAN

Upon the implementation of this project the Company SSILI will comply with all legal obligations and maintain high environmental standards. The Company will also implement the Environmental Management Plan. However, although all reasonable measures would be taken to protect the environment and minimize risks, there may be occasions when an environmental issue may occur. In the event of such a situation, the reaction would be to ensure a prompt and effective response, and to minimize the effects.

10.1 Introduction

This ERP is intended for use by SSILI personnel and is based on hazards and potential incidents that could occur during the operation. This Plan describes the general types of emergency and actions to be followed, should an emergency occur during the construction and operational phases of the project. The ERP includes:

- Emergency Contact Details;
- Emergency Procedures;
- Description of an Emergency;
- Authority of Control;
- Scenario Description and Response; and
- Incident Reporting.

The above information will be provided to employees and placed at strategic locations within the project locations. The HSE Officer would have the responsibility for the coordination and execution of actions as they relate to the environment and health and safety. Furthermore, all staff will be made aware of the procedures that must be complied with in the event such an emergency occurs and periodic training will be conducted for the staff as outlined in Section 8.4 of the EMP, and including safety and emergency procedures such as emergency drills, etc. All personnel will benefit from occupational health and safety training and orientation and made to be aware of the potential hazards of their work area and to take necessary precautions to prevent these from occurring in the course of carrying out duties, as well as to follow good housekeeping practices to prevent accidents, fires and other emergencies. Training will be conducted on a biannual basis and would include areas such as occupational health and safety, fire prevention and use of fire fighting equipment.

10.2 Identification of an Emergency

An environmental issue would involve widespread actual or potential destruction or contamination of the environment and calls for immediate action. Some examples of events that would require the instigation of an emergency response procedure are outlined in the table below.

Natural Causes	Anthropogenic Causes
Flooding	Fuel spills from storage area
Forest Fires	Fuel tanker rollover, thus causing the spillage of large quantities of fuel
	Fires, including forest fires
	Accidents resulting in injuries to workers

10.3 Emergency Response Philosophy

The emergency response procedure is comprised of the following priorities for actions:

1. Protect human health and safety;
2. Protect and minimize the effect to the health and safety of wildlife;
3. Contain the spread of material to avert loss and damage to ecosystem;

4. Neutralize and reduce any noxious or hazardous materials; and
5. Commence clean-up activities and site remediation.

Due to their very nature, emergency response procedures intend to deal with events that were not anticipated or highly unlikely and since emergencies are not a planned part of an operation but can occur, it is necessary to cater for such events and take into consideration worst case scenarios. Furthermore, the principal objective of the ERP is the protection of the Company's personnel, individuals and the environment in the general area of influence of the project through the development of emergency response skills and systems. It is also important to recognize that some crises may have severe impacts and would require a response mechanism well beyond the capacity of what the Company can deliver and as such, support from other entities, including Government agencies, would be required.

10.4 Description of an Accident or Emergency and Response Procedure

An emergency is a situation in which injury to a person(s) and/or damage to the environment is involved thus requiring emergency service attendance and the Company reporting to the GFC, EPA, GPF or another oversight and regulatory body.

10.5 Emergency Contact Details

There are key institutions and agencies that would need to be contacted in the event that an emergency occurs. Table 10-1 outlines the contact information for the Company and key institutions relevant to this operation. Additionally, a list of companies which can provide medivac services if the need arises is included.

Table 10-1: Emergency Contact Details

Institutions	Contact Number
SSILI G/town Office	231 4715
SSILI Country Manager	629 3290
EPA	225 0506
GFC	226 7271
Guyana Police Force G/town	225 6411
Guyana Defence Force G/town	226 4664
Regional Democratic Council Region # 9	772 2018/772 2021
Air Services Ltd	222 4368
Roraima Airways	225 9648
Lethem Hospital	772 2206
Georgetown Hospital	227 8204

10.6 Emergency Procedures and Responsibilities

All personnel must be aware of potential risks and take steps to cope with hazards in their work area. In addition, all personnel are expected to alert security if they discover an accident, fire or spill, in keeping with the procedures set out in this Plan. However, only duly trained personnel should respond to fires or spills. Furthermore, response procedures shall be posted at strategic points in all work areas. Below are the main procedures in responding to an emergency.

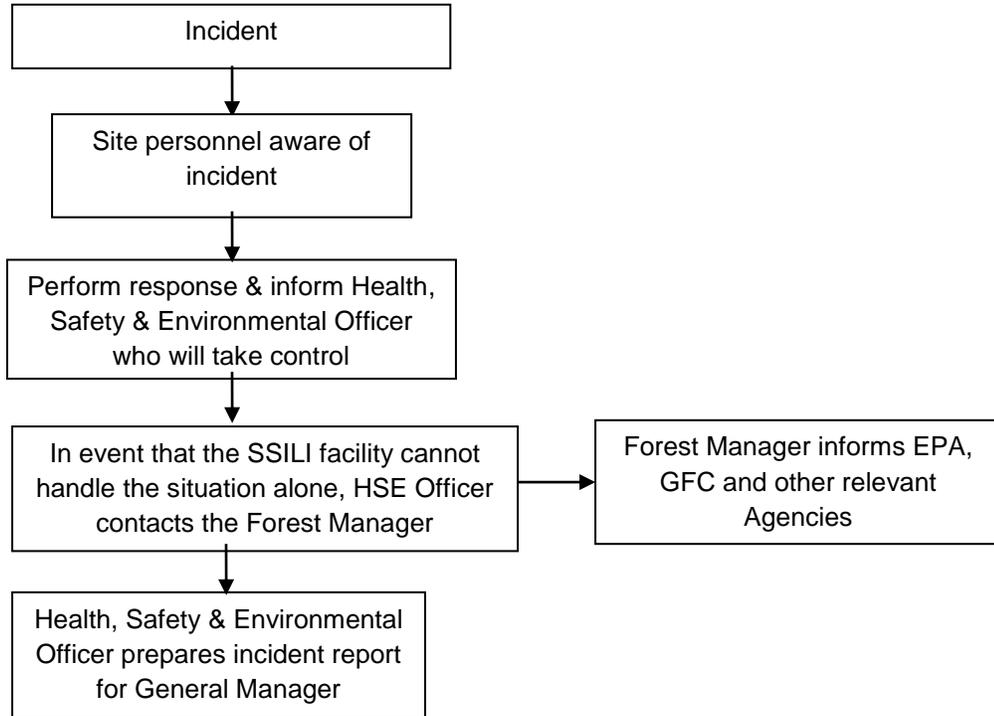


Figure 10-1: Outline of the Emergency Procedures

10.7 Emergency Response Personnel

The HSE Officer will be the key personnel responsible for responding and coordinating emergency response procedures. However, the Forest Manager will ensure the implementation and maintenance of the ERP, report to relevant authorities in the case of an emergency and review event analysis reports with the HSE Officer and relevant supervisors.

Various personnel will be trained in the main areas of emergencies relevant to this project, i.e., fires, fuel/oil spills and injuries/medical. These personnel will be responsible for prompt response and taking the lead in responding to emergencies in their respective areas.

All other personnel will be required to be alert for fire, fuel spills or injuries occurring in their work area and sound an alarm. All personnel will also be required to support the trained responders in the event of an emergency.

10.8 Emergency Response Equipment

SSILI will maintain well stocked and adequate First Aid Kits onsite. These kits will be located in a central area and clearly labeled. The contents of the kits will also be accompanied by proper instructions on usage.

SSILI will acquire a fire alarm/bell in the case on a fire. Fire-fighting equipment such as fire extinguishers and sand buckets, along with instructions on their usage, will be located at strategic points around the Base Camp and the logging camps, such as fuel storage area. Furthermore, the fire extinguishers to be used will be the dry chemicals type such as CO₂ or Halon. These strategic points should be clearly marked, being visible at all times, and employees should have

knowledge of their position. A water pump will also be acquired to deal with any major fire or forest fire which may occur.

Additionally, SSILI will acquire Spill Kits to clean up any spill which may occur. Given the nature of the operation, only spills relating to fuel and oil are expected to occur within the concession.

In the future, the Company plans to construct an airstrip, given the remoteness of the area. This airstrip will facilitate medivac trips from the area and also enable other emergency response if the need arises. In addition, the Company will maintain a vehicle onsite to be used in the case of an emergency.

10.9 Response Mechanisms

Emergency response measures will be applied to both minor and major incidents/accidents.

10.9.1 Minor Incident/Accident

In the event of a minor accident, the HSE Officer will be informed and take responsibility for on-site treatment utilizing First Aid facilities. An entry will be made in the Accident and Emergency Record book.

10.9.2 Major Incident/Accident

The following outlines the emergency response procedures for several types of emergencies that may occur during the construction and operation phases of the project.

10.9.2.1 Accident

For accidents, outside of those involving vehicles or machineries, the following procedures will be initiated:

1. Inform the HSE Officer and/or Forest Manager.
2. In the case of injury, assess the type of injury, e.g. broken limbs, trauma or loss of consciousness will be made.
3. Apply the appropriate First Aid treatment, based on the patient's type of injury.
4. Arrange transportation to the hospital. The hospital to be utilized will depend on the type and seriousness of the injury. For minor injuries the Lethem hospital will be utilized, however, for more serious injuries the person (s) will be transported to Georgetown.
5. Make an entry in the Accident and Emergency Record book.

10.9.2.2 Traffic Accidents

There will be movement of logging trucks and other heavy duty machinery onsite and within the concession. Therefore, the possibility of accidents occurring during the transport of logs and other materials exists. In the case of such an accident, the following procedures will be followed.

1. Inform HSE Officer and/or General Manager.
2. In the case of injury, assess the type of injury, e.g. broken limbs, trauma or loss of consciousness will be made.
3. Apply appropriate First Aid treatment, based on the patient's type of injury.
4. Arrange transportation to the hospital. The hospital to be utilized will depend on the type and seriousness of the injury. For minor injuries the Lethem hospital will be utilized, however, for more serious injuries the person (s) will be transported to Georgetown.
5. Arrange Medivac if injury is severe.
6. Make an entry in the Accident and Emergency Record book.

10.9.2.3 Fire

In the event of a fire, employees will initiate the following procedure, which they would be familiar with as a result of fire drills:

1. Immediately warn others and evacuate buildings or area.
2. Attack the fire, if safe to do so, with firefighting equipment provided without taking personal risks.
3. Contact the HSE Officer and/or Forest Manager.
4. Make quick decisions on containment. If it is a small fire, use the fire extinguisher. In the event of a larger fire, employ the water spray. If a fuel based fire occurs, move the fuel container from the inflamed area, unless this is impossible without personal risk, cool containers that are exposed to flames, from their flanks, with water even after the flames have dissipated to ensure the fire is out and stay away from the ends of the containers.
5. Withdraw immediately in cases of rising sounds coming from venting safety devices or any discoloration of the container due to heat.
6. HSE Officer to inform General Manager.
7. Make an entry in the Accident and Emergency Record book.

10.9.2.4 Fuel Spills

Fuel will be stored on-site for the generator and re-fuelling of trucks and other vehicles and machinery. In the event of a spill, the following action will be taken.

1. Inform HSE Officer and/or General Manager.
2. Stop the flow of the fuel, if possible, using the on-site Spill Kits.
3. Prevent the movement of people or vehicles into the affected area.
4. Treat spill with absorbent materials such as sand or sawdust and form a berm, if possible, to prevent the spill from spreading.
5. Collect absorbent materials and store it in a secured area with an impervious base and restrict access to the zone.
6. Make an entry in the Accident and Emergency Record book.
7. HSE Officer will prepare a detailed report.
8. Inform EPA and GFC (for spills greater than 2m x 2m).
9. If a significant spill which can affect downstream communities occurs, the residents should be informed.

10.10 Incident Reporting

After every incident/accident, a report will be required. The HSE Officer will be directly responsible for the preparation of such a report, regardless of the nature of the incident. The following are formats which would be used in preparing reports for both incidents and injuries respectively.

Figure 10-2: Accident/ Incident Record Form - Incidents

Simon and Shock International Logging Inc.		Date: _____
Record of Accident/Incident		No: _____
HEALTH, SAFETY & ENVIRONMENT MANAGEMENT INFORMATION		
1. Duty Station:	2. Location of Incident:	
3. Description of Accident/Incident		
4. Extent of Damages:		
5. Description of Action Taken:		
6. Follow-up Acton:		
Signature: _____		Date: _____
Title: _____		

Figure 10-3: Accident/ Incident Record Form - Injuries

Simon and Shock International Logging Inc. Record of Accident/Incident HEALTH, SAFETY & ENVIRONMENT MANAGEMENT INFORMATION	Date: _____ No: _____
TO BE COMPLETED BY SUPERVISOR	
1. Reason for Record: <input type="checkbox"/> Accident <input type="checkbox"/> Incident	
PERSONNEL AFFECTED	
2. Name: _____ <small style="margin-left: 150px;">(Last, First, M.I.)</small>	
3. Position: _____ 4. Contact #: _____ _____	
5. Date of Birth: _____ 6. Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	
7. Date of Accident/Incident: _____ Time: _____ <input type="checkbox"/> AM <input type="checkbox"/> PM	
8. Duty Station: _____	9. Location of Incident: _____
10. Description of Accident/Incident	
11. Extent of injury or illness and Body Parts Affected:	
12. Medical Treatment? <input type="checkbox"/> Yes <input type="checkbox"/> No 13. Lost Time? <input type="checkbox"/> Yes <input type="checkbox"/> No	
14. Description of Treatment:	
15. Follow-up Acton:	
Signature: _____	
Title: _____	

SECTION ELEVEN

CLOSURE PLAN

11.1 Introduction

The nature of this project's activities, as a temporary use of land, should not impose any permanent constraints on any future beneficial use of the area, nor have any permanent effects on the local water resources, biodiversity, overall landscape quality and associated socio-economic development.

Guyana practices sustainable logging, inclusive of selective and reduce impact logging practices. Therefore, severe or permanent impacts to the forest are very minimal. Additionally, the GFC is mandated to ensure that the operation is sustainable. The expected lifespan of the project is 25 years, following which the company expects renewal of their TSA for further periods of 25 years. At this stage the Company has not yet prepared a detailed Closure Plan, although consideration has been given to the closure actions to be taken. Within the context of this ESIA, the term 'closure' is used to encompass decommissioning, demolition and rehabilitation activities at the time of conclusion of forestry operations.

It should be noted that, for the logging aspect of the operation, each block will be closed progressively after logging. This process is described in Section 3.7.3.8.

11.2 Approach to Closure Planning and Decommissioning

At this stage of the project, and as a requirement of the ESIA permitting process, SSILI is required to identify appropriate closure and decommissioning methods for the project. Although there is no specific requirement for closure actions by the GFC, the Code of Practice for Timber Harvesting Operations, which concessionaires are expected to adhere to, outlines actions which facilitate sustainable forest operations and minimise environmental and social adverse impacts. An example of these actions is the covering over of skid trails and log markets, as required by the Code of Practice, after block harvesting is completed. Nevertheless, the Company has undertaken the task of developing a Closure and Decommissioning Plan during the implementation of this project and effectively implementing this plan progressively and in the termination phase.

The principal objectives of the Closure Plan are to:

1. Contribute to the effective management of environmental and social issues during the operational phase as a means of facilitating effective closure;
2. Identify suitable best practice measures that are appropriate, given the context of this project, and are able to meet the requirements of the regulatory agencies, while satisfying international benchmarks and standards for forest operations;
3. Return land and water resources to productivity as far as possible;
4. Minimise the potential for any negative post-closure impacts and liabilities;
5. Minimise the requirements for active management of the post-closure environment; and
6. Maximise the potential for post-closure environmental and social benefits

11.3 Potential Factors which can lead to Closure

The following factors could potentially lead to the closure of SSILI operations:

Permitting Conditions

1. If the renewal of the TSA is not granted by GoG.

Biological Conditions

2. If the commercial species within the Concession are exhausted.

3. Other land use within the Concession such as mining, result in considerable damage to harvestable forest stands.

Physical Conditions

4. Changing weather conditions affecting operational activities.

Socio-Economic Conditions

5. Significant cost for transportation, including road maintenance and trucking rendering the project financially unsustainable.
6. Severe accident(s) leading to a heavy loss of equipment and/or lives.
7. SSILI is unable to sustain its financial investment.
8. There is a contraction of markets or a significant drop in price of logs and wood products making the project not profitable.

11.4 Principal Closure and Decommissioning Issues

The principal closure related issues relevant to the project are:

Physical

1. Skid trails, log markets and secondary roads.
2. Main Base Camp and the supporting logging camps.
3. Main access road.

Socio-Economic

4. Contractual arrangements with employees and staff.
5. Obligations to GoG (taxes, royalties, fees etc.).
6. Services and support being offered to local communities, businesses and residents (transport, health, employment, etc.).

11.5 Closure Actions

In addressing the principal closure and decommissioning issues, the Closure Plan is envisaged to include the following actions:

Physical Issues

1. All secondary roads leading into compartments of the Concession will be closed.
2. The main Base Camp will be demolished and the area will be restored.
3. Machinery & equipment will be transferred to SSILI's sister company (Vaitarna Holdings Private Inc.), which is also involved in the forestry sector.
4. The main access road will be closed, unless requested to leave and transfer to the regional government or a government agency. A suitable mechanism for such is to be discussed and agreed upon by the stakeholders.

Socio-Economic Issues

5. The relevant Government Authorities and the Employees/ Workers will be informed at least three months in advance.
6. NIS and PAYE contributions for staff will be discontinued.

7. Severance pay for employees/workers will be paid, along with all other monetary resources due to them, as required by Guyana's Labour Act and the Termination and Severance Payment Act.
8. Acreage fees, royalty fees and all other obligations of the Company, required by the Laws of Guyana, will be settled.

It should be noted that this is a Conceptual Closure Plan. Within the first two years of operation, a detailed Closure Plan will be prepared by the Company.

SECTION TWELVE

CONCLUSION

The project proposed by SSILI will see the establishment of a composite logging and sawmilling operation with associated downstream processing plants and kiln drying facility. Logging activities will be conducted in a relatively pristine area of state forest. There are no communities within or in close proximity to the concession. This ESIA for the proposed project has examined the components of the project, identifying the activities and assessing their potential impacts on the environment based on best-practice guidelines and existing laws and regulations relating to the environment and forestry operations in Guyana.

Most of the potential significant impacts identified which can arise from the implementation of the project can be mitigated. The ESIA has identified mitigation and management actions to be undertaken to minimize adverse environmental and social impacts of the project. It is envisaged that these recommendations will be adhered to by SSILI in its operations and monitored for compliance by the EPA and the GFC as well as by other regulatory institutions.

No significant negative impact is expected on the communities closest to the logging concession. The communities are in excess of 20km from the project site and residents do not use the concession area. However, there are opportunities for the communities to benefit in a meaningful way from the project, especially in the form of employment and capacity building. The Company should constantly engage the communities through the village councils and the NRDDDB to ensure the communities are kept informed of the project's development, to prevent conflicts from developing and ensuring collaboration in areas beneficial to both SSILI and the communities.

Once the logging activities are conducted in a manner which is consistent with the Code of Practice for Timber Harvesting and best practices such as RIL and SFM, impacts to biodiversity will be minimal. The most significant impact to biodiversity anticipated is loss of wildlife from presence of workers, either during conflicts or by hunting. Appropriate measures have been recommended to address this potential impact. A significant portion of the concession will also be spared from logging, consisting of biodiversity reserves, buffers, steep slopes, etc. It is expected that close to 25% of the Concession will not be logged with about 20% can be classified as unusable forest while the Company is expected to identify a biodiversity reserves which would consist of 4.5% of the Concession in representative habitat types that should provide a refuge for wildlife with reserve size taking into account large range species. These areas will provide habitats for species within the Concession. By establishing biodiversity reserves, implementing RIL and following GFC' guidelines for SFM, it is expected that the impact on biodiversity will not be significant and will be temporary and reversible.

There are no other resource users within the SSILI Concession and no mining is anticipated in the near future given the Government's current position regarding mining in the area. The forest to the north of both parts of the SSILI Concession was also allocated for logging by the GFC. As such, no land use conflict is anticipated. The activities proposed by the Company will also not affect the current efforts of CI in maintaining the portion of state forest under its control as a Conservation Concession. In fact, collaboration between SSILI and CI can lead to better resource management and monitoring within the area. It is recommended that a framework be established to allow for integrated resources management within the wider area, involving CI, the logging concessionaires and the communities.

The Company would not be allowed to conduct its activities in a manner that is detrimental to the environment given Guyana's efforts to pursue a low carbon development path. As such, the project should not affect the country's commitment to REDD+ and the implementation of EU FLEGT. The implementation of the project is also within the framework of the LCDS and Guyana's agreement with the Norwegian Government.

Importantly, the company must recognise the impact of seasonality on the concession area and be wary of the severe impact of high levels of the rivers on its operations. Therefore, SSILI must plan to maximise its work in the dry season thereby not disrupting the flood plain ecosystem of

the rivers during the wet season. Conducting its operations during the dry season minimize environmental damages while also ensuring that the activities are done in a more economically viable manner.

SSILI obligations are expected to encompass not only social and economic issues, but also extend to the ecological aspect. This ESIA has recognized that the project, as with any forestry operation, will have an impact on the physical and biological environment in which it takes place. However, SSILI has made a commitment to practice sustainable forest management in its widest sense which embraces ecological and social sustainability along with economic viability. Impacts to the environment will be within acceptable limits once SSILI follows its commitment to best forestry practices and, in particular, meticulously adheres to the standards and guidelines laid down by the EPA and GFC. This ESIA has identified and proposed a number of measures to address the potential impacts associated with the activities of this project, but also measures to foster closer cooperation, collaboration and joint planning and management among the users of the wider area, including the communities, CI and other forest concessionaires.

This ESIA Report has examined the project and assessed its potential impacts. The ESIA Team is confident that there is an understanding of the potential impacts envisaged from the implementation of this project and has recommended the required mitigation and management actions that need to be taken. Once there is adherence this project can realize social, economic and ecological benefits which are sustained.

SECTION THIRTEEN

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APPENDICES

APPENDIX A - Terms of Reference

Revised Terms of Reference

Environmental and Social Impact Assessment (ESIA)

for

Simon & Shock International Logging Inc. (SSILI) Proposed Logging Operations in the Upper Essequibo-Corentyne-North Rupununi District

1. Background to Terms of Reference

Simon & Shock International Logging Inc. (SSILI) has been granted by the Guyana Forestry Commission (GFC) a portion of State Forest as a State Forest Exploratory Permit (SFEP) in the Upper Essequibo-Corentyne-North Rupununi District. The Company had intended to conduct logging within the concession and processing near the Annai area. As such, SSILI had approached the Environmental Protection Agency (EPA) for Environmental Authorisation to conduct the logging within the concession, processing in the vicinity of Annai, and construction of an access road linking the concession to the processing facilities. The EPA determined that an ESIA was required for the project and a Terms of Reference covering all aspects of the project was agreed upon and a Draft ESIA was subsequently prepared and reviewed by the Agency and other institutions. As a result of the current status of the project, where SSILI is focusing on the logging aspect of the project at the moment, the ESIA only covered the proposed logging operations, since the details of processing and transportation are not yet available. In this regard, the Company has requested a change in the Application for Environmental Authorisation, to be granted for the logging operation only. As such, the Terms of Reference for the ESIA has been revised to cover for the logging operations.

2. Objective of the EIA

The objective of this ESIA is to satisfy the requirements of the Environmental Protection Act for environmental authorization to be granted to Simon & Shock International Logging Inc. (SSILI) for the proposed logging operations.

3. Specific Tasks

In the preparation of the ESIA the consultant team will undertake the following tasks:

- Provide a description of the Company, including a background and profile, and a proposed organizational structure for the operation.
- Provide a description of the proposed project, including activities to be conducted.
- Assemble relevant baseline information on the concession area including its geology, soils, hydrology, climate and water quality.
- Collect biodiversity data for the concession area by reviewing existing data and conducting flora and fauna surveys. Fauna data will be collected for both the wet and dry seasons and surveys will be conducted during the day and night.
- Collect information on the socio-economic background of the project area. This will require liaising with the appropriate central and regional government agencies, as well as with non-governmental organizations and on-the-ground stakeholders, including local communities.

- Identify the relevant national policies, laws, guidelines, regulations and standards that would define the operating framework of the project. For aspects where national regulations/guidelines are not available relevant international guidelines such as those of the World Bank and the World Health Organisation will be examined.
- Identify, as far as is possible, and assess the biophysical, socio-economic and cumulative impacts of the project. The potential impacts will be justified by the use of standard impact prediction methods such as an impact prediction matrix.
- Describe alternatives considered in developing the project.
- Prepare an Environmental Management Plan that recommends measures to address those adverse impacts that can be avoided, or reduced to acceptable levels including plans for monitoring and emergency response during the project implementation phase.

4. Issues to be addressed as part of EIA

The consultant team will address the full range of issues as it pertains to the proposed project. These issues include:

- Alignment of the project to the country's national policy direction including the LCDS, REDD+, MRVS, etc., and potential impacts on the REDD+ scheme, and ecological and carbon services.
- Adequacy of forest resource to sustain planned extraction levels.
- Potential loss of biodiversity.
- Potential changes in the structure and composition of the forest due to logging.
- Possible environmental damage due to the storage, use and disposal of fuel, and lubricating oil.
- Impacts of the operation on the surface water quality and flow.
- The effects of road, bridge and skid trail construction within the concession on soil erosion, which may result in silting of streams.
- The environmental and health issues relating to all components of the project; relating to both the employer and employee, including the potential threats/hazards to the health of workers, employer/employees relationship, income, etc. and will cover issues that may arise from the development of permanent logging camps, e.g. solid waste and sewage disposal, concerns about the health and safety of workers.
- Integrated management of natural resources within and around the project area, including collaborating with communities and other stakeholders.
- Relationship between the Company and communities, including potential benefits of the project to neighbouring communities such as employment, and benefit sharing with respect to stakeholders.
- Land use and development issues/conflicts.
- Conceptual plan for the closure of operations.

- Environmental monitoring.
- Training requirements for staff.
- Emergency response plans.

5. Site Visit and Scoping

SSILI has facilitated a site visit to the project site for the regulatory agencies including the EPA and GFC and has also facilitated a public scoping exercise as part of the requirement of the EIA process.

6. EIA Report

The EIA Report will contain the following:

- A non-technical executive summary.
- A description of the project including its locations, proposed staffing and consequential support services.
- A description of the project environment.
- The policy, legal and administrative framework including guidelines, regulation and GFC Code of Practice.
- An analysis of the significant environmental impacts categorizing them into direct and indirect impacts, short and long-term impacts, reversible and irreversible impacts, and avoidable and unavoidable impacts.
- An analysis of the cumulative impacts of the project.
- An analysis of alternatives.
- An Environmental Management Plan which will identify the significant adverse impacts and prescribe actions for mitigation and monitoring.
- A Monitoring Plan and Emergency Response Plan.
- Maps, tables and figures.
- Constraints and Limitations to the Study
- List of References and persons/agencies consulted.
- Appendices including:
 - Terms of Reference for the EIA Study.
 - Minutes of the Public Scoping Meeting.
 - Records of consultations with communities including Apoteri, Rewa, Crash Water and Annai.
 - CVs of EIA Team Members.

7. Duration

A Draft ESIA has already been prepared and reviewed by the EPA, GFC and other institutions and stakeholders. The comments from the review are already being addressed. Once this revised Terms of Reference is accepted the Revised ESIA will be completed within two weeks.

8. ESIA Submission

The ESIA consultant Team will provide the following to the EPA:

- Electronic copies of the ESIA report
- Eight (8) signed hard copies of the ESIA report as required by the Act.

APPENDIX B - ESIA Team Members

The ESIA Team comprised the following members:

Mr. Khalid Alladin - Team Leader, Environmental Specialist
Dr. Frank Clarke – Biodiversity Expert – Fauna
Mr. Godfrey Marshall – Forester and Biodiversity Expert – Flora
Ms. Anne-Marie Forde – Natural Resources and Social Expert
Mr. Lakshman Persaud – Natural Resources and Social Expert

<p>Name: Mr. Khalid Alladin</p> <p>Nationality: Guyanese</p> <p>Present Address: 42 Pln Hope West Coast Berbice Guyana (592).623.1298 khalidalladin@gmail.com</p> <p>Position on Team: Team Leader, Environmental Specialist</p> <p>Qualifications: Academic qualification includes a Bachelors of Arts Degree: Major – Geography, Minor – Law (Best Graduating Student) at the University of Guyana, Guyana (1996 – 2000).</p> <p>Experience: Experience includes Projects Manager, Environmental Management Consultants (2009 – present); Director (ag), Senior Environmental Officer and Environmental Officer I and II in the Environmental Management Division, Environmental Protection Agency, Guyana (2000 - 2009) and as an independent consultant on a range of projects, project management, training and research.</p>	<p>Date and place of birth: May 09, 1980, Guyana</p>
<p>Name: Dr. Francis Clarke</p> <p>Nationality: British</p> <p>Present Address: 218 Glasgow Street Ardrossan, Ayrshire KA22 8JS Scotland (44).(0).7804.864.210 wildlifeconservation@hotmail.co.uk</p> <p>Position on Team: Biodiversity Expert – Fauna</p> <p>Qualifications: Academic qualifications include a PhD in Zoology, University of College (UCL), University of London (1999), Bachelors Degree in Zoology, University of Glasgow – Pass with Honours, (1994).</p> <p>Experience: Experience includes Consultant Conservation Biologist with Zoological Society of London, Wildlife Conservation Society – Papua New Guinea; Fauna & Flora International, Environmental</p>	<p>Date and place of birth: March 27, 1967, United Kingdom.</p>

Management Consultants (EMC), Iwokrama International Centre for Rain Forest Conservation; Post-Doctoral Research Fellow, University of Aberdeen, UK (2000 – 2003) and Post-Doctoral Research Fellow, University of Pretoria, RSA (1999 -2000)

Name: Mr. Godfrey Marshall **Date and place of birth:** November 12, 1954, Guyana.

Nationality: Guyanese

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Position on Team: Forester and Biodiversity Expert – Flora

Qualifications:

Academic qualifications includes a Masters of Science in Forestry, Department of Plant Sciences, University of Oxford, UK; Executive Diploma in Business, UWI School of Business.

Experiences:

Experiences include Director, Forestry Training Centre Incorporated (2005 – present), Project Coordinator, Forestry training Centre Incorporated (2005 – 2002), Deputy Commissioner of Forests, Forestry Department.

Name: Ms. Anne–Marie Ford **Date and place of birth:** February 17, 1981, Guyana.

Nationality: Guyanese

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Position on Team: Natural Resources and Social Expert

Qualifications:

Academic qualifications include Masters of Science in Natural Resource and Environmental Management – Coastal and Marine Resource Management, UWI, Barbados – Pass with Distinction (2003 – 2005); Bachelors of Science in Environment Studies, University of Guyana – Pass with Distinction (1998 – 2002).

Experience:

Experience include Special Projects Consultant, Iwokrama International Centre (2008 – present), Certification Consultant, Tigerwood Guyana Inc. (2008), FSC Certification and Logistics Officer, Tigerwood Guyana Inc. (2007 – 2008).

Name: Mr. Lakshman Persaud **Date and place of birth:** July 02, 1975, Guyana

Nationality: Guyanese

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richardlpersaud@yahoo.com

Position on Team: Natural Resources and Social Expert

Qualifications:

Academic qualifications include a Post Graduate Diploma (Research Methods – Development Studies), University of Guyana (1999); Bachelor of Arts (Geography/Economics), University of Guyana (1997).

Experience:

Experience includes Project Coordinator – Guiana Shield Initiative Phase II Pilot Project, Iwokrama, UNDP Guyana- Special Services Agreement (2008 – Present); Monitoring and Evaluation Specialist, The Poor Rural Communities Support Services Project (2006 - 2007); Environmental Officer II in the Protected Areas Unit of the Natural Resources Management Division, Environmental Protection Agency, Guyana (2002 – 2006).

APPENDIX C – Other ESIA Support Team Members

PERSONNEL	Role on ESIA Team
Renwick English	Social Baseline and Community Consultations
Enrique Monize	GIS
Annalise Bayney	Biologist (Flora)
Ewart Smith	Forrester
George Roberts	Forrester
Michelle Kalamandeen	Biologist (Fauna)
Christopher Chin	Biologist (Fauna)
Waldyke Prince	Biologist (Fauna)
Bibi Aneeza Khan	Biologist (Fauna)
Hemchandranauth Sambhu	Biologist (Fauna)
Glenny King	Field Assistant
Elvis Joseph	Field Assistant
James Campbell	Field Assistant
Benedict Joseph	Field Assistant
Gerald Milton	Field Assistant
Eustace Williams	Field Assistant
Frederick Charles	Field Assistant
Terry Haynes	Field Assistant
Carlos Haynes	Field Assistant

APPENDIX D – Public Scoping

Appendix D 1 - Meeting Minutes



Simon and Shock International Logging Inc. – Proposed Logging and Sawmilling Project, Area A – Right Bank Rewa River, Left Bank Essequibo River and Area B – Right Bank Essequibo River, Left Bank Essequibo River, Left Bank Corentyne River

Public Scoping Meeting (Annai)

Date: June 30, 2011

Time: 11:00 hours

Venue: Annai Benab, Annai, Region 9

- Objectives:
- i. To hold a scoping exercise for the Environmental and Social Impact Assessment (ESIA) for the above-mentioned project.
 - ii. To provide stakeholders the opportunity to highlight the concerns they may have regarding the project so that they can be incorporated into the final Terms of Reference for the ESIA study.

Environmental Protection Agency's (EPA) Representatives:

1. Ms. Geeta Devi Singh – Director, Environmental Management Division
2. Ms. Nalissa Singh - EO II (M&F), Environmental Management Division
3. Ms. Asma Sharief – EOII (M&F), Environmental Management Division

Guyana Forestry Commission's (GFC) Representatives:

4. Mr. Tashreef Khan – Deputy Commissioner of Forests, Forest Monitoring Division

Representative from Simon and Shock International Logging Inc.:

5. Mr. Chethan Bilagali Narayan – Director, Vaitarna Holdings Private Incorporated

Representatives from ESIA Consultant Team from the Environmental Management Consultants:

6. Mr. Khalid Alladin – ESIA Team Leader
7. Mr. Lakshman Persaud – Social Expert

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Environmental Assessment Board (EAB) Representative:

11. Mr. Maurice Veecock – Member, EAB

The Public Scoping Meeting for Simon and Shock International Logging Inc. proposed logging and sawmilling project held in Annai commenced at 11:00 hours.

The Toshi of Annai, Mr. Michael Williams, provided opening remarks and thanked members of the public for attending the meeting.

The Chairperson, Ms. Geeta Devi Singh, then proceeded to introduce members of the head table. She went on to outline the mandate of the Agency, purpose of the meeting and informed attendees that the main focus of the gathering is to hear the concerns and issues that they may have on the proposed operations of Simon and Shock Logging and Sawmilling Project. She proceeded to give a brief background on the project, from the submission of the Application for Environmental Authorization to the point of the scoping meeting. The Chair further stated that the concerns and issues identified at this meeting would assist the EPA in finalizing the Terms of Reference (ToR) for the ESIA study.

The Chair then invited Mr. Tashreef Khan to give a brief presentation on the GFC Licensing Process for the Project.

Mr. Khan identified the project site, both Area A and B, on a map. He explained that acquisition of the State Forest Exploratory Permit (SFEP) is the first step in the licensing process. He mentioned that the SFEP was allocated to Simon and Shock International Logging Inc., a US based Company, bought over by a new company. He identified the site as surrounding the Conservation International Concession, located within an area of approximately 391 853 hectares (968 289 acres), and split into two blocks, Area A and B. The Essequibo River separates the two blocks. The Licensing Process entails the issuance of the SFEP, whereby the Company is given a maximum of three years to complete an Environmental Impact Assessment and acquire approval for the Project from the EPA. Within this time too the Company needs to prepare a five year Forest Management Plan and an Annual Operation Plan which GFC has to approve. While the Company is required to pay acreage fees for the area, they are not permitted to log in the area covered by the SFEP. However, they may be allowed to clear a little vegetation for roads and camps during inventories and studies. Even then monitoring is done to ensure that trees are only cleared for the purposes approved during this phase and to ensure that no high intensity logging is done. He stated that after the ESIA for the project is approved by the EPA, and an Environmental Permit is granted, the GFC will proceed with the next step in their licensing process. At the end of this first phase, three documents, the Approved Five Year Management Plan, the Approved Annual Operation Plan and the Environmental Permit have to be submitted.

In the second phase, the Company writes to the Government of Guyana through the Guyana Forestry Commission and informs them whether they will go ahead with the project. The three documents requested in the first phase are attached to the Timber Sales Agreement which is sent to the government for review approval. If the government approves, the Timber Sales Agreement is issued.

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The third phase in the operational phase of the project, whereby the Company will be allowed to execute the project, by constructing roads, log ponds, camps and other facilities to support logging as well as undertake logging.

He then re-iterated that the purpose of the meeting is to develop the Terms of Reference for the ESIA which will identify operational best practices to safeguard the environment.

On behalf of the EPA, Ms. Nalissa Persaud then presented the EPA's EIA Process for the Project.

Mr. Chethan Narayan, on behalf of Simon and Shock International Logging Inc., then gave an outline of the proposed project and provided a brief background on his Company. He explained that Simon and Shock was bought over by a native Indian based Company, Vaitarna, which is a subsidiary of the much larger Coffee Day Group. The Coffee Day Group controls the biggest coffee café chain in Asia and consists of six divisions. He explained the work of each division. One of the Divisions is responsible to manufacture furniture for these cafés. Another Division is responsible for the coffee plantations. Since coffee grows best in shaded environment, trees are planted within the plantations to provide shade. The Division responsible for furniture manufacture, harvests and utilize these trees within the coffee plantation to produce furniture for the cafés. Recently, the sixth Division, the Vaitarna Company has been created which will be involved in commercial logging in Guyana.

He mentioned that Vaitarna is currently in the 2% Inventory Stage. The Company plans to conduct a 100% inventory of the project site, and from the results of the inventory, will decide the size of business that can be implemented. However, he indicated that the Company will definitely log the concession, once approval is given. Secondly, sawmill(s) will be erected since the concession is large and encompasses an area of almost one million acres. The purpose of the sawmill (s) is to reduce logs to lumber, to facilitate easier transportation. Operation of the sawmill (s) will also enable the Company to give back to nearby communities by providing employment. He stated that Project plans will be with the consent of the Communities. He mentioned that priority will be given to surrounding Amerindian Communities regarding jobs, and only after the opportunity is extended to these Communities, will the vacancies be advertised outside of these communities. He then stated that he cannot provide detailed plans of the project at this stage, since the Company is still in the planning phases of the Project.

Mr. Khalid Alladin, representing the team of consultants, then gave an overview of what the EIA study would encompass and how the consultants would undertake the study. He explained each aspect of the Draft Terms of Reference which was circulated to attendees at meeting.

At this point, the Chairperson then invited the public to make suggestions and comments on the project as well as any issues and concerns they may have.

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Questions/Comments/Suggestions

1. **Mr. Sydney Allicock – Chairman, North Rupununi District Development Board (NRDDDB)**, indicated the following concerns.
 - i.) He commended the Company for making the plans and taking the effort to get the Project started and done in the right way and stated that if all the plans conveyed are executed, there is nothing that will stop the nearby communities from benefitting from the project. However, the main issue he identified was access to their lands since he noticed that in the first paragraph of the Project Summary, that a sawmill complex will be established in or near Annai. He was not certain whether he should comment on this aspect, since Ms. Singh stated that comments should be made regarding the Project Site itself. However, he perceives that the project is already on the move with the EPA and the GFC setting the requirements that will enable the project to proceed. He reiterated his main concern is the road that will have to traverse Annai to get to the Linden/Lethem Road.
 - ii.) He inquired whether there will be a proper Waste Management Plan and wanted to know if there will be a recycling plant there in Annai or nearby within the Region because with development comes a lot of garbage.
 - iii.) The Environmental Impact Assessment should identify carbon emissions that would be released from the construction of the access road. He mentioned that an oil company is planning to drill within the same area and suggested that since more than one company is planning development in the same area, one access road can be used by both companies as well as future investors. Therefore, there will be less degradation of the land and environmental impacts associated will be more manageable.
2. **Ms. Geeta Devi Singh** clarified that while the sawmill site will require separate environmental authorization, impacts regarding the sawmill as well as the potential access road will need to be addressed in the Environmental Impact Assessment. In this regard, issues regarding these aspects of the development should be raised at this meeting as well. Further, prior to the erection to the sawmill, if it is to be located in Annai, the Company will need approval from the Annai Village Council.
3. **Mr. David Singh – Conservation International**, pointed out to Mr. Allicock that there may be no state land available between Annai and the Concession. In this regard, plans for erection of the sawmill on Amerindian Lands will have to be discussed with the respective Amerindian communities on whose lands the footprint of the Project will be.
4. **Mr. Tashreef Khan** assured Mr. Allicock that before the end of the ESIA process, or simultaneous to this process, the GFC will ensure that the sawmill is authorized by the relevant community in which it will be established.

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5. **Mr. Alphonso Forde** – hopes that a Management Plan is developed to ensure that what is proposed by the company is actually done. He would also appreciate if the Company updates the North Rupununi District Development Board and surrounding communities on the progress of the Project. This can be facilitated by letting peoples from the communities work with the team so that they can be well informed about the Project from firsthand experience and can in turn update the NRDDB, who represents the entire North Rupununi.
6. **Mr. Michael Williams – Toshao, Annai**, elaborated on Mr. Forde's comment, suggesting that community members should be part of the ESIA team as well, so that they can be represented. He acknowledged that he knew the team was already selected. However, he still recommended that a representative of the NRDDB, be added to the ESIA team at this time, if this is possible. This member will be able to adequately update the communities since he/she will be directly involved in the ESIA process. Even though there are two persons working on the Project from North Rupununi, they were not selected by the NRDDB. They need someone on the team who they can rely on to represent the members of the North Rupununi, so they can rely on that person to bring information, regarding the Project, to them.
7. **Mr. Glen Allicock – Resident, Surama Village** – informed that the North Rupununi needs a strong agreement signed by both parties regarding employment of community members. A contract should be developed which can be signed by both the employer and employees.
8. **Mr. Chethan Narayan** - responded by saying that the Human Resource Department of the Company, which is an independent body, can look into this issue of developing such a contract.
9. **Mr. Ivor – Resident, Annai** – noticed that training for staff was included in the Draft Terms of Reference for the Project. He wanted to know when this training will take place.
10. **Mr. Khalid Alladin – Consultant, EMC** – informed him that this is not known at this point in time. Details on training will be later determined and will be recommended in the ESIA, as it relates to on the job training, when training will be done, use of safety gear etc. When the project is implemented, more detail on these plans will be known.
11. **Mr. Chethan Bilagali Narayan**– indicated that training will definitely be a part of the project and will occur when employees join the Company. It does not matter how skilled an employee is, the GFC has certain requirements that have to be followed in the operational process. When new equipment are bought, it will be necessary for employees to be trained since they may not have experience using the new technologies. Further, there are various guidelines specific to the use of certain equipment that will have to be learnt and followed.
12. **Mr. Ivor** expressed that it will be better for training to be done before employment so that the community members will know what to do when they are employed.



13. **Mr. Chethan Bilagali Narayan** responded stating that this is not practical since it will not be clear if training fits required profile if a job is not yet assigned.
14. **Ms. Patricia Federicks , Bina Hill Institute** – inquired whether the Company intends to undertake capacity building programmes and if this has not yet been determined, the Company should consider this. She questioned whether there was any way the Company would invest in building capacities of their youths, for example issuing scholarships to study at the University of Guyana.
15. **Mr. Chethan Bilagali Narayan**– responded saying that the Company can look into this recommendation and once they are physically present in the area, they can determine what skills are required to develop them.
16. **Mr. Clement Joseph, Toshao, Apoteri** - When he looks at the concession on the Map, he does not see any gaps between the Project Site and the Conservation International Concession. He inquired how logging will take place with the Conservation concession being close to it and how conservation will take place with the concessions being linked so closely.
17. **Mr. Chethan Bilagali Narayan** – responded saying that the Company is currently in the inventory phase of the Project. Only after the inventory is done, the Company will be able to determine a concrete plan for operation. The Company will then be able to approach Conservation International and other stakeholders for approval to access to the land and discuss other issues. At this point in time it is not practical to make these decisions.
18. **Mr. Joseph** then inquired through where the access road will be built and would appreciate if the Company can consult with the Community to discuss the route of the road, since there are certain sites which the Community will like to be protected. He mentioned that he heard that three hundred people will be employed by the project and questioned how his Community will benefit.
19. **Mr. Chethan Bilagali Narayan**– explained that once persons from the Community are employed, its economy will improve and so the Community will directly benefit from the Project. Regarding the development of the project, the Company will take feedback from the Communities to find out what can be done to benefit the community.
20. **Mr. Alphonso Forde** – referred to the Company's coffee plantations in India and mentioned that coffee is located within the proposed project site. He inquired whether the company would be willing to invest in producing coffee from the concession.
21. However, **several members of the audience** indicated that there is no coffee at the Project Site. Instead, there are cocoa plantations on site.

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22. **Mr. Sydney Allicock** - wanted to hear the views of Conservation International on the location of the Simon and Shock concession and whether they have a problem with their concession being surrounded by it or whether they believe that the area can be exploited in a way to benefit everyone.
23. **Mr. David Singh – Conservation International (CI)**- reserved the right to make written submissions on the Terms of Reference and Ms. Singh informed the gathering that a deadline of July 14, 2011 is given for these written submissions. He expressed his concern that not all stakeholder communities could be present at the Public Scoping Meeting there in Annai and so recommended that similar exercises be held in Rewa, Apoteri and Crashwater since people have different views on the Project He thought that the Company will like to know issues the Public may have with the Project upfront before so that it can be incorporated in the business model. It is better to deal with conflict issues before Project is commissioned so these can be considered in the business plan. He therefore suggested that there is discussion with villagers themselves, prior to finalization of the Terms of Reference. He explained that Conservational International acquired the lease for approximately 80 000 hectares of forest in July 2002 from the Guyana Forestry Commission and it is a model by which they are attempting on one side to demonstrate the conservation of the ecosystem and on the other side, compensation to the resource owners and resource users for that concession. What CI does is manage the concession, maintain its ecosystem with the assistance of stakeholders including nearby communities, while compensating the Guyana Forestry Commission in form of payments of royalties and fees and also payments to the communities of Apoteri, Rewa and Crashwater for the opportunities they might have foregone as a result of it being a conservation Concession. That payment is to the communities and not to individuals, so while they employ persons from the community, the payment which is called the Voluntary Community Investment Fund (VCIF) goes to the communities and is managed by a steering committee comprising the Tshaos of the Communities, the North Rupununi District Development Board and CI. Over the ten years and by the end of next year, they would have invested over a half million US dollars into the operation, so they would have invested just about two million Guyana (ten thousand United States) dollars a year into the VCIF and approximately US \$41 000 in royalties and fees both to the EPA and the GFC. The model portray how we can conserve the ecosystem while at the same time compensate the resource owners and resource users. The five issues he raised to be addressed in the EIA are as follows:
- I. With Guyana having embarked on the Low Carbon Development Strategy, he would like to know whether in the EIA process, there would be a reflection in the way that the business model will incorporate this Strategy. How is the business model that will be developed, going to reflect the Company's commitment to the Low Carbon Development Strategy? In particular, is the business model going to take into consideration REDD+ as a possible business option. From the models that CI has done, not only in Guyana but around Latin America, they have identified that REDD+ is indeed a viable business option, especially if one can then label one's products with the way one is actually maintaining carbon stocks. This is a specific question he would like to see responded to in the Environmental and Social Impact Assessment.
 - II. This point relates to land use conflicts that arise out of increasing access and the importance of

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integrated management of natural resources. Just recently, last week in fact, a book was launched which was sponsored by four entities, NRDDDB, IWOKRAMA, WWF and CI. The book is called 'The Rupununi: Rediscovering a Lost World'. During the presentation of the book, the author pointed out the richness of the Rupununi and the importance of actually managing the Rupununi Region in an integrated manner. He explained that this does not mean that there should not be any businesses there. Rather, how can businesses work alongside communities, work along Government so that there is actually a healthy and sustainable ecosystem(s) within the Rupununi? So he requested that within the EIA there is a reflection of how one would be able to integrate the management of resources even as one opens up access to what is presently an intact part of Guyana's land space. He made this request based on what CI has recognized in other parts of the country with respect to open of access through roads. In 2009, CI conducted a study looking at the effects of upgrading the Linden Lethem road, where they looked at the deforestation that will occur if the road is not managed effectively. That study has informed the Government's REDD+ Readiness Planning Process. Within the Plan it can be identified that three of the five issues that will drive deforestation and forest loss within the country come from the opening of access. Access roads opened up in Guyana become a public asset and it is very difficult to manage those roads without some kind of controlled mechanism in place. For instance, in areas such as the Amaila Hydropower Project where an access road will be established, concerns that are being raised are that that road is a public road and while the Hydropower company would want to maintain the ecosystem, if there is not a good road management plan and if the road is not managed effectively, then there is the potential for illegal mining and unregulated mining. Mining is one of the biggest causes of deforestation and forest loss. Additionally, towards the southern part of the Rupununi, there are good mineral resources and what he would like to understand is how in fact, the roads and the access ways will be managed to ensure that there is integrated management of natural resources.

- III. They welcome the fact that Coffee Day is a massive Company and the name of the Company is important and it would not want to associate its good name with poor practices. He therefore inquired whether the Company would be interested in forest certification and if so how will that process proceed.
- IV. It is important that within the EIA the profiles of the three companies, Simon and Shock International Logging Co. Inc., Dark Forests and Vaitarna are given, because there is enough stuff going on in the international scene in REDD monitor etc., that are painting different pictures as it relates to the Company. So in the EIA there should be clear profiles of each of these companies, their relationship to each other, government, communities etc.
- V. Based on the understanding of the Company profile, what therefore will be the management structure that will be put in place? Who is the man/woman on top and who are the persons that will be in the management team?

Lastly, he referred to Mr. Allicock's observation that the CI concession is embraced by the Company's. The fact that they have been developing a model over ten years, that model will definitely have to be reviewed, refined, even as these developments happen around it. They would have to identify for instance to what extent the conservation concession can be maintained if in fact, the opening of access is going to then raise the cost of their management to the extent that it is not an economical business model. They would

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welcome discussions with the Company, the GFC, the government and especially the communities to see how they can actually have this kind of development integrated in the way they see the Rupununi as a globally important place in the world.

24. **Mr. Eustace Alexander – Conservation International** – inquired about the logging experience of the Company.
25. **Mr. Narayan** informed him that the company has 15000 acres of coffee plantations and when compared with concession size, it may seem very small this is a very big area when it comes to coffee cultivation. Their coffee plantation is the biggest in India. Coffee as a plant cannot grow in direct sunlight. Within a gap of every 5 -6 m and up to 10 m, they should have huge trees. The entire 15 000 acres plantation is filled with very good trees. They constantly upgrade the furniture in their cafés using the trees within the coffee plantations. This is the responsibility of the Dark Forest Division. However, as it relates to logging for sale and export by the Company, this will be the first project from which the Company will gain experience in this area.
26. **Mr. Sydney Allicock** made the following additional comments:
 - I. He pointed out that the concession would have three possible outlets including a road through Sherwood Forrest Inc. Concession, the Essequibo River or through Annai. So in planning the Project, this needs to be taken into consideration. According to the document, in keeping with what the Government advocates, communities should be supported in the development of these entities by having businesses evolve from these exercises. If they should access the Concession through the Sherwood Forest route, for miles there might not be people there to benefit from the forest that is right next to Communities here. This should be taken into consideration by the Company.
 - II. He understands that the permitting process for the operation will take three years. The Project is not going to start immediately. They still have the opportunity to review the EIA when it is finished to determine whether the Project is possible and when it happens; this is another phase in the process so till the end of three years, they will be faced with issues of actual logging. So he believes that the Process should proceed and there is three years for the Company to determine what will actually happen so that the communities can get feedback on these matters.
27. **Mr. Tashreef Khan** interjected at this time and made a clarification to Mr. Allicock, explaining that while the GFC allocates a maximum of three years for the State Forest Exploratory Process, if the Company works along with the Communities, EIA consultants, EPA and other stakeholders, and gets the EIA approved in less time for example six months, it is possible for the process to end within a much shorter time frame. It is the interest of the Company to develop their project in the least time possible.
28. **Mr. Sydney Allicock** continued by requesting updates on the Project's development every month so that it can be reported as news on their radio station.

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29. **Mr. Michael James** – Resident of Apoteri and Member of North Rupununi District Development Board, made the following comment:
- I. He noticed bulletwood listed as a species that may be extracted, but he thinks it is protected by law.
30. **Mr. Tashreef Khan** responded, saying that bulletwood is protected by law. However, persons can apply to the GFC for approval for the removal of these species. The GFC will decide whether approval can be granted by considering a number of factors. He explained that the species was protected because the local communities use the latex for the bulletwood tree to make balata products. Further, it produces a very tasty fruit which provides food for a lot of animals. He informed that his Office has approved cutting of bulletwood in different parts of Guyana example in the North West District, but only for very old trees. However, in the Rupununi, they will be considering the heavy use of bulletwood for balata bleeding since this is more characteristic of the Rupununi Region. He also referred to Mr. Alladin's presentation whereby he mentioned that keystone species will be identified in the ESIA. He also informed the gathering that for all TSA concessions that the GFC allocates, it is mandatory that 4.5 % of the concession is set aside for biodiversity conservation. They find in most of the concessions throughout the country more than 4.5 % is set aside because the geography of certain areas may not facilitate logging. The biodiversity reserve allocated must be in line with requirements of the GFC.
31. **Mr. Eustace Alexander** inquired whether matters not addressed in the EIA process that may arise at a later date, maybe two or five years in the future, can be addressed then. He asked whether all possible issues have to be addressed within the current EIA process.
32. **Ms. Geeta Devi Singh** responded to Mr. Alexander's question, informing him that with regard to EPA's policy, the Agency has the right to recall the Permit and modify it to address issues that may have environmental impact.
33. **Mr. Tashreef Khan** also explained that with regard to GFC's policy, the five (5) year management plan that is submitted is not a fixed document. So if it is recognized that after a year for example, the Company has to revise the management plan due to new development, the GFC will ensure that this happens. Consultations will also take place regarding the development for all five year plans and changes in development that may arise.
34. **Mr. Eustace Alexander** inquired whether consultations are held in the development of all five year plans. He also asked whether consultations will be held after the five year management plan expires for the development of the following five year management plans.
35. **Mr. Tashreef Khan** explained that consultations for the first five year management plan are done within the ESIA process. However, after the Timber Sales Agreement is issued, if matters arise, consultations will be

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done regarding these changes and modifications in the Five Year Management Plan. He also stated that consultations will occur in the development of the following Five Year Management Plans.

36. **Ms. Geeta Devi Singh** explained that the EPA's process allows the public to write at any time to the Agency, regarding any environmental issues they may have regarding the Project. The Agency will then look into the matter and respond to it accordingly.
37. **Mr. Alphonso Forde** – mentioned Crabwood as one of the species within concession and pointed out that it is not presented in the Project Summary. He knows that women from Apoteri use Crabwood from the area. He therefore requested that this species and all others be presented and that the Company should look into the use of products by the communities.
38. **Mr. Tashreef Khan** informed him that this document (the Project Summary) is not the document the Company will use. It just explains how the Company may deal with certain issues. He then gave an example by commenting on the paragraph in which the tree species were listed, indicating that there a lot more species not captured in the paragraph. So he mentioned that after the species list, 'and others' should have been included or 'for example' should have been included. He mentioned that all the species will be listed in the EIA.
39. **Mr. Glen Allicock** – requested that Non Timber Forest Products be included in the ESIA since the communities make use of these resources to make a lot of handicraft, including furniture.
40. **Mr. Eustace Alexander** – mentioned that forest produce as he understands from documents he has read on forestry refers to the timber and all botanical non-timber products like gums, resins, ropes and vines. The TSA gives right to all of this. He understands that some communities may from his experience in Mabura ask permission from concessionaires after logging has taken place, to cut these ropes to make chairs. So he clarified that Mr. Glen Allicock was asking whether communities would be allowed to harvest forest produce or would the Company, as an established furniture Company have interest in the entire ambit of forest produce. He also pointed out a chair made of nibi, since Mr. Chethan Narayan was not aware that it was made from that non forest timber product. So it should be very clearly stated in the ESIA if the Company will take advantage of all rights to the concession, trees and non timber products or if the Company is only interested in the timber from the concession.
41. **Mr. Narayan** – He explained that not because they have all rights to the Concession, it they will not allow the use of these products. Once they implement the Project, they will determine what they can use from their end and what they can give back to the community at no cost or a nominal cost, or if any avenues can be explored which can encourage revenue generation for these communities.
42. **Mr. Alphonso Forde** – recognized the presence of the Guyana Geology and Mines Commission (GGMC) at the meeting and inquired whether there would be a problem if gold is found in the area, for example in

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Apoteri where the community knows there is a good gold deposit there. With the construction of roads it will be easier to harvest this gold.

43. **Mr. Tashreef Khan**, as a director on the GGMC Board, stated that resources in Amerindian Communities belong to the Amerindians. If the Toshao of the Community identifies the gold reserve, he has the right to determine whether the Community would make use of it or if they would allow external parties to make use of the resource, if it ties into to all the national requirements, both from the government and communities. He believes that in Guyana there should be more control regarding access and if there is good partnership controls, a lot of negative issues can be avoided not only regarding resource management but crime etc. The GGMC on the enforcement side is in discussions regarding control and management of access in Guyana.

Mr. Khan also assured the audience including Dr. Singh and Mr. Allicock that from the GFC end, this Project will have to be in line with the LCDS programme that our country has now embarked on, so it will also have to be in line with all REDD+ programmes and our Monitoring Reporting and Verification system. Further, it will also have to take into consideration that in the middle of the proposed site, there is a conservation concession. In Guyana there is a National Reporting System regarding deforestation rate, so the issue of establishing one road for use by the Petroleum Exploration Company, the Project Developer, and other stakeholders will have to be explored. This will enable us to keep our deforestation rate to the lowest, given our commitment to the LCDS. He also acknowledged Mr. Allicock's point regarding access to the concession, and stated that the Company will choose the easiest one. However, if there is rejection to the option chosen by the Company, they would need to explore the others. The Company has chosen to consult with these stakeholders present at the meeting first, since they have realized that the easiest option is to work or vision themselves to the location of the Project Site is through these Communities and by working with the Communities.

There being no further issues and concerns to be raised, Ms. Geeta Devi Singh expressed her thanks to the gathering for attending and reminded the audience that written comments on the Terms of Reference can be submitted to the Agency until July 14, 2011. Mr. Michael Williams also expressed his thanks.

The meeting concluded at 13:16 hours.

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Members of the Public in Attendance

#	Name	Agency/Village	Designation	Tel. #/ Fax#	Address / Email Address
1	Geeta Devi Singh	EPA	Director, EMD	225-0506	Ganges Street, Sophia, Georgetown
2	Nalissa Persaud	EPA	EO II(M&F)	225-0506 Ext. 23	Ganges Street, Sophia, Georgetown
3	Asma Sharief	EPA	EO II(M&F)	225-0506	Ganges Street, Sophia, Georgetown
4	Maurice Veacock	EAB	Member		
5	Khalid Alladin	EMC	Projects Manager	623-1298	60 Area H, Ogle, East Coast Demerara
6	Lakshman Persaud	EMC		225-5465	60 Area H, Ogle, East Coast Demerara
7	Chethan Bilagali Narayan	Simon and Shock International Logging Inc.	Director	629-3290	228, Lance Gibbs Street, Georgetown
8	Tashreef Khan	Guyana Forestry Commission	Deputy Commissioner of Forests	226-7271-4	1, Water Street, Kingston, Georgetown
9	Michael Williams	Annai	Toshao		Annai, North Rupununi
10	Clement Joseph	Apoteri	Toshao		Apoteri, North Rupununi
11	Neville Augustine	Crashwater	Toshao		
12	Patrick Honorio	Rewa	Toshao		
13	Joycelyn Daniels				
14	Sandra James	Annai	Villager (Housewife)		
15	Mitchell Osablo	Annai	Councillor		
16	Ivor Daniels	Annai	Senior Councillor		
17	Matthew Aloin	Rewa	Deputy Councillor		
18	Fay Tracy James	Bina Hill Institute/ Apoteri	Student/ Villager		tracy.james92@yahoo.com tracyjames2008@hotmail.com
19	Marcia Johnny	Bina Hill Institute	Student		Bina Hill/Annai
20	Emily Allicock	NRDDB/ Bina Hill Institute	Administrator		emily.allicock@gmail.com
21	Yonette Jacobus		Assistant Administrator		debsjacobus@yahoo.com
22	Susie Ambrose				
23	Emil Merriman				
24	J J Moses	Annai	Priest		

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25	Kenny Thomas	Apoteri	Villager		
26	Natalie Edwards	Kwatamang	Villager		
27	Smith Johnnie	Crashwater	Villager		
28	Keith Sandy	Annai	Villager		
29	Eustace Williams	Crashwater	Villager		
30	Rickford Daniels	Kwatamang	Villager		
31	Daniford Valour	Annai	Villager		
32	Grifley Meek	Kwatamang	Villager		
33	Winston Edwards	Rewa	Villager		
34	Handley Thomas	Crashwater	Villager		
35	Nelson Henry	Crashwater	Villager		
36	Carlito	Bina Hill Institute			Bina Hill/Annai
37	Vernon Bremmer	Bina Hill Institute			Bina Hill/Annai
38	Elias Cambridge	Bina Hill Institute			Bina Hill/Annai
39	Cherene Calistro	Bina Hill Institute			Bina Hill/Annai chavercalistro@yahoo.com
40	Luke Xavier	Bina Hill Institute			Bina Hill/Annai xavierluke72@yahoo.com
41	Eunette Sway	Surama	Villager		
42	Michael Allicock	Surama	Villager		
43	Alban Lawrence	Bina Hill Institute/ Shunilab	Student/ Villager		
44	Bernard Eusebio	Bina Hill Institute/ Shunilab	Student/ Villager		
45	Linzie Moses	Bina Hill Institute/ Massara	Student/ Villager		
46	Onika Stephen	Bina Hill Institute/ Prashara	Student/ Villager		bbarjoan@yahoo.com
47	Jim George	Bina Hill Institute/ Apoteri	Student/ Villager		
48	Rema James	Bina Hill Institute/ Apoteri	Student/ Villager		
49	Sunita Milton	Bina Hill Institute/ Apoteri	Student/ Villager		
50	Jason Marco	Bina Hill Institute/ Fairview	Student/ Villager		
51	Roxan Sutherland	Bina Hill Institute/ Fairview	Student/ Villager		
52	Ann Marco	Bina Hill Institute/ Parashara	Student/ Villager		
53	Ovid Allicock	Surama	Villager		
54	George Peanor	Guyana Geology and Mines Commission	Driver/ Mechanic		Upper Brickdam, Georgetown

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55	Onika Salty	Annai Central	Villager		onika_natasha@hotmail.com
56	Rosita Jacobs	Annai Central	Villager		
57	Vena Browne	Annai Central	Villager		
58	Davelan Joel	Annai Central	Student		
59	Hezron George	Bina Hill Institute/ Katoka	Student/ Villager		hezrongeorge@hotmail.com
60	Ryan Smith	Guyana Geology and Mines Commission	Environmental Officer	683-0414	Upper Brickdam, Georgetown
61	Marlon Haynes	Bina Hill Institute			Bina Hill/Annai
62	Sixtus Andries	Bina Hill Institute			Bina Hill/Annai
63	Shirwyn Moses	Bina Hill Institute			Bina Hill/Annai
64	Jovana Edwards	Bina Hill Institute			Bina Hill/Annai
65	Delene Lawrence	Bina Hill Institute			Bina Hill/Annai
66	Jackie Allicock	Surama	Villager		jacqueline.allicock@hotmail.com
67	Anderson Severin	Bina Hill Institute			Bina Hill/Annai
68	Nigel A Job	Conservation International Guyana	Conservation Officer		Apoteri Nigeljo6@hotmail.com
69	Howell Haynes	Kwatamang	Villager		
70	Mitchell Oswald	Annai	Councillor		
71	Sandra James	Rupertee	Villager (Housewife)		
72	Joycelyn Daniels	Rupertee	Villager		
73	Bryan Allicock	Ministry of Amerindian Affairs	Community Development Officer		Kwatamang bryannai139@yahoo.com
74	Hugh Greaves	Bina Hill Institute/ Youth Learning Centre	Tutor		Bina Hill/Annai
75	Patricia Fredericks	Bina Hill Institute/ Youth Learning Centre	Principal	645-7007 772-9292	Bina Hill/Annai patfred2009@gmail.com
76	Alphonso Forde	North Rupununi District Development Board	Tourism Councillor	772-9292 685-8486	alphosoforde@yahoo.com
77	Victorine Hack	Bina Hill Institute			Bina Hill/Annai
78	David Singh	Conservation International Guyana	Director		dsingh@conservation.org



79	Sydney Allicock	North Rupununi District Development Board	Chairman	668-9874	Bina Hill/Annai sydneyallicock@hotmail.com
80	Lester Dookram	Aranaputa Community Forestry Society	Member		Aranaputa Valley
81	Eustace Alexander	Conservation International Guyana	Ecosystem Service Coordinator	227-8171	94, Laluni and Oronoque Streets, Georgetown ealexander@conservation.org
82	Glendon Allicock	MYRMI	Manager		Surama, North Rupununi glendonallicock@yahoo.com
83	Gaulbert Sutherland	Stabroek News	Reporter	628-1938	46/47, Robb Street, Georgetown myster_gaulbert@yahoo.com
84	David Scipio	Rupertee	Senior Councillor		
85	Archer Moses	Wowetta	Council		archermoses@hive.com
86	Priscilla Torres	Wowetta	Acting Councillor	692-7192	priscillatorreswowetta@gmail.com
87	Michael James	North Rupununi District Development Board	Senior Finance Officer		Annai, North Rupununi millajam@yahoo.com
88	Jermin Calistro	Guyana Forestry Commission	Forest Ranger		Aranaputa Valley
89	Suresh Andries	Rupertee	Villager		sundries.666@yahoo.com
90	Frank Allicock	F.T.C.I	Forestry Worker		Surama frankalli@hotmail.com
91	Raevun Jacobus	Guyana Forestry Commission	Forest Ranger		Aranaputa Valley
92	Alexandra Moses	Wowetta	Councillor		
93	Rodney Davis	Aranaputa Community Forestry Society	Chairperson	683-0422	Aranaputa Valley heightsmanrd@gmail.com

Appendix D 2 – Scenes of the Meeting



APPENDIX E – Record of Community Consultations

**Simon & Shock Long Inc.
 COMMUNITY CONSULTATIONS, NORTH RUPUNUNI
 Environmental Management Consultants
 05 – 10 September, 2011**

Locations:	<p>Crashwater Village, North Rupununi, Region 9</p> <p>Rewa Villlage, North Rupununi, Region 9</p> <p>Apoteri Village, North Rupununi, Region 9.</p> <p>Annai Village District (Surama, Wowetta, Rupertee, Kwatamaang and Annai Central Villages), North Rupununi, Region 9.</p>
Date of Visits:	September 05 - 10, 2011
EMC Representatives:	<ul style="list-style-type: none"> ▪ Mr. Lakshman Persaud, Team Leader. ▪ Mr. Renwick English.
Background:	<p>Simon & Shock International Logging Inc, (SSILI) has been allocated a State Forest Exploratory Permit (SFEP) by the Guyana Forestry Commission (GFC) for a portion of State Forest in the Upper Essequibo-Corentyne-North Rupununi District to implement a forest operation comprising of logging and processing. The Concession comprises 391,853 hectares mainly of mixed forests and is situated on undulating, hilly and flat terrain, with few steep slopes. The Company will operate in accordance with GFC's Code of Practice for Forest Operations and other relevant standards and aims to maintain and safeguard forest biodiversity and other uses and values to minimize adverse social and environmental impact of its forest operations. The Company is also required to conduct an Environmental and Social Impact Assessment (ESIA) prior to obtaining an Environmental Permit from the Environmental Protection Agency (EPA) and the Timber Sales Agreement (TSA) from the GFC. Environmental Management Consultants (EMC) has been contracted by the company to conduct the ESIA for the project. As part of the ESIA process EMC is conducting consultations with the relevant stakeholders, including surrounding communities at or near proposed project area.</p>
Objective of Visits:	<p>The purpose of the consultations were to:</p> <ul style="list-style-type: none"> ▪ To provide a description of the proposed Project: the Company's background and profile; description of proposed site; proposed activities and facilities. ▪ Identify national policies and regulations for compliance by the proposed project. ▪ Identify and discuss pertinent environmental issues that need to be addressed. ▪ To determine the extent of resource extraction/use or community visits to

	<p>the project site by conducting formal interviews with resource users.</p> <ul style="list-style-type: none"> ▪ Prepare a report of findings from community consultations.
<p>Description of Consultations methodology:</p>	<p>As part of the stakeholders engagement exercise for the ESIA being conducted for the Simon & Shock Logging Inc. Project it was decided and agreed upon to have consultations and more interface discussions with the communities located near or within proposed project area in an attempt to capture concerns holistically regarding the Project. As such, the communities of the North Rupununi were identified to be consulted. Mr. Brian Allicock, the Community Development Officer (CDO) of the Ministry of Amerindian Affairs for the Region, attended the meetings at Crash Water, Rewa and Apoteri Villages. Mr. Allicock provided valuable support during these consultations, addressing in like manner, other concerns raised by the villagers which were sometimes not related to the proposed development.</p>  <p style="text-align: center;">ESIA Team Social Expert providing an overview of the project</p> <p>The Social Team, which is a part of the ESIA Team, was introduced to the audience by the Toshao representing the respective villages. The Team Leader would then open by thanking the villagers for their time and interest to be part of the consultations. The project summary was given to each villager while the Terms of Reference of the ESIA was furnished to the Toshaos and Senior Village Councilors present at the meetings.</p> <p>Using the materials provided (Project Summary and Vegetative Maps of the area) the Team Leader conducted the consultations within each community in keeping with the following format:</p> <ul style="list-style-type: none"> ▪ Identifying the location of the Project on the Map relative to the stakeholder communities; ▪ Briefing the communities on the biological and physical description of

	<p>the project site;</p> <ul style="list-style-type: none"> ▪ Presenting the proposed action of the project within project the area – <i>describing construction and operational activities, project life, initial investment and scope for employment;</i> ▪ Predicting possible impacts to the environment and associated mitigation actions on: <i>soil / land, air, water, noise, plant and animal species, ecosystem, land-use, health and income.</i> ▪ Allowing for interaction during the presentation as villagers voiced their interests, concerns and questions on various matters discussed. Presentations in Crashwater and Rewa were supported by translations. ▪ Obtaining direct responses on activities within the project area (<i>regarding resource use and knowledge</i>). Random interviews were conducted with persons who were willing to be part of the exercise to assist this process.
<p>Information gathered in Communities:</p>	<p style="text-align: center;"><i>Crash Water Village</i></p> <p style="text-align: center;"><u>Community profile</u></p> <ul style="list-style-type: none"> ▪ <i>Population:</i> 210 (109 M: 101 F) of 39 Households. ▪ <i>Health:</i> (1) Health Centre with (1) Medic. Diseases: Malaria, skin rashes and diarrhoea. ▪ <i>Schools:</i> (1) nursery (5 F), (1) primary (36 M: 22 F) with (3) Teachers (2 M: 1 F). ▪ <i>Ethnicity:</i> 99% Amerindians: 1% Mixed race. ▪ <i>Communication:</i> High frequency radio (5300 Hz) 

	<p style="text-align: center;">Interview sessions in Crashwater</p> <p>The total number of persons participating was forty five (45), including the Toshao, Councillors, Farmers, Housewives, and Teachers.</p> <p style="text-align: center;"><u>Comments / Questions raised</u></p> <ul style="list-style-type: none">▪ Project location: villagers expressed satisfaction with the proximity of the project and are confident that it can be of benefit to the community.▪ Forest products: questions arised regarding the company's intention relating to the use of the Non-Timber Forest Products (NTFPs) in the area before the felling of trees. Villagers use these items for domestic production of baskets and mattapee and should be given priority to gather for local use. <i>Response:</i> Collaboration can be worked out between the company and villages on this matter.▪ Impacts on health: health personnel should be available on a full time basis within operation. <i>Response:</i> as part of the company's management plan, a suitably qualified personnel will be employed on a full time basis to respond to medical requirements.▪ Resource use: villagers do not enter into the project area for hunting or gathering. Kufu and Nibi are gathered on a seasonal basis, but not for commercial purposes, and not from the project area.▪ Employment: employment benefits, especially the young as they can stay in the community and help development their homes. Some members requested the company implement strong policies regarding the consumption of alcohol to prevent 'over spending' by workers. Also, the provision of a confectionary store on-site as means to reduce the need to leave work grounds for the sake of shopping. <i>Response:</i> the company will have to consider the impacts of alcohol use on its labour force as it will have production and cost implications <p>The session, which lasted 2 hours and 20 minutes, has seen an overall consensus of being in favour of the proposed project.</p>
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Rewa Village



Social Team addressing the Villagers in Rewa

Community profile

- *Population:* 280 (M: F) of 53 Households.
- *Health:* (1) Health Centre with (1) Health worker (1) Malaria personnel. Diseases: Malaria, skin rashes and diarrhoea.
- *Schools:* (1) nursery (15 M: 7F) with (1) Teacher; (1) primary (24 M: 25 F) with (4) Teachers (2 M: 2 F).
- *Ethnicity:* 100% Amerindians.
- *Communication:* High frequency radio (5300 Hz)

The total number of persons participating was forty (40), including the Toshao, Councillors, Farmers, Housewives, and Teachers.



Rewa Primary School

Comments / Questions raised

- **Road Construction:** on the whole the villagers expressed positive sentiments for the road construction since it can provide much easier mode of transport opportunities – fast medical evacuation, reduced costs, reliable mode of transport, increased business possibilities, increased tourism activities, etc. On this note, members suggest the examination of a possible toll system implementation for persons traversing through Amerindian territories.

Concerns as to the alignment of the road through communities were mounted due to the fact that these areas are mostly swamp lands with few hilly slopes. Villagers recommend the use of locals during the identification of the road alignment and taking into consideration the seasonal variations of flooding which greatly changes the landscape. *Response:* the team informed the gathering that a separate study will be required before the commencement of road works, which will require more direct interface with community members, and other key stakeholders to adequately address all foreseeable issues.

Concerns surround who will regulate the impacts of increased access to the remote community – increasing opportunity for hunting, illegal logging, mining and disturbance to the peace in community? *Response:* some members of the audience suggested that the company adopt a similar strategy as with the road managed by Iwokrama International Centre for Rainforest Conservation & Development, i.e. rangers

monitoring access to road, erect signage prohibiting hunting, logging, fishing, mining, etc. The ESIA team was also in agreement with this recommendation, especially because it indicates a willingness by the communities to manage their resources in a sustainable manner.

- Residents were concerned about the increase in air pollution from the number of vehicles using the road and its increased net impact on the environment. Response: Development comes with a cost to the environment and options with the least carbon footprint will be explored.
- Communication: some members emphasised the need to have adequate communication as experiences from a recent project proved unacceptable.
- Concerned about the increases in river traffic and its impacts on the water quality. River water is used for washing, cooking and drinking by community members. Changes in the water quality will affect the community's health, biodiversity and lead to a loss in tourism revenues.
- Equal benefit sharing of employment for river communities must be acknowledged in the project.

The community engagement lasted over three hours with participants being very supportive of the project and are anxiously awaiting implementation and the opportunities presented to Rewa Village.

Apoteri Village



Community profile

- *Population:* 270 (M: F) of 49 Households.
- *Health:* (1) Health Centre with (1) Health worker (1) Malaria personnel. Diseases: reduced cases in Malaria, sore eyes, and diarrhoea.

	<ul style="list-style-type: none">▪ <i>Schools:</i> (1) nursery (M: F) with (1)volunteer Teacher; (1) primary (38 M: 33 F) with (4) Teachers (2 M: 2 F).▪ <i>Ethnicity:</i> 98% Amerindians, 1% East Indian, 1% Mixed race.▪ <i>Communication:</i> High frequency radio (5300 Hz) <p>The total number of persons participating was forty (41), including the Toshao, Councillors, Farmers, Housewives, Boat captains, and Teachers.</p> <p style="text-align: center;"><u>Concerns / Questions raised</u></p> <ul style="list-style-type: none">▪ The Company seems capable of managing a logging business which is required but the community has reservations about the development because of failed promises of previous companies working in the area and disrespected the local people. Response: This is an international company with its reputation to guard and will not participate in such damaging actions.▪ The area is virgin forest and well suited for the LCDS and residents are concerned about the introduction of heavy machinery polluting the atmosphere and scaring the wildlife away. Response: trees will absorb the monoxides rapidly and there will be a minimum number of machinery present in the area.▪ Will the community people be trained to identify and manage the potential impacts mentioned in the project summary? Response: the company, in coordination with the EPA and GFC, will manage the area. Local people will be given on the job training and there may be room for community participation and coordination.▪ The road will bring lots of problems particularly illegal hunters who will burden the community competing for fish and wildlife. Response: Community must take advantage of development opportunities and devise plans to deal with negative spinoffs▪ The villagers wish to strongly advise against the sale or use of alcohol or drugs on the company's premise. Convicted criminals, particularly rapists and other sex offenders must not be allowed to enter into communities. Response: the communities' views will be taken into consideration in the drafting of the management plan and also the operational guidelines for company staff.▪ Villagers recognised themselves as primary stakeholders and insisted that they must monitor their titled lands and areas in close proximity, including access to the concession.▪ The company is welcomed in the area and community members pledged to work towards a good relationship where both parties can benefit and enjoy a lengthy and successful business venture.
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Villager expressing concerns about the road construction for the project

Annai Village District comprising of Surama, Wowetta, Rupertee, Kwatamang and Annai Central Villages

Community profile for Annai Village District

- *Population:* (M: F) of Households.
- *Health:* (1) Health Centre in Annai; (4) Health Posts in other villages with (1) Medic; (1) Dentist; (1) Nurse (1) Malaria personnel and Mid-wife. Diseases: Malaria, water borne, and diarrhoea.
- *Schools:* (5) Nurseries (M: F) well staffed; (4) Primaries (M: F) understaffed; (1) Secondary (M: F) also understaffed; and (1) Tertiary (M: F) understaffed.
- *Ethnicity:* 98% Amerindians: 2% Mixed race.
- *Communication:* all communities have High frequency radio (5300 Hz) while telephones exist at Bina Hill Institute and government compound. Internet accesses are available at Rock – View Lodge and Surama village.
- *Security:* there is (1) Police Station with (3) personnel to serve the District.

The total number of persons participating was twenty four (24), including persons of who were Senior Councilors, Farmers, and Housewives.



Villager making a point on employment

Concerns / Questions raised

- Road construction: will local people be utilised for assisting in determining the road alignment and participate in the “ground truthing.” Recommends that new machinery be used in the road development. *Response:* the team informed the villagers that a separate study will be required should the construction of a road be feasible, which will require more direct interface with community members, and other key stakeholders to adequately address all foreseeable issues.
- Employment: the company can enquire within communities to determine the skill level of persons relevant to the jobs that would be available and provide employment based on these requirements. It is recommended that women will be employed by the company, but not only as maids or cooks. Previous companies made promises but only a few persons from the villages were employed. Adequate medical and insurance coverage should be made available to employees. *Response:* the presenter went on to mention that coverage is, under law, provided for by the National Insurance Scheme. In relation to the “employment selection”, it was suggested in order to provide a fair chance for the suitably skilled, a rotational system of employment be implement which can also serve as an appropriate “turn-around”.
- Alcohol: there should be a no tolerance for the use of alcohol on the premise. Since income, family and health are often affected by uncontrolled consumption of alcohol. *Response:* the company will work with the villages to ensure all parties are satisfies as far as reasonably possible. It is very likely that alcohol use during the period of employment will be restricted.

	<ul style="list-style-type: none">▪ Medical treatment: procurement of up-to-date tropical medicines, especially from Brazil, should be the company's priority. This can be done through the assistance of the Medic of Annai (who went on to give many examples of cases where the only available treatment for many [chronic] conditions experienced in this region are from Brazil – Mr. Eugene Xavier).
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APPENDIX F – Minutes of Sector Agencies Meeting



Simon and Shock International Logging Inc. – Proposed Logging Project
within SFEP No: 03/2007 A & B, where Area A is situated at Right Bank Rewa River, Left Bank Essequibo River,
and Area B at Right Bank Essequibo River, Left Bank Essequibo River, Left Bank Corentyne River, Region 9.

Sector Agency Scoping Meeting

Simon and Shock International Logging Inc. Sector Agency Scoping Meeting

Date: July 06, 2011
Time: 10:20 hours
Venue: EPA Boardroom, Ganges Street, Sophia, Georgetown
Objective: To hold a sector scoping exercise for the Environmental Impact Assessment of the above-mentioned project, and to provide Sector Agencies with the opportunity to highlight concerns they may have regarding the project so that they can be incorporated into the final Terms of Reference (TOR) for the EIA study.

EPA Representatives:

1. Ms. Geeta Devi Singh – Director, Environmental Management Division
2. Ms. Sonia Luke – SEO (IIE), Environmental Management Division
3. Ms. Asma Sharief –EO II (M&F), Environmental Management Division
4. Ms. Nalissa Persaud - EO II (M&F), Environmental Management Division
5. Ms. Saudia Sadloo – EO I (M&F), Environmental Management Division
6. Ms. Shabana Yusuf - EO I (IIE), Environmental Management Division
7. Ms. Onika Stellingburg – Intern, Environmental Management Division

Representative from Simon and Shock International Logging Inc.:

5. Mr. Chetan Bilagali Narayan - Director

Representatives from EIA Consultant Team:

8. Mr. Khalid Alladin – EIA team leader
9. Mr. Richard Persaud – EIA team member

Representatives of Sector Agencies and Forest Concessionaires:

13. Dr. Raquel Thomas – Director Resource Management and Training, IWOKRAMA
15. Ms. Joycelyn Edinboro – Principal Environmental Health Officer, Environmental Health Unit, Ministry of Health

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17. Ms. Karen Small – Lecturer, National Parks Commission
18. Mr. Eustace Alexander – Ecosystem Coordinator, Conservation International
19. Mr. Curtis Bernard – Technical Manager, Conservation International
20. Ms. Sherrall Gooding – Hydro Power Support Engineer, Guyana Energy Agency
21. Mr. Clive Nurse – Deputy Labour Chief Officer, Ministry of Labour, Human Services, and Social Security

The Sector Agency scoping meeting for the Simon and Shock International Logging Inc. proposed logging project was held in the EPA Boardroom, Ganges Street, Sophia, Georgetown. The meeting commenced at 10:20 hours.

The Chairperson, Ms. Geeta Singh, welcomed and thanked representatives from the Sector Agencies for attending the meeting. She further provided a brief outline of the EPA's EIA process. As it related to the Simon and Shock Logging Project, she indicated that the EPA received an Application from the Company in September, 2010, and as part of the process, a site visit was conducted on October 14, 2010. After review of the Application, findings from the site visit, and based on the magnitude of the project the Agency made the decision that an EIA was required for the project. She mentioned that the project is located in close proximity to the Conservation International Concession in the southeastern section of Guyana. A notice informing the public that an EIA is required was published in the News Papers in January, 2011, and subsequently another notice was published in June, 2011, informing of the Public and Sector Scoping meetings.

She stated the purpose of the Sector Scoping meeting is to allow Sector Agencies to have their inputs made towards identifying issues or concerns that the project can have, and more specifically how it relates to the various Sector Agencies policies that the project should conform. The submission of comments from both the Sector and Public Scopings, would assist in the finalization of the Terms of Reference (ToR) which is currently in a draft format.

Ms. Singh then invited a representative of Simon and Shock International Logging Inc., Mr. Narayan, to give a summary of the project. He first gave an introduction of the Company stating that Vaitarna forms part of a large group called Amalgamated Coffee Day Company Limited which is the parent Company. The group consists of six divisions where Vaitarna is the newest division (only a few months old). The Company is in forestry for the first time though they have some experience but not at this scale. The Company started its export Division in 1991, exporting Coffee to European markets; it then moved to retail, hence the chain of cafes. Mr. Narayan then focused on the Vaitarna division which recently acquired two forest concessions in Guyana one formerly known as Caribbean Resources Limited (CRL) whose operations have commenced and the second one which is still in the SFEP stage (Simon and Shock International Logging Inc.).

He mentioned that a Company has been contracted to carry out the forest inventory and submit the data by August, 2011; this data would indicate the stock that is available. Based on the data, the Company will then determine the scale of sawmilling operation, type of market it would like to sell logs to, type of organization structure, and type of business approach to be adopted. Prior to the inventory, the Company has tentatively presented some plans in the Project Summary. The sawmill location is priority since the Company does not want to transport wood waste to Georgetown given that approximately forty percent of the log is waste. The Company plans to provide employment which will be done through a sawmilling facility within the Concession as the first step and further from there, establish a larger sawmilling

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complex at Annai. At this time the Company can only commit to the fact that it would like to give back to the Community when the operation comes on stream since employment may reach three hundred and more persons and first priority for job openings would be given to the local people. Thirdly, the Company would like to be as transparent as possible. Based on the Geography of the area it is impossible to operate independently due to the dynamics of the geography as such, the Company must involve the Community, especially the senior people who have expertise in this business and take onboard their suggestions as such plans would not be independent but inputs from the Community would be sought.

Mr. Kalid Alladin, representing the EIA team of consultants, was then invited to give an outline of the process the team would use to conduct the EIA study. He first stated that the EIA study must be conducted by a team independent of the EPA and the Company. For this project, given the location and activities, the team put together consists of various expertises such as biologist for flora and fauna, forester, and persons for social issues. He listed the team members and their various responsibilities and include that the team is supported by other biologists for field work etc. The general approach to the study is first to put together a description of the project which is still currently being worked out, for example the access road to the concession, location of processing facilities. He further added that by the completion of the Draft EIA, there should be a better description of the project. There would also be a description of the physical baseline data which would include air and water quality, soil type, topography. This would be achieved by using some existing data and also by conducting field work. There would be a description of the socio-economic environment which would also be done by utilizing some existing information and by conducting additional field work. There would be a review of existing National Policies, Legislations, Regulations, and other laws applicable to the project for example: the Forest Act, Environmental Protection Act, LCDS, REDD+, and Mining Act, Labour Regulations etc. From this examination, there would be an analysis of the potential impacts both Bio-physical and Socio-economic impacts to the environment.

Once the impacts have been identified, an Environmental Management Plan would be developed to mitigate, reduce, and minimize these impacts which are the general approach of the study. Some of specific issues that would be looked at include; potential loss of biodiversity, and the adequacy of the resources in the area and match with the planned logging rate (annual allowable cut) to ensure that there is adequate resources to sustain the planned extraction rate. To assist with this, there is a team currently conducting an inventory of the area which would inform of the resource present. The team would also look at any change in the forest biodiversity for example, if any fauna would be affected through migration, or if habitat fragmentation would occur from logging activities, the construction of roads and skid trails. If there would be species loss in terms of flora or reduction of abundance of species also the presence of invasive species. Impacts on the physical environment such as pollution prevention and control for example from fuel storage and handling, any chemicals to be used, environmental health issues such as waste management, both solid waste and sewerage use of protective gears, introduction of diseases.

There would be a development of an emergency response plan for the event of an accident. The environmental health both within the concession and the sawmill area outside of the concession will be addressed. One of the main areas that would be assessed is the road. There would be good skid trails and logging roads within the concession however, the Company is considering a main road into the Concession from the existing Linden Lethem Road and with if this is the case, the impacts created both impacts to the physical environment and more importantly social impacts would have to be analysed at since the road would have to pass through Amerindian Community Lands whose agreement would have to be worked out. They would also look at issues such as improved access to the areas that were previously only accessible

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to outsiders by river. Other development issues such as land use conflicts given the fact that there are some Titled Amerindian Lands nearby and also the presence of the Conservation International Concession in the middle of the Simon and Shock Concession. Benefits of the project to Communities and to other Stakeholders nearby would be examined. A part of the Environmental Management Plan (EMP) an Environmental Monitoring Plan would be used to test the effectiveness of the EMP and the development of an Emergency Response Plan and a Conceptual Plan. He reiterated that the process is at the stage of finalizing the Terms of Reference which once has been achieved, the study can be conducted.

At that point, the Chairperson then invited representatives from various sector agencies to make any suggestions and comments on the project as well as any issues or concerns they may have.

Questions/Comments/Suggestions

1. **Mr. Clive Nurse – Deputy Labour Chief Officer, Ministry of Labour**

He stated his observation from the Project Summary that the Company plans to hire between forty five to three hundred persons and given that the number of deaths last year was primarily in the mining and forest sector, he is concerned about the safety and health of the employees. He expressed concern that adequate provision for the safety and health of these workers should be provided. He further added that there should be an assessment of the potential threats to life and that the Occupational Health and Safety Act is taken into consideration. He highlighted that the Act is recent and the divisions are quite profound however; there is a tendency for industrial establishments in remote areas to be in breach. Mr. Nurse wanted adequate provision of personal protective equipment, consideration to be given to the work atmosphere, and good employer to employee relationship.

2. **Mr. Curtis Bernard – Conservation International Guyana** –indicated that the assessment should focus on the new direction that the Country is heading with the LCDS. It should also take into account the impacts or the potential impacts the project can have on the success of any sort of the REDD+ scheme, payment of ecosystem services, especially carbon services within Guyana. The project should look at how it fits within the current landscape and land uses within the area in which the concession is located. Since area consists of Amerindian Communities, Conservation Concession, wetlands that contains important biodiversity important to the functioning of the ecosystems within the Rupununi. Thought should also be given to the proposed road which may have to pass through Amerindian Communities and important wetlands to connect to the Georgetown/ Lethem Road. He added that he would like those larger issues to be taken into consideration and to shape how the assessment proceeds.

3. **Dr. Raquel Thomas – Director- Resource Management and Training - Iwokrama** - questioned that given the challenges of the area especially the integrity of the bridges along the road what ideas does the Company have for value adding and how it intends to get its products out to Georgetown or Linden? She further indicated that she understands that the Company would not take logs out and would be establishing a sawmilling facility at Annai, in this regard, she requested more details on the magnitude and type of facility to be constructed. She sought further clarification on the sawmilling facility within the Concession and a

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larger facility at Annai which Mr. Narayan also mentioned are some of the Company's plans.

4. **Mr. Narayan – Director, Simon and Shock International Logging Inc** responded to Dr. Thomas's question by saying that he means anything from the log form to a better form is what he is terming as value adding and not furniture manufacturing. He further stated that the Company does not want to be transporting waste to Georgetown by transporting logs. He added that the size of the Annai operation would be determined after the inventory is completed by August end and because of this he was not in a position to say what size of operation would be at Annai or if it is feasible to carry the business forward. Mr. Narayan responded that the size would depend on whether to have one mill on the concession or two etc. and this could not be determined at this stage.
5. **Ms. Joycelyn Edinboro – Principal Environmental Health Officer, Environmental Unit Ministry of Health** - expressed concern about water safety, in terms of the presence of a well or potable water. She added that water sampling should be conducted four to five times in one year. The Company should make an effort to be in contact with the Divisional Environmental Health Officer who is stationed at Annai, who can be contacted in the event of emergencies. She questioned, the emergency measures in place in the event of flooding, how would the food be stored and separated from chemicals? She requested that food products handlers are updated in terms of safe food handling practices. Which are areas that can have outbreaks resulting in emergencies? She also expressed concern about housing in terms of how staff housing is situated in relation to logging activities. She advised that buildings should be located away from the logging activity to prevent falling timber. Measures should be put in place to adequately address the disposal of domestic waste water from washing, bathroom, and solid waste.
6. **Mr. Eustace Alexander – Ecosystem Coordinator, Conservation International** - Shared some of his personal thoughts on the project and not necessarily representing CI.
 - Firstly based on reading the project summary, there is an impression that the project would follow the practices of the GFC, such as RIL, etc. and went on to commend the project Managers and Developers for this.
 - Secondly, he wanted to reiterate his Organization's point on integrated land management which is very important for the Company based on the following:
 - It encloses an alternative land use; and
 - It sits in a region that will soon become a hive of a variety of land uses for Guyana. As such, whatever procedures and practices, integrated land management, and integrated resource management becomes very important to the developer.
 - Thirdly the EIA team, he has found very often in his review of EIAs, do not demonstrate the competence in some cases for example, he read in an ESIA that the Consultants were afraid to go out at nights to conduct surveys. He added that it is important that the EPA ensure that the persons who conduct these studies are the best and can produce good reports on the project. Since it is amusing to read that a group of scientists refuse to do a night survey because of a fear of nocturnal animals. He recommended that the CVs of the team members be attached to the ToR which would

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- be helpful so that persons can see the quality of persons undertaking these surveys.
- Fourthly, the project would impact on three main Communities in the Area these are; Apoteri, Rewa, and Crashwater, those are considered the closest Communities however; there are sixteen other Communities in the North Rupununi Area that would be impacted either directly or indirectly. He added that he does not believe that the ToR reflects a thorough SIA. The statement within the SIA is more environmental and was not sure if the EPA had guidelines for SIA however, the ToR is more environmental. He further added that he hoped that the social issues that will be impacted by the project can emerge in the report. He stated that much archaeological work was done within that area which has very good archaeological sites which should be conserved and not to determine this. The section relating to monitoring ecology should be extended to monitor sociological impacts so that ten years from now we want to ensure that the project not only has positive environmental impacts but positive social impacts as well.
 - Fifthly, he requested a detailed social analysis given his experiences in this area. He observed that the Company plans to hire in excess of three hundred persons, and questioned what percentage of this would be Guyanese? He added for example, some projects start and shortly after vacancies are filled by persons of other nationalities that should be otherwise filled by Guyanese. The EIA should hold the developer to say what percentage of his human resource would be Guyanese to avoid any confusion.
 - Sixthly, Mr. Alexander wanted to reiterate what he said in Annai that with the Company's experience in coffee and furniture, it might be good to consider furniture manufacture with non-timber forest products (NTFPs). With the profitability behind it, would help the Company to safeguard the forest, fits neatly into the REDD and LCDS plans. Further, it helps the Company to make a great contribution to a skill that is highly needed in the area since, there is no one with the skill to make furniture out of NTFPs of Guyana like the nibbi and kufa vines. The persons with such skills come from the North West Area. He reiterated the benefits of utilizing the NTFPs including; its suitability for the Company's business in furniture manufacturing, keeping the forest intact, generate revenue, create employment, and develop a skill that is needed in the area.
7. **G. Singh – Director EMD, EPA**, indicated to Mr. Alexander that she appreciated the honest feedback and while the EPA does have guidelines set out as to how an EIA can be done, it does leave room for the inclusion of issues that may not have been given thought when those guidelines were developed. The points arising will be factored into the study that has to be done especially as it relates to the team and their expertise and reiterated the need for comments and feedback on the EIAs produced and circulated.
8. **Mr. Eustace Alexander – Ecosystem Coordinator, Conservation International** - indicated that he sends comments however, sometimes when reading the report it can be likened to a comic strip and he is embarrassed. He further reiterated the point that the last EIA report which stated that the nocturnal survey was not done because the scientists were afraid to venture into the forest at night. This gives him a chance to raise it here at the EPA that the Agency should be careful with the team that is selected to undertake the ESIA study and the kind of report that is being produced.

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9. **Dr. Raquel Thomas – Director- Resource Management and Training – Iwokrama** added to E. Alaxender's comment primarily on the social aspect and particularly to the construction or upgrade of the road from the concession to Annai since it is going to pass through Annai (Central Annai). K. Alladin added that the road is not definite plan however, she added that if is being considered then it would have to be discussed since the timber has to get out of the concession and suggested that the road may be the best access as such the impacts such as those on Communities should be given priority since they are titled lands. The social impacts are to be given importance particularly to the type of road that would have to be constructed would require special construction with consideration to wetlands, biological impacts. She also added that she preferred the term integrated resource use since it is not only land use but water etc.
10. **Ms. Karen Small – Lecturer, National Parks Commission** stated that written comments would be submitted.

There being no other questions or concerns raised, Ms. Singh thanked the participants and outlined the next steps of the ESIA process, stating that the comments generated from the scoping meetings would be incorporated in the ToR of the Study. The consultants would then undertake the study and submit the ESIA to the EPA. This document would be circulated to the various sector agencies and relevant stakeholders for review. Comments resulting from the review would have to be addressed in a revised document. Ms. Singh informed the gathering of the Environmental Assessment Board, which oversees the ESIA process and functions to recommend to the EPA whether environmental authorization should be granted for the project. She further urged the stakeholders present to review the ESIA report and to submit comments to the Agency.

The meeting concluded at 11:15 hours.

APPENDIX G - List of Key Stakeholders Engaged and Issues Discussed

Stakeholder	Date & Location of Engagement	Contact	Objective of meetings/consultations	Findings of the Engagement (s)
Guyana Forestry Commission	Jan 18, 2012 GFC Head Office	Mr. Jagdesh Singh - Deputy Commissioner of Forests	To gather and verify information on the perceived and actual social impacts of the proposed project.	<ul style="list-style-type: none"> ▪ Mr. Singh declared that there was no conflict between the objectives of the proposed development and the LCDS. ▪ Mr. Singh believes that the current Code of Practice and prescribed guidelines for timber harvesting will be adequate for successful management of the area ensuring sustainability of resources. ▪ The major benefit to the communities will be in the form of employment and also in capacity building.
Regional Democratic Council - Region 9	Oct 03, 2011 Telephone Interview	Mr. Clarendo Rudolph - Regional Chairman	To engage the RDC in discussions on the proposed project gathering information on the perceived impacts and alternatives for the stakeholders as well as plans for development of the area.	<ul style="list-style-type: none"> ▪ The Chairman believed that employment will be the main impact of this proposed development and so desired that local persons be given first priority thereby maximizing employment benefits to the region. ▪ He indicated that this type of development is directly related to the RDC's commitment to economic growth by the harvesting of natural resources. ▪ The Chairman was confident in the mandates of EPA and GFC to enforce proper operational guidelines at all stages of the operations. ▪ The Chairman believed that the value added to the economy by the processing of raw lumber will be very beneficial to Guyana and Region 9. ▪ Indicated that currently the Region has no plan to develop the project area.
Conservation International	Oct 03, 2011 CI Office, Laluni Street, Queenstown, Georgetown	Dr. David Singh, Executive Director	To provide CI with the opportunity to raise any concerns and also to indicate its areas of support for the proposed development and to identify the areas for possible collaboration in resource management of the general area.	<ul style="list-style-type: none"> ▪ Dr. Singh stressed that there is the need for collaboration in management of the area. He was however confident that their relationship with GFC will lend support for greater input in the management of the area. ▪ Dr. Singh was confident in the relationship that CI has established with the local communities over the years of operation in the region and felt it necessary that any new development in the area should learn from CI. ▪ Dr. Singh indicated that the local communities will have to be connected to the development in the form of some sustainable model built on good relations.

Stakeholder	Date & Location of Engagement	Contact	Objective of meetings/consultations	Findings of the Engagement (s)
				<ul style="list-style-type: none"> ▪ Dr. Singh suggested that CI fulfills the mandate of the GFC by adopting the alternative model for direct conservation within the Concession and was concerned their approach may be under threat by the new development should this operation be done in isolation of CI.
Sherwood Forrests Inc. & WWF Guianas	Oct 21, 2011 WWF Guianas Office	Dr. Patrick Williams – Country Manager	To gather information on Sherwood Forrests and the activities WWF Guianas as it relates to the proposed development and project area.	<ul style="list-style-type: none"> ▪ A partnership was highlighted as the strongest area for possible collaboration between the two companies. ▪ SFI wishes to coordinate in the areas of security, medical emergency, communications and transport. ▪ Dr. Williams believes this area to be a very sensitive one with the climatic conditions being a main determinant of production as the concession will be heavily flooded for almost half of the year making extractive operations extremely challenging and environmentally disruptive. ▪ SFI believes that employment will be the main impact of this proposed development.
Environmental Protection Agency	Jan 18, 2012 – EPA Office, Ganges Street, Sophia	Ms. Teijvarti Persaud – Senior Environmental Officer, EMD	To receive the EPA's environmental management and socio-economic concerns arising out of the proposed project for stakeholders	<ul style="list-style-type: none"> ▪ EPA reiterated that the study should be conducted in keeping with the approved ToR and relevant legislation. ▪ EPA is confident that the project will not have any major environmental impact as long as the recommended guidelines for timber operations are followed. ▪ EPA believes the positive impact to be income generation from employment will benefit the entire Rupununi. ▪ EPA expects a comprehensive ESIA based on the nature and location of the proposed development.
Guyana Geology & Mines Commission	Nov 01, 2011 GGMC Office	Mr. Wendell Alleyne, – Manager (ag) - Environmental Division	To gather information on the perceived impacts of SSILI on the mining industry and the distribution of mining concessions within the area.	<ul style="list-style-type: none"> ▪ Mr. Alleyne stressed the need for collaboration in management of the area particularly with the establishment of all weather road access. ▪ GGMC is willing to work with the company to ensure that the area is properly managed and will request collaboration relating to the sharing of information on movement of speculators or illegal miners within the area. ▪ Mr. Alleyne indicated that Amerindians are being employed by the mining sector as they are comfortable with the informal arrangements and partial freedom this type of employment provides.

Stakeholder	Date & Location of Engagement	Contact	Objective of meetings/consultations	Findings of the Engagement (s)
				<ul style="list-style-type: none"> ▪ Mr. Alleyne indicated that the area does not have any active mining concessions as all applications are awaiting a presidential decision and also that there is a moratorium on river mining for the Rupununi, and Upper Essequibo Rivers.
Forest Producers Association (FPA)	Oct 25, 2011, FPA Office, Georgetown	Mr. Hilbertus Cort - Chairman & Mr. Khalawan – Executive Member	To gather from FPA its concerns and recommendations for the proposed development	<ul style="list-style-type: none"> ▪ Mr. Cort immediately requested that the company joined the FPA thereby being in a better position to benefit from the services of the organization. ▪ The FPA recommends that the company also focus outside of the furniture market and develop markets for the species found within its concession. ▪ The FPA agreed that the major impact will be that of employment but cautioned against having high expectations as the local labor supply is extremely mobile and is currently seeking more lucrative employment in the goldfields. ▪ Expatriates are not welcomed as an economically feasible option because the company will already be face with a high operations cost due to the distant location of its raw material from its shipping facility at Linden.
Wildlife Management Authority	Oct 27, 2011, Ganges Street, Sophia, Georgetown	Ms. Alona Sankar -Head	To engage the WMA in discussions regarding possible impacts of the proposed development	<ul style="list-style-type: none"> ▪ Ms. Sankar believes that the development can play a critical role in wildlife conservation by employing a wildlife management code for the company. ▪ Ms. Sankar does not have pressing concerns regarding the development and its implications for the international trade of wildlife but wishes for the company to engage in proper wildlife management practices which protects species and opposed to indiscriminate killing and trapping by employees.
Bina Hill Institute (BHI)	Nov 02, 2011, Via Telephone Interview	Ms. Patsy Fredricks – Principal BHI		<ul style="list-style-type: none"> ▪ BHI is raising a new generation of youth leaders who need the support of businesses in terms of sponsorship during their studies and employment upon graduation. ▪ BHI can provide capacity building in many technical areas for the community peoples and will be willing to tender its services to the project. ▪ BHI is confident that the company will employ best practices for timber harvesting which will augment what is

Stakeholder	Date & Location of Engagement	Contact	Objective of meetings/consultations	Findings of the Engagement (s)
				<p>being taught by the institution.</p> <ul style="list-style-type: none"> ▪ Capacity building sessions must be provided for the residents and those employed will require specific skills training. ▪ Local people of the Rupununi must be given first priority in employment thereby benefiting the local villages with a boost in the micro economy.
National Agricultural Research Extension Institute (NAREI)	Nov 04, 2011, NAREI, Mon Repos, East Coast Demerara	Mr. David Fredricks - Manager, Soils Division		<ul style="list-style-type: none"> ▪ Mr. Fredricks noted that some soil surveys were done in the area and the area is suitable for agriculture. ▪ He identified legumes as a more lucrative crop for this soil type and made a link to the demand for peas as a staple in Brazil. ▪ Mr. Fredricks believes that the Rupununi needs to be food sufficient and develop ways of processing and storage for the times of food shortage. ▪ He wishes for the project to help this cause by investing in agricultural activities utilizing its vast land resources.
Iwokrama	Jan 18, 2012, Iwokrama Head Office, Georgetown	Dr. Raquel Thomas – Director, Iwokrama		<ul style="list-style-type: none"> ▪ Iwokrama is in support of the project and recommends the RIL model and is of the view that ecosystem management will not be adversely affected if the RIL guidelines are followed, as demonstrated by Iwokrama. ▪ Iwokrama is in the business of project coordination as a consultancy. The Center can facilitate SSILI in its implementation and certification processes as a consultant if required. ▪ The company must ensure that strong relationships are built with the communities. Every effort must be made by the company to ensure that it does not promote alcoholism or absenteeism amongst its male workforce. ▪ Iwokrama recommends the company join with the area management initiative and is willing to share its road management plans with the company.
NRDDB	Jan 26, 2012, Jerries Restaurant,	Mr. Michael Hayles – Vice Chairman, NRDDB		<ul style="list-style-type: none"> ▪ NRDDB is in full support of the project as it is directly related to NRDDB's vision for development in the Region. ▪ NRDDB will pay attention to the ecosystem as it does extensive work in the Rupununi particularly in the are of

Stakeholder	Date & Location of Engagement	Contact	Objective of meetings/consultations	Findings of the Engagement (s)
	Georgetown			<p>arapaima management. Cases of poor environmental management will be reported to the relevant authorities.</p> <ul style="list-style-type: none"> ▪ The NRDDDB is not aware of anyone outside of the tour guides at Rewa who utilizes the area.
Hydromet Division, Ministry of Agriculture	Jan 17, 2012, Hydromet Office, Brickdam, Georgetown	Ms. Bhaleka Seulall - Head, Hydromet Division		<ul style="list-style-type: none"> ▪ Ms Seulall indicated that weather data for the area does not exist and the Division has no weather station in the vicinity. ▪ Ms Seulall was open to coordination and recommends a mini weather station to be located in the base camp. She pledged support to assist in the installation of the system once procured by the company. ▪ A mini weather station will greatly assist in the collection of weather data in the area as the Doppler Weather System does not cover the area due to its far distance from the station in Timehri.
Ministry of Amerindian Affairs	Jan 17 & 18, 2012 Ministry of Amerindian Affairs, Georgetown	Mr. Nigel Dharamlall, Mr. Anil Roberts, Mr. Ren Gonsalves & Ms. Sharon Austin		<ul style="list-style-type: none"> ▪ The Ministry recommends that a MoU be developed to reflect the development and community commitments between the community and the company and is willing to facilitate discussions between stakeholders. ▪ The developer must ensure that no cultural sites are destroyed in the process and that Amerindian culture is protected. ▪ The Ministry is involved in bargaining with developers in some communities in order to ensure that agreements are meaningful to both parties. ▪ It is expected that the major benefit to the communities will be in the form of employment. ▪ In addition, the communities will benefit from many training sessions in various disciplines relating to the logging industry.
Ministry of Local Government & Regional Development	Mar 07, 2012, Ministry of Local Government & Regional	Mr. Bramanand Singh – Regional Planner		<ul style="list-style-type: none"> ▪ Mr. Singh noted that the project will require extensive coordination with stakeholders in the area, including Iwokrama. ▪ There will also be the need for permission from Annai to build the processing facility and the road on its land. ▪ Mr. Singh was confident that the area will be managed

Stakeholder	Date & Location of Engagement	Contact	Objective of meetings/consultations	Findings of the Engagement (s)
	Development Office, Georgetown			<p>properly following the guidelines of the GFC.</p> <ul style="list-style-type: none"> ▪ He encouraged the use of renewable energies at the interior locations in order for the company to be more green and clean. ▪ Mr. Singh believes the employment and the local communities will be the major benefit followed with the potential for development that comes with the road.
Ministry of Public Works & Communication	Mar 27, 2012, Work Services Office, MoPWC, Kingstown, Georgetown	Mr. Hinds – Engineer, Work Services Group		<ul style="list-style-type: none"> ▪ Mr. Hinds was very supportive of the project and believed that the Ministry will be more interested in the design and construction of the proposed road. ▪ He indicated that this type of development is directly related to the Ministry's commitment to economic growth by the harvesting of natural resources. ▪ The company will be required to submit its road construction plans to the Ministry for guidance. ▪ The Ministry will also be required to approve of the appropriate signage for road users. ▪ The company must seek to use the appropriate trucks meeting the load requirements for transportation of lumber along the road in order to minimize its impacts. ▪ The Ministry confirms that employment will be the main impact of this proposed development. ▪ The company may be required by GFC to assist in the development of the local communities while it is in operation in the region.

APPENDIX H – Technical Description of SSILI Concession Boundaries

Part A - Right Bank Rewa River, Left Bank Essequibo River

Commencing at the **mouth** of an **unnamed tributary** on the **right bank Rewa River** having approximate **UTM** geographic coordinates of **03 19 400 E, 03 96 546 N**, thence up the **left bank** of this **unnamed tributary** for an approximate distance of **5.2 km** to a point having approximate **UTM** geographic coordinates of **03 21 737 E, 03 99 261 N**, thence by a cut line in a **North-westerly** direction for an approximate distance of **1.9 km** to a point near the source of an **unnamed tributary** of the **Rewa River** having approximate **UTM** geographic coordinates of **03 20 507 E, 04 00 704 N**; thence down the **right bank** of this **unnamed tributary** for an approximate distance of **6.2 km** to a point having approximate **UTM** geographic coordinates of **03 16 997 E, 04 04 166 N**; thence by a cut line in a **North-easterly** direction for an approximate distance of **2.1 km** to a point near the source of an **unnamed tributary** of the **Rewa River** having approximate **UTM** geographic coordinates of **03 18 383 E, 0405 806 N**, thence down the **right bank** of this **unnamed tributary** for an approximate distance of **8.5 km** to the **mouth** of a small unnamed tributary to a point near its **source** having approximate **UTM** geographic coordinates of **03 15 775 E, 04 13 573 N**, thence by a cut line in a **North-easterly** direction for an approximate distance of **1.5 km** to a point of an **unnamed tributary** of the **Rewa River** having approximate **UTM** geographic coordinates of **03 17 341 E, 0416 386 N**; thence by a **cut line** in an **North-easterly** direction for an approximate distance of **6.7 km** to a point near the **source** of a **small unnamed tributary** of another **unnamed tributary** of the **Essequibo River** having approximate **UTM** geographic coordinates of **03 23 599 E, 04 18 855 N**, thence down the **right bank** of this small **unnamed tributary** to its **mouth** on the **left bank** of this other **unnamed tributary** of the **Essequibo River** having approximate **UTM** geographic coordinates of **03 31 449 E, 04 15 148 N**; thence across and down the **right bank** of his **unnamed tributary** to its **mouth** on the **left bank Essequibo River** having approximate **UTM** geographic coordinates of **03 47 549 E, 04 15 775 N**; thence up the **left bank Essequibo River** for an approximate distance of **29.4 km** to the **mouth** of a large **unnamed tributary** having approximate **UTM** geographic coordinates of **03 55 390 E, 03 95 598 N**, thence up the **left bank** of this large **unnamed tributary** for an approximate distance of **7.7 km** to the **mouth** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 52 529 E, 03 90 544 N**; thence up to the **left bank** of this **unnamed tributary** for an approximate distance of **14.0 km** to a point opposite the **mouth** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 41 610 E, 03 80 503 N**, thence by a **cut line** in a **Southerly** direction for an approximate distance of **8.0 km** to a **point** on an **unnamed tributary** of a **larger unnamed tributary** of the **Essequibo River** having approximate **UTM** geographic coordinates of **03 41 434 E, 03 72 570 N**, thence across down the **left bank** of this **unnamed tributary** to its **mouth** to the **left bank** of this **larger unnamed tributary** of the **Essequibo River** having approximate **UTM** geographic coordinates of **03 44 381 E, 03 71 251 N**, thence up the **left bank** of this **larger unnamed tributary** for an approximate distance of **3.5 km** to a **point** opposite the **mouth** of a **large unnamed tributary** having approximate **UTM** geographic coordinates of **03 44 210 E, 03 68 672 N**; thence across up the **left bank** of this **large unnamed tributary** to a **point** near its **source** having approximate **UTM** geographic coordinates of **03 46 001 E, 03 58 066 N**, thence by a **cut line** in **South- Easterly** direction for an approximate distance of **0.6 km** to a **point** near its **source** of **small unnamed tributary** having approximate **UTM** geographic coordinates of **03 46 301 E, 03 57 552 N**; thence down the **right bank** of this **small unnamed tributary** to its **mouth** of a **larger unnamed tributary** of the **Essequibo River** having approximate **UTM** geographic coordinates of **03 45 624 E, 03 55 838 N**; thence down the **right bank** of this **larger unnamed tributary** for an approximate distance of **2.5 km** to a point opposite the **mouth** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 43 465 E, 03 56 789 N**; thence across and 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 43 199 E, 03 55 538 N**; thence by a **cut line** in **South-westerly** direction for an approximate distance of **1.8 km** to a point near the **source** of an **unnamed tributary** of another **unnamed tributary** of the **Rewa River** having approximate **UTM** geographic coordinated of **03 41 606 E, 03 54 767N**; thence down the **right bank** of this **unnamed tributary** to this **mouth** on **left bank** of this larger **unnamed tributary** having approximate **UTM** geographic coordinates of **03 38 582 E, 03 55 813 N**; thence across and up the **left bank** of this **larger unnamed tributary** to a point near its **source** having approximate **UTM** geographic coordinates of **03 35 643 E, 03 53 200 N**; thence by a **cut line** in **North-westerly** direction for an approximately distance of **2.5**

km to a point on an **unnamed tributary** of the **Rewa River** and opposite the **mouth** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 33 141 E, 03 53 542 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 31 582 E, 03 53 217 N**, thence by a **cut line** in a **Northerly** direction for an approximate distance of **0.3 km** to a point near the **source** of an **unnamed tributary** of a **larger unnamed tributary** of the **Rewa River** having approximate **UTM** geographic coordinates of **03 31 565 E, 03 53 551 N**; thence down the **right bank** of this **unnamed tributary** to its **mouth** on **right bank** of this **larger unnamed tributary** having approximate **UTM** geographic coordinates of **03 28 001 E, 03 54 065 N**; thence down the **right bank** of this **larger unnamed tributary** for an approximate distance of **4.3 km** to a point having approximate **UTM** geographic coordinates of **03 26 022 E, 03 55 975 N**; thence by a **cut line** in **Westerly** direction for an approximate distance of **1.6 km** to a near the **source** of a **small unnamed tributary** of the **Rewa River** having approximate **UTM** geographic coordinates of **03 24 463 E, 03 55 975 N**; thence down the **right bank** of this **small unnamed tributary** to its **mouth** having approximate **UTM** geographic coordinates of **03 22 629 E, 03 56 506 N**; thence across and up the **left bank** of this **larger unnamed tributary** for an approximate distance of **1.2 km** to the **mouth** of an **unnamed tributary** having approximate **UTM** geographic coordinates of **03 21 824 E, 03 55 710 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 20 016 E, 03 54 699 N**; thence by a **cut line** in **South-westerly** direction for an approximate distance of **3.0 km** to a point near the **source** of **unnamed tributary** of the **Rewa River** having approximate **UTM** geographic coordinates **03 17 155 E, 03 53 945 N**; thence down the **right bank** of this **unnamed tributary** for an approximate distance of **2.05 km** to a point opposite the **mouth** of another **unnamed tributary** have approximate **UTM** geographic coordinates of **03 15 527 E, 03 54 502 N**; thence across and up the **left bank** of this **unnamed tributary** to a point near its **source** have approximate **UTM** geographic coordinates of **03 14 105 E, 03 54 425 N**; thence by a **cut line** in an **North-westerly** direction for an approximate distance of **0.4 km** to a point near the source **small unnamed tributary** of the **Rewa River** having approximate **UTM** geographic coordinates of **03 13 788 E, 03 54 570 N**; thence down the **right bank** of this **small unnamed tributary** to its **mouth** on the **right bank Rewa Rive** having approximate **UTM** geographic coordinates of **03 11 064 E, 03 54 348 N**; thence down the **right bank Rewa River** for an approximate distance of **89.5 km** to the first mention **unnamed tributary**, this being the point of commencement.

Save and except all lands legally held, coordinates have not been field tested and description subject to change upon verification.

Map Reference: 61 entire, 62 SW, NW, 66 entire, 67 SW, NW

Part B - Right Bank Essequibo River, Left Bank Essequibo River, Left Bank Corentyne River

Commencing at the **mouth** of a large **unnamed tributary** on the **right bank Essequibo River** having approximate **UTM** geographic coordinates of **03 68 145 E, 03 72 308 N**, thence **up** the **left bank** of this **large unnamed tributary** for approximate distance of **13 km** to a point having approximate **UTM** geographic coordinates of **03 76 789 E, 03 72 039 N**, thence by a **cut line** in a **Northerly** direction for an approximate distance of **12 km** to a point near the **source** of an **unnamed tributary** having approximate **UTM** geographic coordinates of **03 76 911 E, 03 84 754 N**, thence **down** the **right bank** of this **unnamed tributary** to its **mouth** on the **left bank** of a **large unnamed tributary** of the **Essequibo River** having approximate **UTM** geographic coordinates of **03 76 584 E, 03 95 193 N**, thence **up** the **left bank** of this **large unnamed tributary** for an approximate distance of **11 km** to a point opposite the **mouth** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 83 835 E, 03 96 051 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 94 485 E, 03 98 756 N**, thence by a **cut line** in a **east south easterly** direction for an approximate distance of **6 km** to a point neat the **source** of an **unnamed tributary** of the **Corentyne River** having approximately **UTM** geographic coordinates of **04 00 183 E, 03 97 740 N**, thence down the **right bank** of this **unnamed tributary** to its **mouth** on the **left bank Corentyne River** have approximate **UTM** geographic coordinates of **04 08 948 E, 04 04 106 N**, thence up the **left bank** of the **Corentyne River** for an approximate distance of **1 km** to the **mouth** of a **large unnamed tributary** having approximate **UTM** geographic coordinates of **04 09 793 E, 04 03 679 N**, thence up the **left bank** of this

large **unnamed tributary** to a point near its **source** having approximate **UTM** geographic coordinates of **04 12 840 E, 03 82 599 N**, thence by a **cut line** in a **south westerly** direction for an approximate distance of **6 km** to a **point** on a **large unnamed tributary** of the **Essequibo River** having approximate **UTM** geographic coordinates of **04 09 352 E, 03 77 712 N**, thence **up** the **left bank** of this **unnamed tributary** for approximately **17 km** to a point opposite the **mouth** on another **unnamed tributary** having approximate **UTM** geographic coordinates of **04 05 578 E, 03 73 317 N**, thence across and **up** the **left bank** of this **unnamed tributary** to a point near its **source** having approximate **UTM** geographic coordinates of **04 03 769 E, 03 69 828 N**, thence by a **cut line** in a **south easterly** direction for an approximate distance of **1.3 km** to a point near the **source** of an **unnamed tributary** of the **Barrington Brown River** having approximate **UTM** geographic coordinates of **04 04 106 E, 03 68 584 N**, thence down the **right bank** of this **unnamed tributary** to its **mouth** having approximate **UTM** geographic coordinates of **04 07 845 E, 03 66 292 N**, thence by a **cut line** in a **south westerly** direction for an approximate distance of **1.7 km** to a point near the **source** of an **unnamed tributary** having approximate **UTM** geographic coordinates of **04 04 281 E, 03 65 466 N**, thence **down** the **right bank** of this **unnamed tributary** to its **mouth** on a **large unnamed tributary** of **Barrington Brown River** having approximate **UTM** geographic coordinates of **04 04 705 E, 03 60 670 N**, thence **up** the **left bank** of this **large unnamed tributary** to the **mouth** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 97 939 E, 03 53 686 N**, thence **up** the **left bank** of this **unnamed tributary** to the **mouth** of another **unnamed tributary** have approximate **UTM** geographic coordinates of **03 91 019 E, 03 50 545 N**, thence **up** the **left bank** of this **unnamed tributary** to a point near its **source** have approximate **UTM** geographic coordinates of **03 86 501 E, 03 50 844 N**, thence by a **cut line** in a **south westerly** direction for an approximate distance of **2.2 km** to a point near the source of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 84 580 E, 03 49 778 N**, thence down the **right bank** of this **unnamed tributary** to its **mouth** on the **right bank** of a **large unnamed tributary** having approximate **UTM** geographic coordinates of **03 71 115 E, 03 50 438 N**, thence **down** the **right bank** of this **large unnamed tributary** for an approximate distance of **4.0 km** to a point opposite the **mouth** of another unnamed tributary having approximate **UTM** geographic coordinates **03 68 622 E, 03 53 248 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 65 812 E, 03 51 605 N**, thence by a **cut line** in a **north westerly** direction for an approximate distance of **1 km** to a point near the **source** of another **unnamed tributary** of the **Essequibo River** having approximate **UTM** geographic coordinates of **03 64 956 E, 03 52 345 N**, thence **down** the **right bank** of this unnamed tributary to its **mouth** on the **right bank** **Essequibo River** having approximate **UTM** geographic coordinates of **03 64 535 E, 03 53 868 N**, thence **up** the **right bank** **Essequibo River** for an approximate distance of **1.3 km** to a point having approximate **UTM** geographic coordinates of **03 63 690 E, 03 53 035 N**, thence **across** the **Essequibo River** to its **left bank** by a **cut line** in a **westerly** direction for an approximate distance of **314 m**, to the **mouth** of another unnamed tributary having approximate **UTM** geographic coordinates of **03 63 384 E, 03 53 033 N**, thence **up** the **left bank** of this large **unnamed tributary** to a point near its **source** having approximate **UTM** geographic coordinates of **03 50 796 E, 03 54 413 N**, thence by a **cut line** in a **north westerly** direction for an approximate distance of **0.4 km** to a point neat the **source** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 50 420 E, 03 54 513 N**, thence **down** the **right bank** of this **unnamed tributary** to the **mouth** on a **small unnamed tributary** having approximate **UTM** geographic coordinates of **03 45 621 E, 03 55 846 N**, thence **up** the **left bank** of this **unnamed tributary** to a point opposite the **mouth** of a **smaller unnamed tributary** having approximate **UTM** geographic coordinates of **03 46 767 E, 03 56 777 N**, thence across and **up** the **left bank** of this **small unnamed tributary** to a point near its **source** having approximate **UTM** geographic coordinates of **03 46 302 E, 03 57 566 N**, thence by a **cut line** in a **north westerly** direction for an approximate distance of **0.5 km** to a point near the **source** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 46 015 E, 03 58 075 N**, thence **down** the **right bank** of this unnamed tributary to its **mouth** on a **large unnamed tributary** having approximate **UTM** geographic coordinates of **03 44 198 E, 03 68 674 N**, thence **down** the **right bank** of this large **unnamed tributary** to the **mouth** of another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 48 438 E, 03 74 974 N**, thence **up** the **left bank** of this **unnamed tributary** to a point opposite the mouth of a small unnamed tributary having approximate **UTM** geographic coordinates of **03 53 058 E, 03 70 107 N**, thence across and up the left bank of this small unnamed tributary to a point near its **source** having approximate **UTM** geographic coordinates of **03 54 626 E, 03 70 242 N**, thence by a **cut line** in a **south easterly** direction for an approximate distance

of **0.3 km** to a point near the **source** of an **unnamed tributary** having approximate **UTM** geographic coordinates of **03 54 896 E, 03 70 100 N**, thence **down** the **right bank** of this **unnamed tributary** to its **mouth** on another **unnamed tributary** having approximate **UTM** geographic coordinates of **03 59 713 E, 03 68 896 N**, thence **across** and **down** the **right bank** of this unnamed tributary to its **mouth** on the **left bank** of the **Essequibo River** having approximate **UTM** geographic coordinates of **03 64 771 E, 03 71 161 N**, thence down the **left bank Essequibo River** for an approximate distance of **1.6 km** to a point having approximate **UTM** geographic coordinate of **03 66 197 E, 03 71 426 N**, thence **across** the **Essequibo River** by a **cut line** in a **north easterly** direction for an approximate distance of **1.2 km** to a point on the **right bank Essequibo River** having approximate **UTM** geographic coordinates of **03 67 324 E, 03 71 860 N**, thence down the **right bank Essequibo River** to the **mouth** of the first mentioned unnamed tributary, this being the point of commencement.

Save and except all lands legally held, coordinates have not been field tested and description subject to change upon verification.

Map Reference: 62 SE, 63 SW, 67 entire, 68 NW, SW,

APPENDIX I - Description of Compartment Boundaries

Part A

North Rewa Compartment: Bounded in the North by a cutline (SSILI concession boundary) thence by a large unnamed creek tributary of Essequibo River; thence a due South cutline for approximately 14 km block boundary of 17-U/17-V, thence down the right bank of an unnamed creek in generally West direction to Rewa River (SSILI boundary).

Smyths Compartment: Bounded on the North by a large unnamed creek down to its mouth, tributary of the Essequibo River, thence up the left bank of Essequibo River to the mouth of an unnamed creek, thence up the left bank of this creek near its source to the block corner boundary of 28-AJ/28-AK, thence in due West direction for approximately 15 km Southwest corner boundary of block 26-V, thence up in due North for approximately 23 km to the concession boundary within blocks 4-U/4-V.

Middle Rewa Compartment: Bounded in the West by Rewa River, thence in a due East direction between block boundary 35-L/36-L to corner blocks 35-AC/36AC for approximately 19 km, thence down the left bank of a large unnamed creek tributary of Essequibo River for approximately 10 km near the corner South boundary of 28-AJ/28-AK, thence up due North for approx. 2.5 km to the South boundary of blocks 26-AJ/26-AK, thence in due West for approx. 15 km to the Southwest corner of block AV.

South Rewa Compartment: Bounded in the North by the block boundary of 35-L/36-L and 35- AC/36-AC; on the South by a large creek tributary of Rewa River; bounded on the West by Rewa River and on the East by the concession boundary with Conservation International (All are shown on the Topo Map).

Illiwa Compartment: Bounded on the North and West by a large unnamed creek tributary of Rewa River; bounded on the East and South by SSILI concession boundary

Part B

West Essequibo Compartment: Bounded on the North by “Conservation International” (C.I.) thence bounded on the West by SSILI Area “A” boundary, thence on the South by SSILI concession boundary and on the East by the left bank Essequibo River as shown on the topo map.

East Essequibo Compartment: Bounded on the North by C.I. and a large unnamed creek tributary of Essequibo River, thence a cut line from the block corner 48-P/49-P on due South direction to block corner 48-T/49-T, thence down to small creek, thence to a large unnamed creek tributary of Essequibo River, thence bounded in the South by SSILI concession boundary; thence bounded on the West by the right bank of Essequibo River.

West Corentyne Compartment: Bounded in the North by Sherwood Forrest Inc. boundary, thence on the West by Conservation International (CI), thence bounded on the East by an unnamed creek tributary of Corentyne River, thence on the South by block boundary 54-AD/54-AC, thence due West direction for approximately 4.5 km to the junction of small creek up to its source, thence to the source of unnamed large creek tributary of Essequibo River, thence down on the left bank of this large creek to the corner boundary of blocks 34-C/34-D and common border with CI.

East Corentyne Compartment: Bounded on the North by Sherwood Forrest Inc., on the East by a large unnamed creek and tributary of the Corentyne River and common boundary of SSILI Area “B” and on the South by unnamed creeks (as shown on the map), thence on the West by the common boundary with the West Corentyne Compartment.

South Corentyne Compartment: Bounded on the North by West/East Corentyne Compartments; on the East by the SSILI Area “B” concession boundary; on the South by SSILI concession boundary and on the West by an unnamed creek and block boundary of 48-S/49-S to the North corner of blocks 48-P/49-P,

thence down to the right bank of a large unnamed creek tributary of Essequibo River as shown on the topo map.

APPENDIX J - Water Quality Certificates

October 2011 – Dry Season



GUYANA SUGAR CORPORATION INC
CENTRAL LABORATORY

Research Centre, Agriculture Department, LBI Compound, E.C.D, Guyana, S.A.

Telephone #: 592-220-2601 Email: ganpatj@guysuco.com

Fax #: 592-220-4027

CAEMS SOP/RF No.: 013.1	Version: 2	Revision Status: 1	Date of Issue: September 6, 1996	Expiry Date:
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Analysis Report

Report Number: W 161/2011/C

Date: 2011-11-14

To:
Mr. Shyam Nokta
E.M.C
60 Area H, Ogle
East Coast Demerara

From:
Analyst

Central Laboratory
Agromony and Analytical Services Department

Tele Fax #: 222-4565/222-3172

Date Sample Received: 2011-10-24

Date Analysis Completed: 2011-11-14

Sample Type: Surface Water

Sample Description	Parameters (permissible limits)							
	DO (mg/L) ≥5.0	T.S.S (mg/L)	Oil & Grease (mg/L) 25	SO ₄ ²⁻ (mg/L) 200	Al (mg/L) 0.03	Fe (mg/L) 0.3	Cu (mg/L) 0.05	Zn (mg/L) 5
SW 1	1.36	Nd	Nd	0.17	0.11	0.21	Nd	0.004
SW 2	1.52	Nd	Nd	0.39	0.13	0.40	Nd	0.01
SW 3	0.47	Nd	Nd	1.00	0.12	0.28	Nd	0.01
SW 4	0.96	Nd	Nd	0.52	0.14	0.32	Nd	0.01
SW 5	1.24	1	Nd	0.09	0.47	0.60	Nd	0.01
SW 6	0.88	1	Nd	0.26	Nd	0.61	Nd	0.01
SW 7	1.67	Nd	Nd	0.52	0.49	0.59	Nd	0.01
SW 8	1.76	1	Nd	0.87	0.35	0.60	Nd	0.01
SW 9	0.90	Nd	Nd	0.78	0.51	0.62	Nd	0.01
SW 10	1.32	Nd	Nd	1.15	Nd	0.47	Nd	0.01
SW 11	1.10	Nd	Nd	0.43	0.45	0.71	Nd	0.01

Checked by:

Nd-not detected


Mr. Ganpat Jafer

C: Mr. G. Ramnarain –Head-Agric. Research

February 2012 – Wet Season



GUYANA SUGAR CORPORATION INC
CENTRAL LABORATORY

Research Centre, Agriculture Department, LBI Compound, E.C.D, Guyana, S.A.

Telephone #: 592-220-2601 Email: ganpatj@guysuco.com

Fax #: 592-220-4027

CAEMS SOP/RF No.: 013.1	Version: 2	Revision Status: 1	Date of Issue: September 6, 1996	Expiry Date:
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Analysis Report

Report Number: W 63-66/2012/A

Date: 2012-03-12

To:
Mr. Shyam Nokta
Managing Director, Environmental Management Consultants
60 Area H, Ogle
East Coast Demerara

From:
Mr. Ganpat Jafer
Analyst

Tele #: 222-4565

Fax #: 222-3172

Central Laboratory
Agronomy and Analytical Services Department

Date Sample Received: 2012-03-05

Date Analysis Completed: 2012-03-07

Sample Type: Water

SAMPLE DESCRIPTION	PARAMETER (permissible limits)										
	SO ₄ ²⁻ (mg/L) 200	DO (mg/L) ≥5.0	Nitrates (mg/L) 45	TSS (mg/L)	Oil & Grease (mg/L) 25	Total Cu (mg/L) 0.05	Al (mg/L) 0.03	Total Fe (mg/L) 0.3	Total Zn (mg/L) 5		
SW 1	0.20	9.33	Nd	Nd	Nd	Nd	1.55	0.37	0.001		
SW 2	0.24	9.21	Nd	Nd	Nd	Nd	1.75	0.39	0.001		
SW 3	0.30	8.87	Nd	Nd	Nd	Nd	2.10	0.32	0.001		
SW 4	0.24	9.11	Nd	Nd	Nd	Nd	2.34	0.27	Nd		

Checked by: Nd-not detected


.....
Mr. Ganpat Jafer

C: Mr. G. Ramnarain –Head-Agric. Research
Mr. A. Adams-Manager-SPN



GUYANA SUGAR CORPORATION INC CENTRAL LABORATORY

Research Centre, Agriculture Department, LBI Compound, E.C.D, Guyana, S.A.

Telephone #: 592-220-2601 Email: ganpatj@guysuco.com

Fax #: 592-220-4027

CAEMS SOP/RF No.: 013.1	Version: 2	Revision Status: 1	Date of Issue: September 6, 1996	Expiry Date:
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Analysis Report

Report Number: W 16-22/2012/C

Date: 2012-02-17

To:
Mr. Shyam Nokta
Managing Director, Environmental Management Consultants
60 Area H, Ogle
East Coast Demerara

From:
Mr. Ganpat Jafer
Analyst

Tele #: 222-4565

Fax #: 222-3172

**Central Laboratory
Agronomy and Analytical Services Department**

Date Sample Received: 2012-02-08

Date Analysis Completed: 2012-01-16

Sample Type: Water

SAMPLE DESCRIPTION	PARAMETER (with acceptable limits)										
	SO ₄ ²⁻ (mg/L) 200	DO (mg/L) ≥5.0	Nitrates (mg/L)	TSS (mg/L)	Oil & Grease (mg/L)	Al (mg/L) 0.2	Cu (mg/L) 1.5	Fe (mg/L) 1.0	Zn (mg/L) 15		
SW 5	0.54	9.24	Nil	Nd	0.056	0.72	0.06	0.40	0.02		
SW 6	0.25	8.17	Nil	Nd	0.032	Nd	0.07	0.08	0.02		
SW 7	1.15	8.56	Nil	Nd	0.016	0.44	0.08	0.52	0.02		
SW 8	1.08	6.33	Nil	Nd	0.061	Nd	0.08	0.53	0.02		
SW 9	1.69	9.64	Nil	Nd	0.032	0.12	0.09	0.28	0.02		
SW 10	0.84	6.37	Nil	Nd	Nd	0.87	0.08	0.30	0.02		
SW 11	1.04	8.49	Nil	Nd	0.011	0.26	0.09	0.26	0.02		

Checked by:

Nd-not detected

Mr. Ganpat Jafer

C: Mr. G. Ramnarain –Head-Agric. Research
Mr. A. Adams-Manager-SPN

Letter from Laboratory indicating the reasons nitrates analysis was not conducted during the first survey



GUYANA SUGAR CORPORATION INC

AGRICULTURE RESEARCH CENTRE

Research Centre, Agriculture Department, LBI Compound, E.C.D,
Guyana, S.A.

Telephone #: 592-220-2601 Email: ganpatj@guysuco.com Fax #: 592-220-4027/3018

November 17, 2011

**Mr. Shyam Nokta – Managing Director
Environmental Management Consultants
60 Area H Ogle, East Coast Demerara.
Guyana.**

Dear Mr. Nokta

RE: Water Analysis Report W161/2011/C

Our Laboratory was (and still is) unable to conduct Nitrates analysis on the 11 samples submitted on 2011-10-24. We use the HACH test strip and the UVS screening methods to detect nitrates in water. We are currently out of test strips and the UV spectrophotometer is not responding at the specified wavelength for used nitrates.

The Laboratory deeply regrets this inconvenience.

Yours Sincerely,

Guyana Sugar Corporation Inc.


.....

Mr. G. Jafer – Analyst, Guysuco Inc.

Copied to: Mr. Ashley Adams – Manager Soils and Plant Nutrition, Guysuco Inc.

APPENDIX K - Biodiversity Assessment Report of the Concession

**BIODIVERSITY ASSESSMENT
OF SIMON & SHOCK INTERNATIONAL LOGGING INC. FOREST CONCESSION IN THE UPPER
ESSEQUIBO-CORENTYNE-NORTH RUPUNUNI DISTRICT, GUYANA**



17th October to 1st November, 2011
&
31st January to 19th February, 2012

Environmental baseline reports
for
environmental and social impact assessment

INTRODUCTION

The Government of Guyana has tasked the Guyana Forestry Commission (GFC) with promoting sustainable management of Guyana's forest resources. As part of its mandate, GFC has been encouraging sustainable forest operations for the promotion of social and economic development while at the same time safeguarding the integrity of forest resources. Simon & Shock International Logging Inc. (SSILI) has responded to this effort by GFC to implement a project in the Upper Essequibo-Corentyne-North Rupununi District based on a 'sustained yield management programme of logging and to operate in accordance with GFC's Code of Practice for Forest Operations. The Company intends to adopt best-practice approaches in its operations which could eventually lead to forest certification

The Company has conducted a 2% timber inventory of the concession and has produced a 5-Year Management Plan for its timber harvesting operations. Logging will occur within the 391,853 hectares (968,289 acres) concession. All activities will be done in accordance with the requirements of the GFC, including the Code of Practice for Forest Operations. The Company aims to maintain and safeguard forest biodiversity and other uses and values to minimize adverse social and environmental impact of its forest operations under GFC Guidelines. The company aims to adopt best-practice approaches and reduced-impact logging (RIL), in its forest management operations which could eventually lead to forest certification.

The Company has contracted EMC to produce an ESIA. This ESIA will be informed by biodiversity and social surveys undertaken by EMC. Two Rapid Biodiversity Surveys, each of two to three (3) weeks duration, have been deemed adequate to fulfil these requirements³⁵. This document reports on the findings from the biodiversity survey exercises that took place from 17th October to 1st November, 2011, and 31st January to 19th February, 2012, in which the EMC team inventoried the animals and plants of the concession and identified endangered, rare and threatened species at six (6) localities. Impact on biodiversity, ERT species, mitigation, effects-monitoring, and recommendations for additional research are reported.

STUDY AREA AND MAIN METHODS

The project site consists of an area of State Forest of 391,853 hectares (968,289 acres). The Concession comprised primarily of mixed forests and is situated on undulating, hilly and flat terrain, with few steep slopes and well-drained sandy clay loam. The forest comprises of species such as *Mora*, *Greenheart*, *Baromalli*, *Purpleheart*, *Locust*, *Wamara*, *Tatabu*, *Bulletwood*, *Crabwood*, *Black Kakaralli* and *Wallaba*. However, *Mora* represents the highest volume and is regarded as the dominant specie of the Upper Berbice and Upper Essequibo areas. This state forest was allocated through a State Forest Exploratory Permit (SFEP) which was approved by the Government of Guyana and issued by Guyana Forestry Commission (GFC).

The Essequibo River flows through a portion of the concession while the Rewa and Corentyne Rivers form sections of its boundary. There are number of minor rivers inside the concession and some creeks are seasonal and are slow to fast flowing with meandering channels forming scroll complexes, oxbow lakes, swamps, back swamps and small ponds. There are number of lakes on both banks of the Rewa River. The forest concession is situated southeast of the Iwokrama Protected Area. The Concession is

³⁵ Guyana has two (2) wet seasons and two (2) dry seasons, the dry season months have an average of more than 150 mm of rain per month. The long wet season occurs from May to August, and a short wet season from December to February. The months are drier in March and April, with October being the driest month.

south of the Sherwood Forests Inc.'s Concession and east, west, & south of the Conservation International (CI) Concession³⁶.

Some information on the biodiversity of the region is available from Rapid Assessment Programme (RAP³⁷) field surveys undertaken by CI in the Kanuku Mountains. In 1993, CI conducted a three-week rapid biodiversity assessment of the Western Kanuku and the Rewa River. They followed this with a two-week biodiversity assessment of the Eastern Kanuku Mountains, Lower Kwitara and Rewa River in 2001. The team surveyed the plants, birds, mammals (non-volant and bats), and fish, and beetles occurring in lowland rainforest. The plants, fish, amphibians, reptiles, birds and mammals of Iwokrama forest have been well-documented.

Study area

The study area(s) are defined as the forests and ecosystems where exploratory timber inventories were conducted by BJ Management and Associates for SSILI in May - August 2011. Six (6) sites were selected and surveyed by the forest inventory team - four (4) sites along the Essequibo River and two (2) sites along the Rewa River and tributaries. Sites were selected so as to survey the major forest types present, to maximise survey coverage of the concession and to utilize the forest inventory campsites and transects. Where present, transect lines 2 m wide and around 4 to 6 km in length established by forest inventory teams (i.e. light brush clearing) in June-July was used.

The flora survey team established additional transects to obtain a quantitative description of community composition and structure. Visual Encounter Surveys (VES) and Auditory Encounter Surveys (AES) at Transects and Timed Searches were undertaken to survey amphibians, reptiles, birds, and non-flying mammals. Both daytime and night surveys were conducted to detect mammals, reptiles and amphibians. Leaf-Litter Plots and Patch Sampling was undertaken to detect rare and small leaf litter-dwelling amphibians and reptiles. Point Counts were used to survey highly visible or vocal birds; whereas mist nets were set in the forest understory to capture birds and bats. Butterflies were sampled at transects with fruit traps and invertebrates opportunistically sampled to compile a list of invertebrate species. The aquatic environment and the wildlife of rivers, river banks and riparian vegetation were surveyed by boat transect surveys along the sections of the Essequibo and Rewa Rivers and tributaries that flow through the concession. Finally, the fish fauna and river water quality (pH, temperature, conductivity and turbidity) was sampled at twelve localities in the Rewa and Essequibo River systems.

SUMMARY OF RESULTS

Number of species

Plants: 136 species

Invertebrates: 88 distinct types/species

Fish: 121 species

Amphibians: 34 anuran species

Reptiles: 28 species

Birds: 224 species

Mammals: 57 species (34 non-volant, 23 bats)

Plants

The Forest Concession is part of a vast pristine forest wilderness that stretches across the Guiana Shield. Guyana and the surrounding frontier forest of the Guiana Shield contain approximately 8,000 documented plant species of which 50% are considered endemic to the region. The vegetation surveys documented 136 individual species representing 48 plant families. The dominant forest types encountered and

³⁶ In July 2002, Conservation International and the Government of Guyana entered into an agreement that protects 200,000 acres of pristine forest for biodiversity conservation in the upper Essequibo River watershed.

³⁷ The RAP approach was developed by CI and is a simple, very rapid method that is based on assembling a multidisciplinary team of experts who carry out field surveys and immediately write up their list-orientated results with conservation recommendations based on the area's biological diversity, its degree of endemism, the uniqueness of its ecosystems, and its risk of extinction on a national and global scale.

surveyed were Mixed Forest on flat or gently rolling terrain and Mora Forest along rivers. These forests were dominated by species in the families: Lecythidaceae, Chrysobalanaceae, Meliaceae, Sapotaceae, Fabaceae, Caesalpiniaceae, Apocynaceae, Euphorbiaceae, Annonaceae, and Violaceae. The following were especially abundant at all sites: Mora (*Mora excelsa*), Wamara (*Swartzia leicocalycina*), Baromalli (*Catostemma commune*), Yari-Yari (*Duguetia* spp), and Black Kakaralli (*Eschweilera subglandulosa*). In addition to these canopy-forming species; a diverse array of vines, lianas and shrubs dominated the forest understory. The concession likely contains thousands of plants species as this huge concession includes a diversity of habitats, a varied topography and specie-rich plant communities that combine Guianan Shield and Amazon elements. The forest is essentially pristine. The only visible trace of human disturbance was in the form of slashes on the bark of Balata trees (*Manilkara* sp.) exploited until the 1960s for their latex.

Fish Fauna and River Water Quality

The Concession is drained by the Rewa River and Essequibo River systems. Fish are key components of Amazonian rain forest ecosystems. The main channels as well small creeks of the Rewa and Essequibo River Systems were sampled. A total of 121 species of fish from 27 families were documented. The dominant fish families in terms of number of species were the characidae, pimelodidae, cichlidae, and the anostomidae. Fish of the family Characidae were especially abundant. Notable records are *Aphyocharax erythrurus*, *Crenicichla wallacii* and *Nannostomus harrisoni* that are endemic to Guyana. Among the many large-sized food fishes recorded, the arapaima (*Arapaima gigas*) was the most notable species. A management plan in the river systems exists for this CITES Appendix II listed fish. Although indigenous communities fish the river systems, the aquatic habitats did not seem to be disturbed to any large extent, and water quality sampling indicates that existing water quality of the area is typical of the water quality for similar type of areas within Guyana, with very low levels of contamination. Although surveys recorded a very large number of fish species, it is still only approximately a quarter of the actual species of freshwater fishes that occur in Guyana. More sampling, especially of small-sized species, should be undertaken to maximise inventory completeness. The rivers were found to be very close to being in pristine condition and the fish fauna is diverse and abundant. This combination of high fish diversity and abundance, pristine and extensive river systems, and an absence of large human settlements, make the Concession an important biodiversity area whose rivers and aquatic fauna must be protected and safeguard Guyana's rich biological diversity.

Amphibians and Reptiles

Surveys of forest and rivers recorded 34 amphibian species, comprising six families. All were anurans (frogs). Biogeographically, all frogs recorded are widespread throughout Guyana and the wider Amazonian region. None can be considered as threatened. Twenty-eight reptile (28) species representing six families were documented. More detailed and longer studies should be conducted, particularly for elusive and cryptic species such as frogs and snakes, to more accurately survey the concession's herpetofauna. The concession appears to have apparently healthy populations of reptiles that are threatened elsewhere in the region, including black caiman (*Melanosuchus niger*), yellow-footed tortoise (*Chelonoidis denticulata*), yellow-spotted river turtle (*Podocnemis unifilis*) and South American river turtle (*Podocnemis expansa*). Turtles and tortoises are often vulnerable to hunting and over collection. Monitoring of this group, black caiman, and reptiles collected for the wildlife trade is recommended. Commercial hunting should be prevented.

Birds

Visual Encounter Surveys and Point Counts conducted in forests and along the rivers were the main methods used to survey the avifauna. Surveys documented 224 species including several species with limited geographical ranges and one rare raptor species, the Ornate Hawk-Eagle (*Spizaetus ornatus*). The most diverse bird families were antbirds (Thamnophilidae) followed by tyrant flycatchers (Tyrannidae), parrots (Psittacidae), woodcreepers (Dendrocolaptidae), woodpeckers (Picidae), and hummingbirds (Trochilidae). The forests and river systems are characterised by a rich diversity and abundance of bird species, including several species which may be endemic to the Guiana Shield. The ornate hawk eagle, and all psitticines, toucans, cracids and trumpeters occurring in the Concession can be regarded as endangered, rare or threatened in the region. This combination of high bird diversity,

pristine and extensive rain forests and riverine systems, and an absence of large human settlements make the concession an important biodiversity area that must be managed in a sustainable manner to protect and safeguard Guyana's rich bird diversity. Research on the habitat preferences of uncommon, endemic and threatened bird species, which potentially require the most urgent protection is recommended. Commercial hunting or collecting must be prevented. Monitoring of populations of birds potentially threatened by the wildlife trade, such as the parrots, or vulnerable to an increase in hunting pressure, such as cracids and other game birds, is strongly recommended.

Bats

Using direct observation, tracks and sound identification, mist netting, and interviews with field guides, the presence of 57 mammal species was documented. Bats, with 23 species recorded from four families, accounting for more than one third of the mammalian species documented. Notable captures were Schmidt's big-eared bat (*Micronycteris schmidtorum*) and the Bartica bat (*Glyphonycteris daviesi*) which may be rare, though the ecology of these species, like other bats, is poorly known. Although more trapping effort is required before comparisons can be made, it is likely that the bat species diversity of the forest concession may be considerable and approach the diversity of other species-rich sites in the Guianas such as Iwokrama Forest and the Kanuku Mountains. This high species diversity and abundance coupled with the roles of bats as dispersers and pollinators, suggests they have a significant effect on forest dynamics and, if forests are to be managed in a sustainable way, then healthy bat populations need to be conserved.

Non-volant Mammals

Surveys determined the presence of 34 species of non-volant (non-flying) mammals. Findings indicate that the forest concession has a full, biologically rich array of non-volant mammals, including all eight of Guyana's primate species, apparently healthy populations of large carnivores, such as jaguar, margay and puma; as well as many mammals that are threatened elsewhere in the region including lowland tapir (*Tapirus terrestris*), giant anteater (*Myrmecophaga tridactyla*), giant armadillo (*Priodontes maximus*), giant otter (*Pteronura brasiliensis*), brown-bearded saki monkey (*Chiropotes satanus*), and spider monkey (*Ateles paniscus*). Low human population density, cultural practices, and the remoteness of the area, results in low hunting pressure, and apparently healthy populations of many large mammals threatened elsewhere in the region. Measures need to be enacted to ensure that logging operations do not directly or indirectly adversely affect populations of these species and other important components of mammalian diversity.

Butterflies and other Invertebrates

Guyana's butterfly diversity is not as well understood as in other tropical forests in South America. A complete list for of all butterfly families or species within Guyana does not exist, though it is estimated that around 1,100 species may occur. A total of 1,062 observations of butterflies were made, with 14 sub-families and 88 distinct types of butterflies documented. The most dominant families included the Lycaenidae and the Nymphalidae: the Morphinae and Satyrinae were the most common sub-families. Butterflies belonging to the Pieridae (sub-family: Coliadinae), the Hesperidae and the Nymphalidae (sub-family: Danainae) were least common. Considerable more survey effort is required to produce relatively complete and accurate species lists of butterflies. Potentially the forest concession is home to hundreds of species. Other invertebrates were opportunistically sampled. Approximately 21 invertebrate orders were documented. None of the butterfly species or other invertebrates recorded can be considered as endemic, endangered, rare or threatened.

ERT SPECIES/ CONSERVATION ELEMENTS

Surveys documented a number of taxa that can be considered as ERT species (Table 1). ERT species are **E**ndangered species (e.g. IUCN Red Listed as critically endangered, endangered or vulnerable), **R**are species (endemics, locally rare, and species which may not be globally threatened and listed under the above IUCN categories but are **T**hreatened in the region or likely to become threatened within the concession by management activities e.g. logging).

Notable animal species recorded include three endemic fishes that can be considered as ERT species: *Aphyocharax erythrurus*, *Crenicichla wallacii*, and *Nannostomus harrisoni*. The only CITES listed fish documented is *Arapaima gigas*. It is a CITES Appendix II listed species. The Arapaima is protected in Guyana by the Fisheries Regulations under the Fisheries Act of 1953. However, despite legal protection, this species continued to be over-exploited, and, in 2002, the Iwokrama International Centre, the Department of Fisheries, the Mamiraua Sustainable Development Reserve in Brazil and the North Rupununi District Development Board developed a programme which focused on the effective management of the Arapaima population. The Arapaima Management Plan is based on a similar successful system in Brazil which relies on determining the number of individuals to be harvested based on the annual stock assessments, and involves community outreach. The Management Plan was approved by Government of Guyana in 2007, as part of the Fisheries Act and a programme was implemented to monitor arapaima population in the rivers in the Rupununi area, including the Rewa and Upper Essequibo.

Biogeographically, all amphibian species recorded within this survey are widespread and abundant within Guyana. No ERT species of amphibians were recorded. Some species of poison arrow frogs (Dendrobatidae) are collected for the pet trade e.g. the genera *Epipedobates*, *Allobates*, and *Ammerga*. Poison arrow frogs are CITES Appendix II/III listed, regulating their trade.

ERT reptiles recorded included black caiman, yellow-footed tortoise, South American river turtle, yellow-spotted river turtle, and the grooved side-neck turtle. The IUCN Red List of Threatened species lists the yellow-footed tortoise and the yellow-spotted river turtle as Vulnerable. The black caiman and the South American river turtle are listed as IUCN Lower Risk/Conservation Dependent. All species are CITES listed, regulating their international trade. Tortoises and turtles are food sources for local people and other indigenous communities in the region. The yellow-footed tortoise is still commonly encountered in Guyana; whereas elsewhere in the region they have been unsustainably harvested for their meat and are less frequently encountered.

A number of birds were documented that can be regarded as ERT species. All psitticines and toucans are listed as CITES Appendix II species. Large under-storey birds such as cracids (Cracidae) and Trumpeters (Psophiidae) are sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up forest for logging. Elsewhere in the Guianas they have been decimated by unrestricted hunting. The ornate hawk eagle can be considered as locally rare, though this species has a large geographical distribution and cannot be considered threatened.

No ERT bats were documented, though Schmidt's big-eared bat³⁸ and the Bartica bat are apparently rare. However, the sensitivity of gleaning animalivores (bats that glean prey from surfaces) to forest disturbances and logging is well documented. Species in the genera *Micronycteris*, *Tonatia*, and other phyllostominae bats, may be adversely affected by logging. The concession is home to many large non-volant mammals that can be regarded as ERT species. The IUCN Red List categorises the brown-bearded saki monkey as Critically Endangered, the giant otter as Endangered, the lowland tapir, black spider-monkey, giant anteater, and giant armadillo as Vulnerable. The margay and jaguar are listed as Near Threatened. The ocelot is a CITES Appendix I listed species and all primate species are CITES Appendix II. The golden-handed tamarin has a limited distribution in the Guianan Shield. The brown-bearded saki monkey, black spider monkey, lowland tapir, giant anteater, giant armadillo, giant otter and black spider monkey are threatened by habitat loss compounded by hunting. Jaguar and margay are affected by habitat loss and fragmentation and by persecution as they come into conflicts with humans and their livestock. Primate populations are vulnerable to collection for the pet trade. Measures need to be enacted to ensure that logging operations do not directly or indirectly adversely affect populations of these species and other important components of mammalian diversity

³⁸ *M. schmidtorum* may have a limited distribution in Guyana.

Table 1: ERT Species documented

Scientific Name	Common Name	ERT Status ³⁹	Impact of Logging
Mammals			
<i>Pteronura brasiliensis</i>	Giant otter	IUCN Red listed as Endangered ⁴⁰	Threatened by multiple anthropogenic influences arising from increased colonization of tropical lowland rainforests. Illegal harvesting for pelts continues in some regions, but otters are also killed by logging workers who blame otters for depleting local fish resources. Sensitive to increased sedimentation of rivers arising from logging. Increased sedimentation of rivers arising from logging may deplete their fish prey
<i>Myrmecophaga tridactyla</i>	Giant anteater	IUCN Red listed as Vulnerable ⁴¹	Sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up areas for timber extraction. Vulnerable to hunting because of low reproductive rates. Animals are sometimes killed on logging roads or by dogs
<i>Priodontes maximus</i>	Giant armadillo	IUCN Red listed as Vulnerable ⁴²	This species is naturally rare and threatened by hunting for meat (generally for subsistence). Potentially sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up areas for timber extraction.
<i>Tapirus terrestris</i>	Lowland tapir	IUCN Red listed as Vulnerable ⁴³	Sensitive to an increase in hunting pressure that often arises around logging camps and when access roads are constructed to open up areas for timber extraction. Vulnerable to hunting because of low reproductive rates.
<i>Panthera onca</i>	Jaguar	IUCN Red List - Near Threatened ⁴⁴	Increased conflict with humans when areas opened up for timber extraction. Jaguar may be killed.
<i>Chiropotes satanas</i>	Brown-bearded saki	IUCN Red listed - Critically Endangered ⁴⁵	Potentially affected by forest fragmentation and clearing.
			Potentially affected by forest fragmentation and clearing. Vulnerable to hunting because of low reproductive rates.

³⁹ CITES Appendix I - includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances; CITES Appendix II - includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.

⁴⁰ <http://www.iucnredlist.org/apps/redlist/details/18711/0> - March 27, 2012

⁴¹ <http://www.iucnredlist.org/apps/redlist/details/14224/0> - March 27, 2012

⁴² <http://www.iucnredlist.org/apps/redlist/details/18144/0> - March 27, 2012

⁴³ <http://www.iucnredlist.org/apps/redlist/details/21474/0> - March 27, 2012

⁴⁴ <http://www.iucnredlist.org/apps/redlist/details/15953/0> - February 28, 2012

⁴⁵ <http://www.iucnredlist.org/apps/redlist/details/39956/0> - February 28, 2012

Scientific Name	Common Name	ERT Status ³⁹	Impact of Logging
<i>Ateles paniscus</i>	Black spider monkey	IUCN Red Listed - Vulnerable ⁴⁶	Vulnerable to forest fragmentation due to requirement for 'intact' forest with closed canopy.
<i>Saguinus midas</i>	Golden-handed tamarin monkey	Ecologically rare and restricted geographical range in the Guianas	Potentially impacted by wildlife trade when areas opened up for timber extraction.
<i>Glyphonycters, Tonatia, Micronycteris spp.</i>	Phyllostomine bats		Some evidence they are sensitive to some systems of selective logging and other forest disturbances.
Birds			
Psittacines	Parrots, Macaws	Potentially Threatened by over-collecting	Potentially impacted by wildlife trade when areas opened up for timber extraction. Elsewhere in the region unsustainably collected for pet trade.
Ramphastidae	Toucans and Toucanettes	Potentially Threatened by over-collecting	
Psophiidae	Trumpeters	Potentially Threatened by hunting	Sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up areas for timber extraction. Elsewhere in the region unsustainably harvested for meat.
Cracidae (Cracids)	Curasows and Guans	Potentially Threatened by hunting	Sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up areas for timber extraction. Elsewhere in the region unsustainably harvested for meat.
Reptiles			
<i>Chelonoidis denticulata</i>	Yellow- or Red-footed tortoise	IUCN Red Listed as Vulnerable ⁴⁷ . CITES Appendix II	Sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up forest for logging and mining. Elsewhere in the region unsustainably harvested for meat.
<i>Podocnemus unifilis</i>	Yellow-spotted river turtle	IUCN Vulnerable, CITES Appendix II	Sensitive to an increase in hunting pressure that may arise with increased human population in concession.
<i>Podocnemis expansa</i>	Giant South American turtle	IUCN Lower Risk/conservation dependent, CITES Appendix II	Sensitive to an increase in hunting pressure that may arise with increased human population in concession.
		IUCN Lower	

⁴⁶ <http://www.iucnredlist.org/apps/redlist/details/2283/0> - February 28, 2012

⁴⁷ <http://www.iucnredlist.org/apps/redlist/details/9008/0> - March 27, 2012

Scientific Name	Common Name	ERT Status ³⁹	Impact of Logging
<i>Melanosuchus niger</i>	Black caiman	Risk/conservation dependent ⁴⁸ , CITES Appendix I	Sensitive to hunting pressure that may arise with increased human population in concession.
<i>Platemys platycephala</i>	Grooved side-neck turtle	CITES Appendix I	Populations potentially impacted by increased collection for wildlife trade that may arise following increase in human population and use of concession following construction of access roads and logging camps.
<i>Caiman crocodilus</i>	Spectacle caiman	CITES Appendix II	
<i>Eunectes murinus</i>	Green anaconda	CITES Appendix II	
<i>Corallus caninus</i>	Emerald tree boa	CITES Appendix II	
<i>Paleosuchus trigonatus</i>	Schneider's dwarf caiman	CITES Appendix II/III	
Amphibians			
Dendrobatidae <i>Epipedobates</i> spp. <i>Allobates</i> spp. <i>Ameerega</i> spp.	Poison arrow frogs	CITES Appendix II/III	Populations potentially impacted by increased collection for wildlife trade that may arise following increase in human population and use of concession following construction of access roads and logging camps
Fish			
<i>Nannostomus harrisoni</i>		Endemic	Not known. Potentially impacted by increased sedimentation of rivers arising from some logging operations.
<i>Crenicichla wallacii</i>		Endemic	
<i>Nannostomus harrisoni</i>		Endemic	
<i>Arapaima gigas</i>	Arapaima	CITES Appendix II	Overfishing arising from an increase in human population in concession.

⁴⁸ <http://www.iucnredlist.org/apps/redlist/details/13053/0> - March 27, 2012

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BASELINE ENVIRONMENTAL DATA - BIODIVERSITY REPORTS AT A GLANCE

Rational

Biodiversity and social surveys are required inform the preparation of the Environmental and Social Impact Assessment for Simon & Shock International Logging Inc, forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana. Two biodiversity survey exercises each lasting around two to three weeks were undertaken.

Biodiversity Survey Exercise Dates

17th October to 1st November, 2011, and 31st January to 19th February, 2012

Area Description

The concession comprises 391,853 hectares of forests situated on undulating, hilly and flat terrain, with few steep slopes. Surveys focused on lowland seasonally inundated and *terra firma* evergreen tropical rainforest and the Rewa and Essequibo rivers, tributaries and associated habitats at six localities within the Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana.

Preliminary Findings

- diverse, pristine forests and other terrestrial habitats, from swamp forest and low-lying mono-dominant Mora Forest to Mixed Forest on flat, undulating to hilly terrain, to rivers, seasonal creeks, oxbow lakes, small ponds.
- rivers and aquatic habitats are relatively undisturbed, with very low levels of contamination, and they harbour an abundant and diverse fish fauna. Larger species are important protein sources for the indigenous peoples of the region.
- forests and plant communities are essentially pristine. The only visible trace of human disturbance was in the form of slashes on the bark of Balata trees (*Manilkara* sp.) exploited until the 1960s for their latex. Forests exhibit a high tree species richness that combine Guianan Shield and Amazon elements
- a high vertebrate diversity, particularly of mammals and birds
- healthy populations of many globally threatened species including giant otter (*Pteronura brasiliensis*), brown-bearded saki monkey (*Chiropotes satanus*) arapaima (*Arapaima gigas*), black caiman (*Melanosuchus niger*), giant armadillo (*Priodontes maximus*), giant anteater (*Myrmecophaga tridactyla*), and giant river turtle (*Podocnemis expansa*)

The results from these biodiversity assessments confirm that the Forest Concession contains a rich biodiversity and is critically important for conservation on a regional, national and international level.

Number of species

Plants: 136 species

Butterflies: 88 distinct types/species

Fish: 121 species

Amphibians: 34 anuran species

Reptiles: 28 species

Birds: 224 species

Non-volant mammals: 34 species

Bats: 23 species

IMAGES



Some members of the biodiversity survey team depart to survey sites along the Rewa River.

Terra firma evergreen tropical forest on low-lying land close to the Rewa River.



Campsite at Rewa B - located in Mora forest next to the Rewa River.

Team members used field guides and electronic resources to identify species in the field – Bibi Aneeza Khan identifying fish.



A seasonal creek next at Essequibo B - habitat of the cane toad *Rhinella marina* and the lizard *Uranoscodon superciliosus*

Tree palms were particularly dominant in rain forest at both Essequibo sites.



Essequibo B campsite
- located next to the
Essequibo River near the
mouth of Smythe creek.

Ewart Smith and George
Roberts establish transects
to assess the concession's
vegetation.





Bibi Aneeza Khan and Frederick Charlie use a drag net to sample fish in the Essequibo River.

Campbell James casts a cast net and Ewart Smith uses a baited hook and line to sample the fish fauna of the Essequibo River.



Glenny King measures pH, temperature, conductivity and turbidity of a tributary of the Essequibo River.



Waldyke Prince takes a bird out of a mist net.

Maps and study area

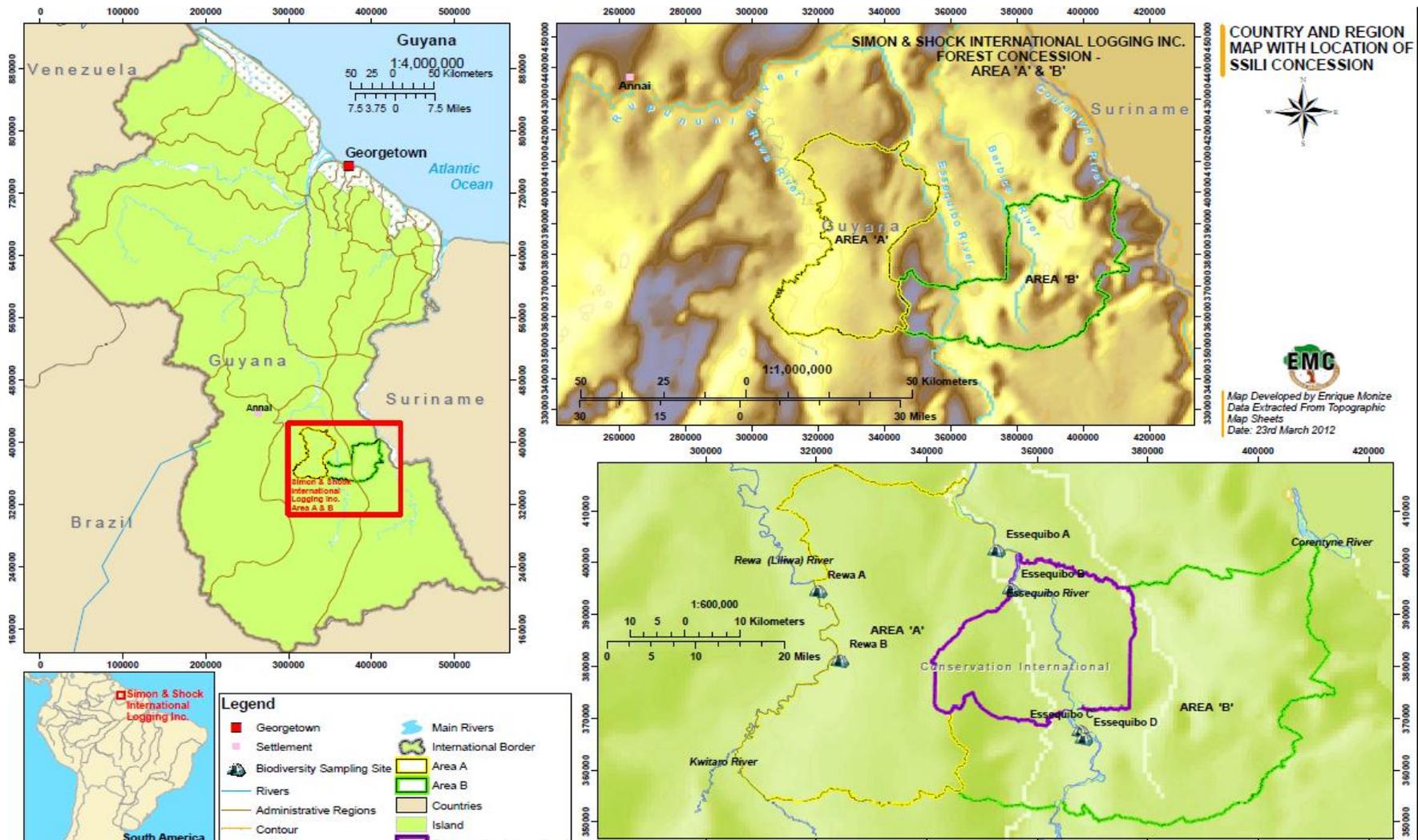


Figure 1: Map of region showing location of the SSILI concession with respect to region, country, and CI Conservation Concession

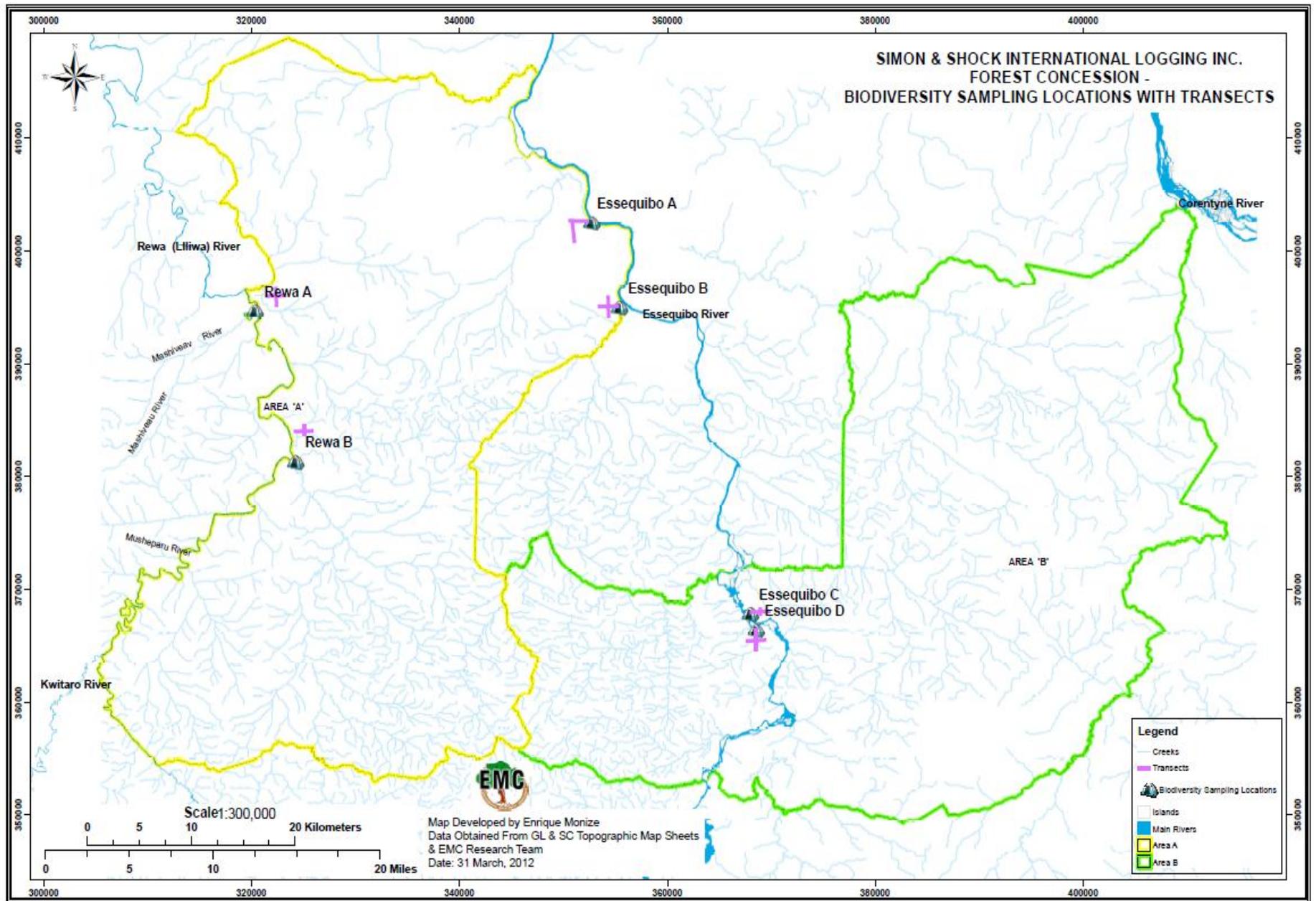


Figure 2: Map of SSILI Concession showing location of study sites and transects

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Chapter 1

Assessment of the Vegetation of the Simon & Shock International Logging Inc. Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana.

Ewart Smith, George Roberts and Annalise Bayney

ABSTRACT

This paper presents the results of a survey of the plants of the SSILI Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana. From 17th October to 1st November, 2011, and 31st January to 19th February, 2012, the structure and species composition of plant communities at four study sites along the Essequibo River and two sites along the Rewa River was assessed, inventoried and described. Plants in different diameter classes were identified and counted at transects. The dominant forest types encountered and surveyed were Mixed Forest on flat or gently rolling terrain and Mora Forest along rivers. Forests were dominated by species in the families: Lecythidaceae, Chrysobalanaceae, Meliaceae, Sapotaceae, Fabaceae, Caesalpiniaceae, Apocynaceae, Euphorbiaceae, Annonaceae, and Violaceae. The following were especially abundant at all sites: Mora (*Mora excelsa*), Wamara (*Swartzia leicocalycina*), Baromalli (*Catostemma commune*), Yari-Yari (*Duguetia* spp), and Black Kakaralli (*Eschweilera subglandulosa*). In addition to these canopy-forming species; a diverse array of vines, lianas and shrubs dominated the forest understory. The concession likely contains thousands of plants species as this huge concession includes a diversity of habitats, a varied topography and plant communities that combine Guianan Shield and Amazon elements. The forest is essentially pristine. The only visible trace of human disturbance was in the form of slashes on the bark of Balata trees (*Manilkara* sp.) exploited until the 1960s for their latex.

INTRODUCTION

Guyana and the surrounding frontier forest of the Guiana Shield contain approximately 8,000 documented plant species of which 50% are considered endemic to the region (Parker *et al.*, 1993). The tropical rainforests of Guyana cover almost 70% of the nation's land base distinguishing the country as one of the most forested lands in the world. Conservation of Guyana's forest has likely resulted, in part, due to low population (<800,000 people who are highly concentrated in the coastal areas), the inaccessibility of much of the forest land base, and historically low human and natural disturbance rates (ter Steege, 1998).

The concession is located along the Upper Essequibo Corentyne – North Rupununi District (Region 9) and supports large tracts of intact forest and a diversity of habitats, with an extraordinary but understudied diversity of plants. Very little exploration has been conducted throughout the concession, especially Part B. However, a 2% timber inventory was undertaken by BJ Management and Associates in May - August 2011 to inform a five year timber harvesting management plan (BJ Management Associates, 2011). In addition to the limited timber inventory, in 2001 a Conservation International (CI) Rapid Assessment Program (RAP) expedition inventoried the vegetation along the nearby lower Kwitaro River, Rewa River Basin, Eastern Kanuku Mountains (Wilmer Díaz, 2001). This 2001 expedition, a 1993 RAP expedition to the Western Kanuku Mountains (Parker *et al.*, 1993), and other biodiversity inventories (ter Welle *et al.*, 1987; Gérard *et al.*, 1996; Jansen-Jacobs and ter Steege, 2000; ter Steege, 2000; Boggan *et al.*, 1997; Hollowell *et al.*, 2001; Hoke, 2002) have emphasized the biological importance of this region in terms of plant diversity. However, in order to adequately inventory, map and understand the complexities of these ecosystems; a great deal more research and exploration throughout this region are required.

MATERIALS AND METHODS

The vegetation survey was conducted from 17th October to 1st November, 2011, and 31st January to 19th February, 2012. Several pre-existing transect lines established by BJ Management and Associates (Associate for SSILI conducted a Management level inventory in May - August 2011) were utilized to

carry out a quantitative description of vegetation structure and plant community composition in Mixed and Mora Forests at six study sites - two sites along the Rewa River and tributaries (Rewa A & B) and four sites along the Essequibo part of concession (Essequibo A, B, C & D) (see Maps)

We followed the methods described by Guyana Forestry Commission for management level inventory but with some modification. Typically a 2 km central transect was established at each site (management level timber inventory transect lines were used when available⁴⁹) and a second 2 km transect line was then cut at 90° at the midpoint of the central transect line. Along each of these transect lines, a sampling point (25m radius plot) was established and sampled at 200 m intervals. Plants in four diameter categories were counted and identified (between 3-5 cm, 6-10 cm, 11-20 cm, and greater than 20 cm), as well as shrubs, vines and assorted lianas. All changes in vegetation along transect lines were recorded with GPS coordinates and photographs. Fruiting or flowering plants were recorded. The dominant plant families and genera (most important in terms of number of species) are compared between sites.

Transects were analysed to determine species diversity and richness at each site. Simpson's Index of Diversity was used to calculate species diversity

$$1 - D = \left(\sum_{i=1}^S \frac{n_i(n_i - 1)}{N(N - 1)} \right)$$

Where; (SDI);

S = Total Number of Species in the Community;
n = the total number of organisms of a particular species; and
N = the total number of organisms of all species.

The value of this index ranges between 0 and 1.

1-D = Simpson's Index of Diversity

RESULTS AND DISCUSSION

A combined total of 136 individual species representing 48 families were recorded within Rewa sites A & B and Essequibo sites A, B, C & D during the survey periods (Appendix 1). A total of 82 species representing 33 families were recorded in Rewa A, 64 species representing 26 families in Rewa B, 78 species representing 32 families in Essequibo A, 84 species representing 32 families in Essequibo B, 67 species representing 31 families in Essequibo C, and 84 species representing 35 families in Essequibo D. All areas sampled can be classified as Mixed tropical forest over a predominantly flat to gently undulating terrain. Several small moist to wet depressions were also recorded within the transect lines. The intact forest displayed very little evidence of anthropogenic activities, timber harvesting or other human disturbance. The only evidence observed throughout the sampling was a series of old (>40 years) slashes on Balata trees.

Dominant families throughout all transects include **Caesalpinaceae** (Wamara - *Swartzia leicocalycina*, Mora- *Mora excelsa*, Sarebebeballi- *Vouacapoua macropetala*), **Annonaceae** (Yari Yari- *Duguetia* sp, Asashi- *Rollinia exsucca*), and **Bombacaceae** (Baromalli - *Catostemma commune*), **Lecythidaceae** (Black Kakaralli - *Eschweilera subglandulosa*) and **Chrysobalanaceae** (Marishaballi - *Licania densiflora*, Kauta- *Licania laxiflora*). The following species dominated: Mora (*Mora excelsa* – 11.8%), Wamara (*Swartzia leicocalycina* – 5.7%), Baromalli (*Catostemma commune* – 4.7%), Yari-Yari (*Duguetia* spp- 4.4%), Black Kakaralli (*Eschweilera subglandulosa* – 3.7%), and Kauta (*Licania laxiflora* – 3.0%).

⁴⁹ There were no existing timber inventory transect lines at Rewa A.

Understory vegetation (3-20 cm dbh) at both Rewa A & B sites and among Essequibo sites displayed similar species composition and species distribution throughout transect lines. Dominant vegetation included Wamara (Caesalpiniaceae), Mora (Caesalpiniaceae), Yari-Yari (Annonaceae), Baromalli (Bombacaceae), Marshiballi (Chrysobalanaceae), Black Kakaralli (Lecythidaceae), Asashi (Annonaceae) and Waiaballi (Combretaceae).

In all areas sampled with the exception of Rewa site B, vegetation exceeding 20 cm dbh made up the majority of recorded vegetation; often exceeding 25% of total vegetation recorded within each area. Dominant canopy vegetation within this category included Mora (*Mora excelsa*), Yari-Yari (*Duguetia sp*), Baromalli (*Catostemma commune*), Yarulla (*Aspidosperma excelsum*), Sarebebeballi (*Vouacapoua macropetala*), Asashi (*Rollinia exsucca*), Wamara (*Swartzia leicocalycina*), Crabwood (*Carapa guianensis*), Black kakaralli (*Eschweilera subglandulosa*) and Kauta (*Licania laxiflora*).

Several species were only recorded within the Rewa Sites; these include Parakusan (*Swartzia ljenmani*), Barabara (*Diospyros spp*), Line Leaf Kakaralli (*Eschweilera grata*), Letter wood (*Brosimum guianensis*), Tonka bean (*Dipteryx spp*), Rubi (*Palicouria spp*), and Kudanab (*Fagara spp*).

Similarly several species were only recorded within the Essequibo Sites; these include Arara Broad leaf (*Gutteria spp*), Burada (*Schefflera paraensis*), Walaba Soft (*Eperua falcata*), Pukari (*Platonia insignis*), Silverballi – Brown (*Licaria canella*), Silverballi – Yellow (*Aniba hypoglauca*), Hairariballi (*Alexa spp*), Tatabu (*Diplotropis purpurea*), Warakaioero (*Leotia procera*), Karishari (*Allophylus racemosus*), Kulishiri (*Matayba oligandra*), and Hakiaballi (*Vitex compressa*).

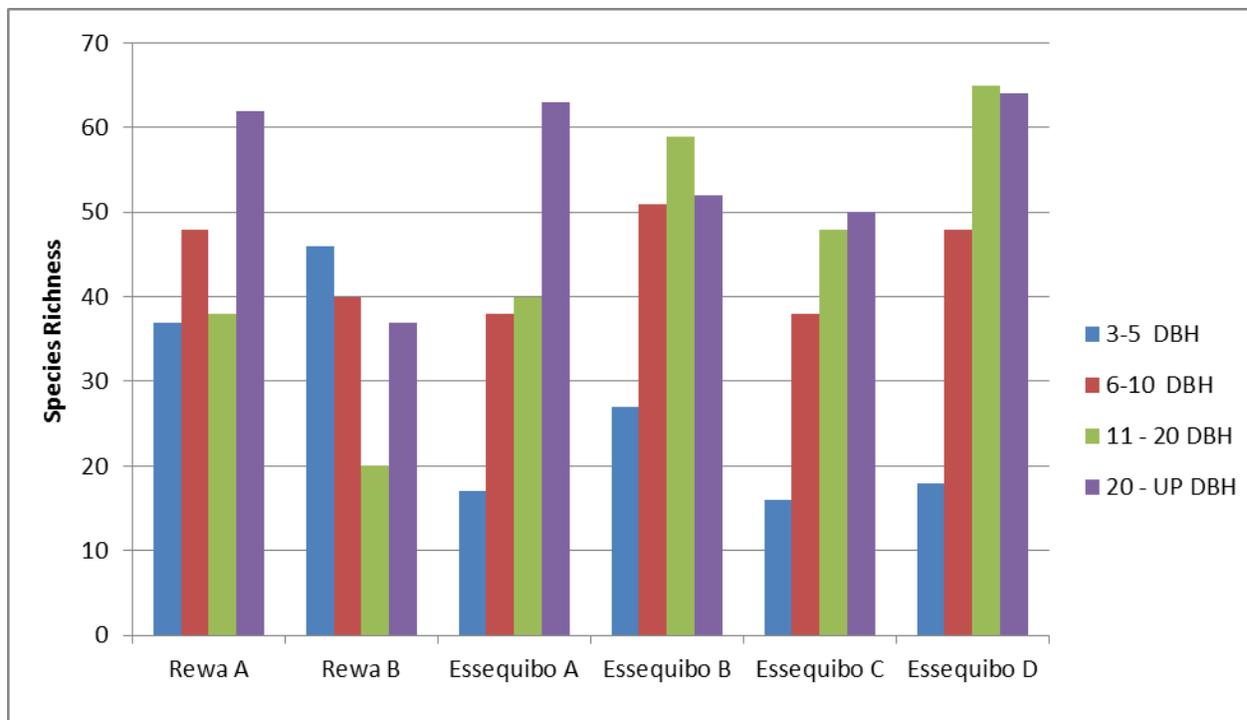


Figure 1-1: Species Richness recorded in Rewa and Essequibo Sites within each diameter class

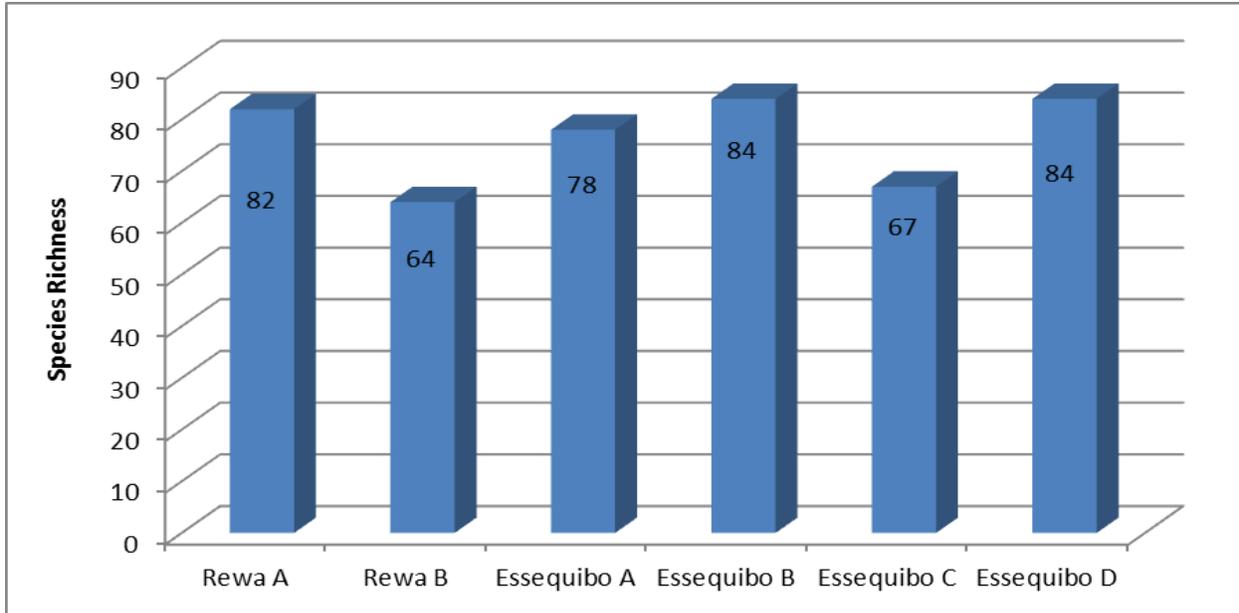


Figure 1-2: Species Richness recorded in Rewa and Essequibo Sites inclusive of all diameter classes

Inclusive of all diameter classes, vines and shrubs; Essequibo Sites B & D were the richest with respect to number of individual species recorded (Figure 1-2). The exception is the Rewa site B transect that contained notably fewer plant species. All sites displayed similarly diverse species composition ranging from 0.930 to 0.970 (Figure 1-3). Essequibo Sites C & D uniformly recorded similarly high levels of understorey vegetation diversity when comparisons of the 3-20 dbh diameter class were analyzed.

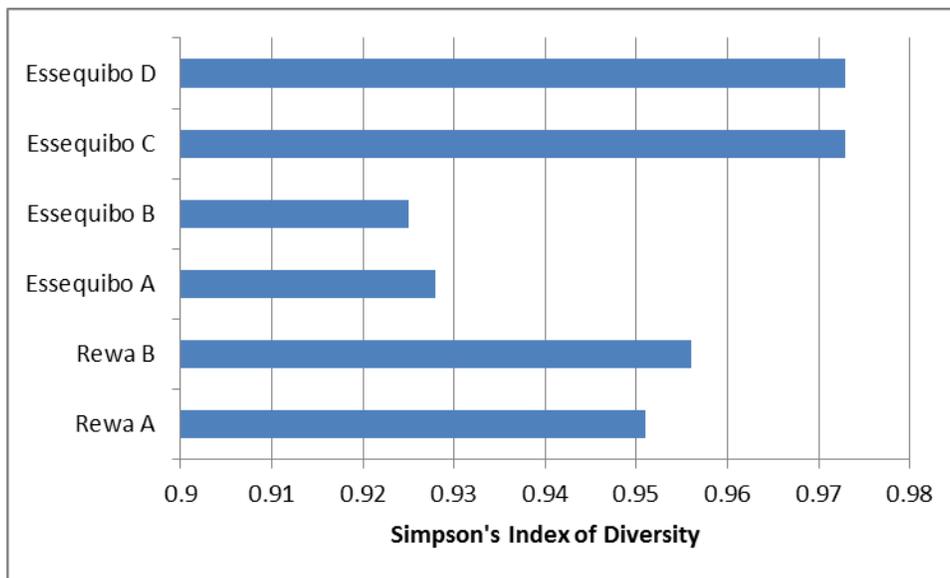


Figure 1-3: Simpson Index of Diversity – a comparison of plant diversity among sites (all diameter classes, vines and shrubs recorded are included)

Table 1-1: Summary of Floral Data Collected within Rewa and Essequibo Sites

	Sampling Locations					
	Rewa A	Rewa B	Essequibo A	Essequibo B	Essequibo C	Essequibo D
Total Individuals	1355	853	1153	1392	658	1244
Species Richness	82	64	78	84	67	84
Family Richness	33	26	32	32	31	35

Table 1-2: Summary of Floral Data Collected per Diameter Class within Rewa and Essequibo Sites

Total Species	Sampling Locations					
	Rewa A	Rewa B	Essequibo A	Essequibo B	Essequibo C	Essequibo D
3-5 DBH	37	46	17	27	16	18
6-10 DBH	48	40	38	51	38	48
11 - 20 DBH	38	20	40	59	48	65
20 - UP DBH	62	37	63	52	50	64
Shrubs	2	2	1	1	1	1
Vines	5	4	4	5	3	2
Total Families	Rewa A	Rewa B	Essequibo A	Essequibo B	Essequibo C	Essequibo D
3-5 DBH	23	21	10	16	12	14
6-10 DBH	24	17	22	29	21	24
11 - 20 DBH	23	11	21	24	27	29
20 - UP DBH	27	21	26	22	23	30
Shrubs	2	2	1	1	1	1
Vines	5	4	4	5	3	2

No significantly unique species of either understory or canopy species were recorded at either Rewa or Essequibo Sites. Similar species dominated both understory (3-20 dbh) and canopy species (>20 dbh) throughout both Rewa and Essequibo sites. Common dominant species exceeding the 20 dbh classification included Mora, Baromalli, Wamara and Yari-Yari. The only significant difference between the sites was the percentage of Mora (*Mora excelsa*) trees exceeding the 20 dbh threshold; which equated to 18% and 37% of the total mass of vegetation recorded exceeding 20 dbh in the Rewa and Essequibo sites respectively.

Field Note: No Greenheart (*Chlorocardium rodiei* – Lauraceae) were observed throughout the areas sampled within both Rewa and Essequibo sites. Since this is a major timber species with harvesting potential listed in the SSI 5 Year Management Plan, it should be noted that no mature trees were observed throughout these transects. These reported results of the timber inventory may need to be reassessed with respect to the distribution and abundance of this particular species.

Table 1-3: Dominant species recorded in Rewa and Essequibo sites with the >20 dbh category (canopy-forming species)

Rewa Sites				Essequibo Sites			
Common Name	Scientific Name	Family	Quantity	Common Name	Scientific Name	Family	Quantity
Mora	<i>Mora excelsa</i>	Caesalpiniaceae	120	Mora	<i>Mora excelsa</i>	Caesalpiniaceae	336
Wamara	<i>Swartzia leicocalycina</i>	Caesalpiniaceae	61	Sarebebeballi	<i>Vouacapoua macropetala</i>	Caesalpiniaceae	86
Adebero	<i>Paypayrola longifolia</i>	Viscaceae	53	Baromalli common	<i>Catostemma commune</i>	Bombacaceae	53
Baromalli common	<i>Catostemma commune</i>	Bombacaceae	40	Carbwood	<i>Carapa guianensis</i>	Melastomataceae	64
Kauta/ Karishiri	<i>Palicourea guianensis</i>	Rubiaceae	34	Wamara	<i>Swartzia leicocalycina</i>	Caesalpiniaceae	57
Yarulla	<i>Aspidosperma excelsum</i>	Apocynaceae	32	Soft Walaba	<i>Eperua falcata</i>	Caesalpiniaceae	78
Kauta	<i>Licania laxiflora</i>	Chrysobalanaceae	25	Kauta	<i>Licania laxiflora</i>	Chrysobalanaceae	56

Table 1-4: Dominant Species Recorded in Rewa and Essequibo sites within the 3-20 dbh category

Rewa A				Rewa B			
Common Name	Scientific Name	Family	Quantity	Common Name	Scientific Name	Family	Quantity
Wamara	<i>Swartzia leicocalycina</i>	Caesalpiniaceae	111	Mora	<i>Mora excelsa</i>	Caesalpiniaceae	62
Yari-Yari	<i>Duguetia spp</i>	Annonaceae	99	Baromalli	<i>Catostemma commune</i>	Bombacaceae	53
Baromalli	<i>Catostemma commune</i>	Bombacaceae	65	Marishaballi	<i>Licania densiflora</i>	Chrysobalanaceae	49
Adebero	<i>Paypayrola longifolia</i>	Viscaceae	53	Wamara	<i>Swartzia leicocalycina</i>	Caesalpiniaceae	49

Rewa A				Rewa B			
Common Name	Scientific Name	Family	Quantity	Common Name	Scientific Name	Family	Quantity
Mora	<i>Mora excelsa</i>	Caesalpiniaceae	46	Kauta/ Karishiri	<i>Palicourea guianensis</i>	Rubiaceae	37
Waiaballi	<i>Terminalia amazonia</i>	Combretaceae	39	Kakaralli - Black	<i>Eschweilera subglandulosa</i>	Lecythidaceae	31
Essequibo A				Essequibo B			
Common Name	Scientific Name	Family	Quantity	Common Name	Scientific Name	Family	Quantity
Mora	<i>Mora excelsa</i>	Caesalpiniaceae	173	Wamara	<i>Swartzia leicocalycina</i>	Caesalpiniaceae	78
Yari-Yari	<i>Duguetia spp</i>	Annonaceae	47	Yari-Yari	<i>Duguetia spp</i>	Annonaceae	54
Kakaralli - Black	<i>Eschweilera subglandulosa</i>	Lecythidaceae	29	Mora	<i>Mora excelsa</i>	Caesalpiniaceae	52
Gauavaballi	<i>Guarea guidonia</i>	Melastomataceae	29	Asashi	<i>Rollinia exsucca</i>	Annonaceae	48
Wamara	<i>Swartzia leicocalycina</i>	Caesalpiniaceae	28	Baromalli	<i>Catostemma commune</i>	Bombacaceae	48
Waiaballi	<i>Terminalia amazonia</i>	Combretaceae	28	Kauta/ Karishiri	<i>Palicourea guianensis</i>	Rubiaceae	44
Arara	<i>Guettarda acreana</i>	Annonaceae	24	Sarebebeballi	<i>Vouacapoua macropetala</i>	Caesalpiniaceae	36
Baromalli	<i>Catostemma commune</i>	Bombacaceae	23	Ruri	<i>Chaetocarpus schomburgkianis</i>	Euphorbiaceae	32

Essequibo C				Essequibo D			
Common Name	Scientific Name	Family	Quantity	Common Name	Scientific Name	Family	Quantity
Kulishiri	<i>Matayba oligandra</i>	Sapindaceae	44	Yari-Yari	<i>Duguetia spp</i>	Annonaceae	49
Kauta	<i>Licania laxiflora</i>	Chrysobalanaceae	29	Haiwa	<i>Protium sagotianum</i>	Burseraceae	49
Yari-Yari	<i>Duguetia spp</i>	Annonaceae	27	Kakaralli - Black	<i>Eschweilera subglandulosa</i>	Lecythidaceae	45
Kakaralli - Black	<i>Eschweilera subglandulosa</i>	Lecythidaceae	21	Sarebebeballi	<i>Vouacapoua macropetala</i>	Caesalpiniaceae	35
Sarebebeballi	<i>Vouacapoua macropetala</i>	Caesalpiniaceae	18	Maho	<i>Sterculia rugosa</i>	Sterculiaceae	36
Maho	<i>Sterculia rugosa</i>	Sterculiaceae	18	Kulishiri	<i>Matayba oligandra</i>	Sapindaceae	32

CONSTRAINTS AND LIMITATIONS

It was hoped that (to save time and effort) the vegetation survey team would use pre-existing vegetation transects that were established by BJ Management and Associates as part of a management level timber inventory in May - August 2011. However, there was no existing transect at Rewa site A.

RECOMMENDATIONS

A review of the commercial timber species list as well as distribution within the concession should be reviewed to ensure accuracy. Collaborations with the GFC as well as local, regional and international partners such as Universities and NGOs can greatly assist with this task.

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Chapter 2

An Assessment of the Fish Fauna and Water Quality of the Rewa River and Essequibo River Systems in the Upper Essequibo-Corentyne-North Rupununi District, Guyana.

Bibi Aneeza Khan

ABSTRACT

The fish fauna and water quality of the Rewa and Essequibo river systems draining the SSILI Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana, was assessed from 17th October to 1st November, 2011, and 31st January to 19th February, 2012. Five locations in the Rewa River and seven in the Essequibo River system were sampled. A total of 121 species of fish from 27 families were documented from both river systems. The dominant fish families in terms of number of species were the characidae, pimelodidae, cichlidae, and the anostomidae. Fish of the family Characidae were especially abundant in main river channels and creeks with species in the genus *Moenkhausia* well-represented among our captures. The black piranha (*Serrasalmus rhombeus*) and lukanani (*Cichla ocellaris*) were also especially abundant. Notable records are *Aphyocharax erythrurus*, *Crenicichla wallacii* and *Nannostomus harrisoni* that are endemic to Guyana. Among the many large-sized food fishes recorded, the arapaima (*Arapaima gigas*) was the most notable species. A management plan exists for this CITES Appendix II listed fish. Although indigenous communities fish the river systems, the aquatic habitats did not seem to be disturbed to any large extent, and water quality sampling indicates that existing water quality of the area is typical of the water quality for similar type of areas within Guyana, with very low levels of contamination.

INTRODUCTION

Fish are key components of Amazonian rain forest ecosystems (Lowe-McConnell 1995; Lundberg 2001). They are linked to forests by migrations of fish through inundated forest ecosystems and through nutrient flows into wetlands. Furthermore, fish are of immense value to humans and are often critical traditional food sources that define human-forest relationships (Robinson and Redford 1991) e.g. fish are a staple item in the diet of the indigenous Mucushi that fish the rivers that drain the SSILI concession. Fish are also the subject of international agreements and can be used as general indicators of pollution (Nelson, 1994). Because fish play a very important role in forested Amazonian ecosystems, their importance to the survival of local people, and their use as indicators of pollution, it is important to understand patterns of fish diversity in Guyana's rivers and wetlands, especially in pristine forests that are to be exploited e.g. the SSILI Forest Concession.

The SSILI Forest Concession is drained by the Rewa River and Essequibo River systems (Figure 2-1). The Rewa River drains into the Rupununi River that then empties into the Essequibo River downstream of the concession. Part A of the concession is bordered by the Rewa River to the West and by the Essequibo River to the East. The Essequibo River flows through and bisects Part B of the concession. The drainage of the concession is seasonally linked to the Amazon drainage when the flooded savannas form a continuous expanse of water between the tributaries of the Rio Branco and the Rupununi River. The rivers and creeks of the SSILI concession seasonally flood into the forests. Waters in the Essequibo generally rise from April, and recede from August to October likely affecting the migration, spawning, and feeding behaviour of fish communities (Watkins *et al.* 2004).

In this survey, sampling was conducted in the Rewa River system and the Upper Essequibo river system. The Essequibo River is the longest river in Guyana is known for its very high diversity of over 450 species of fishes. The Rupununi River drains into the Essequibo and during the rainy season each year floods into the surrounding savannas and forested areas, creating a large, unique wetland, which is an important feeding and spawning area for fish from the Essequibo, Rupununi and Amazonian systems and which accounts for the presence of a high diversity and presence of some Amazonian fishes (Watkins *et*

al., 2004). The fish fauna of the Rewa River has near the SSILI concession also been surveyed recently. A Conservation International (CI) Rapid Assessment Programme (RAP) expedition to the Lower Kwitaro River, Rewa River system, documented 113 fish species in ten days of surveys (Mol, 2001).

MATERIALS AND METHODS

The survey of the fish fauna is part of a biodiversity assessment with two sampling phases: 17th October to 1st November, 2011, and 31st January to 19th February, 2012. The fish fauna of the concession was documented by sampling twelve (12) locations on the main river systems that drain the concession: the Rewa River and the Essequibo River. Five locations were fished in the Rewa River system and seven locations in the Essequibo River system (Figure 1; Appendix 2)⁵⁰. Main river channels as well small creeks were sampled. Locations were chosen based on accessibility and habitat type.

The twelve locations where the fish fauna was sampled were:

- (RA1) main channel Rewa River near Rewa A campsite
- (RA2) creek feeding into Rewa River near Rewa A campsite
- (RB1) large creek (the 'fishing pond') that empties into Rewa River
- (RB2) small creek that forms a swamp before emptying into RB1
- (RB3) main channel of Rewa River near Rewa B campsite
- (EA1) creek feeding into Essequibo River near campsite
- (EA2) near mouth of Coco Creek
- (EA3) main channel of Essequibo River between Coco Creek and camp
- (EB1) Smythe Creek next to Essequibo campsite B
- (EB2) main channel of Essequibo River near campsite B
- (EC1) main channel of Essequibo River near campsite C
- (EC2) creek feeding into Essequibo River near campsite D

In order to effectively sample the fish fauna of the rivers and creeks and to ensure a large number of capture records, a number of different methods were used to catch fish during the day and night. In order to perform a thorough survey, fishes were caught via hook and lines with different hook sizes and bait types, a dip-net- to collect small fishes in shallow water, a cast-net to catch medium sized fishes in shallow areas where there was no or few fallen branches in the water, and gill-nets (5" and 11/2 "mesh size) and drag-nets.

Interview conducted with indigenous field guide Frederick Charlie of Apoteri and Campbell James of Apoteri village who are very familiar with rivers and fauna of the concession area. They confirmed species presence in the area by identifying the photographic plates from Dr. Axelrod's Atlas of freshwater Aquarium fishes. All fish species captured were photographed to aid identification. From analysis of photographs species identifications were confirmed by Dr. Flavio Lima of Brazil, **Museu de Zoologia da Universidade Estadual de Campinas**. Taxonomic classification follows that of Watkins *et al.* (2004).

⁵⁰ In phase two five locations were fished in the Rewa River; whereas in the phase one four locations were fished. In the Essequibo River, four of the five areas sampled in the phase one were fished in phase two and an additional two additional locations were also sampled. Two of the locations sampled in the phase one could not be fished in phase two as these water-bodies had dried out i.e. RB2 and EA1. In the upper reaches of the Essequibo above King Williams falls, the main river channel that was dominated continuously by rapids was too dangerous to sample since the water current was very strong.

Finally water quality in terms of pH, conductivity total dissolved solutes at each fish sampling location was assessed turbidity was measured (Table 1). A comparison of all the results and findings of the dry season (first phase) and wet season (second phase) was undertaken.

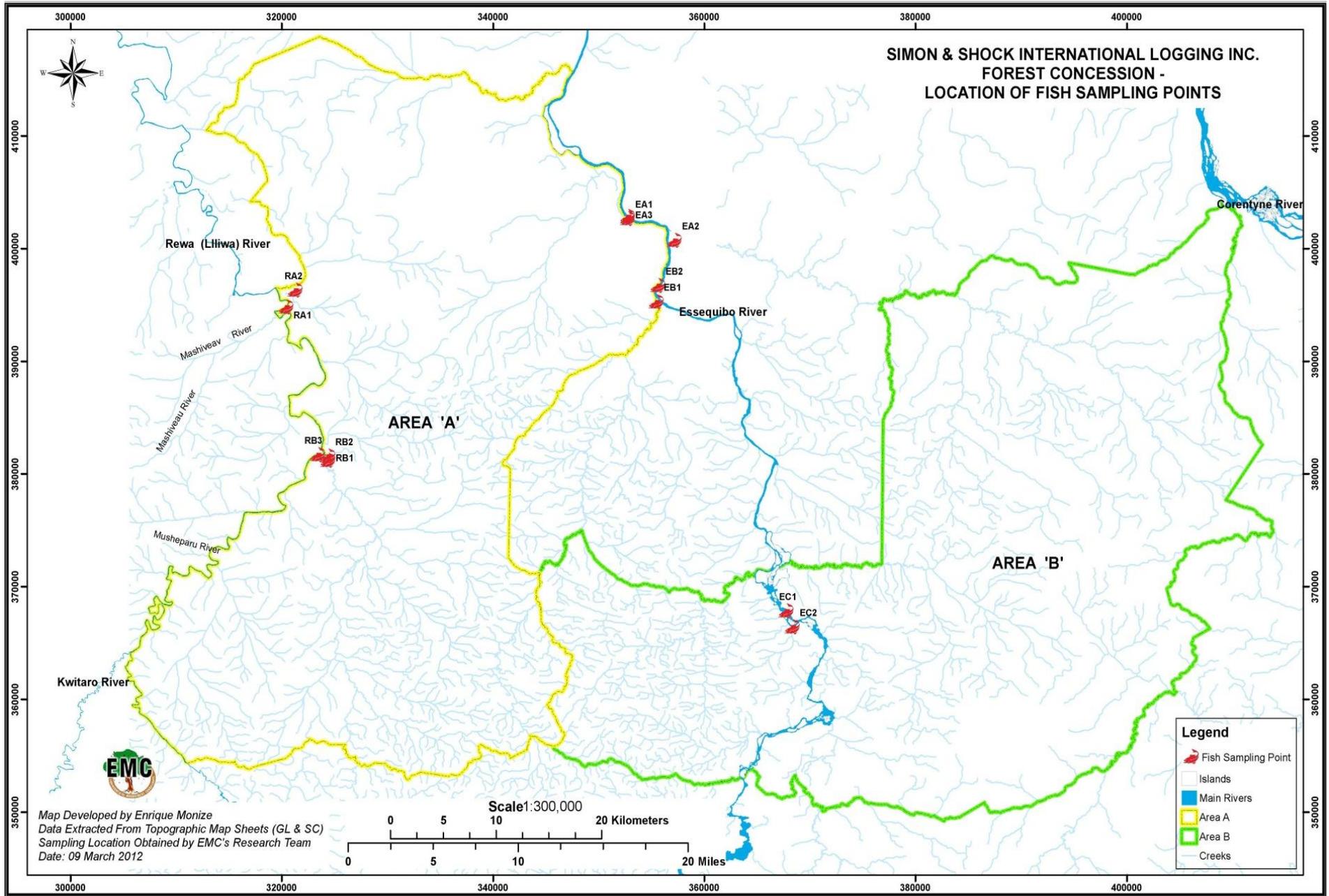


Figure 2-1: Location of fishing points and water quality sample sites within the SSILI Forest Concession

RESULTS AND DISCUSSIONS

Sampling sites and methods

The location of fishing sites and water quality sample sites is given in figure 2-1. Fish sampling was conducted at more than one location at each sampling site in order to ensure the maximum number of species recorded and a larger diversity. For example to survey the fish fauna of the Rewa and Essequibo Rivers we sampled a number of sites on the main river channels as well as a number of creeks feeding the main channels. In creeks there is more vegetation overhanging the waterway and also more submerged dead trees/logs/branches that provide habitat for the smaller fish species. The main river channels which are deeper with less submerged vegetation are preferred by larger species.

In February 2012, it was noted that the creeks and rivers had less water than during the first survey phase in October 2011. Some areas that have very little water and small creeks had dried out completely i.e. RB2 & EA1. Low water levels in the rivers allowed for better sampling in the main channels by the drag-netting method. Some fish species could clearly be observed due to the low the water levels but proved difficult to capture since they could easily see the reflection and movements of the survey team.

A number of different methods was employed to sample fish in order to ensure a high diversity of species were collected since some methods only work for certain types of fish, e.g. the banana fish, *Practocephalus hemiliopterus*, can be caught via a hook and line; whereas a dragnet is more effective at collecting *Corydoras melanistius*. Also different methods are used for different habitat types e.g. the dip-net and dragnet are especially effective at collecting fishes hiding in the leaf litter at the bottom of small creeks and in shallow water and cannot be used in the deeper main river channels. The only method that was not used during night fishing was the gill-net. These nets could not be set due to the common occurrence of caimans that destroyed the nets while eating the captured fish. As a result of this, the nets were only set during the day and had to be monitored to ensure the caimans didn't destroy them.

Water quality

The water quality of the Rewa and Essequibo rivers systems were measured at a number of locations (Table 1). Water samples were typically taken for each location during both survey phases. Total dissolved solids levels were also below the acceptable limit. All the sites sampled had readings within the normal range known for Amazonian streams (Furch, 1984; Mol 2001). The pH was within the range of 5.22 to 7.2, the conductivity between 9.5 $\mu\text{S cm}^{-1}$ to 210 $\mu\text{S cm}^{-1}$, the turbidity between 3.98 ntu to 30.4 ntu, and the total dissolved solids were between 6.5 mg/L to 87.8 mg/L. Total dissolved solids levels were also below the acceptable limit. Results show that the creeks were slightly more acidic than the main river. This observation was also noted by Mol (2001). It was observed that, during the wet season survey, the total dissolved solids levels recorded in the Rewa River were slightly higher than those recorded in the Essequibo River. The turbidity level in both rivers was within the expected range. However, the levels recorded at some points in the Rewa River were slightly elevated than those recorded in the Essequibo River, and are consistent with the results from the water quality assessment conducted. Conductivity levels were also within the acceptable range.

Surface water quality samples were also obtained for other localities for detailed chemical analyses and to provide a better understanding of the water quality within the general project area. The results of these analyses indicated that the existing water quality of the area is typical of the water quality for similar type of areas within Guyana. The results published in the ESIA indicated very low level of contamination.

In 1934 Carter categorized the rivers found in Guyana as either black water (acidic, with high carbon dioxide and low oxygen content) or white water (turbid, with low carbon dioxide, high silica, and low acidity). The Essequibo has high sediment loads and can be considered a white water. However the upper Essequibo is considerably darker than the lower Essequibo (Watkins et al. 2004). The Rewa River is considered as a white water river because of its high sediment load. Nevertheless, Sioli (1950) classified the Essequibo and Rewa rivers as White Water Rivers. The difference in the classification of these rivers may be as a result of the change in water quality over the years.

Table 2-1: Water Quality data of the fish sampling sites in the Rewa and Essequibo River systems

Sampling Location	Date	River Width (m)	River depth (m)	pH	Total dissolved solids (mg/L)	Conductivity ($\mu\text{S cm}^{-1}$) ⁵¹	Turbidity (ntu) ⁵²	Temperature
Rewa								
(RA1)	Oct 19	70	-	6.12	34.3	51.5	12.4	-
	Feb 3	70	3	6.51	143	210	17.7	29.1
(RA2)	Feb 3	40	3	6.30	56.4	76.0	15.6	29.3
	Oct 23	25	-	6.29	17.2	24.6	18.7	-
(RB1)	Feb 5	25	3.90	5.69	87.8	39.5	11.7	25.7
(RB2)	Oct 23	10	<1	5.77	17.2	73.2	3.98	-
	Oct 23	70	-	6.71	28.3	41.1	30.4	-
(RB3)	Feb 5	70	3.20	6.42	24.5	35.2	11.7	29.3
Essequibo								
(EA1)	Oct 27	4	0.25	5.22	22.4	23.3	9.98	-
	Oct 27	50	-	6.34	55.7	76.2	13.6	-
(EA2)	Feb 17	50	2	5.80	15.9	18.5	25.7	27.0
	Oct 27	295	-	6.56	31.9	45.3	6.84	-
(EA3)	Feb 17	295	3.85	7.20	6.5	9.5	10.1	27.5
	Oct 30	40	-	6.53	25.0	40.3	10.0	-
(EB1)	Feb 9	40	1.75	6.24	33.3	98.9	15.8	26.2
(EB2)	Oct 30	245	-	6.60	24.2	32.7	5.93	-
	Feb 9	245	6	6.72	35.3	71.9	8.40	28.5
(EC1)	Feb 14	310	5.80	6.64	7.7	12.5	7.40	29.4
(EC2)	Feb 14	10	2.90	6.78	7.5	10.7	6.69	27.5

Fish species abundance and diversity

During Phase One of sampling in October 2011, a total of 59 species of fishes were captured in both river systems (Appendix *). During Phase Two in February 2012, a total of 65 fish species were captured, 16 of which were not captured in the Phase One surveys. The presence of an additional 40 species was confirmed through interviews with indigenous field assistants (Appendix 2). A total of 121 species of fish from 27 families have now been documented from both river systems, including the species confirmed by field assistants (Table 2). Our capture data suggests that larger sized fish species are more likely to be present in both river systems than smaller sized species (see also Lowe-McConnell, 1964).

Even though an additional 16 new species were recorded in phase two, and more than 120 species have now been documented from the river systems, the species list is still a fraction of the actual checklist found in Guyana. With more extensive surveys undoubtedly a higher diversity of fish species will be documented. FishBase⁵³, an organization that provides species checklist for research purposes, lists 467 species of freshwater fishes as occurring in Guyana. Eigenmann in 1912 reportedly collected 336 species from the northern portion of Guyana (Eigenmann *et al.*, 1912); Watkins *et al.* extensive surveys recorded over 400 species of fishes from Iwokrama Forest (Watkins *et al.* 2004), with 345 species in the Essequibo River drainage; whereas Hardman *et al.* (1998) retracing Eigenmann's survey recorded 270 species of which 73 species were new records. In only ten days of sampling Mol (2001) collected 113 fish species in the catchments of the Lower Kwitaro River and the Upper Rewa River during a Rapid Assessment Programme (RAP) expedition.

The dominant fish families in terms of number of species are the characidae (32 species documented), the cichlidae (16), pimelodidae (14), and anostomidae (14). Members of the family Characidae and Pimelodidae were especially abundant in rivers and creeks. Species in the genus *Moenkhausia* were well represented among our capture records, especially *Moenkhausia lepidura*. Large black piranhas (*Serrasalmus rhombeus*) were notably abundant at most locations fished.

Information obtained from interviews conducted communities using the Rewa and Essequibo Rivers and from indigenous field guides indicates that almost all the fish species are consumed; however, the larger species are preferred. Large species that were collected in this survey exercise and are preferred for use are freshwater basha (*Plagioscion squamosissimus*), huri (*Hoplias malabaricus*), yarrow (*Hoplerythrinus unitaeniatus*), skeete or banana fish (*Phractocephalus hemiliopterus*), short head culet (*Pseudoplatystoma fasciatum*), baiara (*Hydrolycus tatauaia*), lukanani (*Cichla ocellaris*), boots (*Trachycorystes trachycorystes*), black piranha (*Serrasalmus rhombeus*), butterflyfish (*Hemisorubim platyrhynchos*), and tigerfish (*Leiarius marmoratus*). Although indigenous communities fish the Rewa and Essequibo river systems, the aquatic habitats did not seem to be disturbed to any large extent.

Notable species recorded include three species that are endemic to Guyana: *Aphyocharax erythrurus*, *Crenicichla wallacii*, and *Nannostomus harrisoni* (FishBase). The only CITES listed fish documented was *Arapaima gigas*. It is listed on CITES Appendix II. The Arapaima is protected in Guyana by the Fisheries Regulations under the Fisheries Act of 1953. However, despite legal protection, this species continued to be over-exploited, and, in 2002, the Iwokrama International Centre, the Department of Fisheries, the Mamiraua Sustainable Development Reserve in Brazil and the North Rupununi District Development Board developed a programme which focused on the effective management of the Arapaima population. The Arapaima Management Plan is based on a similar successful system in Brazil which relies on determining the number of individuals to be harvested based on the annual stock assessments, and involves community outreach. The Management Plan was approved by Government of Guyana in 2007, as part of the Fisheries Act.

⁵³ <http://www.fishbase.org>

Table 2-2: List of fishes documented as occurring in the Rewa and Essequibo river systems within the SSILI concession area

Achiridae	Characidae	Cichlidae	Lebiasinidae
<i>Apionichthys finis</i>	<i>Acestrorhynchus falcatus</i>	<i>Acarichthys (Guianacara) geayi</i>	<i>Pyrrhulina</i> spp.
Ageneiosidae	<i>Acestrorhynchus falcirostris</i>	<i>Aequidens tetramerus</i>	<i>Nannostous trifasciatus</i> *
<i>Ageneiosus inermis</i>	<i>Agoniat es halecinus</i>	<i>Apistogramma</i> spp.	<i>Nannostomus harrisoni</i> *
Anostomidae	<i>Aphyocharax erythrurus</i>	<i>Biotodoma cupido</i>	<i>Nannostomus unifasciatus</i> *
<i>Anostomus anostomus</i>	<i>Brycon falcatus</i>	<i>Cichlasoma</i> spp.	Loricaridae
<i>Anostomus gracilis</i> *	<i>Brycon pesu</i>	<i>Cichla temenis</i>	<i>Ancistrus</i> spp.
<i>Anostomus plicatus</i> *	<i>Carnegiella strigata</i>	<i>Cichla ocellaris</i>	<i>Hemiodontichthys acipencerinus</i>
<i>Anostomus ternetzi</i> *	<i>Characidium fasciatum</i>	<i>Crenicichla cf. notophthalmus</i>	<i>Hypostomus</i> spp.
<i>Leporinus</i> spp.	<i>Chalceus macrolepidotus</i>	<i>Crenicichla wallacii</i>	<i>Hypostomus plecostomus</i>
<i>Leporinus agassizi</i> *	<i>Characidium</i> spp.	<i>Mesonata festivus</i>	<i>Rineloricaria fallax</i>
<i>Leporinus arcus</i> *	<i>Cynopotamus essequibensis</i>	<i>Cichlasoma bimaculatum</i> *	Osteoglossidae
<i>Leporinus fasciatus</i>	<i>Charax gibbosus</i> *	<i>Crenicichla alta</i> *	<i>Arapaima gigas</i>
<i>Leporinus friderici</i> *	<i>Catoprion mento</i> *	<i>Geophagus surinamensis</i> *	<i>Osteoglossum bicirrhosum</i>
<i>Leporinus granti</i> *	<i>Triportheus angulatus</i> *	<i>Krobia guianensis</i> *	Pimelodidae
<i>Leporinus octofasciatus</i> *	<i>Astyanax fasciatus</i> *	<i>Pterophyllum scalare</i> *	<i>Batrochoglanis</i> spp.
<i>Leporinus maculatus</i>	<i>Astyanax bimaculatus</i> *	<i>Satanoperca leucosticta</i>	<i>Goeldiella eques</i>
<i>Leporinus nigrotaeniatus</i>	<i>Hyphessobrycon cf. copelandi</i>	Cynodontidae	<i>Hemisorubim platyrhynchos</i>
<i>Schizodon fasciatum</i> *	<i>Moenkhausia oligolepis</i> *	<i>Hydrolycus tatauaia</i>	<i>Leiarius marmoratus</i>
Aspredinidae	<i>Moenkhausia colettii</i>	<i>Hydrolycus armatus</i> *	<i>Leiarius pictus</i>
<i>Bunocephalus</i> spp.	<i>Moenkhausia cf. cotinho</i>	Dasyatidae	<i>Practocephalus hemiliopterus</i>
Auchenipteridae	<i>Moenkhausia grandisquamis</i>	<i>Potamotrygon hystrix</i> *	<i>Pimelodella cristata</i>
<i>Trachycorystes trachycorystes</i> *	<i>Moenkhausia lepidura</i>	<i>Potamotrygon cf. motoro</i> *	<i>Pimelodus blochi</i>
<i>Trachycorystes geleatus</i> *	<i>Myloplus</i> spp.	Doradidae	<i>Pimelodus ornatus</i>
<i>Tatia aulopygia</i> *	<i>Myleus setiger</i>	<i>Amplydoras hancocki</i>	<i>Pinirampus pinirampu</i>
Belonidae	<i>Poptella</i> spp.	<i>Platydoras costatus</i> *	<i>Pseudoplatystoma tigrinum</i> *
<i>Potamorrhaphis guianensis</i> *	<i>Pristobrycon striolatus</i>	Erythrinidae	<i>Sorubim lima</i> *
Callichthyidae	<i>Pygocentrus nattereri</i>	<i>Hoplerethrinus unitaeniatus</i>	<i>Paulicea</i> spp.*
<i>Callichthys callichthys</i> *	<i>Pygopristis denticulata</i>	<i>Hoplias malabaricus</i>	<i>Pseudoplatystoma fasciatum</i>
<i>Corydoras melanistius</i>	<i>Serrasalmus serrulatus</i>	Gymnotidae	Sciaenidae
<i>Megalechis picta</i>	<i>Serrasalmus rhombeus</i>	<i>Brachyhypopomus</i> spp.	<i>Plagioscion squamosissimus</i>
Cetopsidae	<i>Tetragonopterus chalceus</i>	<i>Rhabdolichops</i> spp.	Trichomycteridae
<i>Halogenes marmoratus</i> *	<i>Triportheus brachypomus</i>	<i>Gymnorhamphichthys ronndoni</i>	<i>Paracanthopoma</i> spp.
	Ctenolucidae	<i>Electrophorus electricus</i> *	<i>Ochmacanthus</i> spp.
	<i>Boulengerella cuvieri</i>	Hemiodontidae	Prochilodontidae

	Curimatidae	<i>Bivibranchia</i> spp.	<i>Prochilodus nigricans</i>
	<i>Curimata</i> spp.	<i>Hemiodus gracilis</i> *	Tetraodontidae
		<i>Hemiodus microlepis</i> *	<i>Colomesus asellus</i>
		<i>Hemiodus unimaculatus</i> *	

*presence confirmed through interviews with in indigenous field assistants.

LIMITATIONS AND CONSTRAINTS

Some limitations and constraints that may have affected capture success were:

- Night Sampling - sampling fishes at night was limited to a few methods. Gill nets are most effective at collecting fishes feeding at night. However, these could not be set at night because they were being destroyed by caimans.

CONCLUSIONS AND RECOMMENDATIONS

- Although a very large number of species was recorded, it is still only approximately a quarter of the actual species of freshwater fishes that occur in Guyana.
- Company should implement rules to limit fishing of the rivers within the concession area by workers.
- The rivers are very close to being in pristine condition and the fish fauna is diverse and abundant. This combination of high fish diversity and abundance, pristine and extensive river systems, and an absence of large human settlements, make the SSILI concession an important biodiversity area whose rivers and aquatic fauna must be protected and safeguard Guyana's rich biological diversity.

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Chapter 3

Amphibians and Reptiles of the Simon & Shock International Logging Inc. Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana.

Michelle Kalamandeen and Frank Clarke

ABSTRACT

This paper presents the results of a survey of the herpetofauna of the Simon and Shock International Logging Inc. Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana. Fieldwork was conducted 17th October to 1st November, 2011, and 31st January to 19th February, 2012. The purpose of this survey was to assess the biological diversity of amphibians and reptiles within the forest concession. Day and night visual encounter surveys, auditory encounter surveys, leaf litter plots, patch sampling, and river surveys were used to identify the presence of amphibians and reptiles at six sites within the Essequibo and Rewa River systems. A total of sixty-two (62) species of amphibians and reptiles were documented during field surveys comprising 34 anuran species and 28 reptilian species. Abundance and species diversity was higher in the wet season surveys. The dominant anurans observed were *Hypsiboas boans*, *Allobates femoralis* and *Ameerega picta*. Commonly encountered reptiles in the rivers and creeks include caimans *Melanosuchus niger* and *Caiman crocodyllus* and river turtles (*Podocnemus*). Dominant reptiles of *terra firme* rainforest include the lizards *Kentropyx calcarata*, *Ameiva ameiva* and *Uranoscodon superciliosa*, and tortoises were also encountered at most study sites. The concession area appears to have apparently healthy populations of reptiles that are threatened elsewhere in the region, including black caiman (*Melanosuchus niger*), yellow-footed tortoise (*Chelonoidis denticulata*), yellow-spotted river turtle (*Podocnemus unifilis*) and South American river turtle (*Podocnemis expansa*).

INTRODUCTION

Until recently, the herpetofaunal diversity of much of Guyana had been largely unknown and was inferred primarily from studies conducted in French Guiana (e.g. Starace, 1998). Recently, however, a number of studies have shed some light on the amphibians and reptiles of Guyana (Kok and Kalamandeen, 2008; Pires, 2005; Senaris and MacCulloch, 2005; Noonan and Bonett, 2003; Kok, 2006a; Kok, 2006b; Means and Savage, 2007; Means and Kalamandeen, 2007; Kok and Castroviejo-Fisher, 2008; Donnelly et al, 2006). Although the herpetofauna of the Upper Essequibo-Corentyne-North Rupununi District in which the SSILI Forest Concession is located is largely unknown, in 2009, Pickles *et al.* (2009) recorded the reptiles at localities along the Rewa River above the Corona Falls. Their study sites were near to the western boundary of the concession. Additionally, in 2001, Conservation International (CI) conducted a Rapid Assessment Programme (RAP) expedition to sites along the Lower Kwitaro River, Rewa River Basin, near to the SSILI concession area. Although, CI did not systematically survey the herpetofauna, they noted the presence of populations of black caiman (*Melanosuchus niger*) and the giant Amazonian river turtle (*Podocnemis expansa*) in the Rewa River Basin (Montambault and Missa, 2002).

MATERIALS AND METHODS

Herpetofauna surveys were conducted in the SSILI forest concession in two survey phases from 17th October to 1st November, 2011, and 31st January to 19th February, 2012. During the first survey phase, the weak La Nina conditions that regenerated in early August strengthened slightly, and persisted (see Red Cross *et al.*, 2011) leading to periods of heavy rainfall during the first half of the survey period. During the second phase the sites were noted as being drier than on the previous survey which is inconsistent with the season. This may be due to shifts in climatic patterns. Six study sites were sampled for amphibians and reptiles. Two study sites were situated along the Rewa River (Rewa A & B) and four were along the Essequibo River (Essequibo A, B, C & D) (see Maps). At each study site two to three days of amphibian and reptile surveys was undertaken by two field assistants. Visual Encounter Surveys (VES)

and Auditory Encounter Surveys (AES) were conducted each day along a 4km transect to determine species presence, distribution and relative abundance. Each day Patch Sampling⁵⁴ of habitats was conducted in the morning and afternoon⁵⁵. Each night nocturnal VES and AES river surveys were conducted by boat along the main river channels, tributaries and creeks. These river surveys lasted approximately 1 to 2 hours, commencing around 19:00 h to 20:00 h. A high-powered spotlight attached to a car battery provided >1 million candles to spotlight reptiles and amphibians. Caiman and tree boas were typically located by their eyeshine.⁵⁶ General searches for amphibians and reptiles around the campsites were also carried out and opportunistic observations were recorded by all other survey team members. Additional information on species presence was gleaned through interviews with field guides.

RESULTS AND DISCUSSION

A total of sixty-two (62) species of amphibians and reptiles were documented during field surveys comprising 34 amphibian species and 28 reptile species (Appendix 3).

Amphibians

Three-hundred and twenty-six (326) of 34 species of amphibians representing six families were recorded in total over the two survey exercises in 2011 and 2012.

In the dry season survey in October and November 2011, 32 individuals of 13 species of amphibians were documented. All were anurans (frogs and toads). They were observed mainly near large creeks and rivers and in swampy areas in Mixed Forest and Mora-dominated Forest (*Mora excelsa*), with the majority of species encountered belonging to the families Hylidae and Leptodactylidae. The dominant anurans observed were *Hypsiboas boans* and *Allobates femoralis*. *Hypsiboas boans* was the only frog recorded at all sites during the dry season survey. Several large males could be heard calling next to water at most sites. *Hypsiboas calcaratus* males were also heard calling some nights after sporadic rainfall. In contrast, the poison arrow frog *Allobates femoralis* was active during the day and all individuals of this conspicuous species were encountered among leaf litter and rotting logs. This species is a terrestrial species that lives and breeds in the forest floor. Males guard carry eggs laid by females and carry the hatched tadpoles to pools. *Rhinella marinus*, *Rhaebo guttatus*, *R. nasicus*, *Osteocephalus* spp., and *Ameerega* spp. were also observed among leaf litter.

In the wet season survey exercise in January and February 2012, 295 individuals of 27 species of amphibians were documented, an increase in individuals and species compared to those encountered in the dry season. All were anurans (frogs and toads). They were observed mainly near large creeks and rivers and in swampy areas in Mixed Forest and Mora-dominated Forest (*Mora excelsa*), with the majority of species encountered belonging to the families Hylidae and Leptodactylidae. The dominant anurans observed were *Hypsiboas boans* and *Ameerega picta*. *Physalaemus* spp., *Rhinella marinus*, *R. nasicus*, *Allobates femoralis*, *Ameerega picta*, *Ameerega trivittatus* and *Ameerega hahneli* were observed among leaf litter.

No endangered, rare or threatened species of amphibians were documented, although the brilliant-thigh poison frog (*Allobates femoralis*) is collected for the pet trade. It is a CITES Appendix II listed species regulating trade.

Reptiles

Two-hundred and twenty-eight (228) of 27 species of reptiles representing six families were recorded in total over the two survey exercises in 2011 and 2012. Although not observed, interviews with field guides confirmed the presence of green anaconda (*Eunectes murinus*) in the Rewa and Essequibo Rivers and

⁵⁴ Randomly sampling of microhabitats or habitat patches where concentrations of reptile and amphibian densities are the highest e.g. along creeks, logs, etc

⁵⁵ Transects surveys or patch sampling were scheduled for different times of day as species have different activity patterns or are detectable at different times of day

⁵⁶ Some frogs and crocodylians can be identified by the colour of their eyeshine

creeks. Thus 28 species of reptiles have now been documented as occurring in the SSILI Forest Concession.

In the dry season survey in October and November 2011, 96 of 16 species of reptiles were recorded. In the wet season survey exercise in January and February 2012, 192 individuals of 21 species of reptiles were recorded.

The most commonly encountered reptilian species was the black caiman (*Melanosuchus niger*). Black caimans were frequently observed along most stretches of the Rewa and Essequibo Rivers surveyed. Several individuals, probably old males, were estimated to measure over 4.5m in length. Black caiman measuring around 4m were commonly encountered but most observed were between 2-3m in total length. An exception was a 60cm juvenile black caiman that was observed at Smythe Creek near Essequibo site B. Interviews with field guides and published information reveals that black caiman have undergone substantial recovery throughout parts of its range (Ross, 2000). Very large specimens are now not uncommon in some parts of the Rewa and Essequibo River Basins (Campbell James, pers. comm.). Fewer black caimans were observed in the Upper Essequibo above the King William Falls near Essequibo sites C and D.

As for other crocodylians, a number spectacled caiman (*Caiman crocodilus*) were observed. Typically juveniles measuring less than 1m in length were encountered. In the Rewa River system, Pickles *et al.* (2009) reported that Schneider's dwarf caiman was common above the Corona Falls where black caiman and spectacled caiman were absent; as a result of the falls acting as a dispersal barrier. They suggested that the high numbers of dwarf caiman present above the falls may be due to their preference for cool, fast flowing forest streams rather than ecological release from competition with other crocodylians. Despite suitable habitat and guides predicting that the dwarf caiman would be especially common in the Upper Essequibo above the Wanatoba Falls on rocky reaches, no dwarf caiman were recorded. Wanatoba Falls consisted of approximately 3km of incremental rapids, before meeting Essequibo sites C and D. The extended rapids may prevent small-bodied species such as the dwarf caiman from being observed above these areas. A few dwarf caiman, however, were observed in the lower reaches of the Essequibo and Rewa River systems.

Table 3-1: ERT species recorded (based on IUCN and CITES listings)

Common Name	Scientific Name	Status ⁵⁷
Brilliant-thigh Poison Frog	<i>Allobates femoralis</i>	CITES Appendix II
Spot-legged Poison Frog	<i>Ameerega pictus</i>	CITES Appendix II/II
Three-striped Poison Frog	<i>Ameerega trivittatus</i>	CITES Appendix II/III
Emerald Tree Boa	<i>Corallus caninus</i>	CITES Appendix II
Grooved Sideneck	<i>Platemys platycephala</i>	CITES Appendix I
Giant South American Turtle	<i>Podocnemis expansa</i>	IUCN Lower Risk/conservation dependent, CITES II
Yellow-spotted River Turtle	<i>Podocnemis unifilis</i>	IUCN Vulnerable, CITES II
Red/Yellow-footed Tortoise	<i>Chelonoidis denticulata</i>	IUCN Vulnerable, CITES II
Spectacled Caiman	<i>Caiman crocodilus</i>	CITES Appendix II
Black Caiman	<i>Melanosuchus niger</i>	IUCN Lower Risk/conservation dependent, CITES I

⁵⁷ CITES Appendix I - includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances; CITES Appendix II - includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.

Schneider's Dwarf Caiman

*Paleosuchus
trigonatus*

CITES Appendix II/III

The forest lizards *Kentropyx calcarata*, *Ameiva ameiva* and *Uranoscodon superciliosus* were commonly encountered near our campsites and on transects. *Kentropyx* and *ameiva* lizards were observed basking in sunlit patches in the forest floor. During dry season surveys, *Uranoscodon superciliosus* was documented at the edge of rivers and creeks on tree trunks and branches at all study sites, but was only recorded at one site during the wet season surveys. Iguanas were also encountered in the dry season surveys, basking on tree branches overhanging creeks, but were not observed during the wet season surveys. Iguanas are undoubtedly much more common than our observations suggest as they are difficult to observe when lying stationary high in the canopy. Most individuals were only recorded when they were disturbed by our presence and leapt into the water.

Amazon tree boas (*Corallus hortulanus*) and most other snakes were spotted by torchlight during nocturnal surveys along the Rewa and Essequibo Rivers and large creeks. The largest observed was estimated at over 1.5m but most individuals captured were smaller at around 1m total length. Several Emerald tree boas (*Corallus caninus*) were observed; one being a juvenile measuring around 1m. Other snakes documented were *Erythrolamprus aesculapii* and *Drymoluber dichrous*. Both snakes were observed during the day at Essequibo B; whereas a blunt-headed slug eating snake (*Dipsas varieagata*) that was observed at night in a vine tangle at the edge of the main Rewa River channel. As discussed, the green anaconda is known to occur in both Rewa and Essequibo River Basins (see also Pickles *et al.* 2009) but was not observed during our surveys.

A number of tortoise and turtles species were documented. Several giant South American river turtles (*Podocnemis expansa*) were observed on logs and on a sandbank of the Rewa River near to the Rewa B campsite. A single small individual (50cm in length) was captured in a gill net set in a large creek near the same campsite. In the same creek (named 'the fishing pond') two adult yellow-spotted river turtle (*Podocnemis unifelis*) were also captured in a gill net. This species was observed on two subsequent occasions in creeks flowing into the Essequibo River. During the wet season surveys, a nest containing 24 individuals of juvenile *Podocnemis unifelis* was encountered at Essequibo A. The shell remains of Grooved Side-neck turtle (*Platemys platycephala*) were observed at Essequibo D. Finally, adult red/yellow-footed tortoises (*Cheloniodis denticulata*) were encountered at most sites surveyed, particularly in Mixed Forest.

Biogeographically, all amphibian and reptile species recorded within this survey are widespread throughout Guyana and the wider Amazonian region. They can be found in tropical moist forest in and other biogeographic provinces throughout the Guianas (Kok and Kalamandeen, 2008; Avila Pires, 1995; Starace, 1998; Lescure and Marty, 2000; Smithsonian Institute, 2000; Donnelly *et al.*, 1998; Senaris *et al.*, 2008). Table 1 lists endangered, rare and threatened species documented during surveys. Notable species recorded were black caiman, yellow-footed tortoise, South American river turtle, and yellow-spotted river turtle. The IUCN Red List of Threatened species lists the yellow-footed tortoise and the yellow-spotted river turtle as Vulnerable (Tortoise & Freshwater Turtle Specialist Group, 1996a,b). The black caiman and the South American river turtle are listed as IUCN Lower Risk/conservation dependent (Tortoise & Freshwater Turtle Specialist Group, 1996c; Ross, 2000). All species are CITES Appendix II listed, regulating their international trade (Table 1). Tortoises and turtles are food sources for the local Macushi and other indigenous communities in the region. The yellow-footed tortoise is still commonly encountered in Guyana (see Kok and Kalamandeen, 2008; Smithsonian Institute, 2000; Donnelly *et al.*, 1998; Senaris *et al.* 2008); whereas elsewhere in the region they have been unsustainably harvested for their meat and are less frequently encountered.

RECOMMENDATIONS

- Species from the families Hylidae and Leptodactylidae would be more adversely affected by logging as a result of their diversity, low dispersal rate, water-dependent larval development and moisture content necessary for their skin.
- Commercial hunting should be prevented within the study area, particularly of ERT species such as the yellow/red footed tortoises and black caiman. The majority of land turtles are harvested opportunistically and as such controlled harvesting should be practised within the area. In this regard, SSILI should implement a no hunting policy by workers within its concessions.
- Monitoring of species used in the wildlife trade is essential, particularly for turtles and caimans.

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Chapter 4

The Avifauna of the Simon & Shock International Logging Inc. Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana

Waldyke Prince

ABSTRACT

This paper presents the results of two surveys of birds conducted in the SSILI forest concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana, from 17th October to 1st November, 2011, and 31st January to 19th February, 2012. Visual Encounter Surveys and Point Counts conducted terrestrially and along the river systems were the main survey methods. The Rapid Biodiversity Assessment within the SSILI Concession show that the known bird fauna diversity numbers at least 224 species including several species with limited geographical ranges and one rare raptor species, the Ornate Hawk-Eagle (*Spizaetus ornatus*). The SSILI concession consists of extensive pristine forests and thus harbors a rich bird diversity and abundance including several species which may be endemic to the Guiana Shield. This combination of high bird diversity, pristine and extensive rain forests and riverine systems, and an absence of large human settlements make the SSILI concession an important biodiversity area that must be managed in a sustainable manner to protect and safeguard Guyana's rich biological diversity.

INTRODUCTION

The SSILI Concession which is upriver from the Conservation International Conservation Concession, due to its size of 391,853ha, diversity of habitats, remoteness, and very low human population density should be similar to the bird species diversity of the avifauna of the CI Conservation Concession area, and the Eastern Kanuku Mountains and Lower Kwitaro River areas⁵⁸. No published information is yet available on the bird fauna of the CI Conservation Concession area⁵⁹. There were several visits by naturalists to the region since the mid-1800s (Parker *et al.*, 1993) and more recent to the Eastern (Finch *et al.* 2001) and Western Kanuku Mountain areas and their environs (Parker *et al.*, 1993). This includes faunal assessments in lowland forest, upland forest, and savannahs. The results of bird surveys of the SSILI Forest Concession presented here reports on the two recent surveys of the bird diversity of this remote area of extensive rain forest.

MATERIALS AND METHODS

Avifauna surveys were conducted in the SSILI forest concession from 17th October to 1st November, 2011, and 31st January to 19th February, 2012. During the expedition, birds were surveyed (primarily by Waldyke Prince, with additional observations from Glenn King, Campbell James and Carlo Haynes) at six (6) sites within the SSILI Concession. Survey sites were: 1) Rewa A, Rewa B in the Rewa River System, and 2) Essequibo A, Essequibo B, Essequibo C and Essequibo D in the Essequibo River System. Lowland forest around the camps, such as Mora Forest, the undulating landscapes of Mixed Forest, and the surrounding riverine areas along the upper Rewa and upper Essequibo Rivers were surveyed. At each study site, two to three days of Avifaunal surveys were undertaken. The main methods were Visual Encounter Surveys (VES) and Auditory Encounter Surveys (AES), namely Point Counts, that were conducted each day along a 4km transect in *terra firme* rain forest. Additionally, boat surveys along all rivers and creeks within 3km upstream and downstream of the campsites were undertaken each day to determine bird species presence, distribution and relative abundance. Vocal identifications of many of the cryptic and canopy bird species were verified by using playback of pre-recorded bird songs.

⁵⁸ An Avifauna survey by Conservation International of the Eastern Kanuku Mountains and the Lower Kwitaro river area in September 2001.

⁵⁹ There has been a brief biodiversity survey of the CI Conservation Concession by CI and a BBC film crew while filming the BBC documentary series 'The land of the Jaguar'

Mist-netting was also conducted at all of the sites. To capture birds mist nets⁶⁰ were positioned to in all microhabitats present at the four study sites: streams, flat well-drained ground, and swampy areas, under closed canopy or in tree-fall gaps. A total of five (5) nets were set along trails in pairs set perpendicular to each other. Mist-nets were opened twice per day; from 5:30 to 11:00 hours and from 15:00 to 18:00 hours. Captured birds were identified to species before being immediately released at the site of capture.

RESULTS AND DISCUSSION

The two surveys recorded a total of 224 bird species via VES, AES and mist-netting (Appendix 4). During the first survey phase in October 2011, a total of 143 bird species were recorded. In the second survey phase in February 2012, a total of 201 species were recorded.

A total of 145 bird species were recorded at sites in the Rewa River system and 178 species were recorded at sites in the Essequibo River system. It should be noted that there were more sites surveyed along the Essequibo than the Rewa River system hence a larger survey effort, probably partly explaining why more bird species were recorded in the Essequibo River system.

Species totals include seven (7) individuals of five (5) species that were caught in the mist-nets at the Rewa sites and includes forty-six (46) individuals of twenty-eight (28) species captured in mist nets at the Essequibo sites. The following species were exclusively recorded via mist netting and not by other sampling methods: Plain Xenops (*Xenops minutes*), Lined Forest-Falcon (*Micrastur gilvicollis*), Grey-breasted Sabrewing (*Campylopterus largipennis*), Pale-tailed Barbthroat (*Threnetes leucurus*), Straight-billed woodcreeper (*Xiphorhynchus picus*), White-plumed Antbird (*Pithys albifrons*), Scaled-backed Antbird (*Hylophylax poecilinotus*), Northern Royal Flycatcher (*Onychorhynchus coronatus*), Cinereous Mourner (*Laniocera hypopyrra*), Collared Gnatwren (*Microbates collaris*), Ochre-bellied Flycatcher (*Mionectes oleagineus*), and the Flame-crested Tanager (*Tachyphonus cristatus*). Opportunistic sightings were mainly along the rivers as we travelled by boat from one campsite to another - observations of the Ornate Hawk-Eagle (*Spizaetus ornatus*) and the Osprey (*Pandion haliaetus*) only occurred on the main channel of the Essequibo River. We surveyed two sites in the higher elevation vegetation (hill forest) in Part B of the SSILI concession located just downstream from King William Falls: Essequibo sites C and D. Thus we were able to sample species that are located within the higher-elevations present within the SSILI concession.

The most diverse bird families were Antbirds (Thamnophilidae, 29 species) followed by tyrant flycatchers (Tyrannidae, 25 species), parrots (Psittacidae, 11 species), woodcreepers (Dendrocolaptidae 11 species), woodpeckers (Picidae 10 species), hummingbirds (Trochilidae 10 species), falcons (Falconidae 7 species), pigeons (Columbidae 7 species), and herons (Ardeidae 7 species).

A total of thirty-four (34) species were recorded in the SSILI concession that were not recorded in bird surveys of the Western and Eastern Kanuku Mountains and their environs (Parker *et al.*, 1993; Finch *et al.* 2001). These species were the Fasciated Tiger-Heron (*Tigrisoma fasciatum*), Slaty-backed Forest-Falcon (*Micrastur mirandollei*), Pale-vented Pigeon (*Columba cayennensis*), Ruddy Quail-Dove (*Geotrygon montana*), White-tipped Dove (*Leptoptila verreauxi*), Masked Trogon (*Trogon personatus*), a Leaf-tosser (*Sclerurus* spp.), Olivaceous Woodcreeper (*Sittasomus griseicapillus*), White-throated Woodcreeper (*Xiphocolaptes albicollis*), Red-billed Woodcreeper (*Hylexetastes perrotii*), White-chinned Woodcreeper (*Xiphorhynchus guttatus*), Chestnut Woodpecker (*Celeus elegans*), Little Woodpecker (*Veniliornis passerines*), Barred Antshrike (*Thamnophilus doliatus*), Plain-winged Antwren (*Myrmotherula behni*), Ash-winged Antwren (*Terenura spodioptila*), Black-throated Antbird (*Myrmeciza atrothorax*), Silvered Antbird (*Sclateria naevia*), Piratic Flycatcher (*Legatus leucophaeus*), Golden-crowned Spadebill (*Platyrinchus coronatus*), White-crested Spadebill (*Platyrinchus platyrhynchos*), Cinereous Mourner (*Laniocera hypopyrra*), Capuchin Bird (*Perissocephalus tricolor*), Tiny Tyrant-Manakin (*Tyrannetes*

⁶⁰ Mist nets were 38mm mesh size and were made by Avinet, Dryden, NY, USA. Two 2.6m x 6m nets and three 12m x 2.6m nets (net area = 124.8m²) were typically set each night for around 12 hours.

virescens), Thrush-like Schiffornis (*Shiffornis turdina*), Ashy-headed Greenlet (*Hylophilus pectoralis*), Collared Gnatwren (*Microbatas collaris*), Black-collared Swallow (*Atticora melanoleuca*), Musician Wren (*Cyphorhinus arada*), White-breasted Woodwren (*Henicorhina leucosticte*), Palm Tanager (*Thraupis palmarum*), Fulvous-crested Tanager (*Tachyphonus surinamus*), Blue-black Grosbeak (*Cyanocompsa cyanoides*) and Red-rumped Cacique (*Cacicus haemorrhous*). An active Cock-of-the Rock (*Rupicola rupicola*) nesting site was also located near the Essequibo D site and this is also a new species record.

Only one raptor observed within the SSILI Concession can be considered as rare, namely the Ornate Hawk-Eagle (*Spizaetus ornatus*). A few species occurring within the concession have restricted geographical ranges and are restricted to the Guianas and adjacent Venezuela and Brazil, including the Caica Parrot (*Pionopsitta caica*), Guianan Toucanet (*Selenidera culik*), Rufous-bellied Antwren (*Myrmotherula guttata*), Todd's Antwren (*Herpsilochmus stictocephalus*), Golden-headed Manakin (*Pipra erythrocephala*), Capuchin Bird (*Perissocephalus tricolor*) and Guianan Red-Cotinga (*Phoenicircus carnifex*).

Ten species recorded from the SSILI Concession are further known to be exclusively distributed north of the Amazon: Black Curassow (*Crax alector*), Black-headed Parrot (*Pionites melanocephala*), Black Nunbird (*Monasa atra*), Yellow-billed Jacamar (*Galbula albirostris*), Spot-tailed Antwren (*Herpsilochmus sticturus*), Black-headed Antbird (*Pernostola rufifrons*), and Yellow-throated Flycatcher (*Conopias parva*), Guianan Warbling Antbird (*Hypocnemis cantator*), Guianan Cock-of-the-Rock (*Rupicola rupicola*) and Capuchin Bird (*Perissocephalus tricolor*). The concession area seems to be rich in birds with small distribution ranges. These include the species endemic to the Guianan Shield mentioned above plus the Tiny Tyrant-Manakin (*Tyrannetes virescens*), Guianan Cock-of-the-Rock (*Rupicola rupicola*) and Guianan Red-Cotinga (*Phoenicircus carnifex*)⁶¹.

All psitticines and toucans recorded in the SSILI Concession are listed as CITES Appendix II species. The Scarlet Macaw (*Ara macao*), Red-and-Green Macaw (*Ara chloroptera*) and the Blue-and-Yellow Macaw (*Ara ararauna*) were the only large species of macaws observed in the SSILI concession. Large understorey birds such as cracids (Cracidae) and Trumpeters (Psophiidae) are sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up forest for logging. Elsewhere in the Guianas they have been decimated by unrestricted hunting (Ridgley and Agro 1998). The ornate hawk eagle, all psitticines, toucans, cracids and trumpeters occurring in the SSILI concession area can be regarded as ERT (Endangered, Rare or Threatened) species.

CONSTRAINTS AND LIMITATIONS

Unusual heavy rainy afternoons during the surveys of the Rewa sites limited observation time and depressed bird activity and also caused the mist-nets to be closed for few hours.

Few trees appeared to be fruiting which limited visual observation of foraging birds.

CONCLUSIONS AND RECOMMENDATIONS

Despite heavy rainfall and a limited survey effort, many bird species and families were recorded indicating that the SSILI forest concession has a diverse avifauna.

Research on the habitat preferences of uncommon, endemic and threatened bird species, which potentially require the most urgent protection is recommended.

Commercial hunting or collecting of wildlife should be prevented.

⁶¹ The locality of the Cock-of-the -Rock active nesting area is close to Essequibo D Transect: (21N 0367540 UTM 0365435)

The avifauna of this region, in particular in the eastern (Essequibo) part of the SSILI concession, is very close to being in pristine condition. This combination of high bird diversity, pristine and extensive rain forests and riverine systems, and an absence of large human settlements make the SSILI concession an important biodiversity area that must be managed in a sustainable manner to protect and safeguard Guyana's rich biological diversity.

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Chapter 5

Rapid Assessment of Mammals in the Simon & Shock International Logging Inc. Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana.

Frank M. Clarke

ABSTRACT

This paper presents the results of surveys of mammals conducted in the SSILI forest concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana, from 17 October to 01 November, 2011, and from 01 to 19 February, 2012. Using direct observation, tracks and sound identification, and mist netting at six localities, and interviews with field guides, the presence of 57 mammalian species in the concession was documented. Bats, with 23 species recorded, accounting for more than one third of the mammalian species documented. Preliminary findings indicate that the forest concession has a full, biologically rich array of mammalian species, including all eight of Guyana's primate species, apparently healthy populations of large carnivores, such as jaguar, margay and puma; as well as many mammals that are threatened elsewhere in the region including lowland tapir, giant anteater, giant armadillo, giant otter, brown-bearded saki monkey, and spider monkey.

INTRODUCTION

Information on biological diversity at a number of locations is essential knowledge for preparation of an Environmental and Social Impact Assessment of logging concessions, especially for such as large area as SSILI's 391,853ha concession in the Upper Essequibo-Corentyne-North Rupununi District. No published information is available for the mammal fauna of the concession area⁶². However, information is available on the mammal fauna at a number of collecting sites to the west of the concession area. Royal Ontario Museum has been collecting mammals in central and southern Guyana since the middle of the last century. More recently Rapid Assessment Programme surveys by Conservation International of the Western and Eastern Kanuku Mountains⁶³ have helped document the region's biodiversity (Parker *et al.* 1993; Montambault and Missa, 2002). Preliminary analysis has shown that overall, at around 155 mammal species, the Kanuku's region may contain about 70% of all mammals known to exist in Guyana (Emmons, 1993; Lim and Norman, 2002; Sanderson and Ignacio, 2002). It is possible that mammal species diversity and abundance of SSILI's forest concession may be comparable to the Kanuku Mountains partly due to its size, diversity of habitats, remoteness, and low human population density with minimal hunting pressure. Here we report on the findings of surveys of the bats and non-volant (non-flying) mammals of SSILI's concession.

MATERIALS AND METHODS

Fieldwork took place in two separate phases: Phase One from 17 October and 01 November 2011, and Phase Two from 31st January to 19th February, 2012. In Phase One, four study sites were surveyed for mammals: Rewa sites A & B and Essequibo sites A & B - for a total of 12 days of survey effort. In Phase Two these four study sites were surveyed for a second time and two additional study sites were surveyed: Essequibo C & D – a total of 17 days of survey effort. Additional mammal survey effort occurred while moving between campsites with opportunistic observations of mammals along rivers and creeks.

To capture bats mist nets⁶⁴ were positioned to in all microhabitats present at the study sites: streams, flat well-drained ground, and swampy areas, under closed canopy or in tree-fall gaps. Nets were set at the

⁶² NB: CI has a conservation concession located in the upper Essequibo between parts A and B of the forest concession and there has been a brief biological survey of this area by CI and a BBC film crew while filming "Land of the Jaguar".

⁶³ CI's bat and non-volant mammal collecting sites at the Lower Kwaitaro River, Rewa River basin, are in close proximity to the western edge of concession part A and our Rewa A and B study sites.

⁶⁴ Mist nets were 38mm mesh size and were made by Avinet, Drysden, NY, USA. Two 2.6m x 6m nets and three 12m x 2.6m nets

same time relative to sunset each night and were typically left open for around 12 hours until dawn⁶⁵. On any given night, five nets were typically set in the forest under-story to a height of 3m above the ground. Nets were placed where bats might be expected in high concentrations because of roost sites or food resources. Capture effort was calculated as the number of hours of net surface-area deployed. Captured bats were identified to species before being immediately released at the site of capture. Bat taxonomy follows Simmons (2005).

We used direct observation of species, track and signs identification, and sound identification, to determine presence of non-volant (non-flying) mammalian species at the study sites. Direct observations and track and sound identification of non-volant mammals were made during daily surveys along 3-4km transects and other excursions from base camp. Transect surveys commenced at either 07.00 h or 15.00 h and typically lasted 3-4 hours. Boat surveys were carried out at night along the banks of the Rewa and Essequibo Rivers, tributaries and creeks using a high-powered spotlight to detect the eyeshine of mammals. Our colleagues also made opportunistic records and we received additional information through personal communication with our field guides. Live traps were not be set to capture rodents, opossum and other small non-volant mammals as trapping-programs have proved relatively ineffective and very time and labour intensive elsewhere in Guyana i.e. Iwokrama Forest and Kanuku Mountains⁶⁶.

RESULTS AND DISCUSSION

Using direct observation, signs (tracks and sound identification), mist netting, and interviews with field guides, we determined the presence of 57 mammalian species in the forest concession: 34 non-volant mammals and 23 species of bats (Appendix 5). Bats accounted for more than one third of the mammalian species documented.

BATS

A total of 23 species of bats belonging to four families were documented from the six study sites in the concession (Appendix 5). White-fronted fishing bats (*Noctilio albiventris*) were seen foraging above the surface of the Essequibo and Rewa Rivers but none were captured in nets. The other 22 species were represented by 96 captures. The dominant species was the sooty fruit-eating bat (*Artibeus obscurus*), followed by the greater fruit bat (*Artibeus lituratus*), the greater moustached bat (*Pteronotus parnellii*), and the common short-tailed fruit bat (*Carollia perspicillata*). However, around one third of species documented were represented by a single capture. Proboscis bats (*Rhynchonycteris naso*) were commonly seen roosting on tree trunks overhanging the Rewa and Essequibo Rivers and smaller creeks though few were captured in mist nets. Notable captures were the woolly false vampire bat (*Chrotopterus auritus*) and the fringe-lipped bat (*Trachops cirrhosus*) - large carnivorous bats found in dense forest. These species were typically captured in nets set across small creeks or adjacent to rivers. Finally, Schmidt's big-eared bat (*Micronycteris schmidtorum*) and the Bartica bat (*Glyphonycteris daviesi*) may be rare, though their ecologies are poorly known (Clarke & Racey, 2003; Sampaio, 2008).

Trapping effort for bats totalled 69,632 m2h and yielded 96 individuals (Appendix 5). In more practical terms, on average, one bat was caught per night per mist net set. Our catch per unit effort was slightly lower than that reported by CI for there study sites near the Kwitaro River (1.3 bats captured per net set) (Lim and Norman, 2002), and could be partly explained by the unusually wet weather on some nights of mist netting. Bat activity and capture rates may have been depressed as a result of rainfall at some of our sites. On a couple of nights the mist nets had to be closed early due to very heavy rainfall and thunderstorms.

(net area = 124.8m²) were typically set each night for around 12 hours.

⁶⁵ Heavy rain forced the closure of mist nets before dawn on one night at Rewa A & B in October 2011 and on one night of mist netting at Essequibo A & B in February 2012.

⁶⁶ In the nearby eastern Kanuku Mountains the overall success rate for a trapping programme of non-flying small mammals undertaken by Conservation International was only 1.4%. The success rate for Iwokrama was only 0.5%

Neotropical bats have diverse diets, which include fruit, pollen, nectar, arthropods, small vertebrates and vertebrate blood (Patterson, Willig and Stevens 2004). Fruit- and nectar-feeding species play key roles in tropical forests as seed dispersers and pollinators, maintaining plant diversity and promoting forest regeneration in degraded land; other bat species consume large quantities of insects (Kalko 1998; Patterson, Willig and Stevens 2004). Following Simmons and Voss (1998), we assigned bats to one of the following broad guilds based on foraging behaviour and diet: aerial insectivores (all non-Phyllostomidae), frugivores (Carollinae, Stenodermatinae), gleaning animalivores (all Phyllostominae except *Phyllostomus*), nectarivores (Glossophaginae), omnivores (*Phyllostomus*), and carnivores (*Chrotopterus auritus* and *Trachops cirrhosus*). Frugivores were the most commonly captured bats, accounting for 63% of captures in (Appendix 5). The next most frequently captured bats were aerial insectivores⁶⁷ (16% of captures), then the gleaning animalivores⁶⁸ (6%), followed by the omnivores (5%), and carnivorous bats (5%), and the nectarivores (5%). No sanguivores (blood-feeding bats) were captured e.g. the common vampire bat *Desmodus rotundus*. This finding is not unusual given that vampire bats are uncommon to rare in pristine forest away from livestock rearing areas.

Other mist netting studies in Neotropical forests have found that fruit-feeding bats are the most abundant bats encountered (Kalko, 1998; Patterson Willig and Stevens, 2004). The sooty fruit-eating bat and greater fruit bats feed principally on *Ficus* (Moraceae) and *Cecropia* (Cecropiaceae) in the canopy; whereas the short-tailed fruit bat feeds selectively on the fruits of *Piper* (Piperaceae) in the understory. The abundance of these species among captures suggests that there were many fruiting *Ficus* and *Piper* in the area. Three species of nectar-feeding bats were also caught - *Choeroniscus godmani*, *Choeroniscus minor*, and *Glossophaga soricina* - indicating that there were flowering trees in the area. The woolly false vampire bat (*Chrotopterus auritus*) and the fringe-lipped bat (*Trachops cirrhosus*) were typically captured in nets set across small creeks or near water and were probably attracted to feed on small vertebrate prey such as frogs and lizards that the survey team found to be relatively abundant at these locations. That we found gleaning animalivores and carnivorous bats to be relatively abundant suggests that the forest is pristine and supports a high diversity of invertebrates and small vertebrates.

Unsurprisingly the species composition and trophic structure of the bat assemblage of the SSIL forest concession appears broadly similar to that of the bat assemblage of forest along the nearby Kwitaro River (Lim and Norman, 2002). However, whereas CI's bat surveys found the large fruit-eating bat (*Artibeus planirostris*⁶⁹) to be the most abundant species, we found another large fruit-eating bat species, the sooty fruit-eating bat, to be the most abundant bat.

Non-volant mammals

Using direct observation and photography, and track, signs and sound identification, we determined the presence of 32 non-volant mammalian species in the six study areas (Appendix 5). The presence of an additional two species in the concession area - the tamandua (*Tamandua tetradactyla*) and ocelot (*Leopardus pardalis*) - was confirmed by field guides.

The common gray four-eyed opossum (*Philander opossum*) and the common opossum (*Didelphis marsupialis*) were observed and a murine mouse opossum (*Marmosa murina*) was photographed.

Primates were the most commonly observed and heard mammalian species. Our findings indicate that all eight of Guyana's primates occur within the concession area: the common squirrel monkey (*Saimiri sciureus*), brown capuchin monkey (*Cebus apella*), wedge-capped capuchin (*C. olivaceus*), brown bearded saki (*Chiropotes satanus*), Guianan or white-faced saki monkey (*Pithicia pithicia*) red howler monkey (*Alouatta seniculus*), black spider monkey (*Ateles paniscus*), and the golden-handed tamarind (*Saguinus midas*). Red howler monkeys and black spider monkeys were frequently observed and heard at all sites. Capuchin social groups were often accompanied by social groups of squirrel monkeys, both species presumably benefiting from increased predator detection. The Guianan saki monkey and golden-

⁶⁷ bats that capture insects whilst in flight

⁶⁸ bats which glean small insects and vertebrates from surfaces

⁶⁹ Simmons (2005) treats *A. planirostris* under *A. jamaicensis* pending further study.

handed tamarind monkey appear to be rarer within the concession, though both species are generally more difficult to detect than the other primate species.

Tracks and the diggings of giant anteater (*Myrmecophaga tridactyla*), nine-banded long-nosed armadillo (*Dasytus novemcinctus*), and giant armadillo (*Priodontes maximus*) were recorded, all were photographed. Although no individuals or tracks were observed the presence of tamandua (*Tamandua tetradactyla*) within the concession was confirmed by field guides (Campbell James pers. comm.).

A South American coati (*Nasua nasua*) was observed near Essequibo site A and six sinkajou (*Potos flavus*) were observed at Essequibo site D. Both the Essequibo and Rewa Rivers appear to have healthy populations of otters. A southern river otter (*Lutra longicaudis*) was observed on the Essequibo River close to campsite B. At least three large social groups of giant otter (*Pteronura brasiliensis*) were recorded: two social groups in the Rewa River and one in the Essequibo River. In October 2011, six giant otter were observed and photographed on a single occasion on the Rewa River around 10km downstream from the Rewa A campsite. Four giant otter were also observed foraging in a large creek (the 'fishing pond') less than 1km from Rewa A campsite. During Phase Two of the surveys, in February 2012, ten giant otters were observed near Rewa A. These were probably the same social group observed in 2011. In October 2011, field guides observed two giant otters heading towards a den on a bank of the Rewa River around 10km downstream of Rewa B campsite. During Phase Two of the surveys, in February 2012, five individuals were observed near the same locality. These may have been the same social group observed near Rewa B in 2011. In October 2011, on the Essequibo River near Essequibo and near the mouth of Coco Creek, five giant otter were observed and filmed on two occasions. In February 2012, two individuals were observed near the same locality, possibly part of the same social group filmed in 2011.

We believe that six felids occur in the concession. However, only one margay (*Leopardus wiedii*) and two jaguars (*Panthera onca*) were observed, and a puma (*Puma concolor*) was heard calling. The margay was observed at night at the edge of the Rewa River in October 2011. In October 2011, a very large adult jaguar, probably a male, was observed by the field guides swimming across from a small island in the middle of the Essequibo to the opposite shore. Although this jaguar observation was outside of the concession area it was close to Part B of the concession. In February 2012, a jaguar was observed near Essequibo site B. Finally, on the 1st November 2011, when checking mist nets for bats a puma was heard calling near Essequibo campsite B. According to field guides and inhabitants of the local communities, pumas were the most commonly observed carnivores in the region. This perceived abundance may be due in part to their large size, cattle killing habits, or because they encounter people more frequently than jaguars. Although not observed, ocelot (*Leopardus pardalis*) are reported to occur in the concession (Campbell James pers. comm.). The Jaguarundi (*Felis yagourundi*) and oncilla (*Leopardus tigrina*) may also occur in the concession but, as with most small cats, they are hard to detect.

The tracks of brocket deer (*Mazama americana*), white-lipped peccary (*Tayassu pecari*), collared peccary (*Tayassu tajacu*) and tapir (*Tapirus terrestris*) were frequently observed. Tracks of solitary adult tapir were most commonly observed in the soft sand along small creeks but the tracks of tapir and signs and other mammals are especially hard to detect in the dry season.

A Guianan squirrel (*Sciurus aestuans*) was observed on a single occasion at Essequibo B and field guides observed a capybara (*Hydrochaeris hydrochaeris*) on a Rewa River bank a few kilometres upstream from site B. Paca (*Agouti paca*), acouchi (*Myoprocta exilis*), and red-rumped agouti (*Dasyprocta leporina*⁷⁰) were observed. Paca and red-rumped agouti appear common with individuals and their tracks frequently observed at all sites. Our data suggest that pacas, agoutis and the two species of peccaries were the most abundant herbivores. In October 2011, during the dry season surveys, boat surveys at night using spotlighting detected many paca along the banks of the Rewa and Essequibo Rivers, tributaries and creeks. In the dry season these and other mammals may be more concentrated around rivers and other permanent water bodies as they need to drink frequently. Finally, a spiny rat (*Proechimys*

⁷⁰ May be synonymous with *Dasyprocta cristata*

spp) was observed at two of the Essequibo sites and a spiny mouse (*Neacomys spp.*) was photographed at night in a vine tangle at the edge of the Essequibo River.

COMPARISON WITH OTHER LOCALITIES

Bats and non-volant mammal species were still being discovered on the last day of surveys, thus comparisons of species diversity indices among sites are premature. Although more trapping effort is required before comparisons can be made, it is likely that the bat species diversity of the SSILI forest concession may be considerable and approach the diversity of other species-rich sites in the Guianas such as Iwokrama Forest (86 species) (Lim and Engstrom, 2004) and the Kanuku Mountains (89 species) (Lim and Norman, 2002). Although the forest concession lacks the more mountainous terrain of the Kanuku's as well as savannah habitat; the forest concession has a diversity of habitats ranging from terra firma forest on flat to hilly terrain, to rivers, seasonal creeks, and swamp forests, and the concession is huge, with parts bordering Suriname, and may easily include bat species not previously recorded from Guyana or species new to science. Whatever the levels of bat species diversity in the concession; bats are an important component of mammalian diversity. In the lowland forests of the Guianan Shield, bats may comprise more than half the mammal fauna (Simmons and Voss 1998; Lim and Engstrom 2001). This high species diversity and abundance coupled with the roles of bats as dispersers and pollinators, suggests they have a significant effect on forest dynamics and, if forests are to be managed in a sustainable way, then healthy bat populations need to be conserved in logged-over forest.

Our preliminary findings also indicate that the forest concession has a full biologically rich assortment of non-volant mammalian species, including all eight of Guyana's primate species, and healthy populations of giant otter, large herbivores and felids, such as jaguar and puma, similar to that found in the Eastern Kanuku Mountains (Sanderson and Ignacio, 2002). Interviews with field guides indicate that encounters between large cats and humans are not uncommon in the upper reaches of the Rewa and Essequibo Rivers and their tributaries. Abundant carnivores is generally a sign of high mammal densities overall. Low human population density⁷¹, cultural practices (Macushi locals hunt with bow and arrow), and the remoteness of the area, results in low hunting pressure and apparently healthy populations of many large mammals that are threatened elsewhere in the region e.g. tapir, giant anteater, giant armadillo, giant otter, spider monkeys.

CONSERVATION ELEMENTS - ERT SPECIES

ERT species are endangered species (e.g. IUCN Red Listed as Critically Endangered, Endangered or Vulnerable), rare species (endemics, locally rare), and species which may not be globally threatened and listed under the above IUCN categories but are threatened in the region or likely to become threatened within the concession by management activities e.g. logging/road construction. No ERT bats were documented, though Schmidt's big-eared bat (*Micronycteris schmidtorum*⁷²) and the Bartica bat (*Glyphonycteris daviesi*) are apparently rare. However, the sensitivity of gleaning animalivores to forest disturbances and logging is well documented (Fenton *et al.* 1992; Brosset *et al.* 1996; Wilson, Ascorra and Solari 1996; Clarke *et al.* 2005 a,b). *Micronycteris spp.* and *Tonatia spp.* and other genera may be adversely affected by logging.

As discussed the concession is home to many large non-volant mammals that can be regarded as ERT species. The IUCN Red List categorises the brown-bearded saki monkey as Critically Endangered (Veiga *et al.* 2008), the giant otter as Endangered (Duplaix *et al.* 2008), the lowland tapir, black spider-monkey, giant anteater, and giant armadillo as Vulnerable (Vaveda *et al.* 2008; Mittermeir *et al.* 2008; Miranda and Medri, 2010; Superina *et al.* 2010). The margay and jaguar are listed as Near Threatened (Caso *et al.* 2008; Payan *et al.* 2008). The ocelot is a CITES Appendix I listed species and all primate species are

⁷¹ There is abundant historical evidence of exploitation of the forest in the past by indigenous groups in the near past. Balata (*Manilkara*) trees show signs of 'bleeding' for their latex, where they were harvested for their latex up until the 1960s and 1970s and ancient lithographs along the rivers betray a history of long use of rivers.

⁷² *M. schmidtorum* may have a limited distribution in Guyana.

CITES Appendix II. The golden-handed tamarin has a limited distribution in the Guianan Shield. The brown-bearded saki monkey, black spider monkey, lowland tapir, giant anteater, giant armadillo, giant otter and black spider monkey are threatened by habitat loss compounded by hunting. Jaguar and margay are affected by habitat loss and fragmentation and by persecution as they come into conflicts with humans and their livestock. Primate populations are vulnerable to collection for the pet trade.

CONSTRAINTS AND LIMITATIONS

Very heavy rainfall and thvbunderstorms affected bat capture success: on a few nights trapping effort was reduced as mist nets often had to be closed before dawn due to prolonged, heavy rainfall throughout the night.

CONCLUSIONS AND RECOMMENDATIONS

- Despite the limited survey effort, many bat species were captured indicating that the forest concession harbours a species rich bat fauna.
- The bat community structure recorded suggests that the SSILI forest concession ecosystem is quite variable and healthy. Indicators included a high relative of carnivorous bat species and gleaning animalivore bats, indicating that good populations of small vertebrates must exist and the forest must be pristine with a diversity of micro-habitats.
- The high levels of bat abundance and diversity in tropical forests, coupled with the roles of bats as dispersers and pollinators, suggests they have a significant effect on forest dynamics and, if forests are to be managed in a sustainable way, it is important that the responses of bats to forest disturbance are understood and healthy populations of bats are retained in logged forests.
- Snags (dead and dying trees) and over-mature trees often contain cavities that form important roost sites for bats and critical habitat for bats and other wildlife should be retained during logging operations. Fruiting trees such as *Ficus* that are important for frugivorous mammals and other trees valuable for wildlife should be retained. Commercial hunting or collecting of wildlife should be prevented.
- The concession is home to a diverse array of non-volant mammals including all eight of Guyana's primate species and potentially six felids species that include many globally and regionally threatened species of non-volant mammals including the brown-bearded saki monkey, black spider monkey, lowland tapir, giant anteater, giant armadillo, giant otter, jaguar and margay. Measures need to be enacted to ensure that logging operations do not directly or indirectly adversely affect populations of these species and other important components of mammalian diversity.

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Chapter 6

The Lepidoptera and other Invertebrates of the Simon & Shock International Logging Inc. Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana.

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ABSTRACT

This paper presents the results of a survey of the Lepidoptera (butterflies) of the SSILI Forest Concession in the Upper Essequibo-Corentyne-North Rupununi District, Guyana. From 17 October to 01 November, 2011 and from 31st January to 19th February, 2012, butterflies were observed and trapped at a number of study sites along the Rewa and Essequibo Rivers. VES along 1km transects with baited fruit traps were the principal methods used to inventory the butterfly assemblages of Mixed Forest and Mora Forest and other habitats at all six sites. A total of 1,062 observations of butterflies were made, with 14 sub-families and 88 distinct types of butterflies documented. The most dominant families included the Lycaenidae and the Nymphalidae: the Morphinae and Satyrinae were the most common sub-families. Butterflies belonging to the Pieridae (sub-family: Coliadinae), the Hesperidae and the Nymphalidae (sub-family: Danainae) were least common. Butterfly activity and detection was influenced by weather as well as inter-site differences in resource distribution. The most frequently observed butterflies included members of the Pieridae (sub-family Coliadinae), the Helicolinae, Satyrinae, the Charaxinae, and the Little Brown.

INTRODUCTION

As insects, butterflies are important in tropical systems to illuminate patterns and processes of biological diversification (Wilson, 1992). Specifically, DeVries and Walla (2001) reiterated why butterflies are a focal group for characterizing tropical insect diversity, community structure, disturbance effects and as tools in conservation biology (e.g., DeVries, 1987, 1997; DeVries, Murray and Lande, 1997; DeVries, Walla and Greeney, 1999; DeVries, Lande and Murray, 1999). Generally, tropical butterflies can be grouped into two adult feeding guilds: nectar feeders (Papilionidae, Pieridae, Lycaenidae, Riodinidae and some Nymphalidae) and those that feed upon rotting fruits, fermenting saps and animal waste (several sub-families of Nymphalidae). The Satyrinae, Morphinae, Charaxinae are exclusively fermenting sap and rotting fruits feeders (Devries, 1988).

Guyana's butterfly diversity is not as well understood as in other tropical forests in South America. A complete list for of all butterfly families or species within Guyana does not exist. Gillman and Teeuw (1996) provided an estimate of 1,100 species in Guyana (Wright, 1998). Nymphalidae, the largest family, has approximately 292 species (Gillman, 1998). Maharaj (2007) provides a summarized matrix of butterfly surveys which dates back to 1929. Specifically for butterflies within the Essequibo/ Rupununi Region, a small specimen collection is housed at the Centre for the Study of Biological Diversity (CSBD) dates from 1974 onwards. Species lists and accounts exist from previous studies in Guyana that include Gillman (unpublished data, 2002), Fratello (unpublished data, 2001), Wright (1998), Asprey *et al.*, (1992), and Hall (1940); and from a long-term seasonal study of butterflies conducted at Iwokrama Forest between August 2007- July 2008 (Sambhu, 2009 and Maharaj, 2007).

MATERIALS AND METHODS

The Lepidoptera survey is part of a biodiversity assessment with two sampling phases. This paper reports on the findings from two survey exercises that took place from 17 October to 01 November, 2011 and from 31st January to 19th February, 2012, in the SSILI Forest Concession. The butterfly fauna of the

⁷³Specimens were reviewed by H. Sambhu (Manager, KaweAmazonica Butterfly Farm, Iwokrama International Centre). In addition, along with Tsitsi McPherson (PhD), Sambhu along with P. Maharaj (Biologist Lecturer, University of Guyana/ Centre for the Study of Biological Diversity) were technical contributors and reviewers.

concession was documented by surveying six study sites - two sites along the Rewa River (Rewa A & B) and four sites along the Essequibo River (Essequibo A, B, C & D) (Table 1; see Maps). Sites were selected to adequately sample a variety of forest types within the concession boundaries. Collecting occurred in Mixed Forest, Mora Forest, Liana Forest, and near creeks, rivers and on sand banks (see Table 6-1).

Table 6-1: Butterfly collecting localities and environmental variables affecting activity and detection rates

Collecting locality	Forest and habitat description	Lighting and other environmental parameters affecting butterfly activity and detection	
		Nov 2011	February 2012
Rewa A	Mixed Forest and Mora Forest	Low to moderate light levels and forest was wet from previous night's rain	Cloudy on both days
Rewa B	Mixed Forest & Mora Forest by river and Liana Forest near pond/creek	Low to moderate light levels. Typically overcast each day with intermittent showers. Forest was wet from previous night's rain.	Cloudy
Essequibo A	Mora Forest approximately 200 m from river. Many fruiting and flowering understory plants observed.	Sunny. Dry.	Cloudy in the AM and sunny in the PM
Essequibo B	Mixed Mora and Palm Forest approximately 200 m from creek. Many fruiting and flowering understory plants observed.	High to moderate light levels and dry. Some occasional cloud cover.	Cloudy with light drizzle
Essequibo C	Mixed Mora, Wallaba and palm forest with undulating terrain		Cloudy on 13th and rained on 14th
Essequibo D	Mixed Mora and palm forest with undulating terrain		Slight rain on the 11th

The butterfly survey team consisted of one field biologist who adapted the methods used by Wood and Gillman (1998) and Sambhu (2009). Typically three days of sampling per site was undertaken.

Visual Encounter Surveys (VES) along 1km transects using baited fruit trap stations were undertaken at each site. VES were conducted between 8:30 and 11:30h and 13:00 to 15:30h. During transect walks of the VES, the baited traps were checked. The field assistant used the Pollard Method and collected a sample specimen for identification at the camp using the butterfly guide produced by Iwokrama International Centre for Conservation, Guyana (and for subsequent confirmation by a butterfly specialist – H. Sambhu). The date, site ID, species name, numbers observed and habitat description were noted. Photographs of all specimens (ventral and dorsal views) were taken and organized in separate folders.

A number of fruit traps (10-20 set 30m to 50 m apart along a transect line and opened for 48 hours) were baited with a brew of beer, crushed rotten plantain, sugar, and yeast, which was prepared a couple days in advance. Traps were re-baited after first light within the forest. Initially, different baits were used (only plantain, rotting fish guts and the brew) to see if there was an effect on attracting butterflies. A 'point-sample' was conducted for approximately 10 minutes at each baited station with any butterfly observed within a 10m radius netted morning and afternoons when traps were checked.

Despite challenges with tropical forest invertebrate taxonomy, the survey team also endeavoured to compile a list of the various species encountered⁷⁴. Sampling invertebrates presents several technical challenges (including the lack of available entomologists and user-friendly guides for several major invertebrate groups, the high sampling effort required for aquatic and terrestrial ecosystems, and time available for identification because many species require microscopic identification). Given these challenges, the results discussed are mainly restricted to butterflies. Further, several species of butterflies specifically within the Little Browns and Blues were excluded from the main discussion at the species level, but included within the families because of the challenges outlined under the constraints and limitations section.

RESULTS

A total of 1062 observations⁷⁵ (Phase One = 578 and Phase Two = 484) of butterflies representing 14 sub-families⁷⁶ (88 different types of butterflies) were documented (Tables 2 & 3; Appendix 6). The Nymphalidae and the Lycaenidae were the dominant butterfly families. The Nymphalidae sub-families Charaxinae (7 species), Helicolinae (9 species) and Riodinidae (6 species) were not as common as the Morphinae (19) and Satyrinae (18). The Papilionidae, Pieridae (sub-family: Coliadinae), Hesperidae⁷⁷ (sub-family unknown) and the Nymphalidae (sub-family: Danainae; Biblidinae; Ithomiinae; and Limenitidinae) were the least common butterflies encountered. Five additional families were recorded in Phase Two (See Table 3).

Table 6-2: Disaggregated Taxonomy Data for the Lepidoptera Observations

Summary of Information	Rewa Sites				Essequibo Sites					
	A		B		A		B		C	D
	Nov 2011	Feb 2012	Nov 2011	Feb 2012	Nov 2011	Feb 2012	Nov 2011	Feb 2012	Feb 2012	Feb 2012
Total Observations	64	114	234	147	191	69	88	46	51	57
Total Number of Identified Sub-Families	7	5	6	8	10	8	10	7	10	6
Total Number of Species	15	18	15	35	36	15	27	12	22	24
Number of Unique	1	0	2	6	14	2	12	1	4	7

⁷⁴Coleoptera, in particular Dung Beetles (Scarabaeidae: Scarabaeinae) is a relatively easy to sample group provided that a well-developed key and guide is available. Dung Beetles are known to be an indicator group for forest disturbance (Rapid Assessment Programme 2008) and a recent study (Bicknell pers comm. 2011, Phelps et. al. In press) in the Iwokrama forest will demonstrate that selective logging has similar low impacts as a similar study on large vertebrate groups in the Iwokrama Forest reinforcing the benefits of RIL for maintenance of forest biodiversity (Bicknell and Peres, 2010).

⁷⁵This does not include species that escaped.

⁷⁶It was noted that high-flying Papilionids were seen (infrequently) but were difficult to catch.

⁷⁷The Hesperidae were also difficult to identify in the field.

	Rewa Sites				Essequibo Sites					
	A		B		A		B		C	D
Summary of Information	Nov 2011	Feb 2012	Nov 2011	Feb 2012	Nov 2011	Feb 2012	Nov 2011	Feb 2012	Feb 2012	Feb 2012
Records										
Number of Singletons	5	2	7	7	16	5	9	5	10	14
% Unidentified	73%(11)	0	60% (9)	3% (1)	58% (21)	6% (1)	44%(12)	0	8% (2)	4% (1)
% Unidentified Lycaenidae species	45.5%(5)	0	33.3%(3)	0	28.6%(6)	0	25.0%(3)	0	0	0

Table 6-3: Number of Lepidoptera species at the Family and Subfamily level observed

	Family/ Sub-Family	RwA		RwB		EsA		EsB		EsC		EsD	
		Nov-10	Feb-12	Nov-10	Feb-12	Nov-10	Feb-12	Nov-10	Feb-12	Nov-10	Feb-12	Nov-10	Feb-12
1	Nymphalidae: Charaxinae	-	1	-	3	2	1	4	1		2		-
2	Nymphalidae: Danainae	-	-	-	-	1	-	1	-		-		1
3	Nymphalidae: Helicolinae	1	1	3	5	2	1	1	1		4		2
4	Nymphalidae: Ithomiinae*	-	1	-	1	-	-	-	1		0		-
5	Nymphalidae: Limenitidinae*	-	-	-	-	-	-	-	-		1		-
6	Nymphalidae: Morphinae	1	8	1	12	4	2	3	3		4		7
7	Nymphalidae: Nymphalinae	-	1	1	1	2	1	1	-		1		-
8	Nymphalidae: Satyrinae	2	6	-	6	6	6	4	4		5		8
9	Nymphalidae: Biblidinae*	-	-	-	2	-	-	-	-		1		-
10	Lycaenidae: Theclinae*	-	-	-	2	-	2	-	1		1		3
11	Papilionidae: Papilioninae*	-	-	-	-	-	-	-	-		1		3
12	Pieridae: Coliadinae	2	-	3	2	3	1	2	1		2		-
13	Riodinidae: Riodininae	-	-	-	1	1	1	-	-		-		-
	Other												
14	Unidentified Hesperidae	1	-	-	-	1		1	-		-		-
	Unidentified Lycaeinae: Little Brown, Little Yellow	5	-	3	-	6		3	-		-		-
	Unidentified Nymphalidae: Satyrinae	2	-	3	-	4		5	-		-		-
	Unidentified Riodinidae	1	-	1	-	4		2	-		-		-
	Total number of species/types	15	18	15	35	36	15	27	12		22		24

Sites are RwA = Rewa A; RwB = Rewa B; EsA = Essequibo A; EsB = Essequibo B; EsC = Essequibo C; EsD = Essequibo D.

* New family recorded during Phase Two.

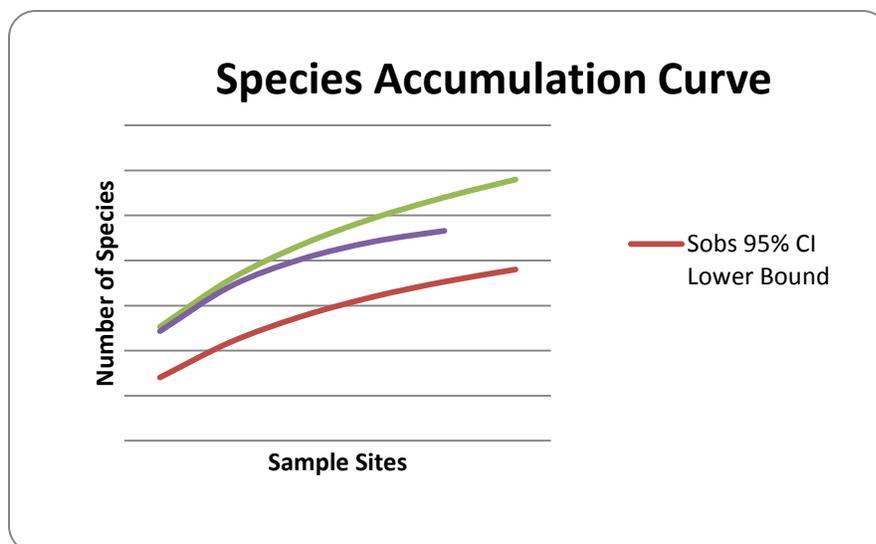


Figure 6-1: Species Accumulation Curve: new Lepidopteran species recorded as a function of survey effort (number of sites sampled). Sites are RWA = Rewa A; RWB = Rewa B; EsA = Essequibo A; EsB = Essequibo B; EsC = Essequibo C; EsD = Essequibo D. The site names given are for ease of identification and the habitats represent a habitat continuum indicative of the larger forested area. EstimateS was used to calculate the species accumulation curve based on the sampling effort (data collected at four sites which included RWA, RWB, EsA and EsB which had repeated surveys for both seasons) without no replacements. Sobs indicate the number of expected species based on the pooled data.

It should be noted that most of the species observed in Phase Two were identified; whereas a greater percentage of species were unidentified to species in Phase One (average 13 per site; 21 in total) – butterflies which mostly belonged to the family Lycaenidae (average 33.1% per site). The challenges of working with the Lycaenidae are discussed later and the taxonomic challenges are considered in the analysis and interpretation of the data. Nevertheless, the patterns of dominance (family diversity and species richness) observed is not greatly affected if these species are excluded from the analysis.

For Phase Two (February 2012) it should be noted that the baited traps were more effective at recording butterflies compared to VES at transects; whereas, in contrast, the opposite was true for Phase One (November 2011). Three Hundred observations were made with the baited traps in Phase two when compared with 73 observations in Phase One. Two hundred and fourteen observations were made with the VES method in Phase Two when compared with 503 observations in Phase One. Mostly, numerous *Cissia sp. 1* individuals were observed feeding at the traps.

Figure 6-1 shows that the number of new butterfly species documented increased steadily throughout the survey exercise as study sites were sampled in November 2010 and February 2012. The species accumulation curve is still increasing indicating that considerable more survey effort is required to produce relatively complete and accurate species lists of butterflies. Thus comparisons of species diversity indices among sites are premature. Despite the sampling limitations of this rapid biodiversity survey, 88 distinct types/species were documented. Based on previous butterfly species lists in similar forests in the Rupununi region, potentially there may be hundreds⁷⁸ of species in this huge forest concession that contains a diversity of habitat types and plant species.

⁷⁸Sambhu and Maharaj 2011 (pers. comm.) explained that a definitive species list does not exist for the region (and for Guyana) because of lack of inventory research, research focus on a particular family, description and identification of new records due to lack of resources (technical, time, and financial), and high diversity.

Among the study sites, unsurprisingly the sites near the Rewa River in closest proximity - Rewa A and Rewa B with no major physical barriers- were most similar in terms of butterfly species composition. Sites along the Essequibo River differed most from the sites along the Rewa River. Many more butterflies were observed and species and families recorded at Essequibo sites A and Rewa B compared other sites. Rewa sites A and Essequibo C and D shared a similar low species richness which reflected the lower sampling effort at those sites – Essequibo C & D were not sampled in Phase One.

Invertebrates opportunistically sampled

Because most groups of invertebrates require considerable technical expertise to identify species we focused on sampling the Lepidoptera since a fairly standard and efficient methodology exists (but see Constraints and Limitations). In addition, most of the published discussion of the region's invertebrates is restricted to analysis at the level of order and family as opposed to at a species level⁷⁹ because species diversity is so high in tropical forests and taxonomic problems remain unresolved. Nevertheless, all survey team members endeavoured to record other invertebrates opportunistically encountered on transects and around the campsites (Appendix 6).

Basset *et. al.* 2005 provides a summary of “Folivorous Insects in the Rainforests of the Guianas”. The British Guiana Tropical Research Station at Kartabo (Beebe, 1925) led to well sampled insect populations (e.g. Beebe and Fleming, 1945; Fisher, 1944; Fleming, 1945, 1949, 1950). More recently, the Tropenbos Programme in the 1990s along with the CI Rapid Assessment Programme has contributed immensely to the understanding of Guyana's insects e.g. at Konashen (Alonso *et al.* 2008). Many invertebrate species are characterised by very strong plant-host relationships that include the trees: *Catostemmafragrans* Benth. (Bombacaceae), *Chlorocardiumrodiei* (Scomb.) (Lauraceae), *Eperuarubiginosa* Miq., *Mora gonggrijpii* (Kleinh.) Sandw. (both Caesalpiniaceae) and *Pentaclethra maculoba* (Willd.) O. Kuntze (Mimosaceae) (Basset 1999, 2000; Basset and Charles, 2000).

It should be noted that no endemic species were recorded for both phases of the survey. The endemic invertebrate species of Guyana⁸⁰ include: a grasshopper *Acanthemustenuis*⁸¹, a katydid *Cnemidophyllumgranti*⁸², an ant *Rogeriatsumani*⁸³, and a leafhopper *Tomopennistumidus*⁸⁴. Other endemic invertebrates include a jumping spider *Scopociracarinata*⁸⁵, a huntsman spider *Sparianthinarufescens*⁸⁶, a goblin spider *Scaphiellakartabo*⁸⁷, and a freshwater crab *Microthelphusameansi*⁸⁸. IUCN recorded two endemic species of freshwater crabs from Guyana⁸⁹ and one threatened species⁹⁰ (grouped as ‘Other Invertebrate’). No crabs were observed in this survey exercise. None of Guyana's butterfly species are listed in the IUCN Red List of Threatened Species as endangered, rare or threatened.⁹¹

The same invertebrates recorded in Phase One were also seen in Phase Two, including the Africanised honey bee (*Apis mellifera*), leaf cutter ants (*Atta* spp.), tailless whip scorpion (*Heterophrynus* spp.), New

⁷⁹ Many records are also new or un-described species

⁸⁰ <http://Intreasures.com/guyana.html>

⁸¹ <http://orthoptera.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=2742>

⁸² <http://orthoptera.speciesfile.org/Common/basic/ShowImage.aspx?TaxonNameID=5093&ImageID=4346>

⁸³ Lapolla, J. & J. Sosa-Calvo. (2006). Review of the ant genus *Rogeria* (Hymenoptera: Formicidae) in Guyana. *Zootaxa* 1330: 59–68.

⁸⁴ J. Maldonado Capriles. 1984. Studies of Idiocerinae Leafhoppers, Xvi: *Tomopennis*, A New Genus from Guyana and a key to the Neotropical Genera of the Subfamily Carib. *J. Sci.* 20(3-4). 1984

⁸⁵ <http://salticidae.org/salticid/diagnost/scopocir/carinata.htm>

⁸⁶ Jäger, P., P. C. Anne Rheims, and F. Martín Labarque. 2009. On the huntsman spider genera *Sparianthina* Banks, 1929 and *Anaptomecus* Simon, 1903 from South and Central America (Araneae, Sparassidae). *ZooKeys* 16: 115-147

⁸⁷ Platnick, N and N. Dupérré. 2010. The Goblin Spider Genus *Scaphiella* (Araneae, Oonopidae). *Bulletin of the American Museum of Natural History* Number 332 :1-156.

⁸⁸ Cumberlidge, N. 2007. A new species of freshwater crab of the genus *Microthelphusa* (Brachyura: Pseudothelphusidae) from a remote isolated cloud forest on a tabletop mountain in western Guyana, South America. *Zootaxa* 1447: 57–62

⁸⁹ http://www.iucnredlist.org/documents/summarystatistics/2011_2_RL_Stats_Table6a.pdf

⁹⁰ http://www.iucnredlist.org/documents/summarystatistics/2011_2_RL_Stats_Table5.pdf

⁹¹ <http://www.iucnredlist.org/>

World army ants (family: Ecitoninae), and the goliath bird-eating spider (*Theraphosablondi*). Approximately 21 invertebrates orders were documented in Phase Two (See Table 4 in Appendix 6).

DISCUSSION

The discussion is specifically focused on butterfly observations and provides a general overview of family dominance and diversity, and the observed species diversity among the study sites in the SSILI concession along the Rewa and Essequibo River systems.

Eighty eight distinct butterfly types/species were documented during Phase One and Phase Two. New butterfly species were still being discovered on the last day of collecting and the species accumulation curve is still rising steeply suggesting that considerable more survey effort is required to produce a more thorough understanding of butterfly diversity in the SSILI forest concession. Potentially the forest concession is home to hundreds of butterfly species.

Essequibo A & Rewa B sites had the highest number of species (Tables 2 and 3). Based on the number of observations per site, butterfly activity seemed to be higher at the Essequibo sites (Tables 2, Appendix 6). Essequibo sites were noted to have more flowering shrubs, partly accounting for the higher abundance of butterfly species. Sunlight may have also influenced butterfly activity. In Phase One, observations at the Rewa Sites were influenced by periods of high rainfall and relatively few hours of sunlight which probably depressed butterfly activity and detection rates at Rewa sites. The weather was drier in Phase two when sampling the Rewa sites and butterfly species richness was higher at these sites; whereas the Essequibo Sites A & B appeared to be wetter when surveyed in Phase Two and fewer species were recorded. Sunlight, more than other environmental factors appears to affect pattern of butterfly species stratification within forests (Basset *et al.*, 2011; Devries and Walla, 2001; Hill *et al.*, 2003; Devries, 1988). Devries (1988) found patterns of stratification within Nymphalidae butterflies in Costa Rican Rainforest. Charaxinae and Nymphalinae were stratified in the canopy and the Morphinae⁹² and Satyrinae in the understory. The Morphinae recorded are known to be territorial species and would tend to defend feeding grounds from other individuals and other species. Furthermore, it is unclear where butterflies may spend their time when not feeding. Due to under-sampling of the canopy in this study it is unclear if the butterfly species documented and their respective relative abundances are characteristic of butterfly community of the forest concession or reflect sampling biases. More research is needed that should involve canopy sampling and different bait and trap types.

On a species level, the common types of butterflies observed in this study included transient species in the Pieridae (sub-family Coliadinae), the Little Browns, and the Nymphalidae sub-families Helicolinae, Satyrinae and Charaxinae (Table 3). These species are all very visible and tend to forage over a wide area. This study's finding that *Aphrissa statira statira* was the most common species is influenced by the large flock encountered and sampled at one site. In Phase One, a nearby open sandy area at Rewa site B was also observed to attract a large transient flock of this species; the flock was notably smaller the next day. No flocks were observed in Phase Two. The next most commonly encountered species at all the sites was the Little Brown (*Cissia sp. 1*), possibly a Satyrinae. The Satyrinae includes both understorey forest specialists that avoid light (Brown and Freitas, 2000; Ghazoul, 2002) and species that become highly abundant following disturbance (e.g. Raguso and Llorente-Bousquets, 1990; Daily and Ehrlich, 1995; Shahabuddin and Terborgh, 1999; Fermon *et al.*, 2005). This is also influenced by the resource availability⁹³ related to the increase in the monocotyledonous annual plants on which their larva depends (Barlow *et al.*, 2007).

The Nymphalidae and the Lycaenidae were the dominant butterfly families in the SSILI forest concession. This pattern is typical of butterfly communities (Maharaj, 2007; Devries, 1988). Other studies in Guyana

⁹²Most of the Morphos seen were most likely the males which tend to prefer sunlit patches.

⁹³"Any potential relationship may be masked by changes in trap efficiency and butterfly behaviour, as butterflies tend to forage farther in areas with less fruit (Fermon *et al.* 2005) and baited traps may become less attractive to butterflies during periods of high alternative fruit availability." cited from Barlow *et al.* (2007).

have found the Nymphalidae to be the most abundant family found in all forest habitats surveyed (Maharaj, 2007; Sambhu, 2009). Together with Riodinidae butterflies they were significantly⁹⁴ habitat specific with a greater abundance in forests (Sambhu, 2009). In addition, some species of the Lycaenidae and the Nymphalidae families were observed at all our study sites in very specific feeding micro-habitats. These families along with the Hesperidae are known to use monocots and dicots extensively as larval host plants (Shields, 1989). The Lycaenidae species observed in this study (specifically *Species 3*) are gap specialists and were found among bamboo grasses and areas with fallen trees. Other species like the Heliconia butterflies are known to be only associated with specific plants. These species will be important to consider for follow up studies and future monitoring programmes in the forest concession.

CONSTRAINTS AND LIMITATIONS

- Misidentification: The diversity of Little Browns and Blues (and other smaller butterflies) is high yet many appear morphologically similar to the naked eye and microscopic examination of their scales is often required to identify species. Since these species are delicate and often lose their scales during the netting and specimen storage process, misidentification is often a challenge for researchers.
- Observer error and sampling effort: The level of observer bias and error is inversely related to the level of experience and also by the sample effort in terms of observation effort⁹⁵. It is possible that some individual were recounted on follow up visits to the traps and transects.
- Types of baits: The types of baits used will influence the types butterflies observed. Future studies should experiment more with bait types.
- Weather and forest light: As alluded to, rainfall and forest light levels⁹⁶ will influence butterfly activity and therefore influence detection. Rain on previous days, the night before, during the day and time of the survey, coupled with the amount of sunlight and forest light will influence butterfly activity

RECOMMENDATIONS

- Research needs to identify the butterfly species that are unable to persist outside of primary forest and thus are likely to be adversely affected by forest disturbances such as logging operations (e.g. Cleary and Mooers, 2006). Patterns of butterfly community turnover may better indicate subtle habitat changes than either patterns of species richness or abundance or the abundance of individual species (cf. Su *et al.*, 2004). It should be noted that none of the butterflies caught in this study are classed as Threatened in the IUCN Red List.
- SSILI should fully implement a reduced-impact harvesting regime to reduce impacts on overall forest ecosystem.

⁹⁴Analysis of variance (ANOVA) for six butterfly families among three habitat types (forest, savannah, and intermediate) was conducted. Response variable was the abundance per month for each habitat (Sambhu, 2009).

⁹⁵The 2008 Iwokrama Study conducted surveys with a 5-person team for 12 months using 30 fruit-baited traps set at 100m intervals and transect walks (1200m- 2600m) at eight study sites covering three habitat types (forest, savannah and intermediate).

⁹⁶Different forest types have characteristic levels of forest light.

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Appendix 1
Plant Species Recorded (E. Smith, G. Roberts and A. Bayney)

Common Name	Scientific Name	Families	Rewa A						Rewa B					
			3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrub s	Vine s	3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrub s	Vines
Aruadan	<i>Spondias mombin</i>	Anacardiaceae		2	9	2								
Duka	<i>Tapirira marchandir</i>	Anacardiaceae												
Ubudi	<i>Anacardium giganteum</i>	Anacardiaceae												
Arara	<i>Guettarda acreana</i>	Annonaceae	4	8	5				1	1	2			
Arara fine leaf	<i>Guatteria schomburgkiana</i>	Annonaceae							2					
Arara Broad leaf	<i>Guatteria spp</i>	Annonaceae												
Yari-Yari	<i>Duguetia spp</i>	Annonaceae	47	52							6	11		
Asashi	<i>Rollinia exsucca</i>	Annonaceae	8		15	3			9		7	14		
Yarula	<i>Aspidosperma excelsum</i>	Apocynaceae	1	6		30			4	11		2		
Shibidan	<i>Aspidosperma album</i>	Apocynaceae				3			1	2				
Sincona	<i>Geissospermum spp</i>	Apocynaceae	1	2		1				2				
Dukalli	<i>Parahancornia amapa</i>	Apocynaceae												
Burada	<i>Schefflera paraensis</i>	Araliaceae												
Match wood	<i>Tapiriria guianensis</i>	Anacardiaceae	4	4		5								
Manicole	<i>Euterpe edulis</i>	Arecaceae	3	1								1		
Lu plam	<i>Oenocarpus bacaba</i>	Arecaceae	1		7									
Futui	<i>Jacaranda copaia</i>	Bignoniaceae		1	3	4				1				

Common Name	Scientific Name	Families	Rewa A						Rewa B					
			3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines	3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines
Bignon		Bignoniaceae						44						
Cedar white	<i>Tabebuia insignis var.</i>	Bignoniaceae												
Baromalli common	<i>Catostemma commune</i>	Bombacaceae	14	22	29	26			19	31	3	14		
Baromalli sand	<i>Catostemma fragrans</i>	Bombacaceae												
Kamakuti	<i>Bombax surinamense</i>	Bombacaceae		1	2					2				
Gama cherry	<i>Cordia tetrandra</i>	Boraginaceae	5	3							1	1		
Haiawa	<i>Protium sagotianum</i>	Burseraceae	1						3					
Haiawaballi	<i>Tetragastris panmensis</i>	Burseraceae												
Kurokai	<i>Protium tenuifolium</i>	Burseraceae	2	1	2	1			1	3		2		
Ulu	<i>Traeeinikia rhoifolia</i>	Burseraceae				3			2	2		2		
Apoukito	<i>Chamaecrista apoucouita</i>	Caesalpiniaceae												
Sarebebeballi	<i>Vouacapoua macropetala</i>	Caesalpiniaceae		4		11			1	1				
Itikiboroballi	<i>Swartzia spp</i>	Caesalpiniaceae		1	3				3			2		
Kaditiri	<i>Sclerolobium guianense</i>	Caesalpiniaceae	2	5	5	1			7	9	3	4		
Locust	<i>Hymenaea courbaril</i>	Caesalpiniaceae												
Mora	<i>Mora excelsa</i>	Caesalpiniaceae	20	26		110			19	42	1	10		
Morabukea	<i>Mora gonggrippi</i>	Caesalpiniaceae		1		8			1			19		
Parakusan	<i>Swartzia ljenmani</i>	Caesalpiniaceae												
Purpleheart	<i>Peltogyne venosa</i>	Caesalpiniaceae				2			1	3				

Common Name	Scientific Name	Families	Rewa A						Rewa B					
			3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines	3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines
Walaba Soft	<i>Eperua falcata</i>	Caesalpiniaceae												
Wamara	<i>Swartzia leicocalycina</i>	Caesalpiniaceae	35	76		61			19	26	4			
Monkey ladder	<i>Bauhinia spp</i>	Caesalpiniaceae						16						7
Sawari Nut	<i>Caryocar nuciferum</i>	Caryocaraceae				1				3				
Buruma	<i>Pourouma ssp</i>	Cecropiaceae	1	5	1	3			2			1		
Congo Pump	<i>Cecropia spp</i>	Cecropiaceae		5		3			1					
Kabukalli	<i>Goupia glabra</i>	Celastraceae	1	3	2	4			2	12		1		
Buruburuli	<i>Licania heteromorpha</i>	Chrysobalanaceae												
Burada	<i>Parinari excelsa</i>	Chrysobalanaceae				2			2	6				
Kairiballi	<i>Licania heteromorpha</i>	Chrysobalanaceae	6		3	1			2		4			
Kauta	<i>Licania laxiflora</i>	Chrysobalanaceae	7	15	8	19			1	14	3	6		
Kautaballi	<i>Licania alba</i>	Chrysobalanaceae		1	1				8					
Konoko	<i>Licania cuprea</i>	Chrysobalanaceae		1	1	6				3	1			
Marishaballi	<i>Licania densiflora</i>	Chrysobalanaceae	1	5		14			30	17	2	9		
Unikiakia	<i>Licania vernicosa</i>	Chrysobalanaceae				3								
Bloodwood	<i>Vismia spp</i>	Chrysobalanaceae			1									
Awatokule	<i>Trattinickia ssp</i>	Clusiaceae	1	1		1						2		
Waiaballi	<i>Terminalia amazonia</i>	Combretaceae	16	23					1		6	11		
Fukadi	<i>Buchenavia spp</i>	Combretaceae										1		

Common Name	Scientific Name	Families	Rewa A						Rewa B					
			3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines	3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines
Wild cherry	<i>Connarus patrisii</i>	Combretaceae												
Nibbi	<i>Asplundia gleasonii Harling</i>	Cyclanthaceae						24						12
Fine rope	<i>Tetracera spp</i>	Dilleniaceae						4						2
Barabara	<i>Diospyros spp</i>	Ebenaceae	1		1									
Ruri	<i>Chaetocarpus schomburgkianis</i>	Euphorbiaceae	1	4		8			2	5				
Suradan	<i>Hieronyma laxiflora</i>	Euphorbiaceae												
Curry wood	<i>Pogonophona schomburgkiana</i>	Euphorbiaceae												
Darina	<i>Hymenolobium flavum</i>	Fabaceae												
Manni	<i>Symphonia globulifera</i>	Guttiferae												
Kufa	<i>Clusia grandiflora</i>	Guttiferae						2						
Pukari	<i>Platonia insignis</i>	Guttiferae												
Dukuria	<i>Sacoglottis guinensis</i>	Humiriaceae				1								
Huruasa	<i>Sacoglottis obovata</i>	Humiriaceae												
Tauroniro	<i>Humiria balsamifera</i>	Humiriceae												
Silverballi - Keteri	<i>Ocotea rubra</i>	Lauraceae	9	12	1	7			2	1	2	2		
Silverballi sawari skin	<i>Ocotea canalicuiata</i>	Lauraceae							1					
Silverballi - Brown	<i>Licaria canella</i>	Lauraceae												
Silverballi - Yellow	<i>Aniba hypoglauca</i>	Lauraceae												
Kakaralli -	<i>Eschweilera</i>	Lecythidaceae	8	11	5	9			14	16	1	13		

Common Name	Scientific Name	Families	Rewa A						Rewa B					
			3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines	3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines
Black	<i>subglandulosa</i>													
Kakaralli - Gauavaskin	<i>Eschweilera alata</i>	Lecythidaceae	4	1	5	3								
Kakaralli line leaf	<i>Eschweilera grata</i>	Lecythidaceae			1	1								
Kakaralli - Wina	<i>Eschweilera corrugate</i>	Lecythidaceae		5	6	4			1	1		2		
Kakaralli - Wirimiri	<i>Lecythis confertiflora</i>	Lecythidaceae	1	14	7	6			7	2	1	2		
Monkey pot	<i>Lecythis davisii</i>	Lecythidaceae												
Wadara	<i>Couratari spp</i>	Lecythidaceae	1	2		8				10		2		
Kirikaua	<i>Ischnosiphon arouma</i>	Marantaceae												
Hicha	<i>Byrsonima spicate</i>	Malpighiaceae												
Crabwood	<i>Carapa guianensis</i>	Melastomataceae	1						6	5	3	3		
Gauavaballi	<i>Guarea guidonia</i>	Melastomataceae			1	1			7	1	9	19		
Cedar red	<i>Cedrela odorata</i>	Meliaceae												
Hachiballi	<i>Pithecellobium adiantifolium</i>	Mimosaceae		2	7	4			1	5				
Huruasa	<i>Abarema jupunba</i>	Mimosaceae				1								
Kirikaua	<i>Lryanthera lancifolia</i>	Mimosaceae												
Maporokon	<i>Inga spp</i>	Mimosaceae				3			1	5				
Manariballi	<i>Pithecellobium ssp</i>	Mimosaceae	1	3		8			2	6				
Manariballi red	<i>Pithecellobium gongrijpii</i>	Mimosaceae												
Warakosa	<i>Inga laterifolia</i>	Mimosaceae		1		2			7			3		

Common Name	Scientific Name	Families	Rewa A					Rewa B						
			3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines	3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines
Dukaliballi	<i>Parkia nitida</i>	Mimosaceae	1		1	7								
Letter wood	<i>Brosimum guianensis</i>	Moraceae				1								
Tibokushi	<i>Piratinera guianensis</i>	Moraceae												
Dalli	<i>Virola surinamensis</i>	Myristicaceae				1								
Dalli hill	<i>Virola spp</i>	Myristicaceae		5	1	3			1			1		
Glass wood	<i>Calycolpus goetheanus</i>	Myrtaceae			1	2			1					
Barakaro	<i>Ormosia coarctata</i>	Papilionaceae							1	2				
Tonka bean	<i>Dipteryx spp</i>	Papilionaceae				1								
Aromata	<i>Clathrotropis spp</i>	Papilionaceae	1	1	3									
Hairariballi	<i>Alexa spp</i>	Papilionaceae												
Tatabu	<i>Diploptropis purpurea</i>	Papilionaceae												
Cork wood	<i>Peterocarpus officinalis</i>	Papilionaceae												
Korokororo	<i>Ormosia coutinhoi</i>	Papilionaceae												
Pipper	<i>Pipper aduncum</i>	Piperaceae					4						2	
Okokonshi	<i>Quiina indigofera</i> Sandw.	Quiinaceae										1		
Kauta/ Karishiri	<i>Palicourea guianensis</i>	Rubiaceae	1	1					23		14	34		
Rubi	<i>Palicouria spp</i>	Rubiaceae												23
Kudanab	<i>Fagara spp</i>	Rutaceae				1								
Warakaoro	<i>Leotia procera</i>	Samydaceae												
Asepoko	<i>Pouteria cladantha</i>	Sapotaceae			4	1						1		

Common Name	Scientific Name	Families	Rewa A						Rewa B					
			3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines	3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines
Asepokoballi	<i>Pouteria jenmani</i>	Sapotaceae				3								
Bullet wood	<i>Manilkara bidentata</i>	Sapotaceae		2		1				4				
Durban pine	<i>Pouteria speciosa</i>	Sapotaceae				1								
Kokoritiballi	<i>Pouteria egregia</i>	Sapotaceae		3	8	14				7				
Aiomorakushi	<i>Pouteria felipes</i>	Sapotaceae	4	2	1	1								
Kudibiushi/ Letterwood	<i>Micropholis venulosa</i>	Sapotaceae			1	1				2		1		
Limonaballi	<i>Chrysophyllum pomiferum</i>	Sapotaceae		3		4				1	5			
Paripiballi	<i>Achroteria pomifera</i>	Sapotaceae												
Suya	<i>Pouteria spp</i>	Sapotaceae				1								
Dog seed	<i>Talisia squarrosa</i>	Sapindaceae					7						4	
Karishari	<i>Allophylus racemosus</i>	Sapindaceae												
Kulishiri	<i>Matayba oligandra</i>	Sapindaceae												
Hikuribianda	<i>Quassia multiflora</i>	Simaroubaceae			2					1				
Simarupa	<i>Simaruba amara</i>	Simaroubaceae												
Kuyama	<i>Xylocarpus rugosa</i>	Sterculiaceae			1	3				6	2		4	
Maho	<i>Sterculia rugosa</i>	Sterculiaceae		6		9				4	8	1	5	
Duru	<i>Apeiba spp</i>	Tiliaceae			1	5								
Muneridan	<i>Sloanea/Couepia ssp</i>	Tiliaceae												
Adebero	<i>Paypayrola longifolia</i>	Viscaceae	28	21	4									
Iteballi	<i>Vochysia</i>	Vochysiaceae												

Common Name	Scientific Name	Families	Rewa A						Rewa B					
			3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines	3-5 cm	6-10 cm	11-20 cm	>20 cm	Shrubs	Vines
	<i>surinamensis</i>													
Hakiaiballi	<i>Vitex compressa</i>	Ulmaceae - Verbenaceae												
Mahicaballi			3	17		2			6	1		1		
Rupunni wood										2		2		
Turtle cherry	<i>Byrsonima spicate</i>	Malpighiaceae		2								2		

Appendix 2 Fishes of the Rewa River System and Essequibo River System (*Bibi Aneeza Khan*)

Values indicate the total number of individuals collected; obs = observed but not captured.

Five locations were sampled in the Rewa River system:

- (RA1) main channel of Rewa River near campsite Rewa A (21N 0320363 UTM 0394819)
- (RA2) water creek feeding into Rewa River (21N 0321236 UTM 0396326)
- (RB1) large creek (the 'fishing pond') that empties into Rewa River (21N 0324331 UTM 0381217)
- (RB2) small creek that forms a swamp before emptying into RB1 (21N 0324324 UTM 0381588)
- (RB3) main channel of Rewa River near campsite Rewa B (21N 0323368 UTM 0381710)

...and seven locations in the Essequibo River system (see Figure 1):

- (EA1) creek feeding into Essequibo River (21N 0352700 UTM 0402672)
- (EA2) Coco Creek (21N 0357130 UTM 0400733)
- (EA3) Essequibo River from Coco creek to campsite (21N 0352713 UTM 0402844)
- (EB1) Smythe Creek, (21N 0355410 UTM 0395289)
- (EB2) Essequibo River main channel (21N 0355575 UTM 0396729)
- (EC1) main channel of Essequibo River near campsite C (21N 0367704 UTM 0367850)
- (EC2) creek feeding into Essequibo River near campsite D (21N 0368289 UTM 0366423)

Phase One Fish Captures & Observations - October 2011

Taxon	Common name	Rewa River System		Essequibo River System	
		RA1, RA2	RB1, RB2, RB3	EA1, EA2, EA3	EB1, EB2
Ageneiosidae					
<i>Ageneiosus inermis</i>	Dawala	1	-	-	-
Anostomidae					
<i>Leporinus maculatus</i>		-	-	1	-
<i>Leporinus</i> spp.		1	-	-	-
Aspredinidae					
<i>Bunocephalus</i> spp.	Banjo Catfish	-	-	1	-
Callichthyidae					
<i>Corydoras melanistius</i>		-	18	>20	-
<i>Megalechis picta</i>	Spotted Hassar	-	2	2	-
Characidae					
<i>Acestrorhynchus falcatus</i>	Small Dogfish	7	-	-	-
<i>Acestrorhynchus falcirostris</i>	Large Dogfish	3	-	-	-
<i>Agoniatas halecinus</i>	Sardine Fish	1	-	-	3
<i>Aphyocharax erythrurus</i>		-	13	-	-
<i>Brycon falcatus</i>		7	-	-	4
<i>Brycon pesu</i>		-	-	2	-
<i>Carnegiella strigata</i>	Marble Hatchet	2	-	10	-
<i>Chalceus macrolepidotus</i>	Pink Ail	4	-	-	-
<i>Characidium</i> spp.		-	1	-	-
<i>Cynopotamus essequibensis</i>		-	-	4	-
<i>Hyphessobrycon</i> cf.		22	-	-	-

Taxon	Common name	Rewa River System		Essequibo River System	
		RA1, RA2	RB1, RB2, RB3	EA1, EA2, EA3	EB1, EB2
<i>copelandi</i>					
<i>Moenkhausia colettii</i>		-	10	-	-
<i>Moenkhausia cf.cotinho</i>		-	>20	-	-
<i>Moenkhausia grandisquamis</i>		>30	2	>30	-
<i>Moenkhausia lepidura</i>		>30	-	>100	>30
<i>Myloplus</i> spp.		1	6	-	-
<i>Myleus setiger</i>	Paku	-	-	-	3
<i>Poptella</i> spp.		-	-	>30	-
<i>Pristobrycon striolatus</i>		2	-	-	-
<i>Pygocentrus nattereri</i>	Red-belly Piranha	12	-	3	-
<i>Pygopristis denticulata</i>		13	-	1	-
<i>Serrasalmus serrulatus</i>		13	-	1	-
<i>Serrasalmus rhombeus</i>	Black Piranha	17	1	7	39
<i>Tetragonopterus chalceus</i>		-	-	7	-
<i>Triportheus brachypomus</i>		1	-	-	-
Cichlidae					
<i>Aequidens tetramerus</i>		1	-	-	-
<i>Apistogramma</i> spp.		-	-	3	-
<i>Cichlasoma</i> spp.		-	1	-	-
<i>Cichla ocellaris</i>	Pond Lukanani	1	2	28	8
<i>Crenicichla cf. notophthalmus</i>		-	-	1	1
<i>Satanoperca leucosticta</i>		1	-	-	-
Ctenolucidae					
<i>Boulengerella cuvieri</i>	Swordfish	-	-	4	3
Curimatidae					
<i>Curimata</i> spp.		1	-	-	-
Cynodontidae					
<i>Hydrolycus tatauaia</i>	Biara	4	-	-	7
Doradidae					
<i>Amplydoras hancocki</i>		1	-	7	-
Erythrinidae					
<i>Hoplerythrinus unitaeniatus</i>	Yarrow	-	2	-	-
<i>Hoplias malabaricus</i>	Huri	-	1	-	-
Gymnotidae					
<i>Brachyhypopomus</i> spp.	Knife Fish	-	2	-	-
Hemiodontidae					
<i>Bivibranchia</i> spp.		-	-	1	-
Lebiasinidae					
<i>Pyrrhulina</i> spp.		-	23	12	-
Loricaridae					
<i>Hypostomus</i> spp.		1	-	-	-
<i>Rineloricaria fallax</i>		3	-	-	-
Pimelodidae					
<i>Batrochoglanis</i> spp.		-	-	1	-

Taxon	Common name	Rewa River System		Essequibo River System	
		RA1, RA2	RB1, RB2, RB3	EA1, EA2, EA3	EB1, EB2
<i>Goeldiella eques</i>		-	-	2	3
<i>Hemisorubim platyrhynchos</i>	Butterfish	-	4	1	2
<i>Leiarius marmoratus</i>	True Tiger Fish	1	-	-	-
<i>Leiarius pictus</i>		-	1	-	-
<i>Practocephalus hemiliopterus</i>	Skeete/Banana Fish	1	6	-	4
<i>Pimelodella cristata</i>		1	-	1	-
<i>Pimelodus blochi</i>		-	2	-	2
<i>Pseudoplatystoma fasciatum</i>	Cullet	-	3	-	1
Sciaenidae					
<i>Plagioscion squamosissimus</i>	Basha	-	-	1	1
Trichomycteridae					
<i>Paracanthopoma</i> spp.	Candiru	-	1	-	-

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Taxon	Common name	Rewa River System		Essequibo River System		
		RA1, RA2	RB1, RB3	EA2, EA3	EB1, EB2	EC1, EC2
Achiridae						
<i>Apionichthys finis</i>	Flounder	7	-	-	-	-
Ageneiosidae						
<i>Ageneiosus inermis</i>	Dawala	-	2	1	-	2
Anostomidae						
<i>Anostomus anostomus</i>	Pencil Fish	obs	-	obs	-	-
<i>Leporinus fasciatus</i>						3
<i>Leporinus maculatus</i>		-	-	obs	obs	obs
<i>Leporinus nigrotaeniatus</i>		-	-	-	-	21
<i>Leporinus</i> spp.		-	-	-	-	1
Aspredinidae						
<i>Bunocephalus</i> spp.	Banjo Catfish	2	-	-	-	-
Callichthyidae						
<i>Corydoras melanistius</i>		27	9	11	>20	-
Characidae						
<i>Acestrorhynchus falcatus</i>	Small Dogfish	3	-	-	2	-
<i>Acestrorhynchus falcirostris</i>	Large Dogfish	-	-	1	-	-
<i>Aphyocharax erythrurus</i>		13	12	3	obs	obs
<i>Brycon falcatus</i>		obs	2	obs	obs	3
<i>Brycon pesu</i>		obs	5	obs	obs	6
<i>Chalceus macrolepidotus</i>	Pink Ail	obs	obs	obs	obs	obs

Taxon	Common name	Rewa River System		Essequibo River System		
		RA1, RA2	RB1, RB3	EA2, EA3	EB1, EB2	EC1, EC2
<i>Characidium fasciatum</i>		23	6	2	3	-
<i>Characidium</i> spp.		16	2	-	-	-
<i>Hyphessobrycon</i> cf. <i>copelandi</i>		11	-	>15	-	-
<i>Moenkhausia colettii</i>		6	17	>15	7	>15
<i>Moenkhausia</i> cf. <i>cotinho</i>		-	-	>15	-	-
<i>Moenkhausia grandisquamis</i>		13	-	>15	10	>15
<i>Moenkhausia lepidura</i>		39	-	>15	-	>15
<i>Myloplus</i> spp.		2	-	-	-	13
<i>Pygocentrus nattereri</i>	Red-belly Piranha	>20	3	7	1	
<i>Pygopristis denticulata</i>		>20	5	12	3	2
<i>Serrasalmus serrulatus</i>		>20	1	3	7	5
<i>Serrasalmus rhombeus</i>	Black Piranha	>20	6	>70	>20	16
<i>Tetragonopterus chalceus</i>		9	-	-	-	-
Cichlidae						
<i>Acarichthys (Guianacara) geayi</i>		-	-	8	-	obs
<i>Aequidens tetramerus</i>		3	-	-	-	-
<i>Apistogramma</i> spp.		11	-	4	-	3
<i>Biotodoma cupido</i>		-	-	-	4	-
<i>Cichlasoma</i> spp.						
<i>Cichla ocellaris</i>	Pond Lukanani	5	12	>100	>30	
<i>Cichla temenis</i>						1
<i>Crenicichla wallacii</i>		-	-	-	-	2
<i>Mesonata festivus</i>		-	-	-	-	obs
Ctenolucidae						
<i>Boulengerella cuvieri</i>	Swordfish	2	-	6	3	2
Cynodontidae						
<i>Hydrolycus tatauaia</i>	Biara	-	-	5	2	-
Doradidae						
<i>Amplodoras hancocki</i>		>30	>20	-	6	-
Erythrinidae						
<i>Hoplerythrinus unitaeniatus</i>	Yarrow	-	-	-	1	-
<i>Hoplias malabaricus</i>	Huri	5	-	11	-	-
Gymnotidae						
<i>Rhabdolichops</i> spp.	Knifefish	1	-	-	-	-
<i>Gymnorhamphichthys ronndoni</i>	Sand knifefish	8	7	2	-	-
Hemiodontidae						
<i>Bivibranchia</i> spp.		-	2	-	3	-
Lebiasinidae						
<i>Pyrrhulina</i> spp.		28	17	-	-	-
Loricaridae						
<i>Ancistrus</i> spp.		1	-	-	-	-

Taxon	Common name	Rewa River System		Essequibo River System		
		RA1, RA2	RB1, RB3	EA2, EA3	EB1, EB2	EC1, EC2
<i>Hypostomus plecostomus</i>		-	-	1	-	-
<i>Hemiodontichthys acipencerinus</i>		-	-	-	1	-
<i>Rineloricaria fallax</i>	Whiptail catfish	12	11	12	3	-
<i>Osteoglossidae</i>						
<i>Arapaima gigas</i>	Arapaima	obs	obs	obs	-	-
<i>Osteoglossum bicirrhosum</i>	Arrowana	3	obs	2	1	-
<i>Pimelodidae</i>						
<i>Goeldiella eques</i>		3	-	-	-	-
<i>Hemisorubim platyrhynchos</i>	Butterfish	1	-	-	1	-
<i>Leiarius marmoratus</i>	True Tiger Fish	-	-	-	-	1
<i>Practocephalus hemilio pterus</i>	Skeete/Banana Fish	3	-	2	14	4
<i>Pimelodella cristata</i>		4	5	-	-	-
<i>Pimelodus blochi</i>		2	2	-	-	-
<i>Pseudoplatystoma fasciatum</i>	Cullet	-	-	3	2	
<i>Pinirampus pinirampu</i>	Blinka	1	-	-	1	1
<i>Pimelodus ornatus</i>		-	-	-	1	-
<i>Prochilodontidae</i>						
<i>Prochilodus nigricans</i>	Yakatu	2	-	-	-	-
<i>Sciaenidae</i>						
<i>Plagioscion squamosissimus</i>	Basha	-	-	-	1	4
<i>Tetraodontidae</i>						
<i>Colomesus asellus</i>	Puffer fish	12	-	-	-	-
<i>Trichomycteridae</i>						
<i>Ochmacanthus spp.</i>	Candiru	15	7	10	-	-

List of fish species confirmed by indigenous field guides as occurring in the river systems

Taxon	Common name	Taxon	Common name
Anostomidae		Characidae	
<i>Anostomus gracilis</i>		<i>Charax gibbosus</i>	
<i>Anostomus plicatus</i>		<i>Catoprion mento</i>	
<i>Anostomus ternetzi</i>		<i>Triporthus angulatus</i>	
<i>Leporinus agassizi</i>		<i>Astyanax fasciatus</i>	
<i>Leporinus arcus</i>		<i>Astyanax bimaculatus</i>	
<i>Leporinus friderici</i>		<i>Moenkhausia oligolepis</i>	
<i>Leporinus granti</i>		Cichlidae	
<i>Leporinus octofasciatus</i>		<i>Cichlasoma bimaculatum</i>	
<i>Schizodon fasciatum</i>	Coan	<i>Crenicichla alta</i>	
Auchenipteridae		<i>Geophagus surinamensis</i>	
<i>Trachycorystes trachycorystes</i>	Boots	<i>Krobia guianensis</i>	
<i>Trachycorystes geleatus</i>		<i>Pterophyllum scalare</i>	
<i>Tatia aulopygia</i>		Cynodontidae	

Taxon	Common name	Taxon	Common name
Belonidae		<i>Hydrolycus armatus</i>	
<i>Potamorrhaphis guianensis</i>	Needle-nose Fish	Dasyatidae	The Stingrays
Callichthyidae		<i>Potamotrygon hystrix</i>	
<i>Callichthys callichthys</i>		<i>Potamotrygon cf. motoro</i>	
Cetopsidae		Doradidae	
<i>Halogenes marmoratus</i>		<i>Platydoras costatus</i>	
Lebiasinidae		Gymnotidae	
<i>Nannostous trifasciatus</i>		<i>Electrophorus electricus</i>	Electric Eel
<i>Nannostomus harrisoni</i>		Hemiodontidae	
<i>Nannostomus unifasciatus</i>		<i>Hemiodus gracilis</i>	
Pimelodidae		<i>Hemiodus microlepis</i>	
<i>Pseudoplatystoma tigrinum</i>		<i>Hemiodus unimaculatus</i>	
<i>Sorubim lima</i>			
<i>Paulicea</i> spp.			

Appendix 3

Amphibian and Reptile Species Documented (*M. Kalamandeen, F. Clarke and G. King*)

Amphibians

Scientific Name	Common Name	Rewa Site		Essequibo Site				TOTAL
		A	B	A	B	C	D	
Leptodactylidae								
<i>Eleutherodactylus</i> spp.	Whistling Frog			1, 0				1
<i>Leptodactylus knudseni</i>	Knudsen's thin-toed frog	0, 16	0, 9		0, 5	0, 1	0, 3	34
<i>Leptodactylus lutzi</i>	Lutz's thin-toed frog					0, 4		4
<i>Leptodactylus mystaceus</i>	Amazonian white-lipped frog	0, 3	1, 1	1, 2				8
<i>Leptodactylus petersii</i>	Peter's thin-toed frog		0, 2		0, 1			3
<i>Leptodactylus lineatus</i>	Gold striped frog				0, 2		0, 2	4
<i>Leptodactylus rhodomystax</i>	Rose-lipped thin-toed frog				0, 1			1
<i>Leptodactylus</i> spp. 1			2, 0					2
<i>Leptodactylus</i> spp. 2			1, 0					1
<i>Leptodactylus</i> spp. 3				1, 0				1
<i>Physalaemus</i> sp.					0, 1			1
Bufonidae								
<i>Rhinella marina</i>	Giant Toad	2, 2						4
<i>Rhaebo guttatus</i>	Spotted Toad		1, 0	1, 0				2
<i>Rhaebo nasicus</i>	Werner's Toad	0, 1	0, 1	1, 6			0, 9	18
Dendrobatidae								
<i>Colethetus</i> sp./ <i>baeobatrachus</i>		0, 2			0, 1	0, 6	0, 5	14
<i>Ameerga</i> spp.		1, 0						1
<i>Ameerega pictus</i>	Spot legged poison frog	0, 13	0, 13		0, 14		0, 4	44
<i>Ameerega trivittatus</i>	Three-stripped poison frog	0, 3						3
<i>Ameerega hahneli</i>		0, 5	0, 17	0, 6	0, 3		0, 1	32
<i>Allobates femoralis</i>			2, 2	3, 2	1, 4	5	9	28
Hylidae								
<i>Hypsiboas boans</i>	Giant Gladiator treefrog	1, 8	2, 7	1, 11	3, 17		0, 12	62
<i>Hypsiboas calcarata</i>	Troschel's treefrog		1, 1		3, 0			5
<i>Hypsiboas cincerascens</i>	Demerara Falls treefrog	0, 2			0, 1			3
<i>Hypsiboas sibleszi</i>	La Escalera treefrog					0, 10		10
<i>Osteocephalus leprieurii</i>	Cayenne slender-legged treefrog	0, 1						1
<i>Osteocephalus oophagus</i>	Oophagous slender-legged		0, 2		0, 2	0, 3	0, 8	15

Scientific Name	Common Name	Rewa Site		Essequibo Site				TOTAL
		A	B	A	B	C	D	
	treefrog							
<i>Osteocephalus taurinus</i>	Manaus slender-legged treefrog				0, 3	0, 2	0, 1	6
<i>Osteocephalus spp.</i>				1, 0				1
<i>Scinax rubra</i>	Red snouted treefrog						0, 2	2
<i>Trachycephalus resinifictrix</i>	Kunawalu casque-headed treefrog	0, 6			0, 1		0, 1	8
<i>Sphaenorhynchus lacteus</i>							0, 2	2
<i>Dendropsophus minutus</i>					0, 3			3
Microhylidae								
<i>Synapturanus salseri</i>	Timbo disc frog	0, 1						1
Pipidae								
<i>Pipa sp.</i>					1			1
	Number of Individuals	67	65	37	67	31	59	326
	Species Richness	14	13	9	17	7	13	34

Cell entries – the first number given highlighted in red is the dry season record and the second number highlighted in blue is the wet season record

Reptiles

Scientific Name	Common Name	Rewa Sites		Essequibo Sites				TOTAL
		A	B	A	B	C	D	
Teiidae								
<i>Kentropyx calcarata</i>	Forest Lizard	1, 3	0, 3	7, 0	12, 4	1, 0		31
<i>Ameiva ameiva</i>					0, 6	0, 15	0, 3	24
Tropiduridae								
<i>Plica plica*</i>		6, 1						7
<i>Tropidurus spp.</i>		2, 0						2
<i>Plica umbra</i>		0, 1						1
Alligatoridae								
<i>Melanosuchus niger</i>	Black Caiman	0, 11	10, 23	7, 7	6, 14		0, 1	79
<i>Paleosuchus trigonatus*</i>	Schneider's Dwarf Caiman		1, 0	0, 9	1, 0			11
Crocodylidae								
<i>Caiman crocodilius</i>	Spectacled Caiman			0, 17			0, 8	25
Boidae								

Scientific Name	Common Name	Rewa Sites		Essequibo Sites				TOTAL
		A	B	A	B	C	D	
<i>Corallus hortulanus</i> *	Amazon Tree boa	0, 1	3, 0	2, 0	1, 0			7
<i>Corallus caninus</i>	Emerald Tree Boa	0, 1	0, 1				0, 1	3
Podocnemididae								
<i>Podocnemis expansa</i>	Giant River Turtle	1, 0	5, 7	0, 1				14
<i>Podocnemis unifilis</i>	Yellow-spotted River turtle	2, 1	0, 3	1, 24	1, 0			32
Chelidae								
<i>Platemys platycephala</i>	Grooved sideneck						0, 1	1
Gekkonidae								
<i>Hemidactylus mabouia</i>			1, 0					1
<i>Gonatodes humeralis</i>		1, 0	0, 1	2, 2	0, 1		0, 2	9
<i>Thecadactylus rapicauda</i>				0, 1				1
<i>Gonatodes</i> spp. 1					0, 1			1
Colubridae								
<i>Erythrolamprus aesculapii</i>			0, 1					1
<i>Drymoluber dichrous</i>					0, 1	0, 1	0, 1	3
<i>Dipsas varieagata</i>	Blunt headed slug eating snake	1, 0						1
Iguanidae								
<i>Iguana iguana</i> *	Green Iguana		5, 0					5
<i>Norops nitens</i>					0, 1			1
Testudinidae								
<i>Chelonoidis denticulata/ carbonaria</i> *	Red/Yellow-footed Tortoise	1, 0		0, 1	1, 1	0, 3	0, 2	9
Polychrotidae								
<i>Anolis ortonii</i>	Orton's Anole				1, 0			1
<i>Anolis</i> spp.				1, 0				1
Garniidae								
<i>Uranoscodon superciliosa</i> *		1, 0	2, 0	4, 0	3, 0		0, 2	12
Gymnophthalmidae								
<i>Leposoma elegans</i>							0, 3	3
Number of Individuals		35	66	86	55	20	24	286
Species Richness		13	12	12	13	4	10	27

Cell entries – the first number given highlighted in red is the dry season record and the second number highlighted in blue is the wet season record

*species observed by Pickles *et al.* 2009 at sites along the Rewa River above Corona Falls. Pickles *et al.* also observed the parrot snake (*Lephtophis ahaetulla*), Iguana (*Iguana iguana*), red fire snake (*Chironius scurrulus*) gold tegu lizard (*Tupinambis teguixin*), jungle runner (*Ameiva ameiva*) – species which may occur within the concession.

Appendix 4
List of Bird Species Recorded (*W. Prince*)

The abundance of each species is indicated by a letter code (see below) for each site surveyed during the October 17 to 01 November 2011 and 31st January to 19th February 2012, during the RBA expeditions. The habitats where the species are usually found are indicated and follow Braun et al. (2000). Common and scientific names and order follow Clements (2000).

* Restricted to the Guianas and adjacent Venezuela and Brazil

** Restricted to north of the Amazon

Habitats

LF	Lowland forest, including both terra firme and seasonally flooded forest
MF	Montane forest
RI	Riverine habitats, including waters, islands, banks, waterfalls, and riparian forests
MA	Marine or salt water habitats, including coastal and pelagic waters
MU	Mudflats and coastal beaches
FW	Fresh water habitats, including lakes, conservancies, ponds, oxbows, marshes, and canals
MN	Mangrove forest
HU	Habitats altered by humans, such as gardens, towns, roadsides, agricultural lands, disturbed forests, and forest edge
SV	Savannah grasslands
SC	Scrub or brush habitats, including white sand scrub, bush islands, and dense, low second growth
PA	Palm trees and forests

Abundance Codes

A	Abundant, more than 20 individuals encountered daily
C	Common, more than 10 individuals encountered Daily
F	Fairly common, fewer than 10 individuals encountered Daily
U	Uncommon, small number of individuals encountered (not daily)
S	Scarce, 1–3 individuals encountered at the site
O	Indicates species encountered only once during the entire survey

List of Bird species with abundance codes

Common Name	Scientific Name	Finch's Surveys	Conservation RAP #26 results (Sept. 2001)			SSILI Concession Surveys							
			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	Rewa Sites		Essequibo Sites				Opportunistic	
						A	B	A	B	C	D	Rewa	Esseq
Tinamous	Tinamidae												
Great Tinamou	<i>Tinamus major</i>	'01	U	U	U	-	F	-	F	-	S	S	-
Cinereous Tinamou	<i>Crypturellus cinereus</i>	'01	U	-	-	-	-	-	-	-	-	-	-
Variiegated Tinamou	<i>Crypturellus variegatus</i>	'98 '01	U	-	U	S	S	F	F	S	S	-	-
Red-legged Tinamou	<i>Crypturellus erythropus</i>	-	U	-	U	S	-	-	-	-	-	-	-
Tinamou	<i>Crypturellus spp.</i>	-	-	-	-	-	-	-	O	-	-	-	-
Cormorants	Phalacrocoracidae			-								-	-
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>	-	F	-	U	-	-	-	-	-	-	S	F
Anhingas	Anhingidae			-									
Anhinga	<i>Anhinga anhinga</i>	'98 '01	F	-	F	F	F	F	F	F	S	F	S
Hérons	Ardeidae			-									
Rufescent Tiger-Heron	<i>Tigrisoma lineatum</i>	'01	O	-	-	-	-	-	-	-	-	-	-
Fasciated Tiger-Heron	<i>Tigrisoma fasciatum</i>	-	-	-	-	-	-	-	O	-	-	-	-
Cocoi Heron	<i>Ardea cocoi</i>	'98 '01	F	-	U	S	F		F		F	S	F
Snowy Egret	<i>Egretta thula</i>	-	U	-	-	-	-	-	-	-	-	-	-
Little Blue-Heron	<i>Egretta caerulea</i>	-	-	-	-	-	-	-	-	-	-		S
Striated Heron	<i>Butorides striatus</i>	'98 '01	F	-	U	-	-	-	-	-	-	S	
Agami Heron	<i>Agamia agami</i>	-	-	-	O	-	-	-	-	-	-		
Capped Heron	<i>Pilherodius pileatus</i>	'98 '01	U	-	U	-	-	-	-	-	-		F
Boat-billed Heron	<i>Cochlearius</i>	'01	-	-	-	-	-	-	-	-	-		

Common Name	Scientific Name	Finch's Surveys	Conservation RAP #26 results (Sept. 2001)			SSILI Concession Surveys								
			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	Rewa Sites		Essequibo Sites				Opportunistic		
						A	B	A	B	C	D	Rewa	Esseq	
	<i>cochlearius</i>													
Great Egret	<i>Ardea alba</i>	-	-	-	-	-	-	-	-	-	-			O
Ibises	Threskiornithidae													
Green Ibis	<i>Mesembrinibis cayennensis</i>	'98 '01	F	-	U	S	S	F	F		F	S	S	
Storks	Ciconiidae													
Jabiru	<i>Jabiru mycteria</i>	-	O	-	-	-	-	-	-	-	-	-	-	-
Ducks, Geese	Anatidae													
Muscovy Duck	<i>Cairina moschata</i>	-	O	-	O	-	F	F	-	-	-	S	F	
Vultures	Cathartidae													
Black Vulture	<i>Coragyps atratus</i>	'98 '01	C	U	U	F	S	C	C	S	S	-	-	
Turkey Vulture	<i>Cathartes aura</i>	-	U	U	U	-	S	F	-	-	S	-	S	
Greater Yellow-headed Vulture	<i>Cathartes melambrotus</i>	'98 '01	U	U	U	-		S	-	-	-	-	S	
King Vulture	<i>Sarcoramphus papa</i>	'98 '01	U	U	U	-			-	-	-	-	-	
Ospreys	Pandionidae													
Osprey	<i>Pandion haliaetus</i>	'98 '01	U	-	-	-		S		S	S	S	S	F
Hawks, Eagles	Accipitridae													
Gray-headed Kite	<i>Leptodon cayanensis</i>	'98	-	-	-	-	-	-	-	-	-	-	-	-
Double-toothed Kite	<i>Harpagus bidentatus</i>	'98	-	-	-	-	-	-	-	-	-	-	-	-
Swallow-tailed Kite	<i>Elanoides forficatus</i>	-	-	-	-	-	-	-	-	F	-	-	-	S
Great Black-Hawk	<i>Buteogallus urubitinga</i>	'98 '01	-	-	O	-	-	-	-	S	-	-	-	-
Black-collared	<i>Leucopternis</i>	-	-	-	-	-	S	-	-	-	-	-	-	-

Common Name	Scientific Name	Finch's Surveys	Conservation RAP #26 results (Sept. 2001)			SSILI Concession Surveys								
			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	Rewa Sites		Essequibo Sites				Opportunistic		
						A	B	A	B	C	D	Rewa	Esseq	
Hawk	<i>albicollis</i>													
Gray Hawk	<i>Asturina nitida</i>	-	O	-	-	-		-	-	-	-	-	-	-
Roadside Hawk	<i>Buteo magnirostris</i>	'98 '01	O	-	-	-	S	S	-	-	-	S	-	
Harpy Eagle	<i>Harpia harpyja</i>	-	-	-	O	-	-	-	-	-	-	-	-	-
Ornate Hawk-Eagle	<i>Spizaetus ornatus</i>	-	-	O	-	-	-	-	-	-	-	-	-	S
Black-and-white Hawk-Eagle	<i>Spizastur melanoleucus</i>	'98	-	-	-	-	-	-	-	-	-	-	-	
Falcons, Caracaras	Falconidae													
Barred Forest-Falcon	<i>Micrastur ruficollis</i>	'98	-	-	-	S	-	-	-	-	-	-	-	-
Lined Forest-Falcon	<i>Micrastur gilvicollis</i>	'98	-	-	O	-	-	-	-	-	O	-	-	
Collared Forest-Falcon	<i>Micrastur semitorquatus</i>	'98	-	-	-	-	-	-	-	-	-	-	-	-
Slaty-backed Forest-Falcon	<i>Micrastur mirandollei</i>	-	-	-	-	S	-	F	S	-	-	-	-	-
Black Caracara	<i>Daptrius ater</i>	'98 '01	U	-	U	-	S	-	-	S	-	-	-	-
Red-throated Caracara	<i>Daptrius americanus</i>	'98 '01	-	-	U	-	F	-	S	S	F	-	-	-
Laughing Falcon	<i>Herpetotheres cachinnans</i>	-	U	-	-	O				-	-	-	-	-
Bat Falcon	<i>Falco ruficularis</i>	-	U	-	-	F	F	F	F	-	-	S	S	
Orange-breasted Falcon	<i>Falco deiroleucus</i>	-	U	-	-	-	-	-	-	-	-	-	-	-
Curassows, Guans	Cracidae													
Little Chachalaca	<i>Ortalis motmot</i>	'98 '01	U	-	F	-	-	-	S	-	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq
Spix's Guan	<i>Penelope jacquacu</i>	-	U	U	U	S	-	S	F	-	-	S	-
Blue-throated Piping-Guan	<i>Pipile cumanensis</i>	-	O	-	-		S	-	S	-	-	-	-
Black Curassow**	<i>Crax alector</i>	-	U	-	U	S	F	-	F	S	F	-	-
Trumpeters	Psophiidae												
Gray-winged Trumpeter	<i>Psophia crepitans</i>	'98	-	-	U	-	S	-	F	F	-	F	-
Sungrebes	Heliornithidae												
Sungrebe	<i>Heliornis fulica</i>	-	U	-	S	-	-	-	-	-	-	-	-
Sunbitterns	Eurypygidae												
Sunbittern	<i>Eurypyga helias</i>	'98 '01	U	-	U	-	S	S	S	-	-	-	-
Plovers	Charadriidae												
Pied Lapwing	<i>Vanellus cayanus</i>	'98 '01	U	-	O	-	-	-	-	-	-	F	-
Sandpipers	Scolopacidae												
Solitary Sandpiper	<i>Tringa solitaria</i>	-	F	-	U	-	-	-	-	-	-	-	-
Spotted Sandpiper	<i>Actitis macularia</i>	'98 '01	F	-	U	-	-	-	-	-	-	S	S
Terns	Sternidae												
Yellow-billed Tern	<i>Sterna superciliaris</i>	-	U	-	U	-	-	-	-	-	-	-	-
Large-billed Tern	<i>Phaetusa simplex</i>	'01	U	-	-		S	-	-	-	-	F	-
Least Tern	<i>Sternula antillarum</i>	-	-	-	-	-	-	-	-	-	-	F	
Skimmers	Rynchopidae												
Black Skimmer	<i>Rynchops niger</i>	-	U	-	-	-	-	-	-	-	-	F	-
Pigeons, Doves	Columbidae												
Scaled Pigeon	<i>Columba speciosa</i>	'01	-	-	-	S	-	-	S	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq
Plumbeous Pigeon	<i>Columba plumbea</i>	'98 '01	U	-	U	F		F	S	S	S	-	-
Ruddy Pigeon	<i>Columba subvinacea</i>	'01	F	-	F	O	-	-	-	-	-	-	-
Pale-vented Pigeon	<i>Columba cayennensis</i>	-	-	-	-	S	S	F	F		S	-	-
Ruddy Quail-Dove	<i>Geotrygon montana</i>	-	-	-	-	-	-	S	-		S	-	-
White-tipped Dove	<i>Leptoptila verreauxi</i>	-	-	-	-	F	-	S	-	S	F	-	-
Gray-fronted Dove	<i>Leptotila rufaxilla</i>	'01	U	-	U	S	-	-	-		S	-	-
Parrots	Psittacidae												
Painted Parakeet	<i>Pyrrhura picta</i>	'98 '01	U	-	U	F	F	C	C	F	F	-	F
Red-and-green Macaw	<i>Ara chloroptera</i>	'98 '01	F	U	F	F	F	F	C	C	-	-	-
Scarlet Macaw	<i>Ara macao</i>	'98 '01	F	-	U	F	F	-	C	F	-	-	F
Blue-and-yellow Macaw	<i>Ara ararauna</i>	'98	U	-	U	-	-	-	-	F	-	-	-
Golden-winged Parakeet	<i>Brotogeris chrysopterus</i>	'98 '01	F	-	F	F		F	S	S	-	-	-
Black-headed Parrot**	<i>Pionites melanocephala</i>	'98 '01	U	-	U		F	F	F	F	F	-	-
Caica Parrot*	<i>Pionopsitta caica</i>	'98 '01	U	-	U	F			F			-	-
Blue-headed Parrot	<i>Pionus menstruus</i>	'98 '01	U	-	U	F	F	F	C	C	F	-	F
Dusky Parrot	<i>Pionus fuscus</i>	'98	U	-	O	F		F	F			-	-
Orange-winged Parrot	<i>Amazona amazonica</i>	'01	F	-	F	C	C	F	F	F	F	-	-
Mealy Parrot	<i>Amazona farinosa</i>	'98	F	-	F	-	-	-	-	-		-	-

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						Rewa Sites		Essequibo Sites				Opportunistic	
			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	A	B	A	B	C	D	Rewa	Esseq
Red-fan Parrot	<i>Deroptus accipitrinus</i>	'98	U	-	U	-	F	S	F	-	S	-	-
Cuckoos	Cuculidae											-	-
Squirrel Cuckoo	<i>Piaya cayana</i>	'98 '01	S	-	S	S		S	S	-	-	-	-
Black-bellied Cuckoo	<i>Piaya melanogaster</i>	'98	-	-	O	-	-	-	O	-	-	-	-
Little Cuckoo	<i>Piaya minuta</i>	'01	-	-	-	-	-	-	-	-	-	-	-
Greater Ani	<i>Crotophaga major</i>	'01	F	-	U	-	-	-	-	-	-	-	-
Typical Owls	Strigidae												
Tropical Screech-Owl	<i>Otus choliba</i>	-	S	-	-	-	-	-	-	-	-	-	-
Tawny-bellied Screech-Owl	<i>Otus watsonii</i>	'98	-	-	-	-	-	O	-	-	-	-	-
Crested Owl	<i>Lophotrix cristata</i>	'01	-	-	-	-	-	-	-	-	-	-	-
Spectacled Owl	<i>Pulsatrix perspicillata</i>	'98 '01	S	-	O	-	-	S	S	-	-	-	-
Amazonian Pygmy-Owl	<i>Glaucidium hardyi</i>	'01	-	-	-	-	-	-	F	-	-	-	-
Potoos	Nyctibiidae												
Great Potoo	<i>Nyctibius grandis</i>	-	-	-	O	-	-	-	-	-	-	-	-
Nighthawks, Nightjars	Caprimulgidae												
Short-tailed Nighthawk	<i>Lurocalis semitorquatus</i>	'01	U	-	-	-	-	-	-	-	-	-	-
Common Pauraque	<i>Nyctidromus albicollis</i>	'01	U	-	U	-	-	-	-	-	-	-	-
Blackish Nightjar	<i>Caprimulgus nigrescens</i>	-	U	-	U	-	-	S	F	-	-	-	F
Nightjar species	<i>Caprimulgus spp.</i>	-	-	-	-	-	-	-	S	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq
Ladder-tailed Nightjar	<i>Hydropsalis climacocerca</i>	-	U	-	U	-	-	-	-	-	-	-	-
Swifts	Apodidae												
White-collared Swift	<i>Streptoprocne zonaris</i>	'01	U	C	U	-	-	-	-	-	-	-	-
Short-tailed Swift	<i>Chaetura brachyura</i>	-	F	U	F	-	-	S	-	-	-	-	-
Band-rumped Swift	<i>Chaetura spinicauda</i>	'98 '01	C	F	C	-	-	-	F	-	-	-	-
Gray-rumped Swift	<i>Chaetura cinereiventris</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-
Chaetura' Swift	<i>Chaetura spp.</i>	-	-	-	-	-	F	-	F	-	-	-	-
Hummingbirds	Trochilidae												
Eastern Long-tailed Hermit	<i>Phaethornis superciliosus</i>	'98 '01	U	U	U	-	-	S	S	-	-	-	-
Straight-billed Hermit	<i>Phaethornis bourcieri</i>	'98	U	U	U	S	-	-	S	-	-	-	-
Reddish Hermit	<i>Phaethornis ruber</i>	'98 '01	U	U	U	F	F	F	F	S	S	-	-
Hermit species	<i>Phaethornis spp.</i>	-	-	-	-	S	-	-	-	-	-	-	-
Gray-breasted Sabrewing	<i>Campylopterus largipennis</i>	'98 '01	S	-	-	-	-	O	-	-	-	-	-
White-necked Jacobin	<i>Florisuga mellivora</i>	'98 '01	-	-	-	-	S	-	-	-	-	-	S
Fork-tailed Woodnymph	<i>Thalurania furcata</i>	'98	U	U	U	O	-	-	-	-	-	-	-
Black-eared Fairy	<i>Heliathyx aurita</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Pale-tailed Barbthroat	<i>Threnetes leucurus</i>	-	-	-	-	-	-	-	-	O	-	-	-
Plain-bellied Emerald	<i>Amazilia leucogaster</i>	-	-	-	-	O	-	-	-	-	-	-	-

Common Name	Scientific Name	Finch's Surveys	Conservation RAP #26 results (Sept. 2001)			SSILI Concession Surveys							
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						A	B	A	B	C	D	Rewa	Esseq
Emerald Species	<i>Amazilia spp.</i>	-	-	-	-	-	-	-	S	-	-	-	S
Trogons	Trogonidae												
White-tailed Trogon	<i>Trogon viridis</i>	'98 '01	F	U	F	F	S	F	S	-	F	-	-
Violaceous Trogon	<i>Trogon violaceus</i>	'98	U	U	U	S		S	S	-	-	-	-
Black-throated Trogon	<i>Trogon rufus</i>	'98	U	U	U	F	-	-	-	-	-	-	-
Black-tailed Trogon	<i>Trogon melanurus</i>	'98	U	U	U	S	-	-	-	S	S	-	-
Masked Trogon	<i>Trogon personatus</i>	-	-	-	-	-	S	S	S	S	-	-	-
Kingfishers	Alcedinidae												
Ringed Kingfisher	<i>Ceryle torquata</i>	'98 '01	F	-	F	F	F	-	-	S	-	-	-
Amazon Kingfisher	<i>Chloroceryle amazona</i>	'98 '01	F	-	F	S			S		S	-	S
Green Kingfisher	<i>Chloroceryle americana</i>	'98 '01	F	-	F	F	S	S	S		S	-	-
Green-and-rufous Kingfisher	<i>Chloroceryle inda</i>	'98	S	-	S		S	S	-	-	-	-	-
American Pygmy Kingfisher	<i>Chloroceryle aenea</i>	-	S	-	S	-	-	-	-	-	-	-	O
Motmots	Momotidae												
Blue-crowned Motmot	<i>Momotus momota</i>	'98 '01	U	-	U	S	S	-	S	S	S	-	-
Jacamars	Galbulidae												
Brown Jacamar	<i>Brachygalba lugubris</i>	'98 '01	F	-	U	-	-	-	-	-	-	-	-
Yellow-billed Jacamar**	<i>Galbula albirostris</i>	-	S	S	S			F	S	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq
Paradise Jacamar	<i>Galbula dea</i>	-	U	-	U	-	-	-	-	-	-	-	-
Green-tailed Jacamar	<i>Galbula galbula</i>	'98 '01	-	-	-	S	S	S	-	-	S	-	-
Great Jacamar	<i>Jacamerops aurea</i>	'98	-	-	-	F	S	F	F	-	-	-	-
Puffbirds	Bucconidae												
Spotted Puffbird	<i>Bucco tamatia</i>	-	U	-	U	-	-	-	-	-	-	-	-
Collared Puffbird	<i>Bucco capensis</i>	-	U	-	U	-	-	-	-	-	-	-	-
White-necked Puffbird	<i>Notharchus macrorhynchos</i>	'01	-	-	-	-	-	-	-	-	-	-	-
Pied Puffbird	<i>Notharchus tectus</i>	'01	-	-	-	-	-	-	-	-	-	-	-
Black Nunbird**	<i>Monasa atra</i>	'98 '01	S	-	F	F	F	S	-	-	-	-	-
Swallow-wing	<i>Chelidoptera tenebrosa</i>	'98 '01	C	-	C	F	-	-	-	-	-	S	F
Barbets, Toucans	Ramphastidae												
Black-spotted Barbet	<i>Capito niger</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Green Aracari*	<i>Pteroglossus viridis</i>	'01	F	U	F	-	-	-	-	-	-	-	-
Black-necked Aracari	<i>Pteroglossus aracari</i>	'98 '01	U	-	U	-	-	-	-	S	-	-	-
Guianan Toucanet	<i>Selenidera culik</i>	-	U	-	U	-	-	O	-	-	-	-	-
Channel-billed Toucan	<i>Ramphastos vitellinus</i>	'98 '01	S	-	S	S	F		S	S	S	-	-
Red-billed Toucan	<i>Ramphastos tucanus</i>	'98 '01	U	U	U	F	F	F	F	S	S	-	-
Woodpeckers	Picidae												
Golden-spangled	<i>Picumnus exilis</i>	-	-	-	U	-	-	-	-	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq	
Piculet														
Lineated Woodpecker	<i>Dryocopus lineatus</i>	'98 '01	U	-	-	-	-	S	-	-	-	-	-	-
Yellow-tufted Woodpecker	<i>Melanerpes cruentatus</i>	-	U	-	U	-	S		-	-	-	-	-	-
Golden-collared Woodpecker	<i>Veniliornis cassini</i>	-	O	-	-	-			-	-	-	-	-	-
Yellow-throated Woodpecker	<i>Piculus flavigula</i>	'98	-	-	-	F	S	F	F	S	S	-	-	-
Waved Woodpecker	<i>Celeus undatus</i>	-	U	-	U	-	S	-	S	S	S	-	-	-
Cream-colored Woodpecker	<i>Celeus flavus</i>	'98 '01	-	-	O	S	S	-	F	S	-	-	-	-
Ringed Woodpecker	<i>Celeus torquatus</i>	'98 '01	-	-	O	-	-	-	S	S	-	-	-	-
Chestnut Woodpecker	<i>Celeus elegans</i>	-	-	-	-	-	-	-	-	-	S	-	-	-
Red-necked Woodpecker	<i>Campephilus rubicollis</i>	'98	U	U	U	S	S	F	-	-	S	-	-	-
Crimson-crested Woodpecker	<i>Campephilus melanoleucos</i>	'98 '01	-	-	U	-	-	-	-	-	-	-	-	-
Little Woodpecker	<i>Veniliornis passerinus</i>	-	-	-	-	S	-	S	-	-	-	-	-	-
Veniliornis Woodpecker	<i>Veniliornis spp.</i>	-	-	-	-	-	-	-	S	-	-	-	-	-
Ovenbirds	Furnariidae													
McConnell's Spinetail	<i>Synallaxis macconnelli</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	-
Plain-crowned Spinetail	<i>Synallaxis gujanensis</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	-
Buff-throated	<i>Automolus</i>	'01	-	-	-	-	-	S	-	S	-	-	-	-

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			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	A	B	A	B	C	D	Rewa	Esseq
Foliage-gleaner	<i>ochrolaemus</i>												
Olive-backed Foliage-gleaner	<i>Automolus infuscatus</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-
Chestnut-crowned Foliage-gleaner	<i>Automolus rufipileatus</i>	'01	-	-	-	-	-	-	-	-	-	-	-
Foliage-gleaner	<i>Automolus spp.</i>	-	-	-	-	-	O	-	-	-	-	-	-
Plain Xenops	<i>Xenops minutus</i>	'98	U	-	-	-	-	S	-	S	-	-	-
Leaf-tosser specie	<i>Sclerurus spp.</i>	-	-	-	-	-	-	O	-	-	-	-	-
Woodcreepers	Dendrocolaptidae												
Olivaceous Woodcreeper	<i>Sittasomus griseicapillus</i>	-	-	-	-	-	-	-	O	-	-	-	-
Plain-brown Woodcreeper	<i>Dendrocincla fuliginosa</i>	'01	U	-	U	S	S	F	S	S	-	-	-
Wedge-billed Woodcreeper	<i>Glyphorhynchus spirurus</i>	'98 '01	F	-	F	C	S	F	C		-	-	-
Barred Woodcreeper	<i>Dendrocolaptes certhia</i>	'98	-	-	-			D	S		-	-	-
Black-banded Woodcreeper	<i>Dendrocolaptes picumnus</i>	'98	U	-	U	S	S	F	F	S	S	-	-
Straight-billed Woodcreeper	<i>Xiphorhynchus picus</i>	'98	-	-	-	O	-	-	-	-	-	-	-
Striped Woodcreeper	<i>Xiphorhynchus obsoletus</i>	'98 '01	U	-	-	-	-	-	-	-	-	-	-
Chestnut-rumped Woodcreeper	<i>Xiphorhynchus pardalotus</i>	'98	-	-	-	-	S	F	F	-	S	-	-
Buff-throated Woodcreeper	<i>Xiphorhynchus guttatus</i>	'98 '01	U	-	U	S	F	S	S	-	-	-	-
White-throated Woodcreeper	<i>Xiphocolaptes albicollis</i>	-	-	-	-	O	-	-	-	-	-	-	-

Common Name	Scientific Name	Finch's Surveys	Conservation RAP #26 results (Sept. 2001)			SSILI Concession Surveys							
			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	Rewa Sites		Essequibo Sites				Opportunistic	
						A	B	A	B	C	D	Rewa	Esseq
Lineated Woodcreeper	<i>Lepidocolaptes albolineatus</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Curve-billed Scythebill	<i>Campylorhamphus procurvoides</i>	-	O	-	-	-	-	-	-	-	-	-	-
Red-billed Woodcreeper	<i>Hylexetastes perrotii</i>	-	-	-	-	S		S	S	-	-	-	-
White-chinned Woodcreeper	<i>Xiphorhynchus guttatus</i>	-	-	-	-	F	S	F	F	-	-	-	-
Typical Antbirds	Thamnophilidae												
Fasciated Antshrike	<i>Cymbilaimus lineatus</i>	'98 '01	-	-	-	S	-	S	S	-	-	-	-
Great Antshrike	<i>Taraba major</i>	'01	U	-	U	S	-	-	-	-	-	-	-
Black-crested Antshrike	<i>Sakesphorus canadensis</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-
Mouse-colored Antshrike	<i>Thamnophilus murinus</i>	'98 '01	U	U	U	F	S	F	S	S	S	-	-
Amazonian Antshrike	<i>Thamnophilus amazonicus</i>	'98 '01	U	-	U	-	-	-	-	-	-	-	-
Spot-winged Antshrike	<i>Pygiptila stellaris</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Dusky-throated Antshrike	<i>Thamnomanes ardesiacus</i>	'98	-	-	-	F	F	F	F	F	F	-	-
Cinereous Antshrike	<i>Thamnomanes caesius</i>	'98	O	-	-	F	F	F	S	S		-	-
Barred Antshrike	<i>Thamnophilus doliatus</i>	-	-	-	-	S	-	-	-	-	-	-	-
Pygmy Antwren	<i>Myrmotherula brachyura</i>	'98 '01	U	-	U	F	F	F	-	-	-	-	-
Streaked Antwren	<i>Myrmotherula surinamensis</i>	'98 '01	-	-	-	S	-	-	-	-	-	-	-
Rufous-bellied	<i>Myrmotherula</i>	'98	-	-	-	S	-	F	-	-	S	-	-

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			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	Rewa Sites		Essequibo Sites				Opportunistic		
						A	B	A	B	C	D	Rewa	Esseq	
Antwren	<i>guttata</i>													
White-flanked Antwren	<i>Myrmotherula axillaris</i>	'98 '01	U	-	U	-	-	-	-	-	-	-	-	-
Long-winged Antwren	<i>Myrmotherula longipennis</i>	'98	-	-	-	F	F	F	F	F	F	-	-	-
Gray Antwren	<i>Myrmotherula menetriesii</i>	'98 '01	U	-	U	S	F	F	F	-	-	-	-	-
Plain-winged Antwren	<i>Myrmotherula behni</i>	-	-	-	-	S		S	-	S	-	-	-	-
Antwren	<i>Myrmotherula spp.</i>	-	-	-	-	-	-	-	-	S	-	-	-	-
Spot-tailed Antwren	<i>Herpsilochmus sticturus</i>	'98	-	-	-	S	S	F	S	S	F	-	-	-
Todd's Antwren	<i>Herpsilochmus stictocephalus</i>	'98 '01	-	-	-	S	S	F	F	S	S	-	-	-
Dot-winged Antwren	<i>Microrhoptias quixensis</i>	'98 '01	-	-	-	S	S	S	-	-	-	-	-	-
Ash-winged Antwren	<i>Terenura spodioptila</i>	-	-	-	-	S	S	S	-	S	-	-	-	-
Gray Antbird	<i>Cercomacra cinerascens</i>	'98 '01	-	-	-	F	F	-	S	S	-	-	-	-
Dusky Antbird	<i>Cercomacra tyrannina</i>	'98	U	-	F	-	S	S	-	-	-	-	-	-
Blackish Antbird	<i>Cercomacra nigrescens</i>	'98 '01	U	-	U	-	-	-	-	S	-	-	-	-
White-browed Antbird	<i>Myrmoborus leucophrys</i>	'98 '01	-	-	-	-	-	S	-	-	-	-	-	-
Warbling Antbird	<i>Hypocnemis cantator</i>	'98	F	-	F		S	S	S	-	-	-	-	-
Black-chinned Antbird	<i>Hypocnemoides melanopogon</i>	'98 '01	U	-	U	F	-	-	-	-	-	-	-	-
Black-headed	<i>Percnostola</i>	-	U	-	U	-	-	-	-	-	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq
Antbird	<i>rufifrons</i>												
Spot-winged Antbird	<i>Percnostola leucostigma</i>	'98	U	-	U	-	-	-	-	-	-	-	-
Scale-backed Antbird	<i>Hylophylax poecilinota</i>	-	U	-	U			S	S		-	-	-
Wing-banded Antbird	<i>Myrmornis torquata</i>	-	U	-	-	-	-	-	-	-	-	-	-
White-plumed Antbird	<i>Pithys albifrons</i>	-	O	-	-	-	-	-	-	S	S	-	-
Ferruginous-backed Antbird	<i>Myrmeciza ferruginea</i>	-	-	-	-	S		F	F	S	-	-	-
Black-throated Antbird	<i>Myrmeciza atrothorax</i>	-	-	-	-	-	-	S	S	-	-	-	-
Silvered Antbird	<i>Sclateria naevia</i>	-	-	-	-	-	-	S	-	-	-	-	-
Ground Antbirds	Formicariidae												
Rufous-capped Antthrush	<i>Formicarius colma</i>	'98 '01	-	-	-	S	S	S	F	-	-	-	-
Black-faced Antthrush	<i>Formicarius analis</i>	'98 '01	-	-	U	-	-	S	-	-	F	-	-
Spotted Antpitta	<i>Hylopezus macularius</i>	'98	-	-	U	F	S	F	F	-	S	-	-
Thrush-like Antpitta	<i>Myrmothera campanisona</i>	'98 '01	-	-	U	F		F	S	-	S	-	-
Tyrant Flycatchers	Tyrannidae												
White-lored Tyrannulet	<i>Ornithion inerme</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-
Southern Beardless-Tyrannulet	<i>Camptostoma obsoletum</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq
Yellow Tyrannulet	<i>Capsiempis flaveola</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Golden-crowned Spadebill	<i>Platyrinchus coronatus</i>	-	-	-	-	F	-	S	S	-	-	-	-
White-crested Spadebill	<i>Platyrinchus platyrhynchos</i>	-	-	-	-	S	-	-	-	-	S	-	-
Yellow-crowned Tyrannulet	<i>Tyrannulus elatus</i>	'98 '01	F	-	F	-	-	-	-	-	-	-	-
Elaenia	<i>Elaenia spp.</i>	-	-	-	O	-	-	S	-	-	-	-	-
Forest Elaenia	<i>Myiopagis gaimardii</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-
Yellow-crowned Tyrannulet	<i>Myiopagis flavivertex</i>	'98 '01	-	-	-	S	F	S	F	S	S	-	-
Whiskered Flycatcher	<i>Myiobius barbatus</i>	-	-	-	-	S	S	F	-	-	-	-	-
Ochre-bellied Flycatcher	<i>Mionectes oleagineus</i>	-	-	-	-	-	-	-	-	S	S	-	-
McConnell's Flycatcher	<i>Mionectes macconnelli</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Slender-footed Tyrannulet	<i>Zimmerius gracilipes</i>	'98	U	-	U	-	-	-	-	-	-	-	-
Short-tailed Pygmy-Tyrant	<i>Myiornis ecaudatus</i>	'98 '01	-	-	-	S	S	-	-	-	-	-	-
Double-banded Pygmy-Tyrant	<i>Lophotriccus vitoriosus</i>	'98 '01	S	-	-	-	-	-	-	-	-	-	-
Helmented Pygmy-Tyrant	<i>Lophotriccus galeatus</i>	-	-	-	-	F	S	F	S	S	-	-	-
Pygmy-Tyrant	<i>Lophotriccus spp.</i>	-	-	-	-	-	S	S	-	-	-	-	-
Common Tody-Flycatcher	<i>Todirostrum cinereum</i>	'98	U	-	U	-	-	-	-	-	-	-	-
Painted Tody-Flycatcher	<i>Todirostrum pictum</i>	'01	-	-	-	-	-	-	-	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq
Ringed Antpipit	<i>Corythopsis torquata</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Rufous-tailed Flatbill	<i>Ramphotrigon ruficauda</i>	'98 '01	-	-	-	-	O	-	-	-	-	-	-
Yellow-margined Flycatcher	<i>Tolmomyias assimilis</i>	'98 '01	-	-	-	S	F	F	S	S	S	-	-
Gray-crowned Flycatcher	<i>Tolmomyias poliocephalus</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-
Royal Flycatcher	<i>Onychorhynchus coronatus</i>	-	O	-	-	-	-	-	O	-	-	-	-
Flycatcher	<i>Contopus spp.</i>	-	-	-	-	O	-	-	-	-	-	-	-
Ruddy-tailed Flycatcher	<i>Terenotriccus erythrurus</i>	-	U	-	U	-	-	-	-	-	O	-	-
Great Kisskadee	<i>Pitangus sulphuratus</i>	-	-	-	-	-	-	-	-	F	-	-	-
Piratic Flycatcher	<i>Legatus leucophaeus</i>	-	-	-	-	-	-	-	-	S	-	-	-
Sulphur-rumped Flycatcher	<i>Myiobius barbatus</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Drab Water-Tyrant	<i>Ochthornis littoralis</i>	'98 '01	-	-	-	S	-	S	-	S	S	S	F
Amazonian Black-Tyrant	<i>Knipolegus poecilocercus</i>	-	F	-	F	-	-	-	-	-	-	-	-
Cinnamon Attila	<i>Attila cinnamomeus</i>	'98 '01	-	-	U	S	S	-	-	-	-	-	-
Bright-rumped Attila	<i>Attila spadiceus</i>	'01	-	-	-	S	S	-	S	S	S	-	-
Sirystes	<i>Sirystes sibilator</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Grayish Mourner	<i>Rhytipterna simplex</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-
Cinereous Mourner	<i>Laniocera hypopyrra</i>	-	-	-	-	-	-	-	O	-	-	-	-
Short-crested	<i>Myiarchus ferox</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq	
Flycatcher														
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>	-	-	-	-	O	-	-	-	-	-	-	-	-
Rusty-margined Flycatcher	<i>Myiozetetes cayanensis</i>	'98 '01	-	-	-		-	-	-	F		-	-	
Yellow-throated Flycatcher	<i>Conopias parva</i>	'98 '01	-	-	U		S	-	F	S	S	-	-	
Tropical Kingbird	<i>Tyrannus melancholicus</i>	'98 '01	F	-	U			F		F	F	-	-	
Thrush-like Mourner	<i>Schiffornis turdinus</i>	'98	-	-	-	-	-	-	-	-	-	-	-	
White-winged Becard	<i>Pachyramphus polychopterus</i>	'01	U	-	U	-	-	-	-	-	-	-	-	
Black-capped Becard	<i>Pachyramphus marginatus</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	
Black-tailed Tityra	<i>Tityra cayana</i>	'98 '01	O	-	-	-	-	-	-	-	S	-	-	
Cotingas	Cotingidae					-								
Screaming Piha	<i>Lipaugus vociferans</i>	'98 '01	C	U	C	C	F	C	C	F	F	-	-	
Guianan Red-Cotinga	<i>Phoenicircus carnifex</i>	-	O	-	-	S	-	S	F	S	-	-	-	
Pompadour Cotinga	<i>Xipholena punicea</i>	-	-	-	O	-	-	-	-	-	-	-	-	
Purple-throated Fruitcrow	<i>Querula purpurata</i>	'98	U	U	U	-	-	F	F	F	F	-	-	
Capuchin Bird	<i>Perissocephalus tricolor</i>	-	-	-	-	-	-	F	S	-	-	-	-	
Guianan Cock-of-the-Rock	<i>Rupicola rupicola</i>	-	-	-	-	-	-	-	-	-	S	-	-	
Manakins	Pipridae													
White-throated	<i>Corapipo gutturalis</i>	'98	-	-	-	-	-	-	-	-	-	-	-	

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						A	B	A	B	C	D	Rewa	Esseq	
Manakin*														
White-crowned Manakin	<i>Pipra pipra</i>	'98	U	U	U		-	S	S	-	-	-	-	-
Golden-headed Manakin	<i>Pipra erythrocephala</i>	'98	U	U	U	S	-	S	S	S	S	-	-	-
White-fronted Manakin	<i>Lepidothrix serena</i>	-	-	O	-	-	-	-	-	-	-	-	-	-
Tiny-Tyrant Manakin	<i>Tyranneutes virescens</i>	-	-	-	-	F	-	F	F	F	F	-	-	-
Thrush-like Schiffornis	<i>Shiffornis turdina</i>	-	-	-	-	S	S	F		S	S	-	-	-
Vireos	Vireonidae													
Red-eyed Vireo	<i>Vireo olivaceus</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	-
Vireo species	<i>Vireo spp.</i>	-	-	-	-	S		S	S	-	-	-	-	-
Lemon-chested Greenlet	<i>Hylophilus thoracicus</i>	'98 '01	-	-	-	F	F	S	S	S	-	-	-	-
Buff-cheeked Greenlet	<i>Hylophilus muscicapinus</i>	'98 '01	-	-	-	F	S	S	S	-	-	-	-	-
Tawny-crowned Greenlet	<i>Hylophilus ochraceiceps</i>	'98	-	-	-	-	-	-	-	-	-	-	-	-
Ashy-headed Greenlet	<i>Hylophilus pectoralis</i>	-	-	-	-	-	S	-	-	-	-	-	-	-
Slaty-capped Shrike-Vireo	<i>Vireolanius leucotis</i>	'98	-	-	-	-	-	S	-	-	S	-	-	-
Rufous-browed Peppershrike	<i>Cyclarhis gujanensis</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	-
Swallows	Hirundinidae													
Gray-breasted Martin	<i>Progne chalybea</i>	'98	F	-	-	-	-	C	-	-	-	-	-	-
Brown-chested	<i>Progne tapera</i>	'98	F	-	U	-	-	-	-	-	-	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq	
Martin														
White-winged Swallow	<i>Tachycineta albiventer</i>	'98 '01	C	-	C	F	F	-	-	F	F	F	F	F
White-banded Swallow	<i>Atticora fasciata</i>	'98 '01	C	-	C	F	F	-	-	-	-	-	-	C
Black-collared Swallow	<i>Atticora melanoleuca</i>	-	-	-	-	-	-	C	-	C	C	-	-	C
Southern Rough-winged Swallow	<i>Stelgidopteryx ruficollis</i>	-	-	C	U	-	-	-	-	-	-	-	-	-
Bank Swallow	<i>Riparia riparia</i>	-	U	-	-	-	-	-	-	-	-	-	-	-
Barn Swallow	<i>Hirundo rustica</i>	'01	-	-	-	-	-	-	-	-	-	-	-	-
Wrens	Troglodytidae													-
Coraya Wren	<i>Thryothorus coraya</i>	'98 '01	F	-	-	F	-	-	-	-	-	-	-	-
Buff-breasted Wren	<i>Thryothorus leucotis</i>	'98 '01	-	-	-	S	-	-	-	-	-	-	-	-
Musician Wren	<i>Cyphorhinus arada</i>	-	-	-	-	F	-	F	F	-	-	-	-	-
White-breasted Woodwren	<i>Henicorhina leucosticta</i>	-	-	-	-	-	-	-	-	-	S	-	-	-
Gnatwrens, Gnatcatchers	Poliophtilidae													
Long-billed Gnatwren	<i>Ramphocaenus melanurus</i>	'98 '01	O	-	-	F	-	-	S	S	-	-	-	-
Collared Gnatwren	<i>Microbates collaris</i>	-	-	-	-	-	-	-	-	O	-	-	-	-
Tropical Gnatcatcher	<i>Poliophtila plumbea</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	-
Thrushes	Turdidae													
Cocoa Thrush	<i>Turdus fumigatus</i>	'98 '01	-	-	U	S	S	F	F	-	S	-	-	-
White-necked	<i>Turdus albicollis</i>	'98	-	-	-	-	-	S	-	-	S	-	-	-

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						A	B	A	B	C	D	Rewa	Esseq	
Thrush														
Wood Warblers	Parulidae													
River Warbler	<i>Basileuterus rivularis</i>	-	F	-	F	S	-	S	-	-	-	-	-	-
Rose-breasted Chat	<i>Granatellus pelzelni</i>	'98	-	-	-	-	-	-	-	-	-	-	-	-
Bananaquits	Coerebidae													
Bananaquit	<i>Coereba flaveola</i>	'98 '01	F	-	U	-	S	-	-	-	-	-	-	-
Tanagers	Thraupidae													
Guira Tanager	<i>Hemithraupis guira</i>	'01	-	-	-	-	-	-	-	-	-	-	-	-
Yellow-backed Tanager	<i>Hemithraupis flavicollis</i>	'98	-	-	-	-	-	-	-	-	-	-	-	-
Hooded Tanager	<i>Nemosia pileata</i>	'01	-	-	-	-	-	-	-	-	-	-	-	-
Fulvous-crested Tanager	<i>Tachyphonus surinamus</i>	-	-	-	-	-	-	O	-	-	-	-	-	-
Flame-crested Tanager	<i>Tachyphonus cristatus</i>	'98	-	-	-	-	-	-	-	S	S	-	-	-
Blood-red Tanager	<i>Piranga haemalea</i>	'01	-	-	-	-	-	-	-	-	-	-	-	-
Silver-beaked Tanager	<i>Ramphocelus carbo</i>	'98 '01	F	-	F	F	-	-	-	-	-	-	-	-
Blue-gray Tanager	<i>Thraupis episcopus</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	-
Palm Tanager	<i>Thraupis palmarum</i>	-	-	-	-	-	-	-	-	S	-	-	-	-
Golden-sided Euphonia	<i>Euphonia cayennensis</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	-
Turquoise Tanager	<i>Tangara mexicana</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-	-
Spotted Tanager	<i>Tangara punctata</i>	'98	-	-	-	-	-	-	-	-	-	-	-	-

Common Name	Scientific Name	Finch's Surveys	Conservation RAP #26 results (Sept. 2001)			SSILI Concession Surveys							
			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	Rewa Sites		Essequibo Sites				Opportunistic	
						A	B	A	B	C	D	Rewa	Esseq
Bay-headed Tanager	<i>Tangara gyrola</i>	'98	O	-	-	-	-	-	-	-	-	-	-
Blue Dacnis	<i>Dacnis cayana</i>	-	F	U	U	-	-	-	-	-	-	-	-
Purple Honeycreeper	<i>Cyanerpes caeruleus</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Swallow-Tanager	<i>Tersina viridis</i>	'98 '01	-	-	O	-	-	-	-	-	-	-	-
Tangara' Tanager	<i>Tangara spp.</i>	-	-	-	-		S	-	S	-	-	-	-
Emberizine Finches	Emberizidae												
Red-capped Cardinal	<i>Paroaria gularis</i>	'98	F	-	F	F	-	F	-	F	-	-	-
Pectoral Sparrow	<i>Arremon taciturnus</i>	'98	-	-	-	-	-	-	-	-	-	-	-
Grosbeaks, Saltators	Cardinalidae												
Slate-colored Grosbeak	<i>Saltator grossus</i>	'98 '01	U	-	U	-	-	-	-	-	-	-	-
Buff-throated Saltator	<i>Saltator maximus</i>	'98 '01	-	-	-	-	-	-	-	-	-	-	-
Yellow-green Grosbeak	<i>Caryothraustes canadensis</i>	-	-	U	U		S	-	-	S	-	-	-
Blue-black Grosbeak	<i>Cyanocompsa cyanooides</i>	-	-	-	-	S	S	S	-	-	-	-	-
New World Blackbirds	Icteridae												
Giant Cowbird	<i>Scaphidura oryzivora</i>	'98 '01	-	-	-	-	-	S	-	S	-	-	-
Moriche Oriole	<i>Icterus chryscephalus</i>	-	U	-	U	-	-	-	-	-	-	-	-
Yellow-rumped Cacique	<i>Cacicus cela</i>	'98 '01	O	-	U	F	-	-	F	F	-	-	-

Common Name	Scientific Name	Finch's Surveys	Conservation RAP #26 results (Sept. 2001)			SSILI Concession Surveys							
						Rewa Sites		Essequibo Sites				Opportunistic	
			Pobawau Creek	Cacique Mtn Forest	Cacique Lowland Forest	A	B	A	B	C	D	Rewa	Esseq
Red-rumped Cacique	<i>Cacicus haemorrhous</i>	-	-	-	-	F	-	F	F	S	S	-	F
Crested Oropendola	<i>Psarocolius decumanus</i>	'98 '01	U	U	U	-	-	-	-	-	-	-	F
Green Oropendola	<i>Psarocolius viridis</i>	-	U	-	U	S	S	S		S	S	-	-

Highlighted species are 'new' species only observed via the recent SSILI surveys and not in previous studies in the region.

List of bird species with numbers of individuals recorded

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
Tinamidae (4)	Tinamous								
<i>Tinamus major</i>	Great Tinamou		3		3		1	1	
<i>Crypturellus variegatus</i>	Variiegated Tinamou	1	2	3	3	1	2		
<i>Crypturellus erythropus</i>	Red-legged Tinamou	2							
<i>Crypturellus spp</i>	Tinamou				1				
Cracidae (4)	Curassows, Guans								
<i>Crax alector</i>	Black Currasow	2	6		14	2	3		
<i>Penelope jacquacu</i>	Spix's Guan	1		1	4			1	
<i>Pipile cumanensis</i>	Blue-throated Piping-Guan		1		4				
<i>Ortalis motmot</i>	Little Chacalaca				4				
Eurypygidae (1)	Sunbitterns								
<i>Eurypyga helias</i>	Sunbittern		1	1	3				
Psophidae (1)	Trumpeters								
<i>Psophia crepitans</i>	Gray-winged Trumpeter		2		17	19		12	
Anatidae (1)	Ducks, Geese								

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Cairina moschata</i>	Muscovy Duck		4	3				2	4
Anhingidae (1)	Aningas								
<i>Anhinga anhinga</i>	Anhinga	3	4	2	3	2	2	3	2
Phalacrocoracidae (1)	Cormorants								
<i>Phalacrocorax brasilianus</i>	Neotropical Cormorant							1	20
Rynchopidae (1)	Skimmers								
<i>Rynchops niger</i>	Black Skimmer							9	
Laridae (2)	Terns								
<i>Phaetusa simplex</i>	Large-billed Tern		1					6	
<i>Sternula antillarum</i>	Least Tern							7	
Ardeidae (7)	Hérons								
<i>Tigrisoma lineatum</i>	Rufescent Tiger-Heron		2	2	2				
<i>Tigrisoma fasciatum</i>	Fasciated Tiger-Heron				1				
<i>Egretta caerulea</i>	Little Blue-Heron								1
<i>Butorides striata</i>	Striated Heron							2	
<i>Pilherodius pileatus</i>	Capped Heron								5
<i>Ardea cocoi</i>	Cocoi Heron	1	4		3		3	2	4
<i>Ardea alba</i>	Great Egret								1
Cathartidae (3)	Vultures								
<i>Cathartes melambrotus</i>	Greater Yellow-headed Vulture			1					2
<i>Cathartes aura</i>	Turkey Vulture		1	3			1		3
<i>Coragyps atratus</i>	Black Vulture	7	1	13	9	2	2		
Pandionidae (1)	Ospreys								
<i>Pandion haliaetus</i>	Osprey			1		1	1	2	4
Accipitridae (5)	Hawks, Eagles								
<i>Elanoides forficatus</i>	Swallow-tailed Kite					3			4
<i>Leucopternis albicollis</i>	Black-collared Hawk		2						

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Buteogallus urubitinga</i>	Great Black-Hawk					1			
<i>Buteo magnirostris</i>	Roadside Hawk		2	1				2	
<i>Spizaetus ornatus</i>	Ornate Hawk-eagle								1
Falconidae (7)	Falcons, Caracaras								
<i>Herpetotheres cachinnans</i>	Laughing Falcon	1							
<i>Falco ruficularis</i>	Bat Falcon	2	2	2	2			2	1
<i>Micrastur mirandollei</i>	Slaty-backed Forest-Falcon	1		5	1				
<i>Micrastur ruficollis</i>	Barred Forest-Falcon	2							
<i>Micrastur gilvicollis</i>	Lined Forest-Falcon						1		
<i>Daptrius americanus</i>	Red-throated Caracara		7		3	2	5		
<i>Daptrius ater</i>	Black Caracara		2			2			
Strigidae (3)	Typical Owls								
<i>Pulsatrix perspicillata</i>	Spectacled Owl			1	2				
<i>Glaucidium hardyi</i>	Amazonian Pygmy-Owl				3				
<i>Megascops watsonii</i>	Tawny-bellied Screech-Owl			1					
Threskiornithidae (1)	Ibises								
<i>Mesembrinibis cayennensis</i>	Green Ibis	1	1	3	4		4	2	2
Charadriidae (1)	Plovers								
<i>Vanellus cayanus</i>	Pied Plover							8	
Scolopacidae (1)	Sandpipers								
<i>Actitis macularius</i>	Spotted Sandpiper							2	1
Columbidae (7)	Pigeons, Doves								
<i>Columba cayennensis</i>	Pale-vented Pigeon	1	1	3	3		1		
<i>Columba plumbea</i>	Plumbeous Pigeon	4		4	2	2	2		
<i>Columba subvinacea</i>	Ruddy Pigeon	1							
<i>Columba speciosa</i>	Scaled Pigeon	1			1				
<i>Geotrygon montana</i>	Ruddy Quail-Dove			1			3		

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Leptoptila verreauxi</i>	White-tipped Dove	3		1		1			
<i>Leptoptila rufaxilla</i>	Gray-fronted Dove	2					1		
Psittacidae (11)	Parrots, Macaws								
<i>Ara macao</i>	Scarlet Macaw	4	4		8	2			2
<i>Ara chloroptera</i>	Red-and-Green Macaw	4	5	4	19	8			
<i>Ara ararauna</i>	Blue-and-Yellow Macaw					6			
<i>Amazona amazonica</i>	Orange-winged Parrot	20	14	12	6	4	4		
<i>Pionus menstruus</i>	Blue-headed Parrot	6	5	2	15	12	3		3
<i>Deropterus accipitrinus</i>	Red-fan Parrot		4	2	4		2		
<i>Pyrrhura picta</i>	Painted Parakeet	11	21	40	16	3	6		11
<i>Brotogeris chrysopterus</i>	Golden-winged Parakeet	8		6	2	2			
<i>Pionites melanocephala</i>	Black-headed Parrot		6	9	3	5	3		
<i>Pionus fuscus</i>	Dusky Parrot	3		3	3				
<i>Pionopsitta caica</i>	Caica Parrot	3			5				
Cuculidae (2)	Cuckoos								
<i>Piaya melanogaster</i>	Black-bellied Cuckoo				1				
<i>Piaya cayana</i>	Squirrel Cuckoo	1		1	2				
Apodidae (3)	Swifts								
<i>Chaetura spp.</i>	Chaetura swift		4		5				
<i>Chaetura brachyura</i>	Short-tailed Swift			2					
<i>Chaetura spinicaudus</i>	Band-rumped Swift				15				
Caprimulgidae (2)	Nighthawks, Nightjars								
<i>Caprimulgus nigrescens</i>	Blackish Nightjar			3	5				3
<i>Caprimulgus spp.</i>	Nightjar species				1				
Trochilidae (10)	Hummingbirds								
<i>Phaethornis superciliosus</i>	Eastern Long-tailed Hermit			2	3				
<i>Phaethornis bourcieri</i>	Straight-billed Hermit	1			2				

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Phaethornis ruber</i>	Reddish Hermit	3	1	4	4	2	1		
<i>Phaethornis spp.</i>	Hermit species	2							
<i>Campylopterus largipennis</i>	Gray-breasted Sabrewing			1					
<i>Florisuga mellivora</i>	White-necked Jacobin		2						1
<i>Threnetes leucurus</i>	Pale-tailed Barbthroat					1			
<i>Amazilia spp.</i>	Emerald species				2				2
<i>Amazilia leucogaster</i>	Plain-bellied Emerald	1							
<i>Thalurania furcata</i>	Fork-tailed Woodnymph	1							
Trogonidae (5)	Trogons								
<i>Trogon viridis</i>	White-tailed Trogon	4	2	5	1		4		
<i>Trogon melanurus</i>	Black-tailed Trogon	1				1	1		
<i>Trogon rufus</i>	Black-throated Trogon	4							
<i>Trogon personatus</i>	Masked Trogon		2	2	1	2			
<i>Trogon violaceus</i>	Violaceous Trogon	1		1	2				
Alcedinidae (5)	Kingfishers								
<i>Megaceryle torquata</i>	Ringed Kingfisher	5	4			1			
<i>Chloroceryle amazona</i>	Amazon Kingfisher	1			3		2		1
<i>Chloroceryle inda</i>	Green-and-Rufous Kingfisher		2	2					
<i>Chloroceryle americana</i>	Green Kingfisher	4	2	1	1		1		
<i>Chloroceryle aenea</i>	American Pygmy Kingfisher								1
Galbulidae (3)	Jacamars								
<i>Jacamerops aurea</i>	Great Jacamar	3	1	3	3				
<i>Galbula galbula</i>	Green-tailed Jacamar	2	1	2			1		
<i>Galbula albirostris</i>	Yellow-billed Jacamar			7	2				
Bucconidae (2)	Puffbirds								
<i>Monasa atra</i>	Black Nunbird	8	5	3					
<i>Chelidoptera tenebrosa</i>	Swallow-winged Puffbird	4						2	3

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
Momotidae (1)									
<i>Momotus momota</i>	Blue-crowned Motmot	1	1		2	2	1		
Ramphastidae (4)	Barbets, Toucans								
<i>Ramphastos tucanus</i>	White-throated Toucan	7	6	7	8	1	1		
<i>Ramphastos vitellinus</i>	Channel-billed Toucan	2	3		3	2	2		
<i>Selenidera culik</i>	Guianan Toucanet			2					
<i>Pteroglossus aracari</i>	Black-necked Aracari					3			
Furnariidae (4)	Ovenbirds								
<i>Automolus ochrolaemus</i>	Buff-throated Foliage-gleaner			2		1			
<i>Automolus spp.</i>	Foliage-gleaner		2						
<i>Xenops minutus</i>	Plain Xenops			3		1			
<i>Sclerurus spp.</i>	Leaf-tosser species			1					
Dendrocolaptidae (11)	Woodcreepers								
<i>Sittasomus griseicapillus</i>	Olivaceous Woodcreeper				1				
<i>Dendrocolaptes picumnus</i>	Black-banded Woodcreeper	2	1	5	5	2	2		
<i>Dendrocincla fuliginosa</i>	Plain-brown Woodcreeper	2	2	3	3	1			
<i>Glyphorhynchus spirurus</i>	Wedge-billed Woodcreeper	17	1	6	17				
<i>Xiphorhynchus picus</i>	Straight-billed Woodcreeper	1							
<i>Xiphorhynchus pardalotus</i>	Chestnut-rumped woodcreeper		2	4	7		1		
<i>Xiphocolaptes albicollis</i>	White-throated Woodcreeper	1							
<i>Dendrocolaptes certhia</i>	Amazon-barred Woodcreeper			6	1				
<i>Hylexetastes perrotii</i>	Red-billed Woodcreeper	2		3	4				
<i>Xiphorhynchus pardalotus</i>	Buff-throated Woodcreeper	3	5	3	3				
<i>Xiphorhynchus guttatus</i>	White-chinned Woodcreeper	3	2	5	5				
Picidae (10)	Woodpeckers								
<i>Dryocopus lineatus</i>	Lineated Woodpecker			2					
<i>Campephilus rubricollis</i>	Red-necked Woodpecker	2	2	5			2		

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Celeus flavus</i>	Cream-colored Woodpecker	2	1		6	1			
<i>Celeus elegans</i>	Chestnut Woodpecker						2		
<i>Piculus flavigula</i>	Yellow-throated Woodpecker	4	2	6	6	2	1		
<i>Melanerpes cruentatus</i>	Yellow-tufted Woodpecker		2						
<i>Celeus undatus</i>	Waved Woodpecker		2		2	2	2		
<i>Celeus torquatus</i>	Ringed Woodpecker				2	2			
<i>Veniliornis passerinus</i>	Little Woodpecker	1		1					
<i>Veniliornis spp.</i>	Verniliornis' Woodpecker				2				
Thamnophilidae (29)	Typical Antbirds								
<i>Thamnophilus murinus</i>	Mouse-colored Antshrike	8	2	10	2	2	2		
<i>Myrmeciza ferruginea</i>	Ferruginous-backed Antbird	2		10	7	2			
<i>Myrmotherula guttata</i>	Rufous-bellied Antwren	2		4			1		
<i>Myrmotherula menestresii</i>	Gray Antwren	2	6	4	2				
<i>Myrmotherula spp.</i>	Antwren					2			
<i>Myrmotherula brachyura</i>	Pygmy Antwren	4	4	7					
<i>Herpsilochmus stictocephalus</i>	Todd's Antwren	2	2	8	6	2	2		
<i>Herpsilochmus sticturus</i>	Spot-tailed Antwren	2	2	6	2	2	6		
<i>Myrmotherula behni</i>	Plain-winged Antwren	2		2		1			
<i>Microrhophias quixensis</i>	Dot-winged Antwren	2	2	4					
<i>Myrmotherula surinamensis</i>	Guianan streaked Antwren	2							
<i>Terenura spodioptila</i>	Ash-winged Antwren	2	2	2		2			
<i>Cercomacra cinerascens</i>	Gray Antbird	4	6		2	2			
<i>Hylophylax poecilinota</i>	Scaled-backed Antbird			1	2				
<i>Hypocnemis cantator</i>	Guianan Warbling Antbird		1	2	2				
<i>Thamnophilus doliatus</i>	Barred Antshrike	3							
<i>Myrmotherula longipennis</i>	Long-winged Antwren	5	2	2	2	2	2		
<i>Hypocnemoides melanopogon</i>	Black-chinned Antbird	4							

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Thamnomanes ardesiacus</i>	Dusky-throated Antshrike	10	8	8	6	4	2		
<i>Thamnomanes caesius</i>	Cinereous Antshrike	2	2	4	2	3			
<i>Cymbilaimus lineatus</i>	Fasciated Antshrike	4		1	2				
<i>Taraba major</i>	Great Antshrike	2							
<i>Cercomacra tyrannina</i>	Dusky Antbird		4	6					
<i>Hypocnemoides melanopogon</i>	Black-chinned Antbird	4							
<i>Pithy albifrons</i>	White-plumed Antbird					2	1		
<i>Myrmoborus leucophrys</i>	White-browed Antbird			2					
<i>Cercomacra nigrescens</i>	Blackish Antbird					2			
<i>Myrmeciza atrothorax</i>	Black-throated Antbird			2	2				
<i>Sclateria naevia</i>	Silvered Antbird			2					
Formicariidae (4)	Ground Antbirds								
<i>Myrmothera campanisoma</i>	Thrush-like Antpitta	3		6	2		1		
<i>Hylopezus macularis</i>	Spotted Antpitta	4	1	7	12		1		
<i>Formicarius colma</i>	Rufous-capped Antthrush	1	1	2	3				
<i>Formicarius analis</i>	Black-faced Antthrush			3			3		
Tyrannidae (25)	Tyrant Flycatchers								
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher	1							
<i>Tolmomyias assimilis</i>	Zimmer's Flycatcher	2	6	4	2	2	2		
<i>Conopias parva</i>	Yellow-throated Flycatcher		2		7	2	2		
<i>Lophotriccus galeatus</i>	Helmented Pygmy-Tyrant	3	2	6	1	2			
<i>Myiornis ecaudatus</i>	Short-tailed Pygmy-Tyrant	1	2						
<i>Myiopagis flavivertex</i>	Yellow-crowned Tyrannulet	2	5	1	4	2	1		
<i>Platyrrinchus coronatus</i>	Golden-crowned Spadebill	6		3	1				
<i>Platyrrinchus platyrhynchos</i>	White-crested Spadebill	1					1		
<i>Myiobius barbatus</i>	Whiskered Flycatcher	2	1	4					
<i>Mionectes oleagineus</i>	Ochre-bellied Flycatcher					1	2		

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Onychorhynchus coronatus</i>	Northern Royal Flycatcher				1				
<i>Contopus spp.</i>	Flycatcher	1							
<i>Elaenia spp.</i>	Elaenia			1					
<i>Tyrannus melancholicus</i>	Tropical Kingbird			5		2	2		
<i>Pitangus sulphuratus</i>	Great Kiskadee					2			
<i>Myiozetetes cayanensis</i>	Rusty-margined Flycatcher					3			
<i>Legatus leucophaeus</i>	Piractic Flycatcher					2			
<i>Terenotriccus erythrurus</i>	Ruddy-tailed Flycatcher						1		
<i>Tityra cayana</i>	Black-tailed Tityra						2		
<i>Octornis littoralis</i>	Drab Water-tyrant	2		2		2	2	3	5
<i>Ramphotrigon ruficauda</i>	Rufous-tailed Flatbill		1						
<i>Attila cinnamomeus</i>	Cinnamon Attila	1	1						
<i>Attila spadiceus</i>	Bright-rumped Attila	2	1		1	1	1		
<i>Laniocera hypopyrra</i>	Cinereous Mourner				1				
<i>Lophotriccus spp.</i>	Pygmy-Tyrant		2	2					
Cotingidae (5)	Cotingas								
<i>Lipaugus vociferans</i>	Screaming Pia	15	6	15	26	1	5		
<i>Perissocephalus tricolor</i>	Capuchin Bird			4	1				
<i>Querula purpurata</i>	Purple-throated Fruitcrow			3	3	8	4		
<i>Phoenicircus carnifex</i>	Guianan Red-Cotinga	2		2	4	1			
<i>Rupicola rupicola</i>	Guianan Cock-of-the-Rock								
Pipridae (4)	Manakins								
<i>Tyranneutes virescens</i>	Tiny-Tyrant Manakin	5		4	6	6	8		
<i>Pipra erythrocephala</i>	Golden-headed Manakin	1		2	2	2	1		
<i>Pipra pipra</i>	White-crowned Manakin			1	1				
<i>Shiffornis turdina</i>	Thrush-like Schiffornis	1	1	7		2	1		
Turdidae (2)	Thrushes								

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Thryothorus coraya</i>	Cocoa Thrush	3	2	7	4		1		
<i>Turdus albicollis</i>	White-necked Thrush			1			1		
Poliophilidae (2)	Gnatwrens, Gnatcatchers								
<i>Ramphocaenus melanurus</i>	Long-billed Gnatwren	4			2	2			
<i>Microbates collaris</i>	Collared Gnatwren					1			
Vireonidae (5)	Vireos								
<i>Hylophilus thoracicus</i>	Lemon-chested Greenlet	4	6	2	2	2			
<i>Hylophilus muscicapinus</i>	Buff-cheeked Greenlet	4	2	2	2				
<i>Hylophilus pectoralis</i>	Ashy-headed Greenlet		1						
<i>Vireolanius leucotis</i>	Slaty-capped Shrike-vireo			2			3		
<i>Vireo spp.</i>	Vireo	1		1	2				
Hirundinidae (4)	Swallows								
<i>Tachycineta albiventer</i>	White-winged Swallow	7	5			5	6	7	5
<i>Atticora fasciata</i>	White-banded Swallow	4	7						17
<i>Atticora melanoleuca</i>	Black-collared Swallow			23		15	20		25
<i>Progne chalybea</i>	Gray-breasted Martin			34					
Troglotidae (4)	Wrens								
<i>Thryothorus coraya</i>	Coraya Wren	4							
<i>Cyphorhinus arada</i>	Musician Wren	4		6	6				
<i>Thryothorus leucotis</i>	Buff-breasted Wren	3							
<i>Henicorhina leucosticta</i>	White-breasted Woodwren						2		
Coerebidae (1)	Bananaquits								
<i>Coereba flaveola</i>	Bananaquit		2						
Thraupidae (5)	Tanagers								
<i>Ramphocelus carbo</i>	Silvered-beaked Tanager	6							
<i>Tachyphonus surinamus</i>	Fulvous-crested Tanager			1					
<i>Tachyphonus cristatus</i>	Flame-crested Tanager					1	1		

Common Name	Scientific Name	Rewa Sites		Essequibo Sites				Opportunistic	
		A	B	A	B	C	D	Rewa	Esseq
<i>Thraupis palmarum</i>	Palm Tanager					2			
<i>Tangara spp.</i>	Tangara species		3		2				
Cardinalidae (2)	Grosbeaks, Saltators								
<i>Caryothraustes canadensis</i>	Yellow-green Grosbeak		1			2			
<i>Cyanocompsa cyanooides</i>	Blue-black Grosbeak	1	1	3					
Parulidae (1)	Warblers								
<i>Phaeothlypis rivularis</i>	Riverbank Warbler	2		2					
Emberizidae (1)	Seedeaters, Seedfinches, Cardinals								
<i>Paroaria gularis</i>	Red-capped Cardinal	4		5		5			
Icteridae (5)	New World Blackbirds								
<i>Molothrus oryzivorus</i>	Giant Cowbird			3		1			
<i>Cacicus cela</i>	Yellow-rumped Cacique	6			3	14			
<i>Cacicus haemorrhous</i>	Red-rumped Cacique	7		5	4	2	3		30
<i>Psarocolius viridis</i>	Green Oropendola	1	1	1		2	4		
<i>Psarocolius decumanus</i>	Crested Oropendola								9
Number of Individuals		380	274	502	447	230	171	76	173

Appendix 5

List of Non-volant Mammals and Bat Species Recorded (F. Clarke)

Non-volant mammals observed and identified by signs (tracks/faeces or sounds) at different study sites or known to occur within the concession (interviews with local assistants and guides). Obs = mammals observed and/or photographed (estimated numbers of individuals given in parenthesis); Signs =mammal signs (tracks, faeces, diggings, wallows, scratch marks, vocalisations). The presence of an additional two species in the concession area - tamandua (*Tamandua tetradactyla*) and ocelot (*Leopardus pardalis*) - was confirmed through interviews with indigenous field guides.

Phase One Survey Results - 17 October to 01 November, 2011

Taxon	Common Name	Rewa A	Rewa B	Essequibo A	Essequibo B
MARSUPIALIS					
Didelphidae					
<i>Didelphis marsupialis</i>	Common opossum	Obs (1)			Signs
<i>Philander opossum</i>	Common gray four-eyed opossum		Obs (1)		
<i>Marmosa murina</i>	Murine mouse opossum		Obs (1)		
EDENTATA					
Myrmecophagidae					
<i>Myrmecophaga tridactyla</i>	Giant anteater			Signs	Signs
Dasypodidae					
<i>Dasypus novemcinctus</i>	Nine-banded long-nosed armadillo			Signs	Signs
<i>Priodontes maximus</i>	Giant armadillo	Signs			
PRIMATES					
Callitrichidae					
<i>Saguinus midas</i>	Golden-handed tamarin				Obs (4)
Cebidae					
<i>Cebus olivaceus</i>	Wedge-capped capuchin monkey	Obs (6)			Obs (>5)
<i>Cebus apella</i>	Brown capuchin monkey		Obs (>5)	Obs (7)	Obs (<10)
<i>Alouatta seniculus</i>	Red howler monkey	Obs (2)	Obs (12)	Signs	Signs
<i>Ateles paniscus</i>	Black spider monkey	Signs	Obs (5)	Signs	Obs (5)
<i>Chiropotes satanus</i>	Brown-bearded saki monkey		Obs (5)		
<i>Saimiri sciureus</i>	Squirrel monkey		Obs (>5)		Obs (<20)
CARNIVORA					
Procyonidae					
<i>Nasua nasua</i>	South American coati			Obs (1)	
Mustelidae					
<i>Lutra longicaudis</i>	Southern river otter				Obs (1)
<i>Pteronura brasiliensis</i>	Giant otter	Obs (10)	Obs (2)	Obs (5)	

Taxon	Common Name	Rewa A	Rewa B	Essequibo A	Essequibo B
Felidae					
<i>Leopardus wiedii</i>	Margay	Obs (1)			
<i>Leopardus pardalis</i>	Ocelot				
<i>Puma concolor</i>	Puma				Signs
<i>Panthera onca</i>	Jaguar				Signs
ARTIODACTYLA					
Cervidae					
<i>Mazama spp.</i>	Brocket deer			Signs	Signs
Tayassuidae					
<i>Tayassu pecari</i>	White-lipped peccary	Signs			
<i>Tayassu tajacu</i>	Collared peccary	Signs	Signs	Signs	Signs
PERISSODACTYLA					
Tapiridae					
<i>Tapirus terrestris</i>	Lowland tapir	Signs		Signs	Signs
RODENTIA					
Sciuridae					
<i>Sciurus aestuans</i>	Guianan squirrel				Obs (1)
Hydrochaeridae					
<i>Hydrochaeris hydrochaeris</i>	Capybara	Obs (1)			
Agoutidae					
<i>Agouti paca</i>	Paca or Labba	Obs (1)	Obs (6)	Obs (1)	Signs
Dasyproctidae					
<i>Dasyprocta leporina</i> ⁹⁷	Red-rumped agouti	Obs (1)	Obs (1)	Obs (3)	Obs (3)
<i>Myoprocta exilis</i>	Acouchi	Obs (1)			
Muridae					
<i>Neacomys spp.</i>	Spiny mouse			Obs (1)	

⁹⁷ May be synonymous with *Dasyprocta cristata*

Phase Two Survey Results - 01 to 19 February, 2012

Taxon	Common Name	Rewa A	Rewa B	Essequibo A	Essequibo B	Essequibo C	Essequibo D
MARSUPIALIS							
Didelphidae							
<i>Marmosa murina</i>	Murine mouse opossum			Obs (1)	Obs (1)		
EDENTATA							
Dasypodidae							
<i>Dasypus novemcinctus</i>	Nine-banded long-nosed armadillo		Signs (2+2)	Signs (3)	Signs (1)	Signs (1+2)	
<i>Priodontes maximus</i>	Giant armadillo					Signs (1)	Signs (1)
PRIMATES							
Cebidae							
<i>Cebus olivaceus</i>	Wedge-capped capuchin monkey	Obs (6+5)			Obs (6)		Obs (8)
<i>Cebus apella</i>	Brown capuchin monkey				Obs (<10)		Obs (4)
<i>Alouatta seniculus</i>	Red howler monkey	Obs (2+2)	Obs (4+2)	Obs (7)	Obs (4)	Obs (4+6)	Obs (4)
<i>Ateles paniscus</i>	Black spider monkey	Obs (2)	Obs (6+2)		Obs (4)	Obs (3+4)	Obs (11+3+2)
<i>Chiropotes satanus</i>	Brown-bearded saki monkey			Obs (9)		Obs (17)	
<i>Pithecia pithicia</i>	Guianan saki monkey				Obs (4)		Obs (1)
<i>Saimiri sciureus</i>	Squirrel monkey						Obs (24)
CARNIVORA							
Procyonidae							
<i>Potos flavus</i>	Kinkajou						Obs (6)
Mustelidae							
<i>Pteronura brasiliensis</i>	Giant otter	Obs (10)	Obs (5)	Obs (2)			
Felidae							
<i>Panthera onca</i>	Jaguar				Obs (1)		
Artiodactyla							
Cervidae							
<i>Mazama americana</i>	Red-brocket Deer				Obs (1)	Signs (2)	Signs (1+1)
<i>Mazama spp.</i>	Unidentified deer					Signs (2)	
Tayassuidae							
<i>Tayassu pecari</i>	White-lipped peccary	Sign(>30)	Signs (>40)	Signs (>50)	Signs (>40)		

Perissodactyla							
Tapiridae							
<i>Tapirus terrestris</i>	Lowland tapir		Signs (2)	Signs (1)	Signs (1)	Signs (1+1)	Signs (2)
RODENTIA							
Agoutidae							
<i>Agouti paca</i>	Paca or Labba	Signs (2)			Signs (1+1)	Signs (2)	Signs(1)/Obs (3)
Dasyproctidae							
<i>Dasyprocta leporina</i> ⁹⁸	Red-rumped agouti	Signs (2)	Obs (3+1)	Signs (2)	Obs (3+2)	Obs (2+4)	Signs (2+2)
Echimyidae							
<i>Proechimys spp.</i>	Spiny Rat/Bush Rat				Obs (1)	Obs (1)	

List of bat species recorded during Phase One and Phase Two surveys

Taxon	Common name	Rewa A	Rewa B	Essequibo A	Essequibo B	Essequibo C	Essequibo D	Totals
Emballonuridae								
<i>Diclidurus ingens</i>	Greater ghost bat						1	1
<i>Rhynchonycteris naso</i>	Proboscis bat or river bat	Obs	3	Obs				3
<i>Saccopteryx bilineata</i>	Greater white-lined sac-winged bat	2	Obs					2
Noctilionidae								
<i>Noctilio albiventris</i>	White-fronted fishing bat	Obs	Obs	Obs				
Mormoopodae								
<i>Pteronotus parnellii</i>	Greater moustached bat		2		5			7
Phyllostomidae								
<i>Artibeus lituratus</i>	Greater fruit-eating bat	1	2	2	1			7
<i>Artibeus gnomus</i>	Dwarf fruit-eating bat			1	1	1		3
<i>Artibeus obscurus</i>	Sooty fruit-eating bat	1	2	7	12	5	3	28
<i>Artibeus planirostris</i>	Flat-faced fruit-eating bat	2	1	4	1	5	1	14
<i>Carollia perspicillata</i>	Common short-tailed fruit bat		2	2	3			7
<i>Choeroniscus godmani</i>	Godman's long-tailed bat				2			2
<i>Choeroniscus minor</i>	Lesser long-tailed bat				1			1
<i>Chrotopterus auritus</i>	Woolly false vampire bat				1			1

⁹⁸ May be synonymous with *Dasyprocta cristata*

Taxon	Common name	Rewa A	Rewa B	Essequibo A	Essequibo B	Essequibo C	Essequibo D	Totals
<i>Glossophaga soricina</i>	Common long-tongued bat			1				1
<i>Phyllostomus elongatus</i>	Dark spear-nosed bat		1		4			5
<i>Micronycteris daviesi</i>	Bartica bat						1	1
<i>Micronycteris megalotis</i>	Little big-eared bat				1			1
<i>Micronycteris schmidtorum</i>	Schmidt's big-eared bat			1				1
<i>Rhinophylla pumilio</i>	Dwarf little fruit bat						1	1
<i>Tonatia saurophila</i>	Stripe-headed round-eared bat		1					1
<i>Tonatia silvicola</i>	White-throated round-eared bat			2				2
<i>Trachops cirrhosus</i>	Fringe-lipped bat or frog eating bat	1		1	2			4
Vespertilionidae								
<i>Myotis riparius</i>	Riparian myotis		2					2
Total captures		7	16	21	34	11	7	96
Mist-netting effort (M²h)		4,867	9,235	24,590	24,950	2,995	2,995	69,632
Captures per unit effort		0.0014	0.0017	0.0008	0.0013	0.0037	0.0023	0.0014

Appendix 6

List of Butterfly Species (includes fruit trap and VES records) and other Invertebrates Recorded (C. Chin and H. Sambhu)

No.	Species	Family/ Group	Method	Rewa A		Rewa B		Essequibo A		Essequibo B		Essequibo C		Essequibo D		Total
				Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	
1	<i>Aphrissa statira statira</i>	Pieridae: Coliadinae	VES	10		130		25		3						168
2	<i>Cissia sp. 1</i>	Nymphalidae: Satyrinae	VES/ Traps	27		16		65	2	5						115
3	<i>Cissa penelope</i>	Nymphalidae: Satyrinae	VES/ Traps		35		24	1	9	2	8		6		14	99
4	<i>Heliconius wallaceae</i>	Nymphalidae: Heliconiinae	VES/ Traps	1	2	53	3	17		7			1			84
5	<i>Paraceuptycha metaleuca</i>	Nymphalidae: Satyrinae	VES/ Trap		34		31	3					2		2	72
6	<i>Bia actorion</i>	Nymphalidae: Morphinae	VES/ Traps		5		4		18	6	11		3		4	51
7	<i>Morpho helenor extremus</i>	Nymphalidae: Morphinae	VES/ Traps		1		4		7	6	14		2		6	40
8	<i>Phoebis argante argante</i>	Pieridae: Coliadinae	VES	3		10	3	8		2			3			29
9	<i>Phoebis sannae</i>	Pieridae: Coliadinae	VES				11		5		1		7			24
10	<i>Taygetis laches</i>	Nymphalidae: Satyrinae	VES/ Traps	2	3		2	4		4			2		5	22
11	<i>Posttaygetis penelea</i>	Nymphalidae: Satyrinae	VES/ Traps				3	15	1	1					1	21
12	<i>Pierella lena</i>	Nymphalidae: Satyrinae	VES/ Traps		2		1		7		3		4		1	18
13	<i>Opsiphames cassina merianae</i>	Nymphalidae: Morphinae	Traps		4		4			2	2		2		1	15
14	<i>Pierella astyoche</i>	Nymphalidae: Satyrinae	VES/ Traps						6		1		3		4	14
15	Species 15	Hesperiidae	VES	6				6								12
16	<i>Prepona pheridamas</i>	Nymphalidae: Charaxinae	VES/ Traps							11	1					12

No.	Species	Family/ Group	Method	Rewa A		Rewa B		Essequibo A		Essequibo B		Essequibo C		Essequibo D		Total
				Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	
17	<i>Species 7 (Little Brown, c.f.)</i>	Lycaeinae	VES	1		2		4		4						11
18	<i>Colobura dirce</i>	Nymphalidae: Nymphalinae	VES/ Traps		4	1	3	1	1				1			11
19	<i>Species 3 (Little Brown, c.f.)</i>	Lycaeinae	VES	2		7										9
20	<i>Archaeoprepona demophon</i>	Nymphalidae: Charaxinae	VES/ Traps		3		3	2					1			9
21	<i>Strephonota strephon</i>	Lycaenidae: Theclinae	VES						6				1		1	8
22	<i>Morpho melaneus melaeus</i>	Nymphalidae: Morphinae	VES/ Traps				1	2					2		3	8
23	<i>Lycorea halia halia</i>	Nymphalidae: Danainae	VES					4		3					1	8
24	<i>Eryphanis automedon</i>	Nymphalidae: Morphinae	Traps		4		4									8
25	<i>Caligo idomeneus</i>	Nymphalidae: Morphinae	VES/ Traps				8									8
26	<i>Dryadula phaetusa</i>	Nymphalidae: Helicolinae	VES			7										7
27	<i>Caligo illioneus</i>	Nymphalidae: Morphinae	Traps		4		3									7
28	<i>Caeruleusplychia caerulea</i>	Nymphalidae: Satyrinae	VES/ Traps		3		3								1	7
29	<i>Species 9</i>	Riodinidae	VES			1		1		4						6
30	<i>Species 8 (Little Brown c.f.)</i>	Nymphalidae: Satyrinae	VES			1		4		1						6
31	<i>Species 4 (Little Brown c.f.)</i>	Nymphalidae: Satyrinae	VES	3		2		1								6
32	<i>Helicops cupido</i>	Riodinidae	VES				1			6						7
33	<i>Haetera piera</i>	Nymphalidae: Satyrinae	VES/ Traps		2				2		1				1	6
34	<i>Cissia sp. 4 c.f.</i>	Nymphalidae:	VES/			2		4								6

No.	Species	Family/ Group	Method	Rewa A		Rewa B		Essequibo A		Essequibo B		Essequibo C		Essequibo D		Total
				Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	
		Satyrinae	Traps													
35	<i>Cissia sp. 3 c.f.</i>	Nymphalidae: Satyrinae	VES/ Traps			1		5								6
36	<i>Pseudolycaena marsyas</i>	Lycaenidae: Theclinae	VES				2			2					1	5
37	<i>Philaethera dido</i>	Nymphalidae: Heliconiinae	VES				2		1				2			5
38	<i>Parides aeneas</i>	Papilionidae: Papilioninae	VES										2		3	5
39	<i>Dryas julia</i>	Nymphalidae: Heliconiinae	VES				3			1			1			5
40	<i>Species 5 c.f.</i>	Lycaeindae	VES	2				1		1						4
41	<i>Morpho sp.</i>	Nymphalidae: Morphinae	VES	1		1		2								4
42	<i>Heliconius erato</i>	Nymphalidae: Heliconiinae	VES				4									4
43	<i>Heliconius antiochus</i>	Nymphalidae: Heliconiinae	VES				2						1		1	4
44	<i>Eryphanis reevesii</i>	Nymphalidae: Morphinae	Traps		2		2									4
45	<i>Catonephele acontius</i>	Nymphalidae: Biblidinae	VES				4									4
46	<i>Caligo eurilochus</i>	Nymphalidae: Morphinae	Traps		2		2									4
47	<i>Caligo brasiliensis</i>	Nymphalidae: Morphinae	Traps		3		1									4
48	<i>Tigridia aesta tapajona</i>	Nymphalidae: Nymphalinae	Traps					1		2						3
49	<i>Species 6 (Little Yellow c.f.)</i>	Riodinidae: Little Yellow	VES	2				1								3
50	<i>Species 14. (Little Blue c.f.)</i>	Lycaeindae	VES					3								3
51	<i>Species 13</i>	Riodinidae	VES					3								3
52	<i>Prepona sp. 1</i>	Nymphalidae:	VES/					1		2						3

No.	Species	Family/ Group	Method	Rewa A		Rewa B		Essequibo A		Essequibo B		Essequibo C		Essequibo D		Total
				Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	
		Charaxinae	Traps													
53	<i>Prepona laertes</i>	Nymphalidae: Charaxinae	VES							1			2			3
54	<i>Phoebis philea philea</i>	Pieridae: Coliadinae	VES			1		2								3
55	<i>Panthiadea aeolus</i>	Lycaenidae: Theclinae	VES				1		2							3
56	<i>Hypna clytemnestra</i>	Nymphalidae: Charaxinae	Traps				1			2						3
57	<i>Cissia sp. 2 c.f.</i>	Nymphalidae: Satyrinae	VES	2		1										3
58	<i>Antirrhea adoptiva</i>	Nymphalidae: Morphinae	Traps				3									3
59	<i>Tithoera harmonia</i>	Nymphalidae: Ithomiinae	VES		1						1					2
60	<i>Taygetis sp. 1</i>	Nymphalidae: Satyrinae	VES					2								2
61	<i>Stalactis calliope</i>	Riodinidae: Riodininae	VES					1	1							2
62	<i>Species 11 (Little Blue c.f.)</i>	Lycaeindae	VES	1				1								2
63	<i>Opsiphames cassiae cassiae</i>	Nymphalidae: Morphinae	Traps/ VES							1					1	2
64	<i>Heliconia metharme metharme</i>	Nymphalidae: Helicolinae	VES					2								2
65	<i>Hamadryus feronia</i>	Nymphalidae: Biblidinae	VES				2									2
66	<i>Zaretis isidora</i>	Nymphalidae: Charaxinae	VES						1							1
67	<i>Tigridia sp.</i>	Nymphalidae: Nymphalinae	VES										1			1
68	<i>Theclinae sp.</i>	Lycaenidae: Theclinae	VES												1	1

No.	Species	Family/ Group	Method	Rewa A		Rewa B		Essequibo A		Essequibo B		Essequibo C		Essequibo D		Total
				Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	
69	<i>Taygetis sp. 2 c.f.</i>	Nymphalidae: Satyrinae	VES					1								1
70	<i>Taygetis echo</i>	Nymphalidae: Satyrinae	VES							1						1
71	<i>Species 19</i>	Hesperiidae	VES							1						1
72	<i>Species 18 (Little Brown c.f.)</i>	Nymphalidae: Satyrinae	VES							1						1
73	<i>Species 16 (Little Blue c.f.)</i>	Lycaeidae	VES							1						1
74	<i>Species 12 c.f.</i>	Riodinidae: Riodininae	VES					1								1
75	<i>Species 10 (Little Blue c.f.)</i>	Lycaeidae	VES					1								1
76	<i>Parides sesostris</i>	Papilionidae: Papilioninae	VES												1	1
77	<i>Morpho sp. 2</i>	Nymphalidae: Morphinae	Traps					1								1
78	<i>Morpho sp. 1</i>	Nymphalidae: Morphinae	Traps					1								1
79	<i>Morpho rhetenor</i>	Nymphalidae: Morphinae	VES												1	1
80	<i>Heraclides thoas</i>	Papilionidae: Papilioninae	VES												1	1
81	<i>Heliconius burneyi</i>	Nymphalidae: Heliconiinae	VES												1	1
82	<i>Heliconia sp. 1</i>	Nymphalidae: Helicolinae	VES			1										1
83	<i>Catoblepia berecynthia</i>	Nymphalidae: Morphinae	VES												1	1
84	<i>Caligo suzanna</i>	Nymphalidae: Morphinae	Traps				1									1
85	<i>Caligo sp.</i>	Nymphalidae: Morphinae	VES	1												1
86	<i>Biblis hyperia</i>	Nymphalidae:	VES										1			1

No.	Species	Family/ Group	Method	Rewa A		Rewa B		Essequibo A		Essequibo B		Essequibo C		Essequibo D		Total
				Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	Nov 11	Feb 12	
		Biblidinae														
87	<i>Archaeoprepona licomedes</i>	Nymphalidae: Charaxinae	Traps				1									1
88	<i>Adelpha sp. 1</i>	Nymphalidae: Limenitidinae	VES										1			1
Species Total				15	18	17	35	36	15	26	12		23		24	
Site Totals				31 species		48 species		46 species		33 species		23 species		24 species		

List of invertebrate taxa opportunistically recorded within the concession

Invertebrates Opportunistically Recorded*	Phase One	Phase Two
Odonata (Dragon-flies, Damselfly)	✓	✓
Phasmatidae (Stick-insects)	✓	✓
Blattaria (Roaches)	✓	✓
Mantodea (Mantids)		✓
Coleoptera (Beetles, diving beetles)	✓	✓
Diptera (True Flies)	✓	✓
Hymenoptera (Ants, Bees and Wasps)	✓	✓
Isoptera (Termites)	✓	✓
Plecoptera (stoneflies)		✓
Embioptera (webspinners)		✓
Araneae (Spiders)	✓	✓
Trichoptera (Caddisflies)		✓
Hemiptera (Stink bugs)	✓	✓
Homoptera (Leafhoppers, Cicada, Planthopper)		✓
Dermaptera (earwigs)		✓
Orthoptera (Grasshoppers)		✓
Lepidoptera (moths)		✓
Chordeumida (Millipede)		✓
Neuroptera (Dobsonfly)		✓
Ephemeroptera (Mayflies)		✓
Amblypygi (Whip scorpion)	✓	✓
Africanised honey bee (<i>Apis mellifera</i>)	✓	✓
Leaf cutter ant (<i>Atta</i> spp.)	✓	✓
Orb web spider	✓	✓
Army ant	✓	✓

*It should be noted that no endemic species were recorded for both survey phases. Endemic species⁹⁹ include: a grasshopper *Acantheremus tenuis*¹⁰⁰, a katydid *Cnemidophyllum granti*¹⁰¹, an ant *Rogeria tsumani*¹⁰², and a leafhopper *Tomopennis tumidus*¹⁰³. Other endemic invertebrates include a jumping spider *Scopocira carinata*¹⁰⁴, a huntsman spider *Sparianthina rufescens*¹⁰⁵, a goblin spider *Scaphiella kartabo*¹⁰⁶, and a freshwater crab *Microthelphusa meansi*¹⁰⁷. IUCN recorded two endemic species of freshwater crabs¹⁰⁸ and one threatened species¹⁰⁹ (grouped as 'Other Invertebrate'). The IUCN Invertebrate Red Data Book¹¹⁰ (1983) listed none of the butterfly species found in this survey. None of Guyana's butterfly species were found listed on the IUCN Red List of Threatened Species as

⁹⁹ <http://Intreasures.com/guyana.html>

¹⁰⁰ <http://orthoptera.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=2742>

¹⁰¹ <http://orthoptera.speciesfile.org/Common/basic/ShowImage.aspx?TaxonNameID=5093&ImageID=4346>

¹⁰² Lapolla, J. & J. Sosa-Calvo. (2006). Review of the ant genus *Rogeria* (Hymenoptera: Formicidae) in Guyana. *Zootaxa* 1330: 59–68.

¹⁰³ J. Maldonado Capriles. 1984. Studies of Idiocerinae Leafhoppers, Xvi: *Tomopennis*, A New Genus from Guyana and a key to the Neotropical Genera of the Subfamily Carib. *J. Sci.* 20(3-4). 1984

¹⁰⁴ <http://salticidae.org/salticid/diagnost/scopocir/carinata.htm>

¹⁰⁵ Jäger, P., P. C. Anne Rheims, and F. Martín Labarque. 2009. On the huntsman spider genera *Sparianthina* Banks, 1929 and *Anaptomecus* Simon, 1903 from South and Central America (Araneae, Sparassidae). *ZooKeys* 16: 115-147

¹⁰⁶ Platnicka, N and N. Dupérréb. 2010. The Goblin Spider Genus *Scaphiella* (Araneae, Oonopidae). *Bulletin of the American Museum of Natural History* Number 332 :1-156.

¹⁰⁷ Cumberlidge, N. 2007. A new species of freshwater crab of the genus *Microthelphusa* (Brachyura: Pseudothelphusidae) from a remote isolated cloud forest on a tabletop mountain in western Guyana, South America.

¹⁰⁸ http://www.iucnredlist.org/documents/summarystatistics/2011_2_RL_Stats_Table6a.pdf

¹⁰⁹ http://www.iucnredlist.org/documents/summarystatistics/2011_2_RL_Stats_Table5.pdf

¹¹⁰ <http://www.archive.org/details/iucnvertebrate83well>

endangered, rare or threatened.¹¹¹ Butterflies within the North Rupununi Butterfly Guide were not listed on the IUCN Red List (Sambhu, Per. Comm., 2011).

¹¹¹ <http://www.iucnredlist.org/>

**Appendix 7
Images**

Fish



Serrasalmus cf. serrulatus (Characidae)



Serrasalmus cf. rhombeus (Characidae)



Pygocentrus nattereri (Characidae)



Pimodella cristata (Pimelodidae)



Pygopristis denticulata (Characidae)



Myloplus spp. (Characidae)



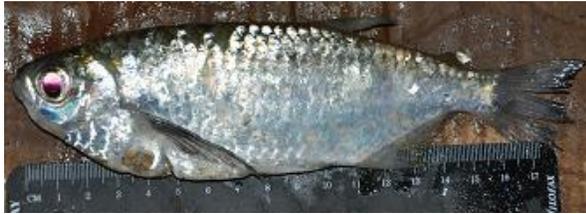
Leiarius marmoratus (Pimelodidae)



Agoniates halecinus (Characidae)



Pristobrycon striolatus (Characidae)



Triportheus roundatus (Characidae)



Hydrolycus tatauaia (Cynodontidae)



Moenkhausia grandisquamis (Characidae)



Moenkhausia lepidura (Characidae)



Leporinus spp. (Anostomidae)



Pygocentrus nattereri (Characidae)



Aphyocharax erythrus (Characidae)



Pseudoplatystoma fasciatum (Pimelodidae)



Leiarius pictus (Pimelodidae)



Paracanthopoma spp. (Trichomycteridae)



Characidium spp. (Characidae)



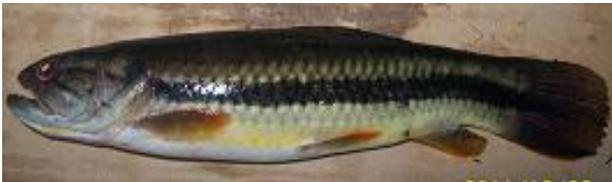
Moenkhausia cf. cotinho (Characidae)



Hyphessobrycon cf. copelandi (Characidae)



Moenkhausia collettii (Characidae)



Hoplerethrinus unitaeniatus (Erythrinidae)



Megalechis picta (Callichthyidae)



Pyrrhulina spp. (Lebiasinidae)



Brachyhypopomus spp. (Gymnotidae)



Bunocephalus spp. (Aspredinidae)



Cichla ocellaris (Cichlidae)



Apistogramma spp. (Cichlidae)



Leporinus maculatus (Anostomidae)



Crenicichla cf. *notophthalmus* (Cichlidae)



Batrochoglanis spp. (Pimelodidae)



Plagioscion squamosissimus (Sciaenidae)



Cynopotamus essequibensis (Characidae)



Hemisorubim platyrhynchos (Pimelodidae)



Tetragoneopterus chalcus (Characidae)



Bivibranchia spp. (Hemiodontidae)



Brycon pesu (Characidae)



Boulengerella cuvieri (Ctenolucidae)



Myleus setiger



Cichla temenis (Characidae)



Hemiodontichthys acipencerinus (Loricaridae)



Amplydoras hancocki (Doradidae)



Characidium fasciatum (Characidae)



Gymnorhamphichthys ronndoni (Gymnotidae)



Ochmacanthus spp.- (Trichomycteridae)



Osteoglossum bicirrosum (Osteoglossidae)



Prochilodus negricans (Prochilodontidae)



Colomesus asellus (Tetraodontidae)



Apionichthys finis (Acharidae)



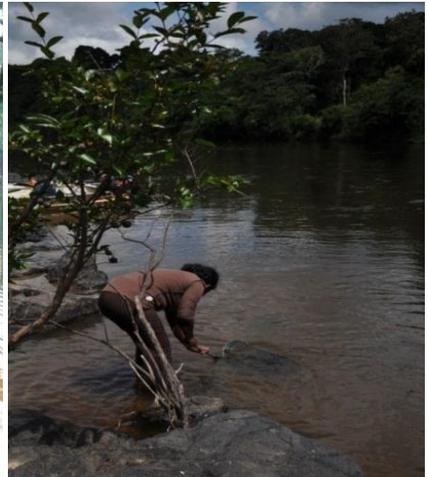
Leporinus nigrotaeniatus



Hypostomus plecostomus



Leporinus fasciatus



From left to right the main fishing methods used: baited hook and line, cast net, and dip-net



Pictures above showing (left to right) gill net and dragnet methods being used

Amphibians and Reptiles



Glenny King uses a snake stick to search among buttress roots for snakes



Hypsiboas calcaratus



Hypsiboas boans



Allobates femoralis



Ameiva ameiva (adult)



Podocnemis expansa



Podocnemis unifilis



Corallus caninus (juvenile)



Hypsiboas sibleszi



Colestehus spp.



Ammerga trivittatus



Podocnemis unifilis (juvenile)



Corallus caninus (adult)



Drymoluber dichrous



Erythrolamprus aesculapii

Mammals



Pteronura brasiliensis



Marmosa murina



Agouti paca



Cebus olivaceus



Saguinus midas



Peccary wallow



Chrotopterus auritus



Artibeus obscurus



Micronycteris schmidtorum



Myotis riparius



Pteronotus parnellii



Tonatia silvicola

Avifauna



Wedge-billed Woodcreeper



Yellow-billed Jacamar



White-chinned Woodcreeper



Golden-crowned Spadebill



Plain Xenops



Blue-throated Piping-Guan



Eastern Long-tailed Hermit



W. Prince taking a bird out of the mist-net

Lepidoptera



Peridae: Coliadinae
Aphrissa statira statira



Peridae: Coliadinae
Phoebis argante argante



Peridae: Coliadinae
Phoebis philea philea



Nymphalidae: Danainae
Lycorea halia halia



Nymphalidae: Mophinae
Bia actorion actorion



Nymphalidae: Mophinae
Morpho helenor extremus



Nymphalidae: Mophinae
Opsiphames c. cassiae



Nymphalidae: Mophinae
O. cassina merianae



Nymphalidae: Satyrina
Cissia Penelope



Nymphalidae: Satyrina
Paraceuptycha metaleuca



Nymphalidae: Satyrina
Posttaygetis penelea



Nymphalidae: Satyrina
Taygetis echo



Nymphalidae: Satyrinae
Taygetis laches



Nymphalidae: Satyrinae
Taygetis sp. 1 c.f.



Nymphalidae: Satyrinae
Taygetis sp. 2 c.f.



Nymphalidae: Charaxinae
Archeoprepona demorphon



Nymphalidae: Charaxinae
Hypna clytemnestra



Nymphalidae: Charaxinae
Prepona laertes



Nymphalidae: Charaxinae
Prepona pheridamas



Nymphalidae: Charaxinae
Prepona sp. 1



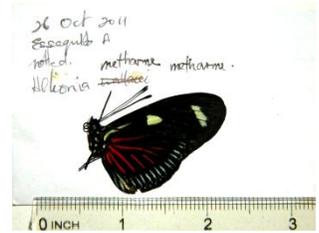
Nymphalidae:
Nymphalinae
Colobura dirce



Nymphalidae: Nymphalinae
Tigridia acesta tapajona



Nymphalidae: Helicolinae
Dryadula phaetusa



Nymphalidae: Helicolinae
Heliconia m. metharme

APPENDIX L – Forest Base Camp

