

SHERWOOD FORREST INCORPORATED

State Forest Exploratory Permit 1/2007

FINAL ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT



August, 2014

TABLE OF CONTENTS

FOREWORD 8

ACRONYMS 9

EXECUTIVE SUMMARY 11

ACKNOWLEDGEMENTS 14

CHAPTER 1: BACKGROUND 15

1.0 INTRODUCTION 15

1.1 Background to the Study..... 16

1.2 Scope of the ESIA 17

1.3 ESIA Objectives..... 17

1.4 Approach and Methodology 18

1.5 Constraints and Limitations of Study 19

1.6 Structure of the ESIA Report 21

2.0 COMPANY INFORMATION 23

2.1 Company’s Profile and Policy 23

2.2 SFI’s Environmental and Forest Management Policy 23

2.3 SFI’s Occupational Health and Safety Policy Statement 24

2.4 SFI’s Organisational Structure 25

3.0 PROJECT DESCRIPTION 27

3.1 Nature and Scope of the Project..... 27

3.2 Project Location and Environs 28

3.3 Scope of Operations/Phases of the Project 28

3.4 Feasibility of the Project 37

3.5 Partnerships for Development..... 38

3.6 Risks 39

4.0 LEGAL AND POLICY CONTEXT FOR THE PROJECT 41

4.1 Introduction 41

4.2 National Management Policies, Strategies and Plans..... 41

4.3 Institutional Governance and Instruments 43

4.4 Legislation 46

CHAPTER 2: THE FOREST ENVIRONMENT 50

5.0 NATURAL ENVIRONMENT BASELINE CONDITIONS 51

5.1 Physical Environment..... 51

 5.1.2.1 *Soils and Geology* 51

 5.1.2.2 *Land use* 54

 5.1.2.3 *Climate* 56

 5.1.2.4 *Noise Conditions*..... 57

 5.1.2.5 *Air Quality* 59

 5.1.2.5 *Water Quality*..... 61

5.2 Geographic Attributes of the Concession Area..... 64

 5.2.1 Location and access 64

 5.2.2 Hydrology/drainage density 65

 5.2.3 Relief 65

5.3 Ecological Attributes of the Area 67

 5.3.1 Biological resources 67

 5.3.1.1 *Flora* 67

 5.3.1.2 *Fauna* 75

 5.3.1.2.1 *Mammals (Mammalia)* 76

 5.3.1.2.2 *Birds (Avifauna)*..... 82

 5.3.1.2.3 *Fish* 85

 5.3.1.2.4 *Reptiles and Amphibians* 86

 5.3.1.2.5 *Lepidoptera (butterflies) and other Macro-invertebrates* 89

6.0 SOCIO-ECONOMIC ENVIRONMENT BASELINE CONDITIONS..... 90

6.1 Background 90

6.2 Stakeholder Assessment 90

6.3 Recommendations 99

CHAPTER 3: ENVIRONMENTAL IMPACT ASSESSMENT 100

7.0 ENVIRONMENTAL ASSESSMENT OF IMPACTS 101

7.1 Introduction 101

7.2 Preliminary Environmental Impact Assessment 101

7.3 Environmental Impact Assessment using RIAM 105

7.4 Description of the Direct and Indirect Impacts of the Proposed Operations 111

7.5 PROJECT ALTERNATIVES..... 131

CHAPTER 4: ENVIRONMENTAL MANAGEMENT PLAN 133

8.0 ENVIRONMENTAL MANAGEMENT PLAN 134

8.1 Introduction 134

8.2 MONITORING PLAN..... 146

9.0 EMERGENCY PREPARENESS AND RESPONSE PLAN..... 153

9.1 Capacity Building..... 153

9.2 Occupational Safety and Health..... 154

9.3 Emergency Response Plan 156

9.4 Fire Prevention and Response 159

9.5 Oil Spill Prevention and Response 160

10.0 CLOSURE PLAN 162

10.1 Introduction 162

10.2 Factors that may lead to the closure of SFI operations 162

10.3 Closure Actions 163

11.0 CONCLUSION..... 164

12.0 REFERENCES 165

13.0 APPENDICES 171

Annex I: Terms of Reference for the ESIA Study..... 171

Annex IIa: Minutes of Scoping Meetings-February 4, 2010-Annai, Region 9 177

Annex IIb: Minutes of Scoping Meeting-February 8, 2010-Georgetown, Region 4..... 190

Annex III: List of Persons Consulted 200

Annex IV: Description of the boundaries of the area under SFEP 202

Annex V: FAO Forest Types (Wright, 1999) 204

Annex VI (a): Classification of forests of Guyana (Ter Steege, 1998)..... 205

Annex VI (b) Presence and abundance of Selected Species by Forest Region (ter Steege, 1998) 206

Annex VII: Specimen of Field Forms used for Forest Inventory..... 208

Annex VIII (a): Monitoring Report on Forest Inventory 211

Annex VIII (b): Sustained Yield Report - Primary Merchantable Species..... 212

Annex VIII (c): Sustained Yield Report - Lesser Used Species 213

Annex IX: Forestry Inventory 215

Annex X: Fauna Recorded within the Concession Area 219

Annex XI: Threatened Species of Guyana (IUCN Red List 2008) 240

Annex XIII: Results of Measurements of the Natural Baseline Physical Environmental Parameters within SFI..... 243

Annex XIII: Consultant’s Response to EPA’s Comments on the Third Revised Environmental and Social Impact Assessment Report for Sherwood Forrest Inc. – Logging and Sawmilling Project 247

LIST OF FIGURES

Figure 1: Organisational Chart of Sherwood Forrest Incorporated 26

Figure 2: Map 1 showing Access Road Alignment (in red) for Sherwood Forrest Inc. Concession 36

Figure 3: Map showing soil types within the forest concession area 52

Figure 4: Soil Sample Points of Sherwood Forrest Inc. 53

Figure 5: Photo of Cocoa (Theobroma Cacao) Research plot, in the vicinity of a Cocoa Creek, Right Bank Essequibo River, SFEP 01/07 55

Figure 6: Miner's notice board on right bank of Essequibo River 56

Figure 7: Graph showing trend in annual rainfall at Annai, Apoteri and Kurupukari 57

Figure 8: Noise Measurement Points within Sherwood Forrest Inc. 58

Figure 9: Field Analysis of Noise Level Measurements 58

Figure 10: Air Quality Sample Points of Sherwood Forrest Inc..... 60

Figure 11: Field Analysis of Air Quality 60

Figure 12: Water Sample Points of Sherwood Forrest Inc..... 62

Figure 13: Field Analysis of Water Quality 62

Figure 14: Elevation map showing attributes of the terrain - Sherwood Forrest Inc. Concession 66

Figure 15: Vegetation map of the concession area (Source: GFC, 2010) 69

Figure 16: Graph showing SFI's concessions proportion of trees by diameter class 71

Figure 17: Photos showing Forestry Inventory being conducted within Sherwood Forrest Inc. 73

Figure 18: Map of Sherwood Forrest Inc_SFEP 01/07 showing Proposed Forest Management Plan 74

Figure 19: Photos showing examples of fauna encountered within the concession area 78

Figure 20: Map showing habitat of Giant Otter *Pteronura brasiliensis* along Coco Creek 79

Figure 21: Map showing mist-netting sites for Bats along Sherwood Forest Transects..... 82

Figure 22: Photos showing Fish Catching within Sherwood Forrest Inc. 85

Figure 23: Herpetofauna within Sherwood Forrest Concession 88

Figure 23: Emergency Response Procedures..... 158

Figure 25: Oil/fuel spill report form 161

LIST OF TABLES

TABLE 1: COMMUNITIES IN THE VICINITY OF THE CONCESSION AREA..... 28

TABLE 2: PROJECTED PRODUCTION AND REVENUE FOR PERIOD 2014 TO 2023 37

TABLE 3: KEY PARTNERSHIPS ENVISAGED BY SFI 38

TABLE 4: ACTIVITY SCHEDULE - SFI: 2013-2017..... 40

TABLE 5: GNBS GUIDELINES FOR NOISE EMISSIONS INTO THE ENVIRONMENT 47

TABLE 6: DESCRIPTION OF SOILS IN THE CONCESSION AREA 52

TABLE 7: SOIL MOISTURE CONTENT (%) COLLECTED FROM VARIOUS SOIL SAMPLES AT THE PROJECT SITE..... 54

TABLE 8: MEAN RELATIVE HUMIDITY (%) FOR TWO LOCATIONS (FANSHAWE, 1952) 57

TABLE 9: VEGETATION SUMMARY -SFEP 01/07-BASED ON VEGETATION MAP 68

TABLE 10: MAIN COMMERCIAL TIMBER SPECIES ENCOUNTERED..... 70

TABLE 11: BAT SPECIES ENCOUNTERED WITHIN THE SHERWOOD FORREST INC. 81

TABLE 12: ERT SPECIES DOCUMENTED 84

TABLE 13: MAIN ERT SPECIES OBSERVED 84

TABLE 14: POTENTIAL FOR INCOME EARNING OF APOTERI RESIDENTS, 2009 93

TABLE 15: PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT OF ACTIVITIES RELATING TO SFI’S OPERATIONS . 102

TABLE 16: EVALUATION SYSTEM SHOWING THE CRITERIA THAT WAS APPLIED TO THE IDENTIFIED IMPACTS..... 107

TABLE 17: ENVIRONMENTAL IMPACT ASSESSMENT OF SHERWOOD FORREST INC. LOGGING OPERATIONS USING THE RIAM 108

TABLE 18: DESCRIPTION OF THE DIRECT AND INDIRECT IMPACTS OF ACTIVITIES RELATING TO SFI’S PROPOSED OPERATIONS..... 111

TABLE 19: PROPOSED MITIGATION MEASURES FOR POTENTIAL NEGATIVE ENVIRONMENTAL IMPACTS ASSOCIATED WITH SFI’S OPERATIONS..... 135

TABLE 20: MONITORING PLAN FOR SFI..... 147

TABLE 21: GENERAL CHECKLIST FOR MONITORING OPERATIONS..... 149

TABLE 22: SFI BIENNIAL CHECK SHEET FOR FIRE EXTINGUISHERS..... 151

TABLE 23: ANNUAL BUDGET FOR EFFECTING MITIGATION MEASURES 151

TABLE 24: INITIAL TRAINING OPTIONS IDENTIFIED FOR CAPACITY BUILDING..... 153

TABLE 25: NOISE LEVELS RECORDED WITHIN SHERWOOD FORREST INC. 243

TABLE 26: AIR QUALITY WITHIN SHERWOOD FORREST INC. 244

TABLE 27: WATER QUALITY ANALYSIS WITHIN SHERWOOD FORREST INC. (DRY SEASON) 245

TABLE 28: WATER QUALITY ANALYSIS WITHIN SHERWOOD FORREST INC. (WET SEASON) 246

FOREWORD

This is the *fifth* version and 4th Revision of the ESIA Report for SFEP 1/2007. This document seeks to address the shortfalls accrued by the previous versions and provide the necessary content as was requested by key stakeholders, particularly the EPA. This version represents a substantial revision of the previous versions, firstly by a complete reorganisation of the content of the report, the proposed environmental impacts of the project was reassessed using an improved methodology, the content of the Environmental Management Plan was substantially improved and finally the valued comments made by all stakeholders inclusive of the EPA and EAB, since the conception of the Terms of Reference in 2010 were addressed. Outstanding baseline data which has been collected is also presented in this copy of the revised ESIA. This document has been prepared to meet to EPA requirements for the issuance of an Environmental Authorisation for Sherwood Forrest Inc.

ACRONYMS

| | |
|-------|--|
| AOP | Annual Operations Plan |
| BHI | Bina Hill Institute |
| CI | Conservation International (Guyana) Inc. |
| CoP | Code of Practice for Timber Harvesting |
| Dbh | Diameter at breast height |
| EAB | Environmental Assessment Board |
| EPA | Environmental Protection Agency |
| ESIA | Environmental and Social Impact Assessment |
| EMP | Environmental Management Plan |
| ERP | Emergency Response Plan |
| ERT | Emergency Response Team |
| FAO | Food & Agricultural Organization |
| FCA | Forest Concession Agreement of the UN |
| FCPC | Forest Carbon Partnership Facility |
| FLEGT | Forest Law Enforcement, Governance and Trade |
| FMP | Forest Management Plan |
| FMPG | Forest Management Plan Guidelines |
| FPA | Forest Producers Association of Guyana |
| FSC | Forestry Stewardship Council |
| FTCI | Forestry Training Centre Incorporated |
| GFC | Guyana Forestry Commission |
| GGMC | Guyana Geology & Mines Commission |
| GGDMA | Guyana Gold & Diamond Miners Association |
| GLSC | Guyana Lands & Surveys Commission |
| GNBS | Guyana National Bureau of Standards |
| GNRA | Guyana Natural Resources Agency |
| ITTO | International Tropical Timber Organization |
| IUCN | International Union for the Conservation of Nature and Natural Resources |
| KCCR | Kwakwani Cocoa Creek Road |
| LCDS | Low Carbon Development Strategy |
| MNRE | Ministry of Natural Resources and the Environment |
| NDS | National Development Strategy |
| NFAP | National Forestry Action Plan |
| NRDDB | North Rupununi District Development Board |
| OCC | Office of Climate Change |
| OSH | Occupational Safety & Health |
| OSHC | Occupational Safety & Health Committee |
| PAHO | Pan American Health Organization |
| PET | Potential Evapo-Transpiration |
| PSG | Personal Safety Gears |
| PPE | Personal Protective Equipment |
| RAB | Rapid Biodiversity Assessment |
| RDC | Regional Democratic Council |
| REDD+ | Reducing Emissions from Deforestation and Forest Degradation |
| SFEP | State Forest Exploratory Permit |

| | |
|------|---|
| SFP | State Forest Permission |
| THAG | Tourism and Hospitality Association of Guyana |
| UN | United Nations |
| UNDP | United Nations Development Programme |
| WHO | World Health Organization |
| WWF | World Wildlife Fund, Guyana |

EXECUTIVE SUMMARY

Guyana launched its unprecedented Low Carbon Development Strategy (LCDS) in June of 2009. The LCDS is a duo-faceted initiative, aimed at creating economic development while combating climate change through a REDD+ mechanism. LCDS does not seek to deter timber production, but rather promote and enforce the sustainable use of Guyana's mostly pristine forests. It is on this note that Sherwood Forrests Inc. (SFI) seeks to utilize modern sustainable forestry techniques, to add economic and social value to the forests within the concession area.

In July 2007, in accordance with Regulation 7B of the Forests Act, Cap. 67:01, the GFC granted Sherwood Forrest Inc. a State Forest Exploratory Permit designated SFEP 1/2007 for an area of 167,066 hectares within the Upper Berbice-Corentyne Watershed, in Administrative Region 6 (please see Map 1). The UTM coordinates for the North-Western and South-Eastern points are 21N 0358400, 0442300 and 21N 04093000, 0403700 respectively. The concession area *has no current* land use activity of any kind taking place within it. There are however, remnants of Cocoa (*Theobroma cacao*) research plots on the south-western edge of the concession area as well as evidence of past *balata* bleeding activity. In terms of land occupation/use outside of the concession area, there are three communities in the lower Rupununi River: Crash Water Amerindian Village, Rewa Amerindian Village and Apoteri Amerindian Village; the former Conservation International (Guyana) Inc. *Conservation Concessionis* located to the South of SFI's concession; and Forest Concessionaires are located well North of SFI'S concession. The abovementioned, are some of the stakeholders who have expressed very strong interest in the developments SFI intends to carry-out.

The primary objective of SFI is to engage in commercial harvesting of timber from the concession area at a rate of approximately 35,000 m³ timber per annum, subject to the provisions of the forest concession agreement to be granted to the company, the Forests Act and its revisions, other sectoral policies and guidelines, the EPA Act 11 of 1996, and National policies inclusive of the LCDS.

In order to commence timber harvesting operations at the concession, SFI needs to construct an all weather access road of about 250km in length linking the concession area to a site near Kwakwani, on the right bank of the Berbice River. This alignment will traverse extensive portions of currently intact forests and possibly, in the long term, drive the development of (new) forestry, agricultural, and mining enterprises respectively. The company also believes that that access road (when linked to the concession roads) will allow for the establishment of a major road link between the Corentyne coast and the New River Triangle, and between the Corentyne and the Rupununi (Region 9). The 250km access road is projected to cost approximately US\$3.5m.

Consistent with timber harvesting practices based on the principles of reduced impact logging, SFI will also engage in road, skid trail and log market construction works, the establishment of one or more fully functional base camps, the felling of trees, and skidding and hauling logs to prescribed locations. These works in turn require the regular use of a variety of heavy duty vehicles and the corresponding need for fuel, lubricants and ancillary servicing facilities and fuel storage facilities respectively. SFI expects to invest at least US\$2.5 million for concession development and employ 220 persons full time on the concession itself.

An Environmental and Social Impact Assessment (ESIA) Report, a requirement by the EPA, is a prerequisite for the granting of a *Forest Concession Agreement* to Sherwood Forrest Inc. The *Forest Concession*

Agreement will set out the conditions under which timber harvesting and ancillary operations will occur, including the preparation of the FMP and AOPs that incorporate approved recommendations and mitigation measures from this ESIA Report.

This is the *fifth* version and 4th Revision of the ESIA Report for SFEP 1/2007. This document seeks to address the shortfalls accrued by the previous versions and provide the necessary content as requested by key stakeholders, particularly the EPA. This version represents a substantial revision of the previous versions, achieved firstly by deliberately improving the quality of baseline information and secondly by reviewing the valued comments made by all stakeholders inclusive of the EPA and EAB, since the conception of the Terms of Reference in 2010. Outstanding baseline data which has been collected is also presented in this copy of the revised ESIA. This document has been prepared to meet EPA requirements for the issuance of an Environmental Authorisation for Sherwood Forrest Inc.

During this process, the team identified potential impacts of the establishment and operation of such a facility, and provided more details in the section titled “Environmental Impact Assessment”, which can be summarised as follows:

Physical Impacts:

- Grubbing and scarification of soil surface, sub-soil exposure, erosion, soil compaction;
- Dust and smoke (especially along roads), minor changes in microclimate, partial smothering of roadside dwellings;
- Sediments in waterways, decreased infiltration rates, modifications in water temperature, turbidity, and pH, and modification of stream bed profile;
- Pollution with oil and grease;
- Leaching (and consequent chemical, biological changes), water logging.

Biodiversity Impacts:

- Destruction of juvenile trees, genetic impoverishment of the forests, modifications in forest structure and soil fertility due to removal of biomass from poor soils;
- Increased potential for blow downs of residual trees due to freer, faster air flow through the canopy/under-storey or rampant growth of vines due to more forest gaps;
- Modification, destruction of habitats (especially in terms of cover and food sources), depletion in number/variety of some species;
- Major modifications of prevailing ecological relationships: plant-plant, plant-animal, animal-animal (for example predation), soil fauna.

Socio-economic Impacts:

- Restriction of access, alienation of rights, unplanned changes in life style (restrictions on hunting for example);
- Training and skills transfer, job creation for men and women, new competencies;
- Crime; use of alcohol; health risks, disagreeable behaviour; new social structures;
- Probability of fatal road accidents;
- Pollution of the air and water sources; the accelerated proliferation of vectors for various diseases such as malaria, typhoid and dengue fever.
- Within workshops, the probability of burns from battery acid and fires from the accidental ignition of flammable liquids and fuels used mainly within the workshop injuring;

- the probability of the inhalation of toxic fumes;
- Improvement of infrastructure;
- Loss, destruction or modification of the assets.

These impacts have been discussed more comprehensively and appropriate mitigation measures proposed in the relevant sections of the report.

The consultants assert that the assessments of the core events and issues, and the impacts related to the proposed logging operation have been addressed. The consultants note that the developer has a special interest in building capacity to address all variables and impacts associated with the logging operation; specifically, a special coordinator to manage stakeholder issues will be appointed. Consequently, the consultants affirm that the impacts risks and challenges associated with project have been identified, and that the recommendations contained in the document would address them.



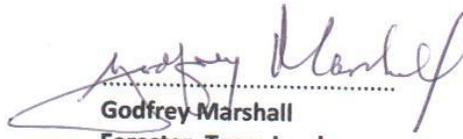
.....
Khalawan
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ACKNOWLEDGEMENTS

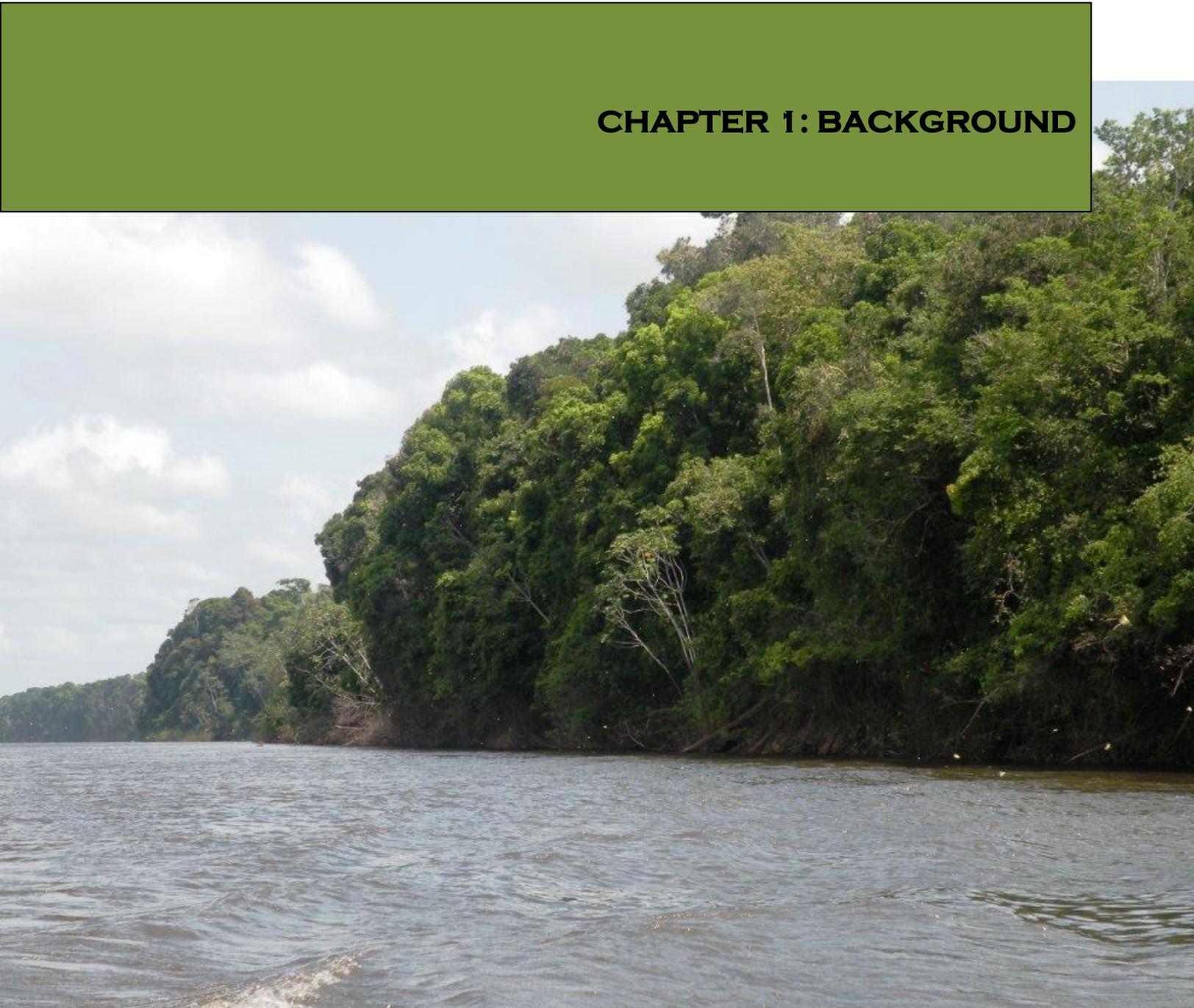
SFI acknowledges the support of all those who provided information on the concession area and who shared information about their interests and concerns on logging in the area, either through the scoping meetings or in private discussion. Special acknowledgement is given to the community of Apoteri, which to date, has been very supportive in all reconnaissance work undertaken by the company.

SFI also acknowledges the following support:

- 1) GFC for general guidance and in particular for support with map work;
- 2) EPA for guidance on the ESIA development process;
- 3) Staff of Conservation International who shared their conservation philosophy and principles with the consultants;
- 4) Participants at the scoping meetings at Annai and Georgetown respectively; and,
- 5) The numerous stakeholders who have demonstrated an interest in the access road on the Berbice-Corentyne watershed.

Finally, SFI expresses its gratitude to all those who provided comments on the previous draft ESIA reports, which served very useful in guiding the consultants to add more critical content to the document.

CHAPTER 1: BACKGROUND



1.0 INTRODUCTION

1.1 Background to the Study

Policy makers and other stakeholders in the local forestry sector, in response to global and local forestry priorities, are piloting various sectorised initiatives, including forest policy review, the development of Codes of Practice, the LCDS, REDD++ initiative, and emerging market driven developments such as FLEGT and Legal Assurance Systems. It is apparent that issues of forest resources based services, for example the role of forests in generating fresh water, combating climate change or in conserving biodiversity, currently drive the discussions and activities in the Natural Resources sector. Consequently and quite appreciably, stakeholders (including customers) are demanding more responsible behaviour from logging companies.

It is in this context that SFI acquired an SFEP for an area of 167,066 hectares of mostly intact forests in the Upper Berbice-Corentyne Watershed (see Map 1). Sherwood Forest Inc. will be investing more than US\$30million over a five year period to develop the concession, construct a 250km access road linking the concession area to Kwakwani District and recruit and train up to 350 persons before logging operations begin.

SFI's obligations under the SFEP entail feasibility studies on logging within the concession area in the face of several variables, including:

- a) analysis of the potential of the commercial timber stock on the concession area;
- b) measures required to recruit and train employees and accommodate them on the concession area;
- c) haul distance between the concession area and Kwakwani District where the company plans to set up its primary timber processing plant; and,
- d) management of the current and emerging concerns of stakeholders.

SFI's obligations under the *EPA Act 11 of 1996* include:

- a) identification and assessments of environmental and social impacts associated with the development of the concession; and
- b) development of measures to mitigate negative impacts, and report on these to the EPA, in effect seeking approval from the Agency for an Environmental Permit.

1.2 Scope of the ESIA

After being granted an SFEP (1/2007) by the GFC, SFI was required to compile an ESIA for submission and approval by the EPA, so that Environmental Authorization can be obtained. Subsequent to being granted an Environmental Authorization, the GFC upon consideration, may issue a TSA to SFI.

- 1) The scope of the ESIA Study as outlined in the Terms of Reference (see Annex I) includes: A review of all relevant legislation and agencies that set the legal and environmental context for logging and sawmilling projects and major hinterland roads;
- 2) A detailed description and analysis of the variables and technology that constitutes the start-up and implementation phases of logging project;
- 3) Reviewing baseline data from the concession area and its immediate environs (including land use activities) and assessing their consequences for the project;
- 4) Identifying and assessing potential environmental impacts and their significance through start-up and implementation phases of the logging project, including identifying and assessing potential receptors of impacts;
- 5) Mitigation measures and mechanisms to implement them;
- 6) Mechanisms to address contingencies with grave environmental & social implications.

1.3 ESIA Objectives

The objective of the ESIA Report is to comply with the requirements of Part IV of the Environmental Protection Act 11 of 1996, EIA Guideline Volume 5 Forestry, ancillary legislation and guidelines, and the concerns of stakeholders for environmental authorization to be granted by the EPA to Sherwood Forrest Inc. for the proposed logging operations.

The specific objectives of the ESIA as outlined in the Terms of Reference (Annex I) are to:

- 1) Present the full scope of all the technological considerations involved in the project (at the level of the access road and timber harvesting operations on the concession area itself), citing feasible alternatives and risks where appropriate;
- 2) Incorporate an environmental appraisal of project impacts for all aspects of the logging project and the primary access road and ancillary operations (such as the construction of bridges and culverts), and impacts on other land uses in and around the concession area and provide recommendations for managing and mitigating negative impacts;
- 3) Establish and describe the social impacts of the project, and measures to mitigate negative impacts and foster positive impacts;
- 4) Establish mechanisms, capacity requirements and costs for implementing and monitoring mitigating or remedial actions;
- 5) Establish mechanisms for addressing the concerns of stakeholder;
- 6) Describe partnerships for ensuring conservation of the environment to the maximum extent possible.

1.4 Approach and Methodology

The Consulting team applied the following methodology in conducting the ESIA study:

- 1) Consulted with the developers to establish the full nature and scope of the project, the feasibility of alternatives, and the construction and management of the primary access road;
- 2) Reviewed all relevant legislation pertaining to logging, road construction and projects as contemplated by the developer;
- 3) Reviewed the nature and scope of all projects or developments occurring in the vicinity of the SFEP area and *assessing* the impacts of these on the proposed logging operation (as well as how the proposed logging operation by SFI would impact on land use activities on the perimeter of the SFEP area);
- 4) Visited the area under SFEP during period November 2009 to February 2010, October 2010 and April 2011 to collect information including, but not limited to:
 - The physical environment (topographic attributes of the area and its environs, geology and soils, current infrastructure in terms of roads, trails, waterways and hydrology and drainage density, meteorological data, cyclic features of water flows and weather patterns and assessing the consequences of the physical attributes of the SFEP area for the project);
 - The biological environment-fauna and flora, forest structure and forest types, ecological attributes of the vegetation (in terms of endemism, etc.) and assessing the consequences of the biological attributes of the SFEP area for the project;
 - The socio-economic environment: land use on the concession area and within the general North-East Rupununi district and the Corentyne-Essequibo Watershed, indigenous peoples and their livelihoods, possible indigenous assets within the concession area, actual timber and non-timber utilization of the concession area and environs, and impacts related to the conservation concession (held by Conservation International Guyana) and assessing the consequences of the socio-economic situation of stakeholders for the project;
- 5) Estimated timber stocks, their commercial potential and the engineering considerations required to harvest timber;
- 6) Carried out desk studies on the alignment for the access road ,and the potential impacts;
- 7) Analysed risks associated with the project taking into consideration the elements of a) to f) above;
- 8) Consulted stakeholders, including the communities at Apoteri, Rewa and Crash Water;

- 9) Carried out environmental and social impact assessments relating to the variables identified through all phases of the logging project, including considerations for the access road; and small scale sawmilling¹ activity within the concession area;
- 10) Developed a draft environmental impact statement; developed an environmental management plan, emergency response and monitoring plan; developed an implementation plan detailing mechanisms for action in relation to the various plans cited; and
- 11) Participated in the scoping studies organized by the EPA/GFC.

1.5 Constraints and Limitations of Study

The ESIA Team encountered several limitations and challenges while conducting the ESIA. The main limitations encountered during the conduct of the ESIA are discussed below:

Access to the concession area

Access to and within the Concession was difficult. The concession is very remote and can be accessed only by boat. The Essequibo River at its junction with Cocoa Creek currently provides the only practical and feasible point of access to the concession *at this time*. There are currently no roads, trails or navigable streams *within* the concession that facilitate access and the creeks within the area are seasonal and small, shallow, and blocked with trees. The traditional labour intensive methods where everything has got to be carried on the backs of the field teams is currently the only possibility for conducting site surveys. The consultants hired residents of Apoteri and St. Cuthbert's Mission respectively, who are used to walking for several hours with loads; however even they were concerned about the time evacuation measures would take in the event of sickness, an accident or snake-bite.

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.

Seasonality

In the dry season it was easier to traverse the area to conduct site surveys; however during the dry season-when the river is relatively shallow- is also the most difficult time to access the concession area via the Essequibo River due to hazards linked to the prevalence of sand bars, rock bars, and submerged tree trunks. Access to the concession area (Primus Inlet or Cocoa Creek) would be faster and easier in the rainy season due to elevated water levels, when it is easier to pass over rock outcrops and sand bars. In the rainy season however, rivers overflow their banks producing water logged conditions for up to seven kilometres *inland* creating treacherous conditions for anyone trying to traverse the concession area. Moreover, while most of the mammalian fauna seek higher ground during the wet season, caimans extend their forage area by leaving the natural waterways.

¹The use of portable sawmills.

The team does recognize the value of wet season surveys for capturing data on *amphibians* in particular, for dietary patterns or preferences of herbivores and rodents, and for phenological studies on commercial tree species.

Scarcity of potable water

Within the concession area, there is a significant variation in water flows in the *smaller* creeks encountered, for the dry and wet season. These creeks will have relatively high waterlevels in the rainy season, when field camps have to be chosen with great care and when it's tedious to traverse the extensive water-logged areas in the rainy season; on the other hand, the creeks *dry out* rapidly in the dry season. This affected the location of camp grounds and made reaching prescribed sample points more time consuming.

Generally the scarcity of water means that other animals, such as deer, peccaries and tapir use the same water source. It is also known that tapirs defecate in water; during reconnaissance visits, teams found that they were using creek water tainted with faecal matter from tapirs. In addition, peccaries forage along river banks, literally churning up the soil leaving streams muddy and not suitable for any human use.

It is also commonly known that wildlife; quite often end up using the same water sources as humans in the hinterland regions, such as tapirs and other small animals as well as their main predators, the jaguar and puma.

Risks and Safety

As the reconnaissance team proceeded further east from the Essequibo River, the terrain in which work needed to be carried out became more risky. In the event of any incidence, it would be necessary to traverse at least 14km on foot (3 hours normal walking time under trail conditions), then travel to Apoteri by boat (about five to six hours); then another three hours at the minimum to arrange a charter and get the person to a hospital at Lethem or in Georgetown. If the event were to happen at night, the situation would be even more critical. It is with this in mind that the reconnaissance team comprised of residents of Apoteri, who are aware of the risks and the conditions in the upper Essequibo.

1.6 Structure of the ESIA Report

The ESIA Report is organised by the following chapters and sections:

- **Executive summary:** this section summarises the findings of the impact assessment of the project and all related activities.
- **Chapter 1: Background:** this chapter contains several sections which introduces the project, outlining the scope and methodology of the study; presents company information and a description of the project, and describes the Legal framework and Policy Context for the Project in which SFI will be operating – the framework within which the ESIA was performed and the project will be developed. The relevant institutions, laws, policies and management plans are detailed. Further, the forestry sector (a brief overview of recent developments in the forestry sector, issues of REDD+ and the LCDS, Sherwood Forrest Inc.'s SFEP, the company's objectives and their obligations under the SFEP, geographic location of the SFEP area, and a brief description of the status of land-use activities on the perimeter of the concession area) is discussed.
- **Chapter 2: Forest Environment:** describes the relevant physical, biological and socio-economic conditions in the area of the project's direct and indirect influence. It presents the key geographic attributes of the area (drainage density and hydrology, special sites, indigenous assets, forest stocks, etc.). Current land use within and on the perimeter of the concession area is also discussed within this chapter. Information about the physical status of the environment (characterising the baseline conditions for various parameters such as water quality, evidence of pollution, fragile or vulnerable areas, and establishing parameters for measuring or estimating changes in those conditions) is also presented in this part of the document.
- **Chapter 3: Environmental Impact Assessment:** identifies and assesses the potential negative, positive, direct and indirect impacts that the various phases of the project will have on the physical, ecological and socio-economic environment. The details of the impacts are also discussed. A section on containing an analysis of alternatives, which compares feasible alternatives in the project, is also included in this chapter.
- **Chapter 4: Environmental Management Plan:** describes the mitigation, monitoring and institutional measures to be taken during construction and operation to mitigate adverse impacts, offset them, or reduce them to acceptable levels, and to enhance the positive effects of the the project. This section revisits the moderate to severe impacts that the project will have and indicates the measure that the company will undertake to prevent or mitigate the significance of the impact. This includes proposed work programmes, budget estimates, schedules, staffing, training requirements, and other necessary support services to implement the mitigation measures such as, the environmental monitoring plan, waste management plan, emergency response and preparedness plan.
- **References:** lists the sources of information used in the preparation of the ESIA.

This document also includes the following (**Appendices**):

Annex I: Terms of Reference for the ESIA Study

Annex IIa: Minutes of Scoping Meetings-February 4, 2010-Annai, Region 9

Annex IIb: Minutes of Scoping Meeting-February 8, 2010-Georgetown, Region 4

Annex III: List of Persons Consulted

Annex IV: Description of the boundaries of the area under SFEP

Annex V: FAO Forest Types (Wright, 1999)

Annex VI (a): Classification of forests of Guyana (Ter Steege, 1998)

Annex VI (b) Presence and abundance of Selected Species by Forest Region (ter Steege, 1998)

Annex VII: Specimen of Field Forms used for Forest Inventory

Annex VIII (a): Monitoring Report on Forest Inventory

Annex VIII (b): Sustained Yield Report - Primary Merchantable Species

Annex VIII (c): Sustained Yield Report - Lesser Used Species

Annex IX: Forestry Inventory

Annex X: Fauna Recorded within the Concession Area

Annex XI: Threatened Species of Guyana (IUCN Red List 2008):

Annex XIII: Results of Measurements of the Natural Baseline Physical Environmental Parameters within SFI

Annex XIII: Consultant's Response to EPA's Comments on the Third Revised Environmental and Social Impact Assessment Report for Sherwood Forrest Inc. – Logging and Sawmilling Project

2.0 COMPANY INFORMATION

2.1 Company's Profile and Policy

The developer's primary business objective is the harvesting of timber resources. SFI, Company # 5279 of 9 Shamrock Gardens, East Bank Demerara Guyana was incorporated under Section 8 of the Companies Act of Guyana on November 22, 2004. The current directors are:

- a) *Mr. Chu Hong Bo*: Businessman/Manager, 9 Shamrock Gardens, EBD, Guyana.
- b) *Mr. Kang Bo*: Businessman/Manager, 9 Shamrock Gardens, EBD, Guyana.
- c) *Mr. Jolyon Hatmin*: Attorney-at-Law, 42 Area 'Q', Turkeyen, ECD, Guyana

The company is committed to ensure that both worker safety and environmental management is at the center of its operations. The company's Environmental and Forest Management Policy and Occupational Safety and Health Policy are highlighted below.

2.2 SFI's Environmental and Forest Management Policy

In the thrust to provide timber products of approved grades to local, regional and global markets, SFI recognizes that its timber harvesting operations generate several impacts on the environment.

SFI is committed to fostering improvements in environmental performance and in mitigating pollution through collaboration with public agencies, NGOs and communities.

Environmental regulations, laws, codes of practice and relevant standards developed by the respective competent authorities will be considered as the minimum standards of environmental performance.

SFI undertakes to ensure all employees and contractors internalise this policy through training sessions, internal mails, team briefing sessions, posters and newsletters. The managing director, SFI has personal responsibility for the implementation of this policy.

In particular, SFI will:

- 1) conserve the forest environment through planning every intervention, especially the deployment and use of machines;
- 2) minimize waste and dispose of all waste through safe and responsible methods;
- 3) foster good relations with neighbouring communities;
- 4) discourage hunting within the concession area by its employees;
- 5) coordinate route planning and delivery schedules to reduce fuel consumption and lower exhaust emissions;

- 6) collaborate with other resource users and with public agencies to develop and conserve public roads and public waterways;
- 7) coordinate our policies through a coordinated environmental management system;
- 8) consider the environmental impacts of its operations at all stages of the production cycle;
- 9) implement our policies through guidelines and through training at all levels;
- 10) conduct an annual self-evaluation of our performance in implementing these principles and in complying with all applicable laws and regulations. We will facilitate monitoring of forest operations, log and lumber depots, processing plants and ancillary operations by duly authorised agencies or individuals.

2.3 SFI's Occupational Health and Safety Policy Statement

SFI believes that its employees are its most important assets while the company recognizes that forestry practices generally and timber harvesting practices in particular are hazardous. Consequently, SFI commits itself to fostering improvements in employee performance and in reducing or eliminating accidents at the work place. SFI will therefore provide employees with appropriate OHS training through collaboration with public agencies and NGOs.

OHS regulations, laws, codes of practice and relevant standards developed by the respective competent authorities will be considered as the minimum standards for the company's OHS practices

SFI undertakes to ensure all employees and contractors internalise this policy through frequent briefing sessions, internal mails, posters and newsletters.

The operations manager will be directly responsible for matters of Occupational Safety & Health.

In particular, SFI will:

- 1) adopt a safety first policy at all work locations;
- 2) establish up worker safety committees to oversee employee welfare in OHS;
- 3) train at least 15% of staff members in first aid with a recognised, professional agency;
- 4) provide employees with safety gear appropriate for their own requirements;
- 5) ensure that all employees receive common vaccines (Yellow fever, typhoid, etc);
- 6) establish opportunities for regular testing for malaria and other common maladies.
- 7) establish partnerships with public agencies and stakeholders to conserve water sources and waterways;

- 8) in collaboration with safety committees, provide first aid kits at all forward camps and ensure workers are trained in the application or use of the various pharmaceutical products;
- 9) provide a MEDEX at camps with more than 50 persons and establish conditions for the proper storage of pharmaceutical products;
- 10) maintain registers of events of all reported illnesses or injury;
- 11) conduct an annual self-evaluation of our performance in implementing these principles and in complying with all applicable laws and regulations.

2.4 SFI's Organisational Structure

SFI's organisational structure is outlined below. The logging operations will be headed by an Operations Manager and directly supported by the Forest Manager, Human Resources Manager and Stakeholder Relations Coordinator for the Road Corridor. The Forest Manager will have the responsibility for ensuring compliance with all the environmental and forestry requirements; and in particular ensuring that the Environmental Management Plan (EMP) prepared for the project is implemented.

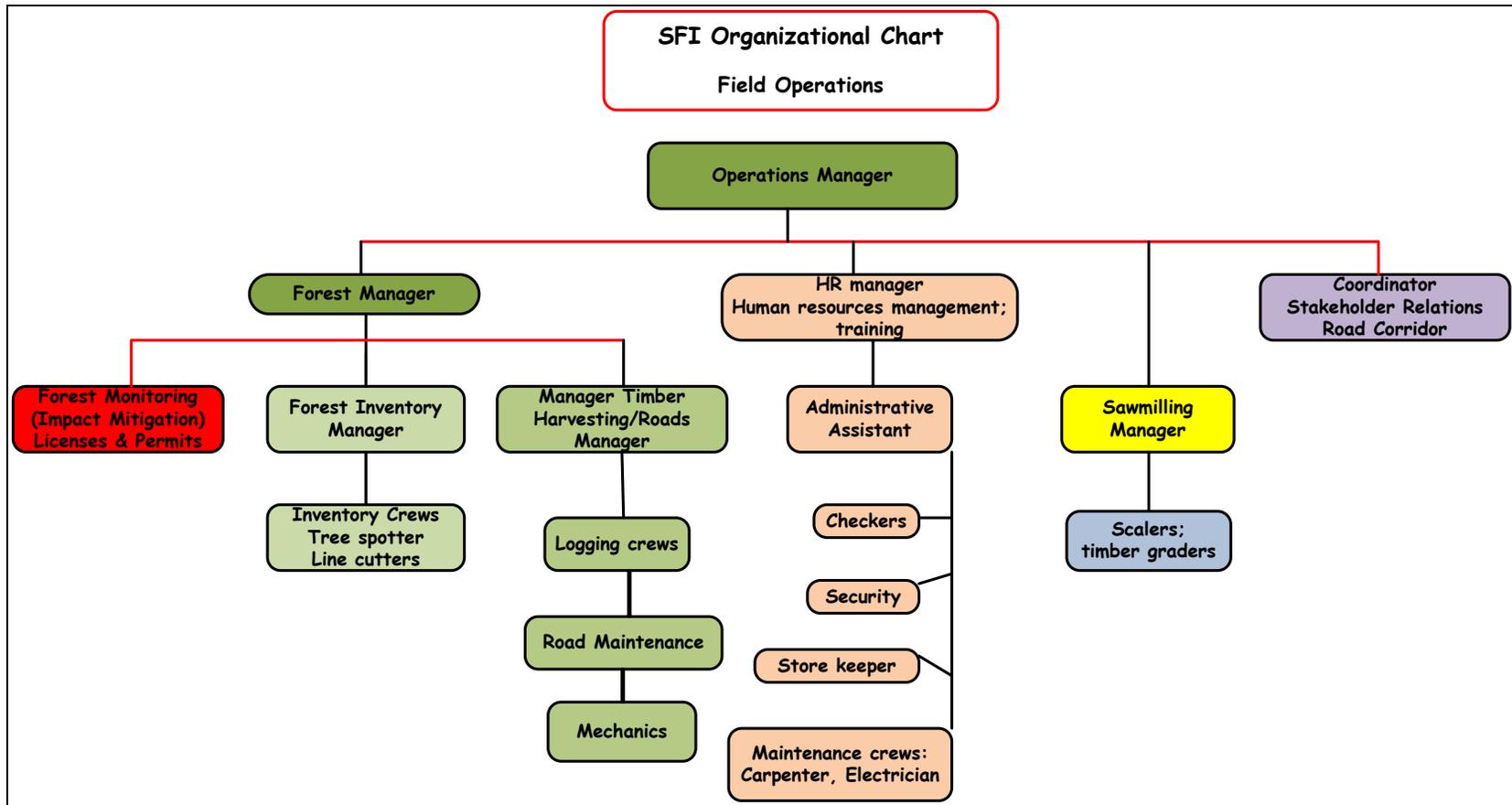


Figure 1: Organisational Chart of Sherwood Forrest Incorporated

3.0 PROJECT DESCRIPTION

3.1 Nature and Scope of the Project

In July 2007, in accordance with Regulation 7B of the Forests Act, Cap. 67:01, the GFC granted Sherwood Forrest Inc. (SFI) a State Forest Exploratory Permit designated SFEP 1/2007 for an area of 167,066 hectares within the upper Berbice-Corentyne Watershed, in Administrative Region 6 (please see Map 1).

The primary objective of SFI is to engage in commercial harvesting of timber from the concession area at a rate of about 35,000 m³ timber per annum, subject to the provisions of the forest concession agreement to be granted to the company, the Forests Act and its revisions, other sectoral policies and guidelines, the EPA Act 11 of 1996 and compatibility with relevant regional developmental initiatives. Consistent with timber harvesting practices based on the principles of reduced impact logging, SFI will engage in road, skid trail and log market construction works, the establishment of one or more fully functional base camps, the felling of trees, and skidding and hauling logs to prescribed locations; these works in turn require the regular use of a variety of heavy duty vehicles and the corresponding need for fuel, lubricants and ancillary servicing facilities and fuel storage facilities respectively. SFI expects to spend approximately US\$2.5 million for concession development and anticipates employment of 220 people full time on the concession itself.

To deploy the necessary productive assets and to extract timber, SFI needs to construct an all weather access road of about 250km linking the concession area to a site near Kwakwani, right bank Berbice River. This alignment will traverse extensive parcels of currently intact forests and possibly, in the long term, drive the development of (new) forestry, agricultural, and mining enterprises respectively. The company also believes that that access road (when linked to concession roads) will offer options for a major road link between the Corentyne coast and the New River Triangle, and between the Corentyne and the Rupununi (Region 9). The 250km access road is projected to cost about US\$3.5m.

Since the acquisition of the SFEP, the company engaged in research on the history of the area, started a feasibility study leading to a business plan, contracted FTCI to carry out a management level inventory of the concession area, and embarked on a number of business alliances.

In accordance with the requirements of the EPA, as well as for its own benefit, the Company recruited a team of consultants to do the following:

- 1) Consult stakeholders who may be affected either positively or negatively by the planned logging development;
- 2) Study and describe the environmental and social impacts linked to timber harvesting and ancillary operations within the concession area;
- 3) Develop management plans to reduce or eliminate the moderate to severe negative impacts; and
- 4) Prepare an ESIA Report for review and approval by the EPA/EAB and other stakeholders.

3.2 Project Location and Environs

The concession, with area of 167,066 hectares, is located within the Upper Corentyne-Berbice Watershed, Region 6 (see Map 1). The UTM coordinates for the North-Western and South-Eastern points are 21N 0358400, 0442300 and 21N 04093000, 0403700 respectively. No logging was done at the concession prior to the issuance of the SFEP to SFI in 2007. There are however, remnants of Cocoa (*Theobroma cacao*) research plots on the South-Western edge of the concession area as well as evidence of past *balata* bleeding activity.

Apart from an occasional tourist and subsistence fishing by residents of the North Rupununi to the south western end of the concession where it meets the Essequibo River, no **current** use is being made of the concession area. Very old plots of cocoa (*Theobroma cacao*) along the Essequibo River are testimony to human activity many, many years ago; however only those plots in the vicinity of right bank Cocoa Creek , right bank Essequibo River are within the concession area (and even so, at the very south western perimeter of the concession area).

Three communities in the lower Rupununi River-Crash Water Amerindian Village, Rewa Amerindian Village and Apoteri Amerindian Village, Conservation International (Guyana) Inc. and holder of the former *Conservation Concession* south of SFI’s concession and forest concessionaires well to the north of SFI’S concession on the Berbice - Corentyne Watershed are among the stakeholders who have expressed very strong interest in the developments SFI intends to carry out.

The nearest communities to the concession area are:

TABLE 1: COMMUNITIES IN THE VICINITY OF THE CONCESSION AREA

| Community | No. of Households | No. of persons | Distance from Primus (km) | Distance from Cocoa Creek (km) | Distance from Base Camp (km) |
|-------------|-------------------|----------------|---------------------------|--------------------------------|------------------------------|
| Apoteri | 53 | 290 | 34 | 40.6 | 80 |
| Rewa | 35 | 178 | 112 | 54 | 81 |
| Crash Water | 31 | 181 | 160 | | |

Crash water is a community that was established in 1998; the next communities lie a considerable distance away: these are Fairview 134.4 km from Primus Inlet and Iwokrama Field Centre 136.8 km from Primus Inlet. SFI will engage with these communities to the maximum extent feasible.

3.3 Scope of Operations/Phases of the Project

In order to carry out timber harvesting operations within the area, the company will engage in a number of activities. The scope of the operations comprises four phases described below:

Pre-operation Activities

Phase 1: Preparatory Activities

SFI is already engaged in discussions and preparatory activities for developing the forest concession and access road. These activities include:

- 1) Gathering baseline data on topographic attributes of the general area, geology and soils, biodiversity, and social issues within the concession area, in consultation with stakeholders;
- 2) Sourcing surveying equipment and soil maps;
- 3) Gathering baseline data on forest resources, in particular through forest management level inventories and reconnaissance surveys to determine the critical skills sets required to organize the planning and harvesting operations;
- 4) Identifying and recruiting the relevant expertise, in particular recruiting a forest manager, and technicians who will form a planning team;
- 5) Assessing skills sets and vocational training opportunities available locally;
- 6) Consulting with the relevant public agencies for carrying out boundary demarcation exercises on the perimeter of the concession;
- 7) Determining the requirements for heavy-duty equipment and exploring financing options from various suppliers;

Phase 2: Planning for development of the access road, concession area and organizing timber harvesting operations

Planning activities will include:

Access Road

- 1) Quantifying road alignments and construction works required for the access road, for the concession based primary road network (as a function of the topographic parameters of the area), and mapping and laying out of skid-trails;
- 2) Identifying major users of the access road and where practicable developing partnerships with them for road use and road maintenance and for implementing and monitoring mitigation measures agreed with the EPA and the GFC.

Concession Area

- 1) Continuing the management level inventory and ongoing reconnaissance works targeting the central and eastern segments of the concession;
- 2) Zoning of the concession area to establish areas designated for *production* and for *protection* respectively by organizing the area designated for production into compartments and 100 hectare blocks as well as identifying and demarcating parcels of forests suitable for biodiversity reserves. Any site containing assets of indigenous or archaeological value will automatically be protected pending their evaluation by the relevant experts;
- 3) Estimation of the commercial stock of timber (pre harvesting inventory - species, volume, size class of trees): undertaking 100% pre-harvest inventories and the preparation of stock maps within forests designated for production, and determining feasible production (felling) cycles

and production levels in keeping with the procedures published by the Guyana Forestry Commission and in consultation with the GFC;

- 4) Identifying sites for log markets and carrying out skid trail alignment works;
- 5) Conducting tree marking operations and preparing tree location maps;

Organizing timber harvesting operations

In anticipation of the award of a Forest Concession Agreement, the company has already initiated a number of activities for organizing inputs for timber harvesting operations within the concession area, including:

- 1) Planning for the recruitment and training of field operatives covering a range of skills sets including heavy duty equipment operators, forest surveyors, tree spotters, bookers for inventory tasks, mechanics, timber graders, accountants, etc.;
- 2) Sourcing and deploying a range of equipment including but not limited to bulldozers, skidders, excavators, compactors, heavy-duty logging trucks, light utility trucks, light utility 4 x 4 vehicles, front-end loaders, forest mensuration and surveying tools (GPS devices, compass, clinometers, diameter tapes, 30m and 50m tapes, flagging tapes), logging rigs, chainsaws, accessories, typical workshop tools (welding plants, lathes, tyre management tools, general tools, compressors), radio sets and building materials;
- 3) Sourcing other goods: fuel and lubricants, furniture, computers and accessories, office supplies, kitchen utensils and supplies, fire extinguishers, etc.;
- 4) Scheduling the purchasing and deployment of all inputs.

Operation Activities

Phase 3: Construction of infrastructure to facilitate logging and logging operations

Within the forest concession, planning tasks will start followed by operations within a six months period and the planning operational sequence will occur at the same time but in small blocks of time relative to the blocks and compartments being exploited.

Apart from the planning activities identified above, SFI will be engaged in the following on receipt of a Forest Concession Agreement:

- 1) Further construction of access road and the road network-including bridges and culverts, skid trails (in accordance with annual plans of operations for the productive area within the concessions);
- 2) Establishing *initially* more than 250 km of all weather road between Kwakwani District and the northern part of the concession area, in consultation with a number of logging enterprises-including Wanotobo Forest Resources Inc. and Haimorakabra Logging Company-two concessionaires north of SFI's concession. The all weather road will incorporate a large number of bridges and culverts and the establishment of a number of borrow pits; the construction of the roads will lead to the felling of trees along the planned road alignment;

- 3) Developing and implementing procedures for:
 - a. Skid trail and log market construction;
 - b. Timber harvesting operations;
 - c. Post harvesting operations.
- 4) Establishment of log markets for temporary stockpiling of logs;
- 5) Construction and Operations of the Main Base Camp: setting up small but fully functional camps/villages to include office space, stores for spares, logging rigs, wood treatment tools and chemicals, stationery, depots for fuel and lubricants, garages, workshops and ancillary units; facilities for worker welfare: dormitories, ration stores, potable water supply, sanitary facilities, MEDEX outposts, recreational facilities, schools, churches, sites for garbage disposal, security outposts and log depots/sawmill sites.

SFI will have to clear a large number of small areas to store logs and lumber; to set fuel depots and machine servicing areas; and to set up camps and ancillary facilities for employees. A maximum of three such clearings of about 200m² is expected to be constructed in each block. *(Naturally the site for log markets is selected with great care and since their constructions incur costs, use will be made of existing clearings as far as possible).*

KWAKWANI-COCOA CREEK ACCESS ROAD (KCCR)

SFI plans to establish the Kwakwani-Cocoa Creek Road (KCCR) as its access road to the Sherwood Forrest Concession (Figure 2, Map 1, page 36). The access road would run northerly for some 250km along the Berbice-Corentyne Watershed linking the concession area to existing logging roads to Hururu Landing, right bank Berbice River.

Originally, the UNAMCO Road was being considered as the better option for accessing the concession because the road already existed. However, the establishment of road using this alignment would entail the bridging of the Berbice River in order to get to the right bank of the Berbice river, where the Concession is situated, and this would require major financial input,

While that option was being considered, the management of SFI acquired interests in a two logging concessions (Haimorakabra Logging Company Inc. and Wood Associated Industries Company Limited) on the Berbice – Corentyne watershed. These concessions, which lie well north of SFI, are already accessed by road to Kwakwani and Hururu respectively on right bank Berbice River, due to logging and bauxite mining activities prevalent in the area.

Further, the company engaged with loggers on the left bank Corentyne River who have been exploring the development of a road on the Berbice – Corentyne Watershed (or left bank Corentyne River) to access timber stocks in the upper Berbice-Corentyne watershed. SFI and consultants were further able to informally consult a number of surveyors, road engineers and persons who traversed the area, including Bernard Matthews, Benjie Pacis, Vincent Joseph, Colville Cappell - all surveyors/engineers and several loggers including Doodnauth Singh, Ganesh Singh *et al.* who were already discussing the development of a road that would link logging areas on left bank Corentyne with Crabwood Creek (where the sawmills are situated) to eliminate concerns related to the hazards of transporting logs down the Corentyne River and all of whom have extensive experience constructing roads on the Berbice-

Corentyne watershed. The consensus from these consultations revealed that the road alignment opted for is feasible. The technical challenges for the actual construction of the road are entirely within the competence of SFI and no problem is anticipated in this regards, especially as the terrain is favourable for road construction. The primary considerations are:

- Determining the shortest road possible;
- Avoiding stream crossings, bridge or culvert construction because these require major road works, as far as practicable;
- Avoiding swamps, rocky outcrops, fragile areas and other potential hazards;
- Wherever possible, the road will be pushed through scrub forests so that the felling of merchantable trees on areas outside of the concession will be minimal;
- No attempt will be made to bridge the Berbice River outside of the boundaries of the concession due to the huge flood plain detected on the margins of the river; this implies that the entire access road will be constructed on the Berbice-Corentyne Watershed.

These criteria could be established from detailed topographic, vegetation and soil maps of the area.

The design and quality of each road segment will be based on the terrain, the soil type and the volume of timber to be extracted; the duration of use of the road, and the kind of logging vehicles to be used (for example 6 x 4 heavy-duty trucks). Field operatives of the company have reportedly flown over the area several times. However, the company relied on site visits by its engineers and the extensive use of topographic and soil maps to make decisions on the actual road alignment. On average about 8% of the road is flooded for short periods during the rainy season when the creeks in the area overflow their banks. (Note that generally the northern part of the road is flat while nearer to the concession, the terrain is slightly undulating). Further, the current road alignment would avoid bridging the Berbice River (with an approximate cost of US\$1 million). Incidentally, the bridges across the Paidaka and the Kerimeru Rivers on UNAMCO Road would have had to be redesigned to accommodate the regular use of heavy duty trucks, if the Company had proceeded with this option.

Finally, much of the northern part of the road would pass through Savannahs and scrub forest that would significantly reduce road construction costs.

A major challenge in planning the development of 250km of forest road, including 180km through intact forests is the absence of a land use plan for the upper Berbice District. SFI believes it will initiate a strategic plan for the Corentyne-Essequibo Watershed. Another challenge is to organize stakeholders to co-manage the use and maintenance of the road and to share a common approach to the resolution of conflicts, if these emerge. Since the allocation of the SFEP to SFI, a couple of SFEPs (SFEP 02/11-Rong-An-Inc, SFEP 01/13-Baishnalín) and SFPs (UBFAPA, ISLA, Reg10FPA) were issued on the right bank Berbice River. Since the Berbice River is not navigable above Kwakwani, all timber extracted there will have to be extracted via the same roadway (after the necessary negotiations on shared costs for road maintenance).

Currently, an access road is being constructed from Kwakwani to Concession Area C with a total length of 105 km (the road from Kwakwani to the Haimorakabra Concession is approximately 45 km, while the access road from Haimorakabra to Area C is 60 km). From Kwakwani to the Haimorakabra Concession, the existing road is being maintained using white sand with 40 cm of loam covering.

SFI is expected to construct more than 180 km of primary roads and to upgrade another 70km in order to transport timber between the concession and Kwakwani. In addition, up to 100km of skid trails will be constructed within the concession area. Closely associated with road construction works are the necessary side drains that require scouring the soil for up to ten meters from the road margin, the construction of bridges and culverts, the layout and excavation of borrow pits, and cut and fill road works. Prior to road construction, several cut lines and measurements will have to be done to determine the final road alignment.

The machinery used for road construction activities are as follows: front-end loaders, dump trucks, excavators, bulldozers, graders and load rollers. From the Haimorakabra Concession to Concession Area C, the road was constructed using bulldozers for clearing vegetation at a width of 8 m. The sides of the road were also cleared to approximately 1 m especially in low swampy areas to allow the heat from the sun to dry the road. Excavators were used to construct drains along the sides of the road to drain water during periods of heavy rainfall. Load rollers are used to compact the road surface materials (white sand and loam mixture). Graders are used to level the road, after which stones were spread on the road surface by front-end loaders to cover the white sand and loam materials to prevent deformation of the road and to keep traction on the road (to prevent skidding).

In areas where the road meets a creek, and according to the size/width of the creek, air cored logs are being used to avoid stagnation of the water (allow water flow) before a culvert is constructed. Road material (loam, sand and stone) are then used to cover the culvert. In the event where the road meets a river, and according to the size/width of the river, wooden bridges are constructed above the rivers. After construction of the access road, the front-end loader and grader machines are used to maintain the road.

Since the construction of the part of the road there has been no major storm that led to an extensive flooding of the road; in fact there will be an opportunity to study this phenomenon during the rainy season. The road is located on the watershed, however there are no major ridges; the engineers will add soil to the road surface to ensure that the road is higher than the surrounding terrain. For segments of road on sandy soils and laterite, most of the fill material will come from excavation of side drains.

While many stakeholders are interested in SFI's road venture and whether or not logging could be feasible with a 250km haul distance, SFI contemplates the development of the road through partnerships with the private and public sectors. Comments made at the scoping meetings (see Annex IIa and IIb) and one to one consultations with various loggers indicate huge stakeholder interest in the 250km access road. Neighbouring concessions have the opportunity to take advantage of the access road for their own requirements. The road will bring so many benefits to so many stakeholders, that the road will eventually be less demanding financially than previously thought. SFI sees itself as the *driver of a process*, and it will proceed with the engineering and partnership building projects until other stakeholders come on board.

SFI believes that that access road will initiate a comprehensive land use plan for the upper Berbice Region, spreading developments southward away from the coast, improving the flow of goods between the coast and the interior, and affording stakeholders other options for reaching and doing business with Region 9. The Berbice River is not suitable for commercial traffic above Kwakwani due to erratic variation in water level with rainfall and the prevalence of rock outcrops. Essentially then a road is the best option for taking personnel and machinery and other production inputs to the concession area and for timber flows between the concession area and Kwakwani.

The establishment of the KCCR would be beneficial to loggers on the right bank Berbice River and left bank Corentyne River. This road will be the first one built there and will allow loggers who own concessions along the Berbice Corentyne Watershed to haul timber by trucks directly to Kwakwani and Hururu. Many of the current loggers in the area still use either the Berbice or Corentyne Rivers, both of which cannot be used except at the peak of the rainy season; production is therefore structured around weather conditions. A new road will allow loggers to haul timber much more regularly which will improve cash flow. Simply put, the KCCR will initiate the launching of millions of dollars in businesses in the upper Berbice via logging, tourism, agriculture and possibly gold mining. A functional road to Cocoa Creek will provide new options for the flow of goods between Regions 6 and 10, and between Regions 6 and 9.

Harvesting operations:

- 1) Tree marking, directional tree felling, bucking and extracting the logs through skidding operations to log markets;
- 2) Log market operations-sorting, grading and stacking of logs by species or dimensions, and loading logs on to logging trucks; short and long haul operations in accordance with onsite wood processing requirements and marketing practices;
- 3) Transportation of logs via trucks (capable of carrying 35-40m³ of timber) through Kwakwani to be exported. SFI will be hauling sawn timber from the concession area to Kwakwani in batches of about 40m³ about three times per week from the concession area to Kwakwani using 6x6 or 6x4 heavy-duty trucks. These trucks will operate by day (preferably) and at night.
- 4) Processing: currently, SFI do not contemplate any commercial scale sawmilling activity *within* the concession. The Company will be engaged in the export of logs, as well as primary and secondary processing of timber acquired from SFI and its other concessions in a large Wood Processing Plant located at Fitz Hope/Moblissa, on the western side of the Linden-Soesdyke Highway. An application for Environmental Authorisation for operations at this site has already been made to the EPA and an Environmental Management and Social Plan has been submitted to the Agency, which provides details of the extent of operations anticipated at the site, and associated mitigation measures for impacts associated with its operations. The sawmill operation at Fitz Hope, Linden-Soesdyke Highway will be processing logs harvested from SFI and its other concessions to produce wood boards and its secondary processing operations will involve the manufacture of various high quality finished products via the following workshops:
 - Veneer workshop
 - Plywood workshop
 - Sliced veneer workshop
 - Multiple layer solid wood floor workshop
 - Wood door and wood window workshop
 - Three layers solid wood floor workshop
- 5) However, there would be a need for lumber on the concession area for various structures and the lumber requirement for these may best be addressed by the occasional use of a portable

mill within the concession area. Hence, some amount of primary processing will be done within the Concession by utilizing chain saws and a portable mill (either a Lucas Mill or a Wood Mizer. A processing shed will be constructed to facilitate the primary processing at the Base Camp location.

Post-Operation Activities

Phase 4: Post harvesting operations

- 1) Assessment of the effectiveness of timber harvesting practices carried out by the company, especially in relation to the removal of all trees felled, and the level of completeness of the relevant documentation;
- 2) Implementation of remedial measures where applicable: (1) road closure after harvesting (for example re-shaping borrow pits and draining of pools of water (ponding) resulting from road construction or road maintenance works or road use); (2) post-harvest silviculture operations;
- 3) Establishing suitable partnerships to facilitate the conservation of biological diversity.

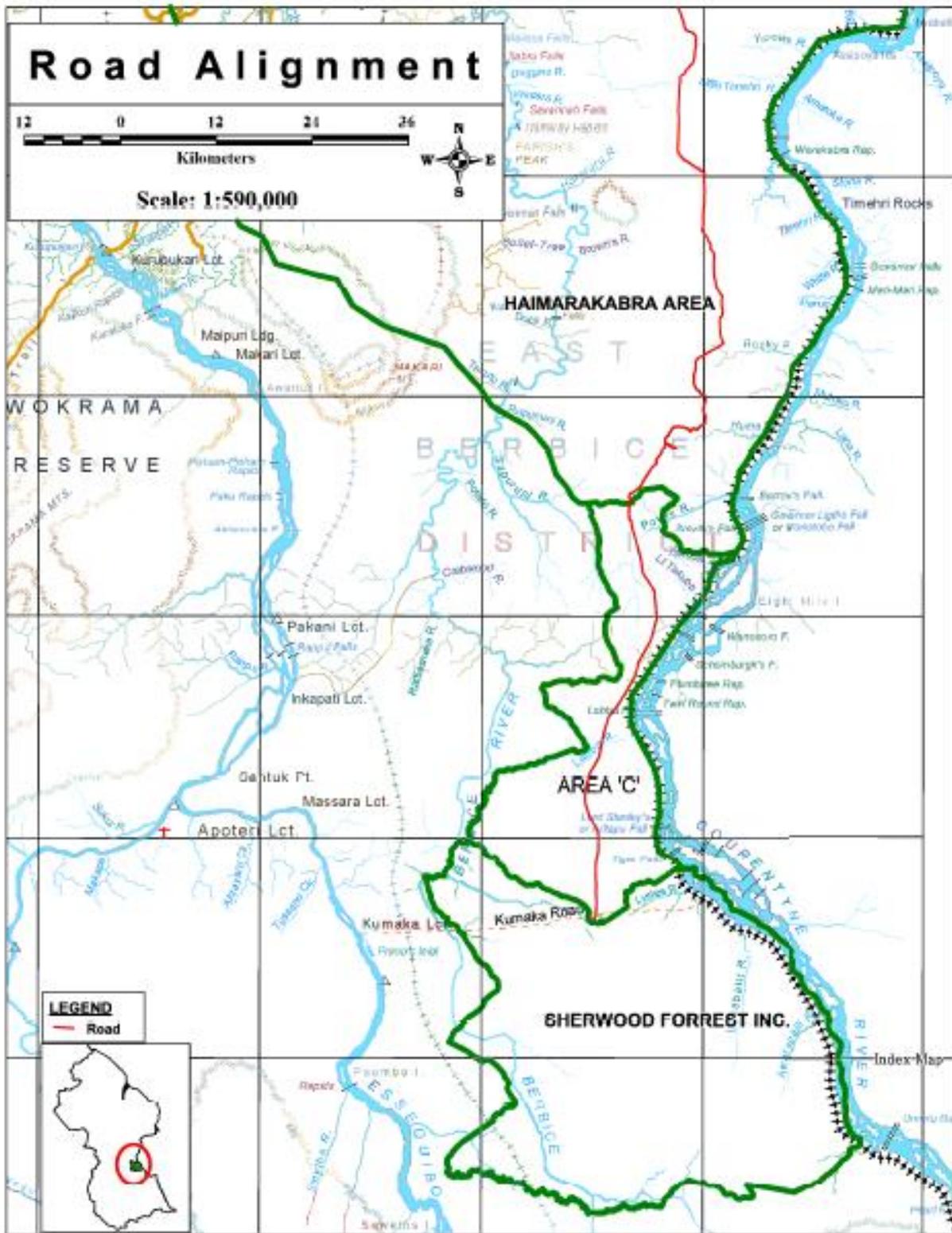


Figure 2: Map 1 showing Access Road Alignment (in red) for Sherwood Forrest Inc. Concession

3.4 Feasibility of the Project

3.4.1 Economic considerations

SFI will acquire a forest concession agreement for 167,066 hectares and it is the opinion of the company that given the nature of terrain, land use and drainage density in particular, that a *maximum* of 70% of this area will be used timber production.

Therefore the Net Productive Area or the net operable area is 116,946.2 hectares. This value will form the basis for SFI's planning.

SFI will opt for a **25 year cycle**, which will allow the enterprise to harvest up to 8.33 m³ of timber per hectare in an area of 4,677 hectares per year. This implies that the company may harvest up to **38,959.41m³** of timber per annum.

Given the logistics of harvesting timber on the concession area and of transporting timber to Kwakwani, SFI will aim for a recovery rate of 70% through value adding to the maximum extent possible; SFI therefore intends to market 27,000m³ of timber products per year. Value adding to the maximum extent possible is essential for the viability of the company. SFI believes that its value adding enterprise will allow the company to earn at least US\$700 per m³ of timber products.

SFI anticipates that by Year 10, it will realise revenues of **US\$18.9million** per year. Projected revenue/expenditures for period 2014-2023 is set out in Table 2, while the projected schedule of activities is set out in Table 4.

3.4.2. Social considerations

Social considerations will have major impacts on the feasibility of the project. SFI will need to develop a suite of remuneration packages linked to incentives to guarantee that field operatives will stay and work in the remote area for extended periods.

SFI will have to attend specifically to the conservation of indigenous assets if these exist as well as the interests of indigenous peoples in the area, if such interests emerge.

SFI will also attend to the conservation of assets of major national importance if these exist. (These could include critical assets – remnants of forts, paals and other markers, or old plantations or research plots such as the Cocoa plots referred to earlier, indicative of Guyana's history).

TABLE 2: PROJECTED PRODUCTION AND REVENUE FOR PERIOD 2014 TO 2023

| PROJECTED INCOME/EXPENDITURE: 2014 -2023 | | | |
|--|--|----------------------------------|-------------------------------------|
| Year | Projected Production (m ³) | Projected Revenue US\$ Millions) | Projected Expenditure US\$ Millions |
| 2014 | 0 | 0 | 5.7 |
| 2015 | 0 | 0 | 9.8 |
| 2016 | 0 | 0 | 4.8. |
| 2017 | 9,000 | USD 6.3 | 6.0 |
| 2018 | 12,000 | USD 8.4 | 6.0 |
| 2019 | 14,500 | USD 10.2 | 6.0 |
| 2020 | 16,000 | USD 11.2 | 6.0 |

| | | | | |
|------|--------|-----|------|-----|
| 2021 | 20,000 | USD | 14.0 | 6.0 |
| 2022 | 24,000 | USD | 16.8 | 6.0 |
| 2023 | 27,000 | USD | 18.9 | 6.0 |

SFI believes its project is feasible. There is a good market for timber produced by companies that display responsibility in addressing the legal, technical, environmental and social challenges of forest concession administration generally and sustainable forest management practices in particular.

3.5 Partnerships for Development

SFI believes that partnerships with several different stakeholders will be critical to managing the conflicts envisaged in the construction *and* use of the access road and in the implementation of mitigation measures to address negative impacts arising from its concession based field operations. The key partnerships envisaged are set out in Table 3.

TABLE 3: KEY PARTNERSHIPS ENVISAGED BY SFI

| # | Agency/partner | Details of collaboration |
|----|---|---|
| 1 | Ministry of Natural Resources & Environment | Land use issues |
| 2 | Ministry of Local Government and Regional Development | Discussion on strategic implications of the access road between Kwakwani and the northern part of the forest concession; the strategic development of Regions 6, 9, 10. |
| 3 | Guyana Forestry Commission | Timber paths where applicable; management of road corridor; use of the access road by other loggers; concession management |
| 4 | Guyana Geology & Mines Commission | Use of the access road by miners; monitoring of concession based mining activities. |
| 5 | Guyana Gold & Diamond Miners Association | Use of the access road by miners; management of mining on the concession area. |
| 6 | Environmental Protection Agency | Monitoring of mitigation measures. |
| 7 | Iwokrama | Information sharing on management systems for the road corridor; enterprise based on NTFPs, management of stakeholder relationships |
| 8 | North Rupununi District Development Board | Conservation of indigenous assets, employment and training of residents of the North Rupununi. |
| 9 | Conservation International | Ecosystem management; conservation of fauna |
| 10 | World Wildlife Fund- Guyana | Ecosystem management; conservation of fauna, fresh water resources; management of concession based mining activities |
| 11 | Forest Products Association of Guyana/CORTIM | Management of the road corridor; use of the access road by other loggers. |
| 12 | Ministry of Human Services & Social Security | Employment statistics, especially as these relate to the employment and training of women and indigenous peoples. |
| 13 | Ministry of Public Works and Communication | Road works, management of stakeholders' interests re the access road. |
| 14 | Ministry of Amerindian Affairs | Conservation of indigenous assets, employment and training of indigenous peoples (including residents of the North Rupununi). |

| | | |
|----|---------------------------------------|---|
| 15 | Guyana Police Force | Security issues |
| 16 | Apoteri Amerindian Village | Technical assistance, logistical support, skilled labourers (boat captains) |
| 17 | Forestry Training Centre Incorporated | Vocational training and education for forest operatives |

3.6 Risks

3.4.1 Degradation of the Access Road

The main risk envisaged by the company is the ***inability to control the use of the access road***. Any ***misuse*** of the access road by other stakeholders resulting from the following events will cause major productivity problems for SFI. Misuse of the road may be characterised by:

- 1) Deterioration of the road surface or drainage structures; and
- 2) The introduction of unnecessary hazards; for example, poor parking of tractors and trailers belonging to 'small loggers', dragging timber across the road, or leaving wood or log sections and other debris lying on the road way.

3.4.2 Stakeholders' and employees' apathy

Another risk could be the inability of the Company to find enough employees who are willing and able to be trained in the skills sets identified by the company. To ensure products of the highest quality, and to maintain the standards that SFI will set in keeping with its environmental policies, employees with high level of self-discipline would be required.

In relation to the access road, stakeholders' indifference can frustrate the management of SFI if such stakeholders do not abide by agreed practices for the proper use and maintenance of the road (corridor).

TABLE 4: ACTIVITY SCHEDULE - SFI: 2013-2017

| ACTIVITIES | 2013 | | | | 2014 | | | | 2015 | | | | 2016 | | | | 2017 | | | |
|---|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|
| | Q01 | Q02 | Q03 | Q04 |
| 1.0 Recruitment of Personnel | | | | | | | | | | | | | | | | | | | | |
| 1.1 Senior Staff | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | |
| 1.2 Technicians | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| 1.3 Support Staff | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | |
| 2.0 Sourcing Critical Documents | | | | | | | | | | | | | | | | | | | | |
| 2.1.Environmental Permit | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | |
| 2.2 TSA | | | | | | | | ■ | | | | | | | | | | | | |
| 2.3 FMP | | | | | ■ | ■ | ■ | | | | | | | | | | | | | |
| 3.0 Sourcing production assets | | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| 4.0 Access Road construction works | | | | | | | | | | | | | | | | | | | | |
| 4.1 Consultations | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| 4.2 Road surveys, alignment | | | | | ■ | ■ | ■ | ■ | | | | | | | | | | | | |
| 4.3 Road construction works | | | | | | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| 5.0 Concession based preparatory works | | | | | | | | | | | | | | | | | | | | |
| 5.1 Base camp works, including construction of Forest Station | | | | | | | | | ■ | ■ | ■ | ■ | | | | | | | | |
| 5.2 Primary road surveys, alignment | | | | | | | | | ■ | ■ | ■ | ■ | | | | | | | | |
| 5.3 Demarcation of concession boundaries | | | | | | | | | ■ | ■ | ■ | ■ | | | | | | | | |
| 5.4 Demarcation of compartments, protected areas | | | | | | | | | ■ | ■ | ■ | ■ | | | | | | | | |
| 5.5 Block demarcation, line cutting | | | | | | | | | | | | ■ | | | | | | | | |
| 5.6 Forest Inventory | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 5.7 Data processing/preparation of tree location maps | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 5.8 APO | | | | | | | | | | | | | ■ | | | | | | | |
| 6.0 Timber production | | | | | | | | | | | | | | | | | | | | |
| 6.1 Felling operations | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 6.2 Skidding operations | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

4.0 LEGAL AND POLICY CONTEXT FOR THE PROJECT

4.1 Introduction

Several pieces of legislation contain provisions related to the management of forest resources; there are separate pieces of legislation that manage *State forests*, *communal forests*, *mangrove forests*, and wildlife. This chapter highlights the core components of the legislative and regulatory framework that shall govern SFI's proposed forestry enterprise; and SFI aims to comply with all laws, integrating it into its marketing strategy.

SFI will comply with all laws, guidelines and policies in line with its obligations under the provisions of its forest concession agreement.

4.2 National Management Policies, Strategies and Plans

4.2.1 National Forest Policy Statement, 2011.

The National Forest Policy Statement 1997 was reviewed in 2011 through engagements with key stakeholders to reflect new and emerging issues, including the country's national and global responsibilities for the sustainable management of local forests and to ensure the alignment of the forestry sector with emerging initiatives such as the LCDS and REDD++.

4.2.2 National Forest Plan (2011)

The National Forest Plan was 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.

4.2.3 Low Carbon Development Strategy

The LCDS seeks to position Guyana to make a major contribution to global interests in climate change mitigation, sustainable forest management, fresh water resources and biodiversity. In essence, the LCDS promotes a low carbon economy by marketing the standing forest and promotes development without significant loss of forest cover. The LCDS also pronounces on value added enterprises in the forestry sector.

A major outcome of the LCDS and the related public consultations is a local citizenry much more knowledgeable about forest management and its implications for climate change and other intangible benefits of forests. The consultations were aimed at developing a shared knowledge of, and support for the strategy. The GFC, Office of Climate Change, WWF-Guyana, and CI-Guyana have been very active in the consultations.

According to the LCDS, "Guyana's forestry and mining sectors are major contributors to the economy. They provide employment for tens of thousands of Guyanese citizens, income for tens of thousands of

families, and generate significant Government revenue that is invested in public services. At the same time, they are the chief contributors to Guyana's existing, albeit low rates of, deforestation and forest degradation. Reconciling the need to balance the economic value and employment generated by these sectors with the desire to limit forest-based emissions is one of the most important and complex challenges in implementing REDD+ and the LCDS”.

The Government and the forestry industry are currently investigating how best to support further international processes to assist in global efforts to support the trade in sustainable forestry products. Work has started to investigate joining both the European Union Forest Law and Enforcement Governance Trade and Extractive Industry Transparency Initiatives processes if appropriate.

4.2.4 Reducing Emissions from Deforestation and Degradation (REDD+) Framework

Local and international policy makers accept that reducing emissions of greenhouse gases from deforestation and degradation is an important tool for mitigating climate change. REDD+ is a suite of internationally agreed policy approaches on issues of deforestation and forest degradation in developing countries. The policy approaches foster sustainable forest management practices. Considerations on REDD+ underlie forest management strategies set out in the LCDS. Reduced impact logging and consultations with stakeholders will underlie the prescriptions set out in SFI's forest management plan and timber harvesting practices. The cooperation between the Governments of Norway and Guyana expresses a willingness to work together to provide the world with a relevant, replicable model for how REDD-plus can align the development objectives of forest countries with the world's need to combat climate change. The initiative required a monitoring, reporting and verification (MRV) of forest carbon stocks and changes. Therefore, the operations of the company in the concession as with other operations will be tracked by the MRV system.

4.2.5 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 Note in 2009. 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 from legal sources and to support partner countries in improving their own regulation and governance of the sector.

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

4.3 Institutional Governance and Instruments

4.3.1 Land use initiatives/Cabinet Subcommittee on Natural Resources

The key agencies in the natural resources sector concerned with forestry, mining, and agriculture meet frequently to review developments in the natural resources sector and specifically to address overlapping land use. The use of the access road to be constructed by SFI will likely come under review by this committee due to the high level of stakeholder interest in the road.

4.3.2 Ministry of Natural Resources and Environment

The establishment of the Ministry of Natural Resources and Environment is the major strategic development in the natural resources sector, providing policy oversight and coordination for the following agencies in the natural resources sector:

- Guyana Forestry Commission
- Guyana Geology & Mines Commission
- Guyana Gold Board
- Guyana Lands & Surveys Commission
- Environmental Protection Agency
- Guyana Wildlife
- National Parks Commission
- Protected Areas Commission

The Ministry of Natural Resources and the Environment has been established to focus on expanding and diversifying the economy on the basis of rationale use of Guyana's natural resources in the context of new economic opportunities through avoided deforestation (REDD+) for which Guyana is one of the first countries to be paid.

A major benefit for developers is that the MNRE will facilitate more coordination among the various agencies vested with the management of particular components of natural resources.

4.3.3 Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA), established under the EPA Act 11 of 96 is the principal authority for *environmental management* in Guyana. In Sec. 4 (1) (a), the EPA is given the mandate to *"take such steps as are necessary for the effective management of the natural environment so as to ensure conservation, protection and sustainable use of its natural resources"* In addition the Agency is given the overall responsibility to *"co-ordinate the environmental activities of all persons, organizations and agencies"* [Sec. 4(1) (c)]; and is mandated *"to play a coordinating role in the preparation and implementation of cross-sectored programmes of environmental contents"* [Sec. 4(1) (1)]. The mandate to serve as the highest authority for granting Environmental Authorizations, where they are required, is supported by Sec. 5 which states that *"any person or authority under any other written law, vested with power in relation to the environment shall defer to the authority of the Agency and shall request a environmental authorization from the agency before approving or determining any matter..."*. This body is therefore in charge of granting environmental permits for projects, including those for 'the harvesting and utilization of forest resources.

4.3.4 Guyana Forestry Commission (GFC)

The Government, through the Guyana Forestry Commission 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. The GFC presides over 13.9 million hectares of State forests and is responsible for advising the subject Minister (Ministry of Natural Resources and the Environment) on issues relating to forest policy, forestry laws and regulations and forestry practices. The work of the Commission is guided by a National Forest Policy Statement, 1997 and a Draft National Forest Plan 2000² that has been developed to implement the forest policy. The Commission develops and monitors standards for forest sector operations, develops and implements forest protection and conservation strategies, oversees forest research and provides support and guidance for forest education and training.

The GFC is the focal point for REDD++ initiatives and for several sectoral projects funded by the ITTO and FAO.

For forest concession agreements (currently described as Timber Sales Agreements and Wood Cutting Leases), GFC prescribes the following:

- a) All concessions will operate on a 60 year felling cycle and a yield of $\leq 20\text{m}^3/\text{hectare}$ (loggers may opt for a smaller cycle providing that the yield will be proportionally smaller, so a 25 year felling cycle will attract a yield of $8.33\text{m}^3/\text{hectare}$;
- b) A minimum distance of 10m should exist between any two merchantable trees before both could be felled;
- c) Loggers must present 100% inventory data and stock (tree location) maps for every block to be harvested to GFC for review and await written approval before being allowed to harvest the block.

Logging companies have 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. GFC, after issuing an 'exploratory permit' for usually a period of three years, requires that the EPA applies due process in the issuance of an Environmental Permit, (the process of which usually requires that an ESIA be conducted before the permit is issued), before the issuance of a Timber Sales Agreement (TSA). The Environmental Impact Assessment Guidelines produced by the EPA and the EAB provides a framework specifically for conducting and reviewing ESIA's.

The GFC consults with the GGMC before granting forest concessions >8,000 hectares. In the context of REDD++ and the LCDS, there have been preliminary discussions between agencies in the local natural resources about a reciprocal arrangement where GGMC consults with the GFC prior to the granting of certain types of mining concessions (No mining concession occurs within the area held by SFI).

² In May 2010, the GFC initiated mechanisms for the revision of National Forest Policy Statement and the National Forest Plan.

4.3.4.1 Code of Practice for Timber Harvesting

The GFC's Code of Practice for Timber Harvesting, 2nd Ed (2011) based on FAO's Model Code of Forest Harvesting Practice, 1996, provides guidance on applicable standards for local forest conditions. It is designed to balance commercial considerations with the conservation of the natural environment and issues of occupational safety and health.

The Forests Bill 2007, grants legal status to the CoP, it is currently supported by a number of detailed manuals developed by the FTCL with the emphasis on reduced impact logging (RIL). RIL will be the basis of the timber harvesting activities to be carried out by SFI.

The CoP is currently under review to update its contents, in line with consultations carried out by the GFC. SFI's draft FMP already includes applicable prescriptions of the CoP.

4.3.4.2 Forestry Management Plan Guidelines

The Forestry Management Plan Guidelines, 1999 elaborates the basis for strategic and operational planning. Guidelines for annual operational plans (AOP) have also been published³. The GFC provide information on forest types, forest classification and forest use; for conducting economic studies on the value of forest goods and services. The outputs of this process will guide decisions on the allocation and use of resources.

4.3.5 Guyana Lands and Surveys Commission (GLSC)

The core function of the GLSC is to survey and map the land and water resources of Guyana, to be custodians of all public lands, to administer these effectively in the national interest, and to provide land-based information to a broad range of public and private sector entities and interests. The GFC consults with GLSC before issuing forest concession agreements. All agencies in the natural resources sector consults with GLSC on land use issues.

A major role of GLSC is *land use planning*. Land use planning creates the conditions required to achieve types of land use which are sustainable, socially desirable and environmentally compatible⁴.

According to GLSC, the goals of land use planning include fostering income generation by optimal allocation and development of physical resources. The objectives of land use planning include establishing priorities in regard to land use and infrastructure development and the creation of a framework to enable land use change. More importantly, for SFI, the benefits of land use planning include a framework for the resolution of land use conflicts, facilitating the effective utilization of existing resources, and fostering the opening up of new areas for development in a sustainable manner.

A Sub-regional Land Use Plan⁵ has been completed for the lower east Berbice-Corentyne District, Region 6. The planned developments by Sherwood Forrest Inc. could have major positive implications for the development of a land use plan for the upper Berbice-Corentyne Watershed.

³Please see www.forestry.gov.gy

⁴Please see <http://www.lands.gov.gy/lup.html>

⁵http://www.forestcarbonpartnership.org/fcp/sites/forestcarbonpartnership.org/files/Documents/PDF/Guyana_Regional_VI_Sub-Regional_Land_Use_Plan_0.pdf.

4.4 Legislation

4.4.1 Environmental Protection Act, 1996 and its associated Regulations

The Environmental Protection Act 11 of 1996 provides the institutional and regulatory framework for the assessment of impacts on the natural, social, and cultural environments originating from economic or developmental activities. The Agency is a regulatory body that provides guidelines on the preparation of and ESIA; when completed, the study is submitted to the EPA and Environmental Assessment Board (EAB) for review. Once approved, the Agency issues an **environmental permit** for development.

In 2000, under the EPA Act, regulations on Environmental Authorisations, Water Quality, Air Quality, Noise Management and Hazardous Wastes Management were established. These regulations require that standards for relevant parameters be established by the Guyana National Bureau of Standards.

4.4.1.1 Environmental Protection (Authorisation) Regulations, 2000

The EPA Authorisations Regulations, 2000, establishes the terms and conditions of environmental authorisations: "(a) that the holder of the environmental authorisation shall take all reasonable steps to (i) avoid all adverse environmental impacts which could result from the activity;(ii) minimize the adverse environmental impact where the avoidance is impractical;(iii) mitigate the impact where the impact cannot be avoided;(iv) avoid cross media transference; and (v) compensate for impacts.

4.4.1.2 Environmental Protection (Water Quality) Regulations, 2000

Guidelines on the discharge of effluents and disposal of waste are detailed in these regulations.

Interim Standard for water quality has been developed by the Guyana National Bureau of Standards (GNBS GYS 262:2004). Common parameters in and around forestry enterprises tested for include: faecal coliform, nitrates, dissolved oxygen (DO), biological oxygen demand (BOD), oil and grease, total suspended solids, total dissolved solids and turbidity.

GNBS has also published Interim guidelines for industrial effluent discharge into the environment (GYS 207:2002); however no industrial effluent is projected for SFI's operations.

4.4.1.3 Environmental Protection (Air Quality) Regulations 2000

Elements related to parameter limits on air contaminants and emission samplings are stated in the regulations. Vehicle and generator exhaust fumes will be the only sources of air contaminants of SFI's operations. Due care will be taken with the occasional use of pesticides (for mosquito control) and wood preservatives, if used at all.

4.4.1.4 Environmental Protection (Noise Management) Regulations, 2000

The Noise Management Regulations also state that standards for permissible noise levels in industry, construction and other areas must be established. The categories for permissible noise levels are to be fixed for the following areas: Residential, Institutional, Educational, Industrial, Commercial, Construction, Transportation and Recreational.

In 2010, the Guyana National Bureau of Standards published its (finalised) Guidelines for Noise Emissions into the Environment⁶.

TABLE 5: GNBS GUIDELINES FOR NOISE EMISSIONS INTO THE ENVIRONMENT
(SOURCE GNBS: GYS263:2005 REVISED 2010)

| Categories | Daytime (06:00-18:00 hrs) Limits (Decibels) | Night time Limits (Decibels) |
|----------------|--|--|
| Residential | 75* | 60 |
| Institutional | 75 | 60 |
| Educational | 75 | 60 |
| Industrial | 100* | 80 |
| Commercial | 80* | 65 |
| Construction | 90* | 75 |
| Transportation | 100* | 80 |
| Recreational | 100 | 18:00 – 01:00h -100 01:00-08:00h-70 |

*Relevant to the project

4.4.1.5 Environmental Protection (Hazardous Wastes) Regulations, 2000

The EP Hazardous Wastes Regulations requires that operations take measures to transport, store, treat and dispose of all hazardous materials. SFI must also apply for an authorisation to handle all hazardous materials in the environmental permitting process; developers such as SFI are also guided by the regulations to develop a preparedness plan detailing the list of hazardous material that will be used, their characteristics and how they will be managed. In addition the regulations also require that SFI should include the need for reporting of emergencies. To some extent, SFI will engage in the use of hazardous materials such as waste oil and chemicals, but shall do so in keeping with these regulations and the conditions outlined in the permit.

4.4.2 Guyana Forestry Commission Act 6 of 2009

This act provides specifically for the establishment, organization, mandate, functions and responsibilities of the Guyana Forestry Commission, the *forestry authority* in Guyana. The Act was recently revised in its entirety and the new forestry legislation addresses broader resource use issues.

The Act authorizes the GFC to, among other things:

- a) Grant forest concession agreements to individuals, loggers’ associations and companies to fell and extract timber from defined tracts of State forests;
- b) Regulate timber harvesting, the conveyance of timber along public roads, and timber exports;
- c) Regulate the rights and privileges of Amerindians in relation to *State forests*.

The Act also outlines the ownership of forest produce, offences and legal proceeding under the Act, and penalties for non-compliance with the provisions of the Act.

⁶ GNBS: GYS 263:2005: Guidelines for Noise Emissions into the Environment

4.4.3 Guyana Geology and Mines Commission Act Mining Act, 1989

The **Guyana Geology and Mines Commission Act Mining Act, 1979** Act provides for the establishment of the Guyana Geology and Mines Commission, a body corporate and prescribes the functions and purview of the Commission.

Act provides for the granting of various categories of mining permits covering reconnaissance and prospecting activities and permits for mining metals, minerals, and precious stones. The Mining Act also empowers the GGMC to regulate the conveyance of mines, mining licences and quarrying permits; it also provides for the conduct of geological and geophysical surveys in any part of Guyana including State forests already allocated under forest concession agreements.

Managing competing land use is a major issue for holders of forest concession agreements.

4.4.3.1 Mining (Amendment) Regulations 2005 (to the Mining Act, 1989).

The Mining Regulations regulate mining technology, including technology for the retrieval of gold using mercury or cyanide. The regulations also state that water which contains any poisonous or injurious chemical must not be permitted to escape or enter any creek, lake, reservoir, or pond unless it has been made harmless. The Mining (Amendment) Regulations 2005 provides specific details on the use of poisonous substances.

4.3.4 State Lands Act, 1903

This Act ensures the proper administration and regulation of lands, rivers and creeks of the State. It allows the President to grant leases or licenses for the use of State property. The provisions of this Act are useful when the company establishes major timber processing facilities.

4.4.5 Wild Birds Protection Act, 1973

This Act protects certain birds in Guyana. It contains two lists – birds that are absolutely protected, listed in the First Schedule of the Act, and birds that are protected some of the time, namely in what is termed the ‘closed season’.

For those birds listed in the First Schedule, it is an offence to knowingly wound or kill any of these birds, or to offer to sell them or attempt to export them. The birds listed in the Second Schedule are protected for the part of the year stipulated in the Act, thus creating a ‘closed season’ during which the birds listed therein may not be captured, wounded or killed. It is also illegal to expose or offer for sale, or purchase any of those wild birds recently captured or killed during the closed season.

It should be noted that S.7 of the Act allows that the birds, although protected in theory, can be hunted in certain circumstances, and that no Amerindian is liable for an offence under the Act.

4.4.6 Occupational Safety and Health Act, 1997

Guyana’s OSH Act was passed in 1997 and brought into force in September 1999. The Act requires a bipartite system of responsibility for OSH in the workplace, where workers and employers work together

to identify and find solutions for OSH. (Guyana's OSH Act is keeping with the draft Model CARICOM Legislation⁷.

In keeping with the laws and regulations a description of the established management procedures to monitor and manage occupational health and safety hazards is critical for this project.

4.4.7 Labour Act

The Act and its conditions specify the conditions that an employer must observe in the contracting of 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 agree on such terms.

Wages should be payable either weekly, fortnightly or monthly, except otherwise agreed.

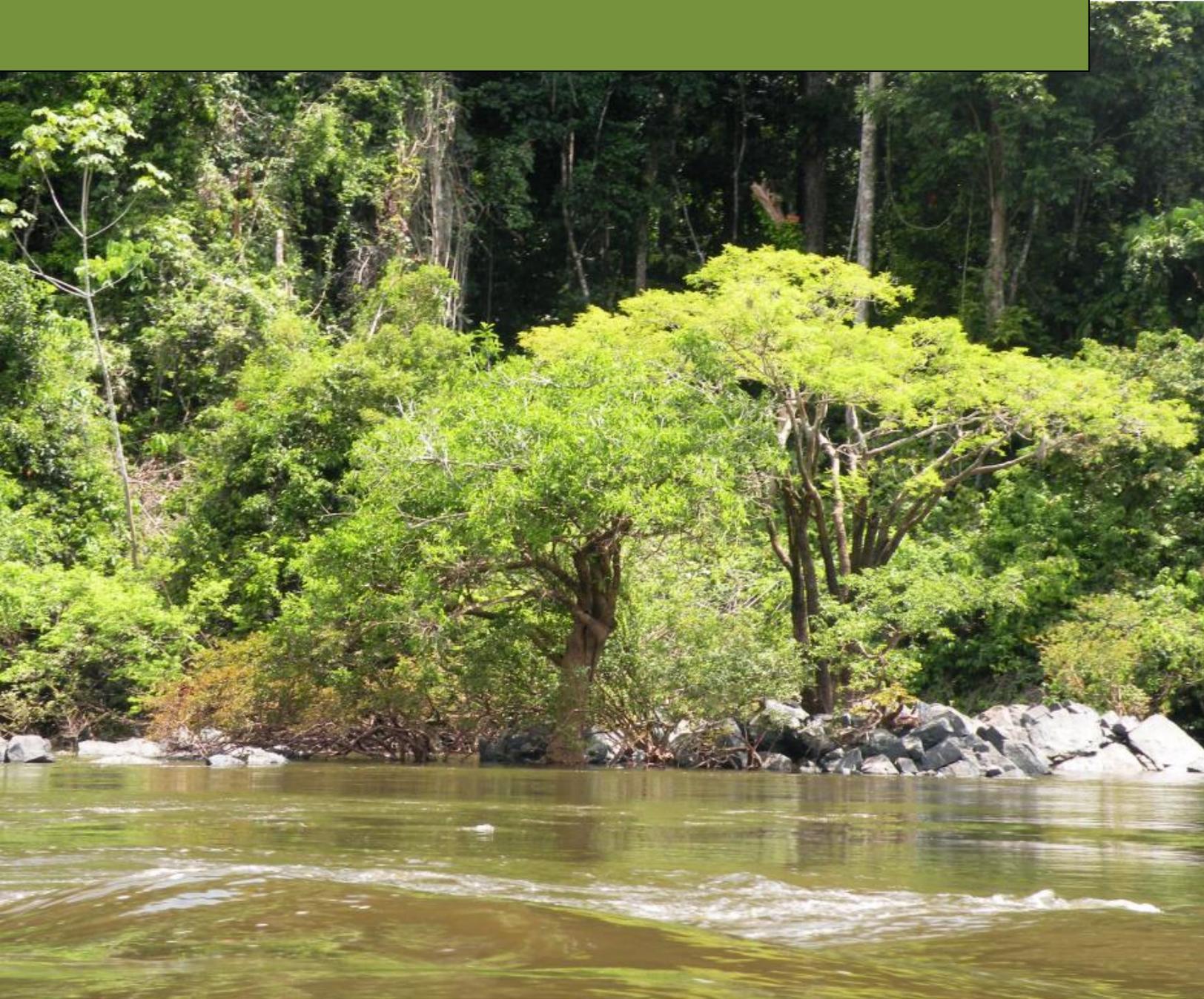
4.4.8 Amerindian Act, 2005

Under the current Act, *non-Amerindians* must obtain permission before they can enter or remain in an Amerindian District, Area or Village, settlement or encampment. The Amerindian Act also addresses the protection of property and legal proceedings on behalf of Amerindians, employment of Amerindians, and prohibiting the supply of intoxicating liquor to Amerindians. Provision is also made for entering into written contracts with Amerindians.

The Act further assigns to every Captain/Toshao the status of *ex officio* Justice of Peace in and for the district, area and village authority, which also allows the Captain (Toshao) to also serve as a rural constable.

⁷Please see <http://www.cehi.org/lc/wh/guyana.htm>

CHAPTER 2: THE FOREST ENVIRONMENT



5.0 NATURAL ENVIRONMENT BASELINE CONDITIONS

5.1 Physical Environment

5.1.1 The natural state of the forests

The area under the SFP may be described as pristine and intact seasonal forests with abundant and diverse fauna and flora. Every attribute points to a fully functional ecosystem, especially in terms of the following indicators:

- (a) diversity of fauna (arboreal, terrestrial and riverine) and implications for healthy predator-prey ratios;
- (b) the large number of *juvenile* animals encountered including juvenile armadillos, agouti and tapir;
- (c) the presence and abundance of large herbivores (tapirs, deer, peccaries) and large predators (including jaguars and harpy eagles, see Annex IX); large carnivores and large terrestrial herbivores are the animals especially vulnerable to human impacts (Primack and Corlett, 2005);
- (d) forest structure in terms of plant diversity, the distribution of diameter classes, and the closeness of the canopy; and
- (e) the absence of accelerated erosion consistent with intact forests.

5.1.2 Baseline conditions

5.1.2.1 Soils and Geology

To date the reconnaissance teams have encountered sandy loams and red earths on the concession area, with more clayey soils near streams and in marsh/swamp conditions. Such soils (the sandy loam in particular) are suitable for road construction. The soil conditions would be even better for road construction on higher ground. Many of the creeks encountered had clear 'white water'; evidence of heavy clay soils as well as the absence of erosion. Figure 3 and Table 6 provides details of soils in the area based on reconnaissance surveys. The work to describe the soils and their implication for timber harvesting operations will be ongoing, on receipt of the forest concession agreement.

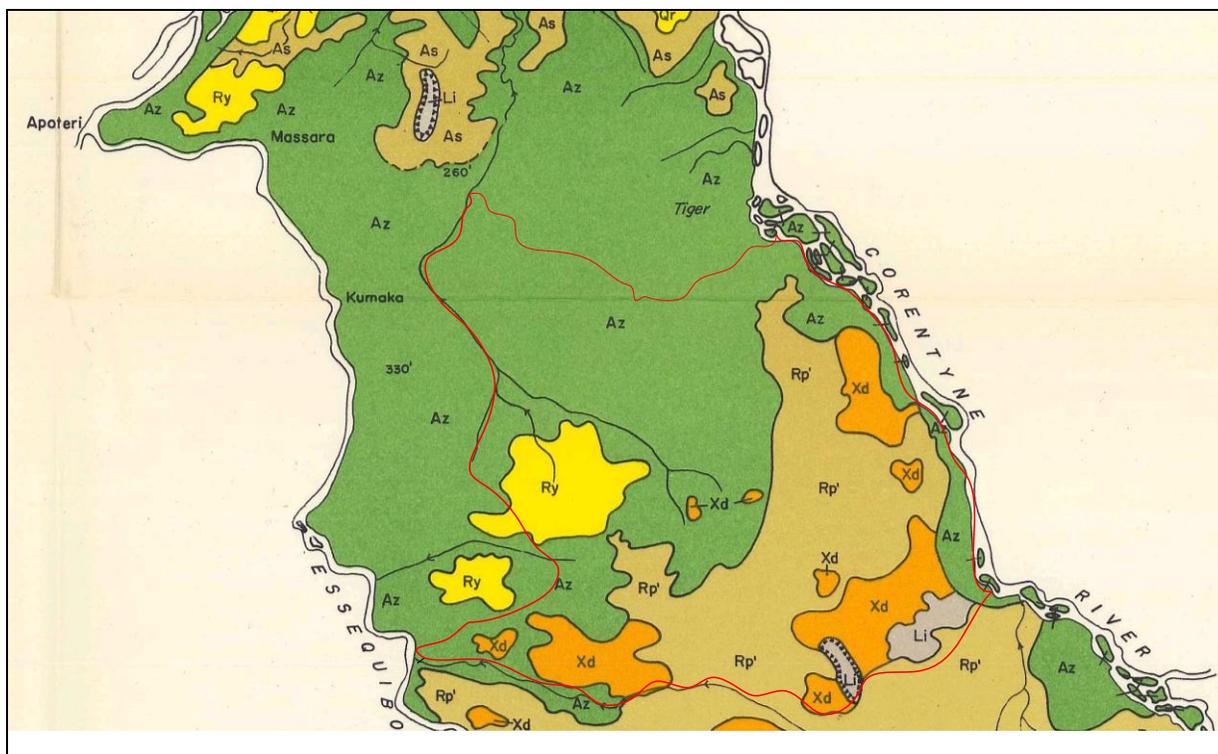


Figure 3: Map showing soil types within the forest concession area
 (Note: perimeter of the concession area in red)

TABLE 6: DESCRIPTION OF SOILS IN THE CONCESSION AREA

| # | Symbol | Soil Great Group | Relief & Landform | Soil Parent Material | Comments |
|---|--------|---|---|---|-----------------|
| 1 | Az | Light brown and grey, deep, usually mottled, poorly and very poorly drained clay and silty clay soils (Alluvial soils, low humic gleys and low humic gleys-ground water laterite intergrades) | Flat and gently undulating, recent river terrace alluvium | Recent and sub recent alluvial clays and silts with some sands | 83,533 ha (50%) |
| 2 | Ry | Brown deep, well drained sandy soils (Regosols); brown quartz sand phase, red-yellow latosols | Gently undulating white sand plateau | Unconsolidated sandy and clayey deposits | 11,695 ha (7%) |
| 3 | Rp | Brown, yellow and red deep well drained loam and clay soils (Red-yellow latosols) | Undulating and densely dissected sub-recent pediplain | Superficial pedimentary deposits | 45,108 ha (27%) |
| 4 | Xd | Brown, red and yellow deep, well and moderately well drained clay soils (red-yellow latosols, fine texture phase, lithosols) | Hilly dissected residual landscape | Granites and various gneiss and colluviums materials | 25,059 ha (15%) |
| 5 | Li | Moderately deep, excessively drained, brownish silt loam, sandy loam and gravelly soils (Lithosolic soils) | Steep hills and mountains | Residual, mainly deeply weathered acidic materials such as sandstone, conglomerate, granite schist and phyllite | 1,671 ha (1%) |

Soil moisture is defined as the water that is held in the spaces between soil particles. This is the measurement of water found in the upper 10 cm of soil, the information is valuable in baseline study to a wide range of government agencies and private companies concerned with weather and climate, runoff potential, flood control, soil erosion, slope failure, reservoir management, geotechnical engineering, foundation and water quality.

Soil samples were taken on Cocoa Creek north east of the Camp site along the 2 km transect lines that were cut (Figure 4). The general soil type of the area is predominantly sandy clay; this was noted from the various soil samples collected throughout the project area the upper 4 inches of the soils were composed of humas. The colour of the soils ranged from light brown to gray and light gray, either showing some indication of light weathering or oxidation. The soil moisture found was from 17.5 to 19.1 % and the Soil pH was from 4.6 to 5.0 and this is considered common for sandy soils or soils rich in humas. These parameters indicate a healthy soil for Tropical forest (Table 7).

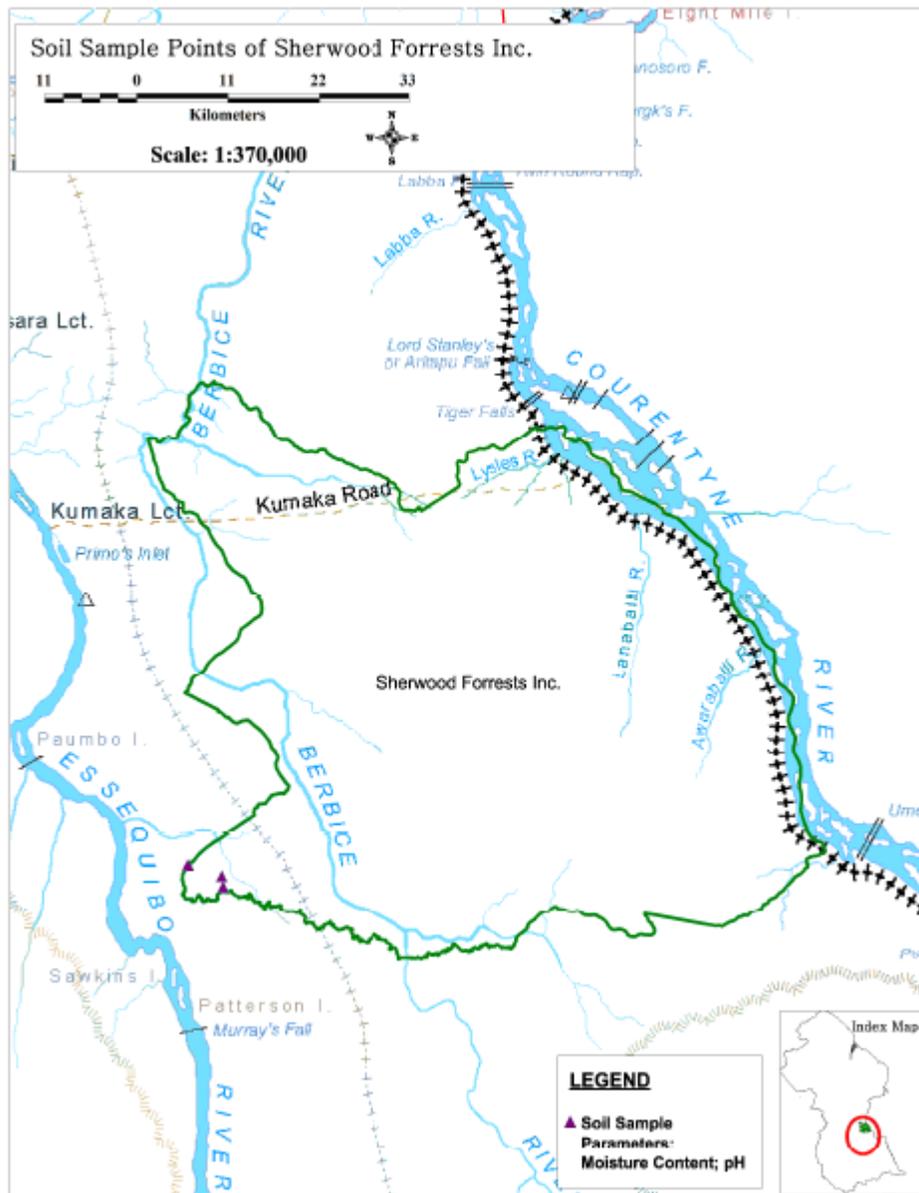


Figure 4: Soil Sample Points of Sherwood Forrest Inc.

TABLE 7: SOIL MOISTURE CONTENT (%) COLLECTED FROM VARIOUS SOIL SAMPLES AT THE PROJECT SITE

| Soil Type (Sandy/Clay) | | | | | | | |
|------------------------|--|------------|-----|-------------------|---------|---|--|
| | | Soil Depth | | Data | | | |
| Sample ID | Coordinates | Top | Sub | Soil Moisture (%) | Soil pH | Soil Colour | Description |
| S1 | 21N - 0360220 UTM – 0401031 | | √ | 19.1 | 5.0 | Dark grey | Soil sample was taken approximately 600 m on the second Transect line for Sherwood Forest Concession. The vegetation type of the area was 3 low swamp which was 0.61% of the Sherwood Concession, with a size of 1025.89 ha (2535.01 acres). |
| S2 | 21N - 0360108 UTM – 0401875 | | √ | 21.5 | 4.6 | Grey with evidence of chemical weathering oxidization due to the red brownish colour present in the soil. | Soil sample was taken approximately 1.4 km on the second Transect line for Sherwood Forest Concession. The vegetation type of the area was 1b mixed forest, flat to undulating which was 19.01% of the Sherwood Concession, with a size of 31756.10 ha (78470.72 acres). |
| S3 | 21N - 0357381 UTM – 0402800 | | √ | 17.5 | 4.6 | Light brown | Soil sample was taken approximately 2 km on the second Transect line for Sherwood Forest Concession. The vegetation type of the area was 1b mixed forest, flat to undulating which was 19.01% of the Sherwood Concession, with a size of 31756.10 ha (78470.72 acres). |

5.1.2.2 Land use

No active land use of any kind whatsoever has been detected to date within the concession area, officially the area is intact State forests. Three facts should be mentioned however:

- 1) Firstly, there is evidence of a trail (more a 'sirih'i') *reportedly* used for a one off-military exercise that starts from Primus Inlet, right bank Essequibo River and goes in a general easterly direction to the Corentyne River (see Map 1);
- 2) Secondly, on the right bank Essequibo River, in the vicinity of Primus Inlet, **outside** the concession area, there is evidence of remnants of a Cocoa (*Theobroma cacao*) research plot. Similarly, in the south western area of the concession, on the margin of right bank Essequibo River there are

cocoa trees, evidence of either a nursery for cocoa seedlings or remnants of a cocoa plantation (see Figure 5). Near Primus Inlet, there is a small untended crop of plantain trees (*Musa* spp.) reportedly planted by a resident of Apoteri; and

- 3) Finally, the few mature Bulletwood trees (*Manilkara bidentata*) encountered to date bear scars of slash marks indicative of balata⁸ bleeding activities some twenty years ago.



Figure 5: Photo of Cocoa (*Theobroma Cacao*) Research plot, in the vicinity of a Cocoa Creek, Right Bank Essequibo River, SFEP 01/07

During the scoping meeting at Annai, residents reported that many years ago, there was a large trail established by the Geological Surveys Division, GGMC, within the concession area for mineral reconnaissance work, but neither the consultants nor the inventory crews encountered any evidence of this trail. However, this old trail from Kumaka, right bank Essequibo River to a point just above Lysles River, left bank Corentyne River, appears on the map of Guyana.

In discussions with GGMC, it appears that there are no active or functional licences within the concession area. Certainly an examination of geological maps currently available does not indicate commercial mineral deposits or current mining concessions in the upper Region 6. The Consultants did observe a miner's notice board (Figure 6) at several points along the Essequibo River (**outside** of the concession) but no signboards of any kind were observed **within** the concession area.

The relatively large Cocoa creek on the right bank Essequibo River which forms a common boundary with the former CI Conservation concession is basically closed to use by boats due to wild guava plants growing thickly across the creek. This implies that the creek is not used by anyone. Several very large caimans were encountered lurking at the mouth of Cocoa Creek.

Occasionally, some foreign tourists traverse the river from Apoteri to King William IV Fall, enjoying the scenery provided by the unpolluted upper Essequibo River and gazing at the caimans, otters, capybara and diverse avian fauna visible along the river banks.

Outside the concession, residents of Apoteri in particular catch Lukanani (*Cichlacoceliaris*), Houri (*Hopliasmalabaricus*), Patwa (*Cichlasomabimaculatum*), Hassar (*Hoplosternum littorale*), Piranha

⁸Apoteri was the main hub for the balata industry within the north Rupununi; the airstrip there was constructed specially to accommodate Dakota aircraft used for airlifting Balata to Georgetown.

(*Serrasalmus niger*), Tiger fish (*Surubim spp.*); Yarrow (*Hoplerythrinus unitaeniatus*), Arapaima (*Arapaima gigas*) and Sunfish (*Crenicichlasaxatilis*).



Figure 6: Miner's notice board on right bank of Essequibo River

5.1.2.3 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. 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.

Rainfall is heaviest in the northwest and lightest in the southeast and interior. Annual averages on the coast near the Venezuelan border are near 2500 millimeters. Although it rains throughout the year, about 50 percent of the annual total arrives in the rainy season that extends from May to the end of July along the coast and from April through September farther inland. Coastal areas have a second rainy season from November through January.

The nearest locations for which rainfall data are available are: Apoteri 1954, 1956-1962 (Suggett and Braun, 1964), Annai 1900-1900 (Fanshawe, 1952) which occupy the **same latitude** as SFI's concession and further north, Kurupukari 1900-1900 (Fanshawe, 1952). Based on Figure 7, it is recommended that logging of the concession area be done February through April, and August through November.

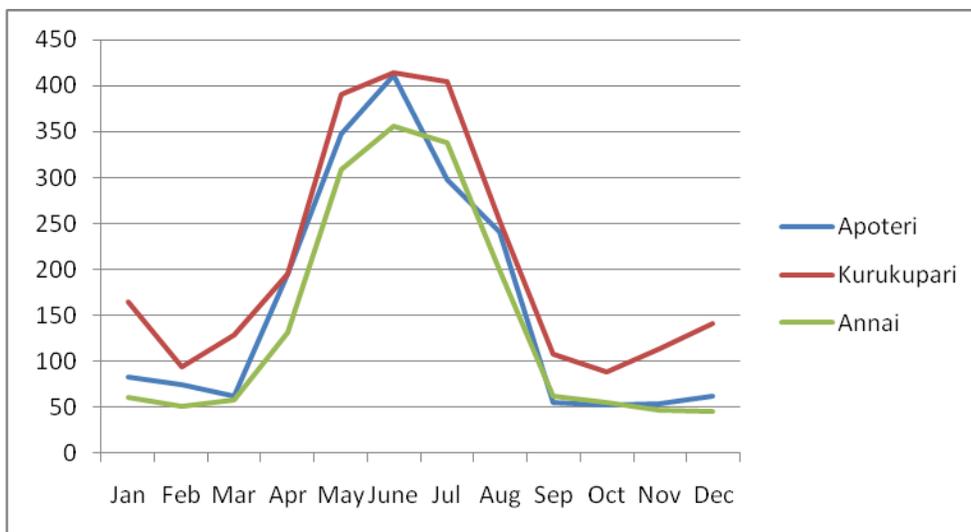


Figure 7: Graph showing trend in annual rainfall at Annai, Apoteri and Kurukupari

Relative humidity is always high in Guyana, rarely falling below 60% during the day; it is always higher in the forested belt than on the coast. The relative humidity for two locations, one coastal and one in the interior is shown in Table 8.

TABLE 8: MEAN RELATIVE HUMIDITY (%) FOR TWO LOCATIONS (FANSHAWE, 1952)

| Time | Georgetown | Bartica |
|-----------|------------|---------|
| 07:00 hrs | 88.3 | 93.7 |
| 13:00 hrs | 72.6 | 77.3 |
| 18:00 hrs | 80.2 | 83.7 |

5.1.2.4 Noise Conditions

The existing sound environment throughout the Concession is characterized almost completely by sounds of nature since the project area is undeveloped lands with no communities, land use or nearby roads. The areas where noise readings were taken were generally very quiet with rustling of trees and chirping of birds in the background. However, there is some noise from the infrequent movement of boats equipped with outboard engines traversing the Essequibo Rivers.

Noise levels were recorded at eleven (11) points (Figure 8); the sampled areas never exceeded 51 decibels (dB). The Sample Point N5 with 50.7 dB and the sample point N8 with 50.6 dB shown a small increment in noise level and was as a result of sounds from the boats with outboard engines. Table 25 in Appex XIII show all the values measured for this concession.

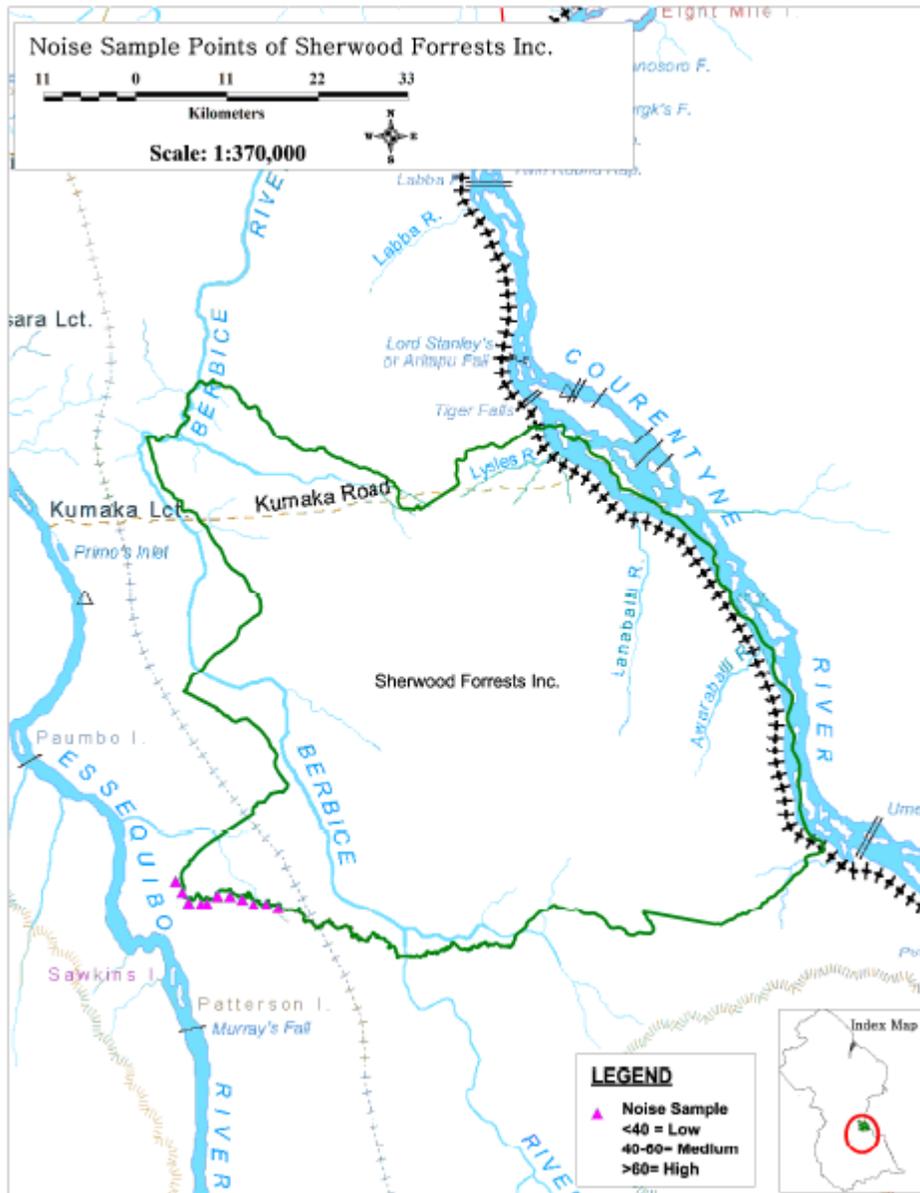


Figure 8: Noise Measurement Points within Sherwood Forest Inc.



Figure 9: Field Analysis of Noise Level Measurements

5.1.2.5 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. There was no historical air quality data for the Project Area, however, the air quality within the project area can be considered good since major activities to affect air quality was limited. As an indicator of Air Quality within the project area, a preliminary assessment was done of Particulate Matter reflected in the Total Suspended Particles concentration during May 2014.

Particulate Matter (PM) is the term for a mixture of solid particles (dust, dirt, soot, and smoke) and liquid droplets suspended in the air. These PM emissions originate from a variety of sources, such as vehicles, factories, industrial sites, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood (Hedges 2004, p.58). Particulate Matter comprises both coarse and fine particles. The coarse particles (PM₁₀) have an aerodynamic diameter between 2.5µm and 10µm.

Total Suspended Particulates (TSP) refers to all particles in the atmosphere that are less than 100 micrometers. The amount of PM₁₀ and PM_{2.5} are related to the amount of total suspended particulates (TSP) in the air (Alias, Hamzah and Kenn 2007, p.255, 258).

The purpose of the qualitative assessment was to get a first-hand impression through observations of the air quality conditions in the areas surrounding the Project Site and an idea of steps that can be taken to reduce air pollution and/or exposure.

Air quality monitoring was conducted at eleven (11) (Figure 10) sites around the Project Site of the Concession Areas using a pDR-1000AN personalDataRAMTM (Figure 11). The Total Suspended Particles (TSP) concentration measured varied based on TWA, Maximum and Average Concentrations at the 11 sites monitored around the Project Area.

The average concentration values recorded within the concession and the TWA values were below the TSP limit for the WHO Guidelines. The maximum concentration values recorded for the Concession Area were all below the TSP limit for the WHO Guidelines with 37 µg/m³ (highest value recorded) for sample point A11 and 3 µg/m³ (lowest value recorded) for sample point A5 .

There was no major impact to air quality within the Project Site. The concession area can be considered pristine since activities to affect air quality were limited. There were no industrial type activities in close proximity, as well as activities which generate significant quantities of dust. Table 26 in Annex XIII shows details of air quality analyses within SFI Concession.

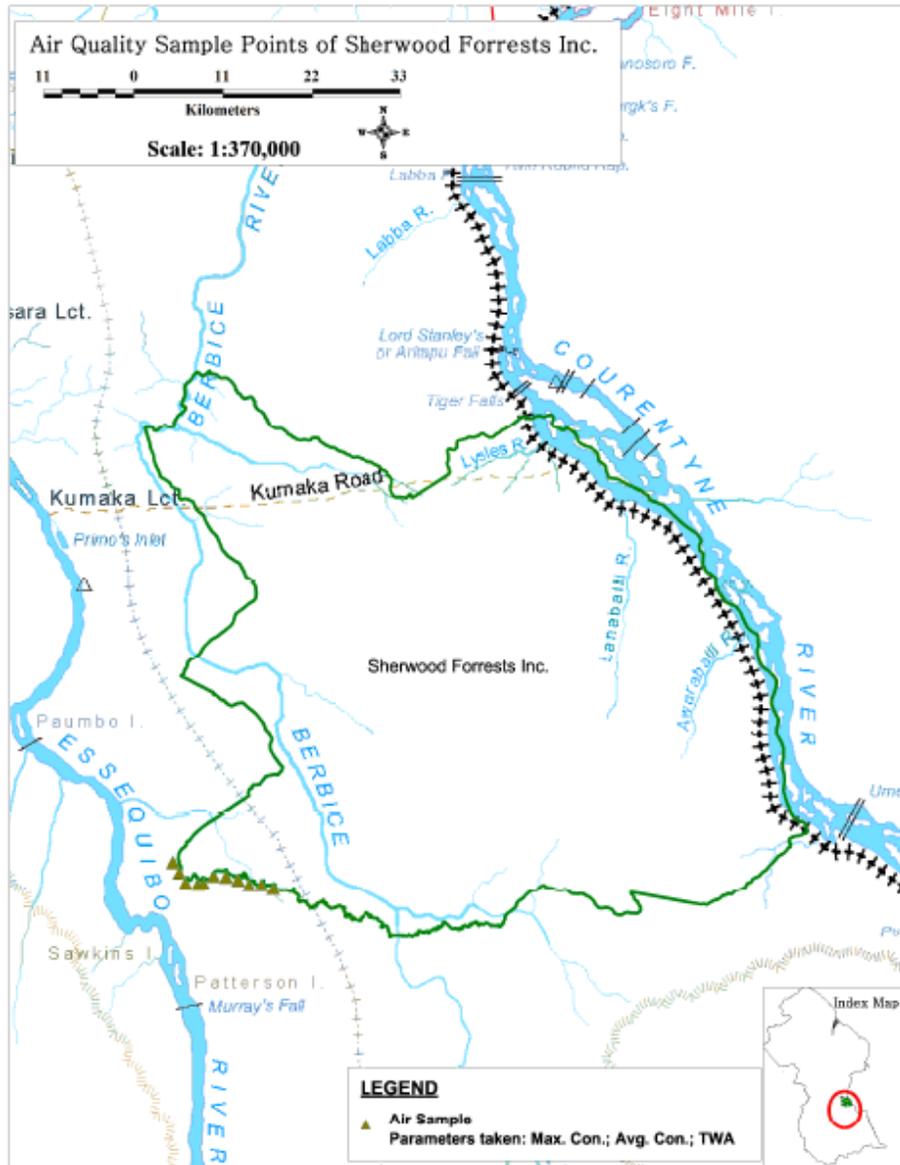


Figure 10: Air Quality Sample Points of Sherwood Forrest Inc.

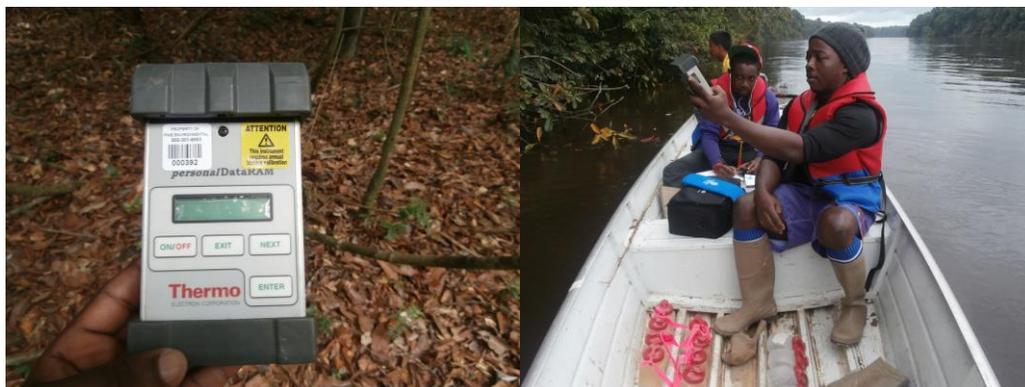


Figure 11: Field Analysis of Air Quality

5.1.2.5 Water Quality

Surface water samples were collected and analysed using the LabQuest 2 Water Quality Package (which includes an electronic interface and several sensors and probes which test for various water quality parameters) to determine the quality of surface water within the project environment. A total of eleven (11) water samples were collected and analysed within and around the concession. These samples were collected from Cocoa Creek and a number of smaller Tributaries located within the Concession. The locations where the samples were collected are identified on the map below (Figure 12) as the WQ locations.

The sample locations were selected at strategic points based on the accessibility to the concession Area to provide an indication of the baseline surface water quality. These locations should also become permanent monitoring sites during project implementation, since, if there are any impacts on water quality by the project during operation, the impacts can be detected by testing these locations. Analyses were conducted in the fields and a description of the surface water sample locations are outlined in Tables 27 and 28, Annex XIII.

Throughout the water courses along the Cocoa Creek and a number of its tributaries, water quality testing was carried out at various points to supply information on how far downstream from the source of activity the quality of water changes, and to what extent it can be affected. Each surface water sample was analysed twice to have a representative value of the water quality in the general project area. Sampling was done during December 2013 (dry season) and May 2014 (wet season), to coincide with the dry and wet seasons of the North Rupununi Area (Figure 7: Graph showing trend in annual rainfall at Annai, Apoteri and Kurupukari). Additionally, since activities within these concession areas are significantly limited due to their inaccessibility, it was assumed that the surface water quality would generally have characteristics of natural watercourses in Guyana.

Surface water quality analysis was performed in the field almost immediately after samples were collected. The samples collected were analyzed for several parameters which are important and generally used to determine the quality of water, i.e. measurements of pH, Turbidity, Total Ions, Conductivity, Flow Rate and Dissolved Oxygen (DO) were taken to assess the spatial changes of the quality of water.

Further, in the absence of a national standard on water quality, comparison was made with the Guyana National Bureau of Standards (GNBS) GYS 262:2004 Specification for Drinking Water as well as internationally acceptable limits from the United States Environmental Protection Agency (US-EPA), 1985, the World Health Organisation (WHO) Drinking Water Guidelines, 2011, and the World Bank, 1984.

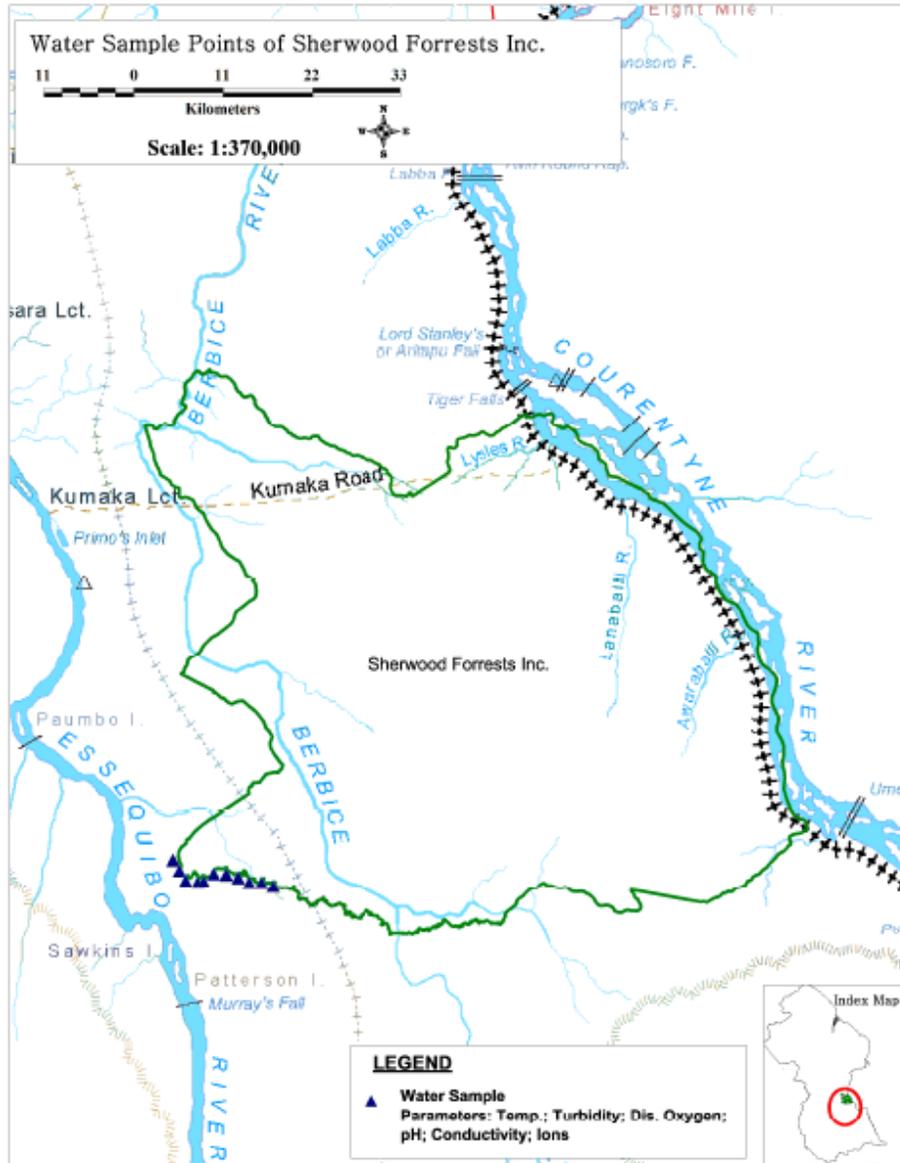


Figure 12: Water Sample Points of Sherwood Forrest Inc.



Figure 13: Field Analysis of Water Quality

The results of the surface water quality analysis conducted for the concession area, most of the parameters analysed were within the acceptable range for both the dry and wet seasons. No oil and grease were detected throughout the concessions and with regards to the other parameters that were analysed the results were as follows:

Water temperature is affected by air temperature, storm water runoff, groundwater inflows, turbidity, and exposure to sunlight (Behar 1997). The surface water temperature readings ranged from 26.9 to 27.2 °C in wet conditions and an average of 29.6 °C for dry conditions and were within the GNBS accepted range of < 40 °C, which is considered healthy for living organisms. It is expected that human activities within the area should not change water temperatures beyond natural seasonal fluctuations.

The pH is a measure of a solution's acidity. In water, small numbers of water molecules (H₂O) will break apart or disassociate into hydrogen ions (H⁺) and hydroxide ions (OH⁻). Other compounds entering the water may react with these, leaving an imbalance in the numbers of hydrogen and hydroxide ions. When more hydrogen ions react, more hydroxide ions are left in the solution and the water is basic; when more hydroxide ions react, more hydrogen ions are left and the water is acidic (Behar 1997). The pH analysis of the surface water samples of the Essequibo River along with its tributaries ranged from 5.2 pH to 7.01 pH. The pH parameters were within the GNBS Interim Guidelines for Industrial effluent into the Environment.

Conductivity is a measure of the capability of a solution such as water in a stream to pass an electric current (Behar 1997). This is an indicator of the concentration of dissolved electrolyte ions in the water. It doesn't identify the specific ions in the water. Significant increases in conductivity may be an indicator that polluting discharges have entered the water. Conductivity of the water samples within the area ranged from 30 to 39 µS/cm and was within the WHO standards for drinking water i.e. 0 to 1500 µS/cm.

Turbidity is a measure of how particles suspended in water affect water clarity. It is an important indicator of suspended sediment and erosion levels (Behar 1997). Turbidity levels within the Essequibo River and its tributaries ranged from 10.5 to 37.1 ntu. Therefore, the majority i.e. 99% of the turbidity levels within the Essequibo River was above the accepted 10 ntu GNBS Interim Standards. Levels recorded were higher, probably as a result of the various soil types and the high concentration of organic matter decomposition from the rain forest itself within the area as well as the fact that turbidity generally increase with distance closer to the river bank or the bank of a stream. This is expected since water samples were collected close to the bank of the Cocoa Creek and its tributaries and the closer the proximity to land, the higher the turbidity level.

Dissolved oxygen is oxygen gas molecules (O₂) present in the water. Plants and animals cannot directly use the oxygen that is part of the water molecule (H₂O), instead depending on dissolved oxygen for respiration. Oxygen enters streams from the surrounding air and as a product of photosynthesis from aquatic plants (Cooke 2014) also from turbulence of the water stream as a natural mechanical mixing, also called current aeration. The Dissolved oxygen readings throughout the Cocoa Creek as well as its tributaries were all within the accepted standard of ≥ 5.0 mg/L during the wet conditions and from 3.5 to 4.7 mg/L during the dry conditions expected from the low movement of water ways. The levels recorded did not exceed a total dissolved gas concentration of 110 percent. Total dissolved gas concentrations above 110 percent can be harmful to aquatic life resulting in "gas bubbles disease." Dissolved oxygen levels of 4 - 7 mg/L is considered good for many aquatic animals (Behar 1997).

Nitrogen is abundant on earth, making up about 80% of our air as N₂ gas. Most plants cannot use it in this form. However, blue-green algae and legumes have the ability to convert N₂ gas into nitrate (NO₃⁻), which can be used by plants. Plants use nitrate to build protein, and animals that eat plants also use organic nitrogen to build protein. Nitrate ion levels of project area ranged from 0.1 to 1.3 mg/L for the

rain conditions and from 4.7 to 7.9 mg/L which is within the safe levels for marine organisms (20 ppm) (J.Camargo, Alonso, and Salamanca. 2005; Joksimovic 2010) and were below the GNBS Guidelines and the WHO drinking water standard of 10 mg/L. Concentrations over 10 mg/L will have an effect on the freshwater aquatic environment. 10 mg/L is also the maximum concentration allowed in human drinking water by the U.S. Public Health Service.

Chloride is a salt compound resulting from the combination of the gas chlorine and a metal. Chloride, in the form of the Cl⁻ ion is one of the major inorganic anions (negative ions) in saltwater and freshwater. Almost all natural waters contain chloride ions. Their concentrations vary considerably according to the mineral content of the soil in the area. Chloride ion levels ranged from 1.2 to 5.8 mg/L for both rain and dry conditions indicating good quality as it was below the US-EPA Secondary Drinking Water Regulations of 250 mg/L.

Ammonia will react with water to form a weak base. The term ammonia refers to two chemical species which are in equilibrium in water (NH₃, un-ionized and NH₄⁺, ionized). When dissolved in water, normal ammonia (NH₃) reacts to form an ionized species called ammonium (NH₄⁺). Ammonium ion levels ranged from 0.1 to 2.9 mg/L with approximately 33% of the levels being above the 0.2 mg/L WHO Guidelines for Drinking Water Quality. However, WHO has indicated that higher natural ammonium contents (up to 3 mg/L) are found in forests and since the readings recorded did not exceed 3 mg/L it is therefore in good standing.

Calcium is a major positive ion in natural fresh water. It is widely found in many minerals. Calcium makes up 4.9% of the surface of the earth and 0.07% to 1.7% of the soil. Calcium ion levels recorded ranged from 0.5 to 11.3 mg/L indicating good standing with 15 mg/L US-EPA Standards in rivers. When the water flows through lime, calcium carbonate is dissolved into calcium bicarbonate (Ca (HCO₃)₂) which is the main source of calcium ions in water.

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 were very similar.

5.2 Geographic Attributes of the Concession Area

5.2.1 Location and access

The concession area is situated in the upper Berbice-Corentyne Watershed in Region 6. The concession area lies immediately north of the SFEP held by Simon & Shock International Logging and the former TSA (a *conservation concession*) held by CI on right bank Essequibo River. Currently there is only one way to access the concession area-via Apoteri, left bank Essequibo River, thence up Essequibo River to the concession area. Neither the Berbice nor the Corentyne Rivers are safely navigable-for anything larger than bateau type aluminium craft with up to 25Hp out-board motor-at the points where they form part of the boundary of the concession.

There are three ways of getting to Apoteri:

- 1) by boat from Kurupukari up Essequibo River for some 115 km to Apoteri;
- 2) from Annai/Kwatamanghence down the Rupununi River for about 112km to Apoteri;
- 3) fly from Ogle Aerodrome to Apoteri airstrip⁹, a flying time of about ninety minutes.

⁹The airstrip there can accommodate all turbo-prop airplanes operated by local enterprises in Guyana.

Access from the Essequibo River is easier during the rainy season when the water level in the Essequibo River increases by about five (5) meters. However water also overruns the banks of the river and inundates large tracts of inland areas, to the extent that there is possible temporary merging of the waters of the Berbice and Essequibo Rivers in the south western part of the concession.

In the dry season, access is more difficult (in the time taken to travel between Apoteri and the mouth of Cocoa Creek-up to four hours, and the use of small aluminium skiffs that limit the amount of cargo per trip).

From the Essequibo River, the consulting and reconnaissance teams chose to access the concession from two points: at Primus Inlet, thence easterly via a sirihi¹⁰ for about 8km to the Berbice River (the north-western boundary of the concession); and at the mouth of the right bank of Cocoa creek (the south western boundary of the concession). Light aluminium skiffs with out-board engines ≤40hp are used for the boat trip since the Essequibo River contains numerous hazards such as rock outcrops and sand bars. Travelling time from Apoteri to the concession area varies from three to six hours depending on the water level. However, it is only possible to travel directly to the concession at the mouth of Cocoa creek.

5.2.2 Hydrology/drainage density

The main rivers within the concession are the Berbice River which forms part of the western boundary of the concession, then veers in a south easterly direction to the centre of the concession; Cocoa Creek, right bank Essequibo River, which forms the south western boundary of the concession; the Corentyne River which forms the eastern boundary of the concession; and the Lysles River which forms part of the north-eastern boundary of the concession. None of the rivers in and around the concession area are navigable to the extent that they can support commercial transport of logs or lumber. Neither the Corentyne River nor the Essequibo River is navigable to large craft at that 'latitude' due to massive rock outcrops and sand bars. More importantly, both rivers are characterised by wide variation in water levels between the dry season and the wet season. With three main rivers (Corentyne, Berbice and Essequibo) converging near the concession area, to the extent that the area is squeezed between the Essequibo River and the Corentyne River in the southern part of the concession, while the Berbice River actually flows from the centre of the concession, major flooding in the western and north western areas of the concession in the rainy season is known to occur. The water levels in the rivers at this 'latitude' routinely show variation of up to 5m depending on the season. The area has a drainage density of 1km/620hectares. The implication of this is that the company will have to construct a large number of bridges and culverts to access the concession. In addition, a considerable area of the concession may be designated as buffer zones to protect the water courses from erosion.

5.2.3 Relief

Figure 14 indicates that the area is slightly undulating with altitudes varying from 65m to 375m. The western edge of the area lies in the flood plain of the Essequibo River, while the eastern edge lies in the flood plain of the Corentyne River. The northern part of the area is generally flat while hilly areas occur in the central western part of the concession: on the left bank of the Berbice River, the southern and south eastern part of the concession and in the eastern part of the concession, just north of Awaraballi creek.

¹⁰This path was reportedly put in by a GDF patrol.

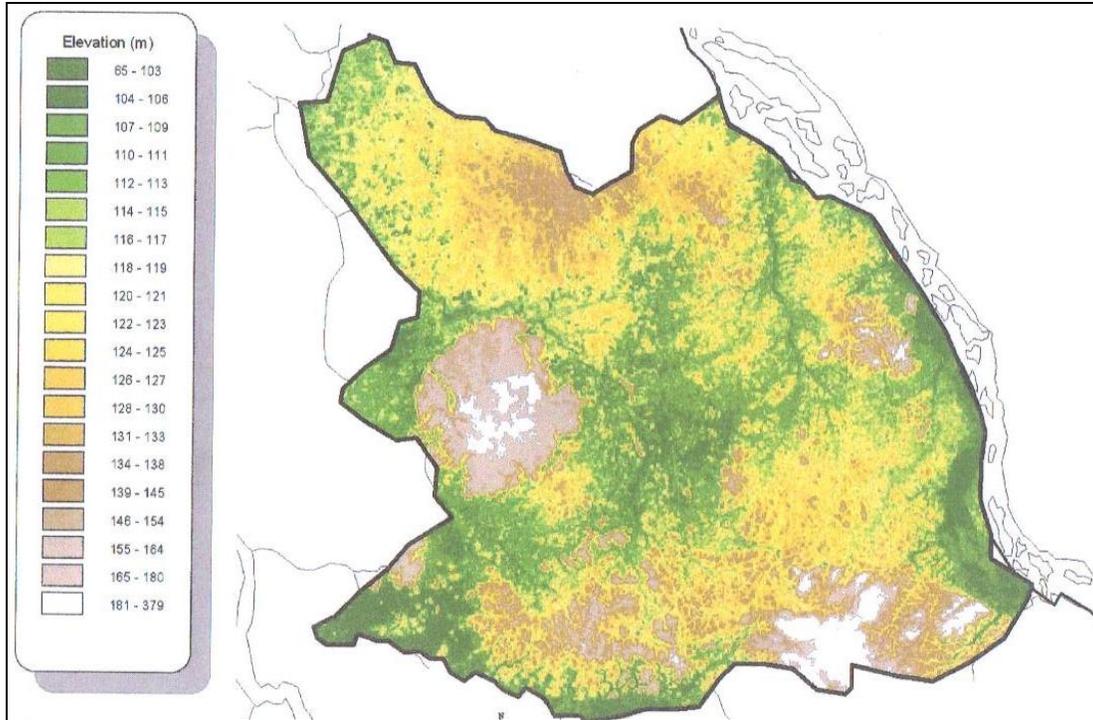


Figure 14: Elevation map showing attributes of the terrain - Sherwood Forrest Inc. Concession
(Source: G. Clarke, 2005)

5.3 Ecological Attributes of the Area

5.3.1 Biological resources

5.3.1.1 Flora

The timber stocking, particularly in terms of species' diameter class, is the most important parameter at the concession level for the enterprise.

The broad parameters of the forests of the Essequibo-Corentyne district concession have been described and documented (Fanshawe, 1952) and the authors believe that in the absence of any economic interventions, the parameters are still valid today. For example, Fanshawe posited the following for trees with **dbh≥40cm** within the Berbice-Corentyne watershed:

All species: 27 trees/hectare (~40m³/ha)

| | |
|-------------|---------------|
| Crabwood | 0.5 trees/ha |
| Greenheart | 1.4 trees/ha |
| Kabukalli | 0.95 tree/ha |
| Purpleheart | 0.1tree/ha |
| Wamara | 1.2 trees/ha |
| Wallaba | 3.99 trees/ha |

While Fanshawe cited many more species than the thirty or so that loggers normally harvest, it is known that some loggers normally fell trees with dbh≥35cm, so 40m³ can be safely used as a guide. (Note that SFI will only harvest volumes≤8.33m³/hectare for a 25 year felling cycle).

Based on the work of TerSteege (1998), the forests in the concession area may be classified as 'Central Guyana Wet Forests (see Annex V(a)); the scientist presents estimates of the number of trees ≥30.5cm per hectare for each region (Annex VI (b)). For example, Greenheart is estimated at 2.56 trees/ha which approximates a volume/hectare of 3.84m³; Crabwood is estimated at 1.29 trees/ha which approximates a volume/hectare of 1.94m³; and similarly, Wamara is estimated at 3.37 trees/hectare which approximates a volume per hectare of 5m³.

Based on more recent data, and more importantly for forests adjacent to (immediately south of) the concession area, Conservation International-Guyana (2002) reported estimates of 58 stems /hectare and mean volume of 94.6m³per hectare for *all species* ≥35cm.

Since the reconnaissance data currently available was collected many years ago, SFI needed to:

- 1) Determine whether there were any major land use activity or natural events that might have led to drastic changes (or degradation) of the forest environment;
- 2) Gather more *localised* baseline data on species composition and stocking to make preliminary assessments on the feasibility of logging the concession area. SFI therefore recruited consultancy services to undertake a management level inventory in accordance with the guidelines published by GFC.

Field surveys were conducted during the period November 2009 to February 2010. The basic features of the methodology¹¹ used were:

- 1) A six man crew was used for the inventory;
- 2) Sample lines were established generally in an east-west orientation perpendicular to the main drainage system; starting points were established with a GPS device;
- 3) Circular plots of 0.1ha (17.84 radius) were established at distances of either 500m or 1000m depending on the variation in forest type;
- 4) All live tree with dbhs ≥ 35 cm were recorded; data on NTFPs were also recorded; and,
- 5) A sub plot 0.02 ha was established in which all trees ≥ 10 cm were recorded.

Annex VII shows a specimen of a completed form, Figure 16 shows the *provisional* distribution of the trees by diameter classes and Table 10 lists the more abundant species encountered which is representative of an intact tropical forest (see also Annex VI(b)). In such 'old growth' forests, trees with smaller dbh greatly outnumber those with larger stems (Ghazoul & Sheil, 2010). Generally, one may describe the forests as seasonal rain forests.

TABLE 9: VEGETATION SUMMARY -SFEP 01/07-BASED ON VEGETATION MAP

| Vegetation types | Principal species expected | Hectares | % |
|-------------------------------------|--|----------------|------------|
| 1h high hills | Greenheart, Black Kakaralli, Haiariballi, Baromalli, Purpleheart, Bulletwood | 8347 | 5.0 |
| 1e flat to undulating | Black Kakaralli, Kautaballi, Baromalli | 44948 | 26.9 |
| 1d Liana forest | Black Kakaralli, Kautaballi, Baromalli | 2020 | 1.2 |
| 1c Mixed forest, deeply dissected | Greenheart, Black Kakaralli, Bulletwood, Baromalli | 2278 | 1.4 |
| 1b Mixed forest, flat to undulating | Black Kakaralli, Kautaballi, Baromalli | 31687 | 19.0 |
| 1 Mixed forest, undulating to hilly | Greenheart, Black Kakaralli, Kautaballi, Baromalli | 1408 | 0.8 |
| 1b/1d Complex of 1b and 1d | Yarula, Kauta, Kakaralli | 16787 | 10.1 |
| 2a Wallaba | Soft Wallaba, IturiWallaba, Shibadan, Simarupa, Baromalli, Tauroniro | 130 | 0.1 |
| 3b Mora | Mora, Crabwood, Manni | 24488 | 14.7 |
| 3 low swamp | Fukadi, Crabwood, Manni | 1026 | 0.6 |
| 1c/1d Complex of 1c and 1d | Aromata, Haiariballi | 28346 | 17.0 |
| clearings | Congo pump, Muri bush | 202 | 0.1 |
| 1/1d Mixture of 1 and 1d | Yarula, Kakaralli, Baromalli | 5401 | 3.2 |
| Total | | 167,066 | 100 |

¹¹GFC has published procedures for Management Level Inventories, including manner for recording field data; this ensures consistency in data collection across the country, and more particularly, all data is processed by GFC using its GEMFORM software.

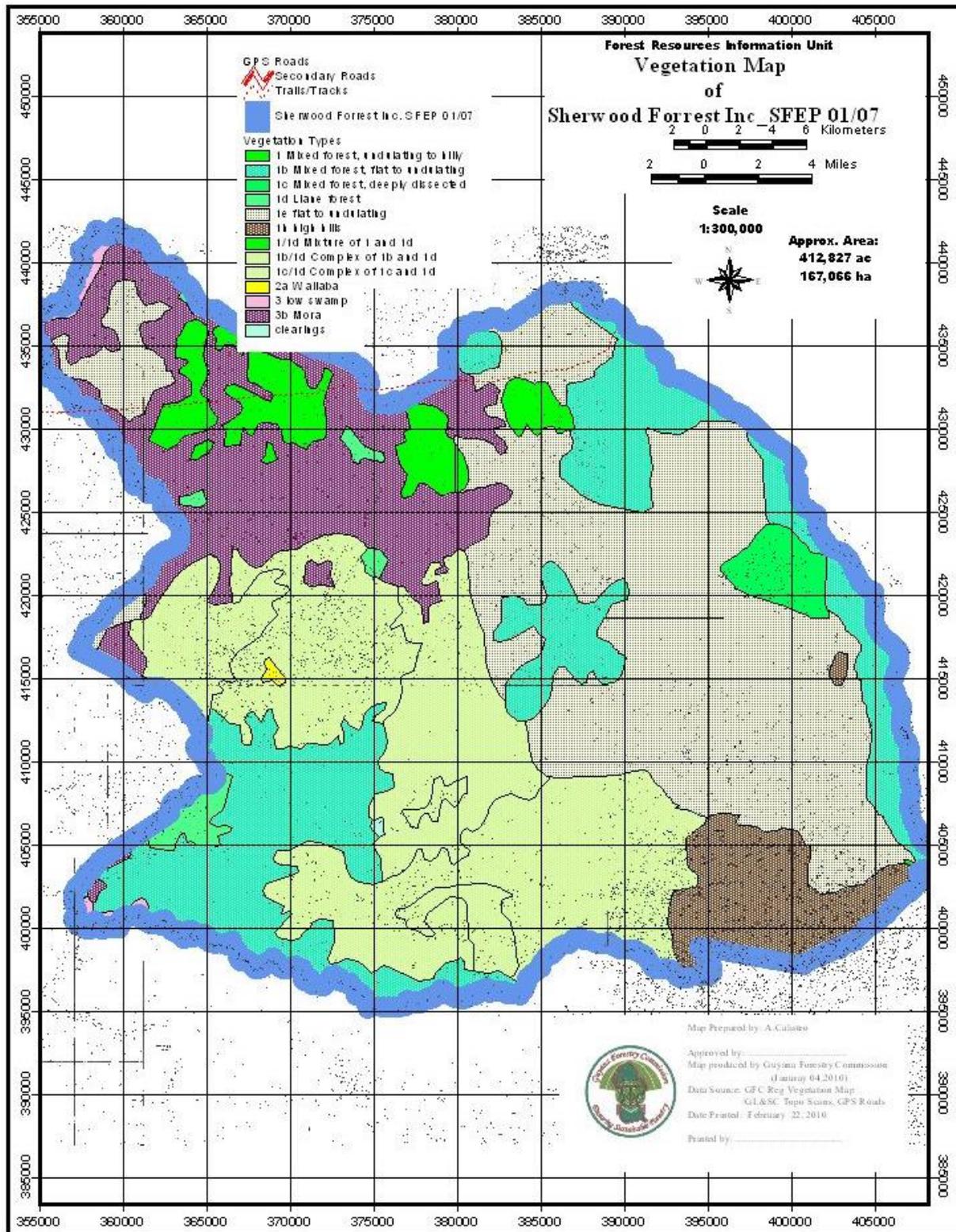


Figure 15: Vegetation map of the concession area (Source: GFC, 2010)

TABLE 10: MAIN COMMERCIAL TIMBER SPECIES ENCOUNTERED
(Western side of forest concession)

| # | Common Name | Botanical Name | Family Name | % |
|--|------------------|---------------------------------------|-----------------------------------|-------------|
| 1 | Arara | GuatteriaatraSandw. | Annonaceae | 1 |
| 2 | Baromalli | Catostemma commune Sandw. | Bombacaceae | 3 |
| 3 | Corkwood | PterocarpusofficinalisJacq. | Leguminosae (Papilionoideae) | 4.8 |
| 4 | Crabwood | CarapaguianensisAublet | Meliaceae | 5.4 |
| 5 | Fukadi | Terminalia Amazonia (J. Gmelin) Exell | Combretaceae | 1.6 |
| 6 | Haiariballi | Alexaimperatricis (Schomb.) Britton | Leguminosae (Papilionoideae) | 3.0 |
| 7 | Kaditiri | SclerolobiumguianensisBenth | Leguminosae (Caesalpinioideae) | 1.1 |
| 8 | Kaiariballi | LicaniaheteromorphaBenth. | Chrysobalanaceae | 1.1 |
| 9 | Kakaralli, Black | EschweilerasagotianaMiers | Lecythidaceae | 2.5 |
| 10 | Kurokai | Protiumdecandrum (Aublet) Marchal | Burseraceae | 2 |
| 11 | Mora | Mora excelsaBenth. | Leguminosae (Caesalpinioideae) | 24 |
| 12 | Mora bukea | Mora gongrijpii (Kleenhoonte) Sandw. | Leguminosae (Caesalpinioideae) | 1.8 |
| 13 | Moroballi | Talisiasquarrosa (Radlk) | Sapindaceae | 2 |
| 14 | Wadara | CouratariguianensisAublet | Lecythidaceae | 3 |
| 15 | Soft Wallaba | Eperua falcate Aublet | Leguminosae (Caesalpinioideae) | 2.3 |
| 16 | Wamara | SwartzialeiocalycinaBenth | Leguminosae (Papilionoideae) | 2.1 |
| 17 | Yarula | AspidospermaexcelsumBenth | Apocynaceae | 1.4 |
| | | | | 62.1 |
| Others (49 species) | | | | 37.9 |
| NB. A total of 76 species were recorded | | | | |

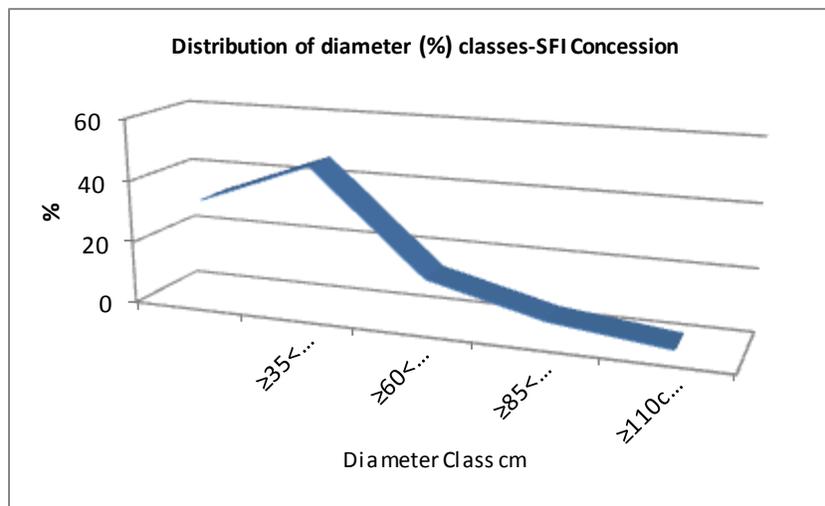


Figure 16: Graph showing SFI's concessions proportion of trees by diameter class

Figure 16 is representative of a normal mature intact forest where the larger mature trees dominate the site. SFI will not harvest trees less than 35cm and will probably aim more for trees with dbh>50cm.

SFI has access to technologies that will allow the company to successfully utilize and market a large number of non-traditional species based on the Company’s more than a decade of experience in both forest operations and wood product marketing of tropical timber in China and other Asian countries (according to Mr. CHU HONG BO, Managing Director, SFI).

SFI will use its vast international network to carry out tests on non-traditional species. Note that GFC is already pioneering research on the use of lesser used species; SFI will simply support the process. Once the company is aware of the technological and utilization properties of the timbers, marketing is the next step.

Recent studies on local timbers include, ‘Gerard, J., Miller, R. B. and Welle, B.J.H. 1996 *Major Timber Trees of Guyana, Timber Characteristics and Utilization. Tropenbos Series 15. Wageningen. Netherlands. ISSN 1383-6811*’. With the support of ITTO, GFC researched and published basic technical information on 15 lesser used species¹². However it is now up to the forest industry to translate the information set out in these publications, actually processing the species and turning out suitable value added products to demonstrate the usefulness of these species. This process still requires some work and it is here that SFI would use Chinese wood processing technology¹³ to validate the research and turn out value added products for various applications.

The NTFP resources on the concession area have been duly recorded as part of the management level inventory. SFI has an interest in partnering with communities to develop enterprises based on the abundant NTFPs and plans to review existing models such as the framework which exists between NRDDDB and Iwokrama, for example, the Arapaima Project in the North Rupununi, or the Honey Project associated with the Mangrove Restoration Project, NAREI, which appears as good models for possible adoption.

¹² GFC, 2008: Guyana Forestry Commission Training Manual - The Use of 15 Lesser Used Species, 34pp.

¹³ More details on the processing technology can be found on in the Wood Processing ESMP for BaiShanLin’s operation at Fitz Hope, Linden-Soesdyke Highway

To note, the establishment of Iwokrama and the NRDDDB respectively witnessed extensive efforts to provide material support to the communities in the North Rupununi and the examples are numerous: for example NRDDDB's Arapaima Project, Aranaputa Processors Friendly Society Peanut Enterprise and the Kawe Amazonica Butterfly Farm are all creative examples of initiatives to help rural peoples on NTFPs.

Several models were pioneered between Iwokrama and the proactive NRDDDB¹⁴ such as Developing Partnerships between the North Rupununi District Development Board NRDDDB and the Iwokrama International Centre Programme for Rain Forest Conservation & Development.

Since previous versions of this ESIA report, SFI has had the chance to move beyond management level inventory to actually conducting 100% enumeration over 2000ha inclusive of the flood plains of Essequibo and Berbice rivers (Figure 17, 18 and Annex 1X). On the basis of the 100% enumeration, the observation may be made that there is a 95% probability that the volume per hectare for the concession lies within the interval 12.15m³ to 20.49m³. The more abundant species are Mora (*Mora excelsa*) 67.60%, Crabwood (*Carapa guianensis*) 8.57%, Wamara (*Swartzia* sp) 8.01% and Kabukalli (*Goupia glabra*) 4.7%.

According to SFI's FMP 2013-2017, the company will operate and managed the concession under a "SUSTAINED YIELD MANAGEMENT PROGRAM" that ensure ecological and economic sustainability of the operation. SFI intends to harvest timber from approximately **24,500** hectares of forested area over the next five (5) years with approximate volume **202,430 m³** of logs from its concession. An approximately **7,157** hectares, which represents **4.5%** of the concessions productive area, will be set aside as Biodiversity Reserves. Steep slopes and high hills where it is not accessible will also be restricted for harvesting and classified as Forest Reserves.

Effective planning will provide long-term benefits, return and employment in the area within the operation and neighboring communities. SFI will implement effective forest planning to meet the requirements of the GFC Code of Practice and Forest Laws. Coordination with the forest authorities will provide a control system, guidelines, procedures and practices for a sustainable forest management. The impact of the forest operation is not thought likely to cause undue concern, as the forest is low yielding. The company intends to operate a selective harvesting of timber at 8.33 m³ per hectare that include less known species. Although the forest is generally low lying (Flat to Undulating), few areas are broken hills and few steep slopes that are inoperable.

This plan therefore, should not be interpreted as a rigid program, but allowances must be made for flexibility and necessary adjustment to cater for changing market unforeseen circumstances. The development and implementation of this Plan is not an attempt to predict the future, but rather it is a way of determining in what direction the Company will go, when it should go and how it should get there. There will be need for constant appraisal of "Plan Performance" in terms of targets and logistics set out and continual revision such as new information on the resources, markets, and possible constraints become available.

SFI operations is subject to conducive conditions, will also see the Company in its expansion program both in timber harvesting and wood processing, thus providing additional employment and training

¹⁴ [Sydney Allicock](http://www.bibsonomy.org/bibtex/23521e7bdc21d25a771764ec0a20892b1/neillhog). Indigenous Rights In The Commonwealth Caribbean & Americas Regional Expert Meeting: Conference Papers Georgetown, Guyana, 23 - 25 June, 2003, Commonwealth Policy Studies Unit CPSU, (March 2004) - <http://www.bibsonomy.org/bibtex/23521e7bdc21d25a771764ec0a20892b1/neillhog>

needs to the Guyanese workers. This plan, must in effect therefore, embody all aspects of forest procedure including forest inventory, logging plans, utilization, silviculture, protection, budgetary accounting and the consequences of other allied land uses.



Establishing transect to assess the concession vegetation



Conducting inventory and data collection of a sample plot in Sherwood Forest concession



Establishing the seedling plots in Sherwood Forest concession

Figure 17: Photos showing Forestry Inventory being conducted within Sherwood Forrest Inc.

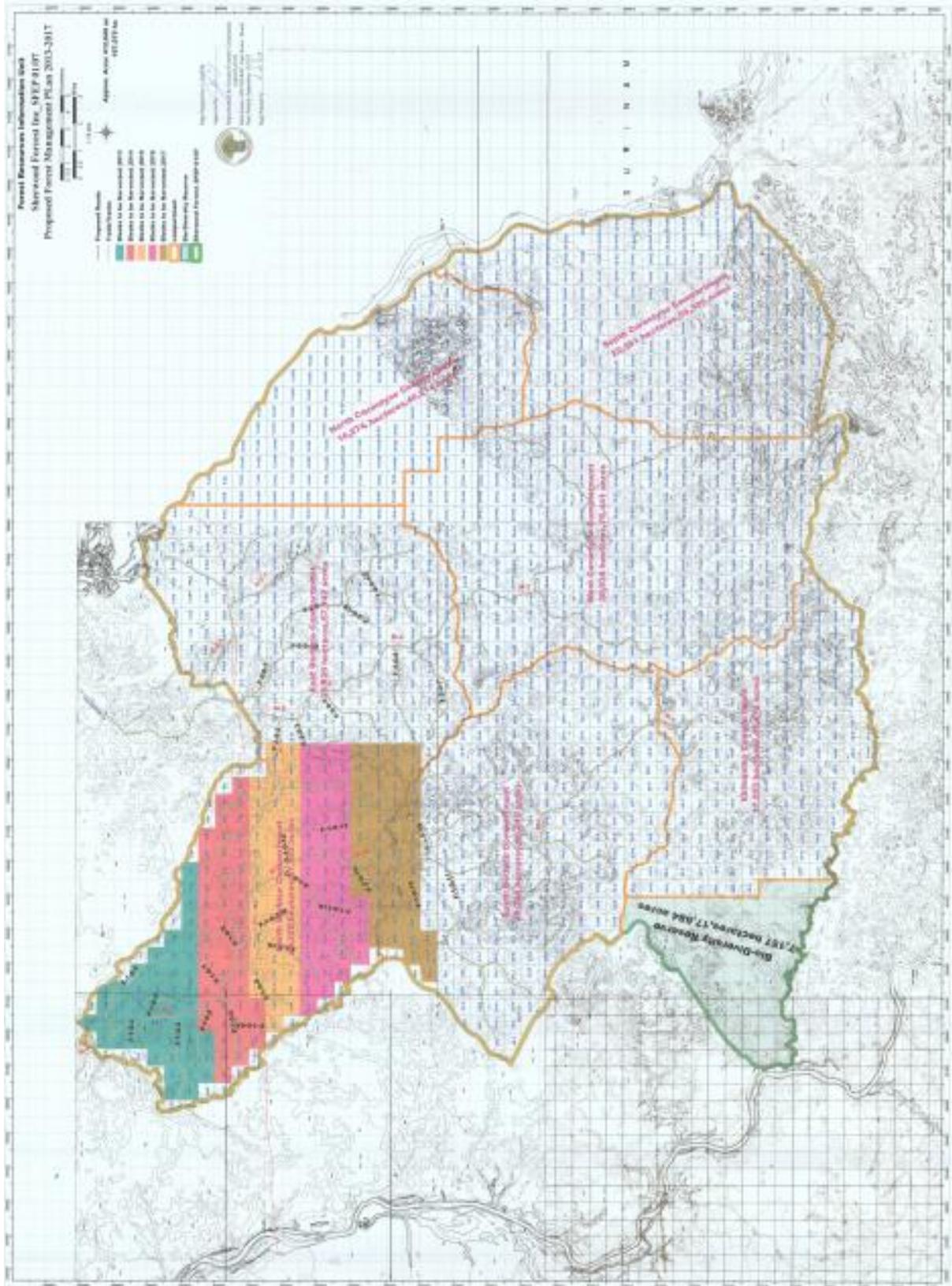


Figure 18: Map of Sherwood Forrest Inc_SFEP 01/07 showing Proposed Forest Management Plan

5.3.1.2 Fauna

This baseline report is the output of a survey of the fauna within SFI's SFEP, Upper Berbice River, conducted from November 2009 to February 2010 (dry season) and May 2014 (wet season). The purpose of the survey was to record the biological diversity of fauna occurring within or near the project area with the aim of determining or predicting how habitat disturbances may directly affect wildlife species and take measures to reduce habitat loss or modification.

The authors took particular note of studies in the REWA district (Pickles, McCann and Holland, 2009) and of CI (CI, 2002)¹⁵ which provided data on fauna at REWA head waters and the Kanuku Mountains, respectively.

There is very limited published information available for the mammalian species for the concession area. There is however, information available on the mammal fauna at a number of collecting sites to the west of the concession area. There have been several rapid assessment programmes which have given estimates of approximately 155 mammal species (volant and non-volant), the Kanuku's region may contain about 70% of all mammals known to exist in Guyana (Emmons, 1993; Lim and Norman, 2002). It is quite likely that there non-volant mammal composition of SFI forest concession may be similar to that region.

Rare and endangered species

Several species of local fauna are classified as *rare* or *endangered* by the I.U.C.N. The Guyana *Official Gazette Extraordinary* of September 29, 1999 cites the following for special attention:

- Sixteen species of mammalian fauna
- Seven species of avian fauna
- One species of fish
- Reptiles and Amphibians:
 - a. All species of frogs of the family Dendrobatidae
 - b. Two species of lizards of the family Teiidae
 - c. Two families of Turtles the Chelonidae and Pelomedusidae
 - d. One species of the family Crocodylidae

The C.I.T.E.S updated list refers to 29 species of mammalian fauna and 15 species of avian fauna. However it must be noted that the status of some species are still to be confirmed in Guyana.

Methodology for faunal surveys

Prior to field work, the consultants perused available information, for example Pickles, McCann, & Holland (2009), and engaged in extensive interviews with residents of Apoteri to determine their knowledge of local fauna. However, this report is based primarily on *visual encounter surveys* (V.E.S.).

Censuses were done mainly during dawn and dusk each day to coincide with peak activity periods for mammalian and avian fauna. The surveys entailed walking slowly along trails cut by forest inventory team, stopping frequently to listen to calls and to scan the area for movements, searching for feeding grounds and scat signs. Baited and glue traps were used to record the smaller species. In addition, the

¹⁵http://11www.conservation.org/Documents/RAP_Reports/Guyan_RAP_2001.pdf

inventory team routinely recorded observations of fauna on their field sheets; most of the inventory team members were experienced 'bush men' with vast knowledge of the behaviour of mammals in particular. Further, the consultant used a number of publications (Emmons, 1990; De Schauensee and Phelps, 1978) to help in the identification of the various species.

Research has shown that most tropical mammals are nocturnal in habits and wide-ranging in their foraging habits. Large mammals were only recorded by fleeting glimpses, tracks, scat and feeding signs. Many species not confirmed as present, could in fact be present, even common. Some monkeys, canopy inhabiting species with large territories or low mobility and nocturnal mammals can be easily missed in the rainforest. Undoubtedly the area is pristine and rich in wild fauna.

It appears that most of the mammalian fauna were scattered and migrated generally towards the larger (perennial) water courses. (At Apoteri, residents reported that jaguars were preying on dogs in the village; this was likely due to scarcity of normal prey species in their habitual range).

5.3.1.2.1 Mammals (*Mammalia*)

Visual encounter surveys (VES) species, including track and signs identification, and auditory encounter surveys (AES) were used to, 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 2 km transects and other microhabitat. Surveys were conducted at 07.00 h and 18.00 h and typically lasted 3-4 hours. Night surveys were also carried out along the banks of the Essequibo River, and creeks using a Maglite to detect the eyeshine of nocturnal mammals. Additionally, opportunistic observations were made by other team members and semi-formal interviews were also conducted with the field guides from the nearby villages.

A distance of approximately 13 km along Cocoa Creek was surveyed for the occurrence and signs of habitat use by the Giant Otter *Pteronura brasiliensis*.

There were three (3) transect locations on the Sherwood Forest concession.

Core Observations

One hundred and seven (107) encounters of non-volant presence within the Sherwood Forest transects were recorded. This represented twenty nine species. The most abundant species recorded for *Samiri sciureus* (15), *Tayassu tajacu* (15), and *Alouatta seniculus* (13).

Approximately 10 km of Cocoa Creek was surveyed for Giant Otters and signs of habitat use (Figure 20). Based on the use of the area, and observations of individuals it may be concluded, that there is one (1) group using the creek as part of its territory. There were two sightings of Giant Otter within the creek, the first being of a solitary (1), and another sighting of seven (7) individuals. There was also a sighting of the Southern River Otter, *Lontra longicaudis* at the entrance of Coco Creek.

The area where transects were located includes a diversity of habitats including swamps, in areas where there is undulating terrain. The tracks of Collared Peccary (*Tayassu tajacu*) were observed while a large group of White-lipped Peccary (*Tayassu peccari*) was observed during a night survey on SFI 3.

During the surveys, eight of the nine primate species which occur in Guyana were observed on the Sherwood Forest transects.

1. *Order Marsupialia (Marsupials)*

Only one species of opossum was caught in a baited trap. Opossums occupy a wide range of habitats in tropical forests; they are arboreal and omnivorous. *Didelphids* are usually active at night and are opportunistic feeders; they eat fruit, meat, eggs, insects and even carrion. The common opossum is often hunted for food.

2. *Order Xenarthra (Edentata)*

- Myrmecophagidae (Anteaters)

Anteaters are highly specialized for feeding on ants and termites. Apart from the giant anteater, anteaters are arboreal and nocturnal in habit. One species was observed.

- Bradypodidae (Three and Two-toed Sloths)

No sloths were observed but guides confirm their presence in the area. These upside-down animals feed exclusively on leaves and are common dwellers of tropical forests but are difficult to detect.

3. *Primates (Monkeys)*

Monkeys are widely distributed throughout Guyana and are represented by two families, the hand-tailed *Cebidae* with eight species and the marmoset – *Callithricidae* with one species. All monkeys recorded in Guyana are diurnal and omnivorous; they forage within the canopy and on the forest floor for fruits, nuts, and insects. Howler monkeys were heard signalling their presence along the river edge.

4. *Order Carnivora (Carnivores)*

- Procyonidae (Coatis)

The Coatimundis or “Kibihee” are common forest animals usually running in bands or singly. They forage on the forest floor for fallen fruits, nuts, lizards and insects; they are excellent climbers.

- Felidae (Cats)

Cats are carnivores, generally live in low densities, and are mostly solitary in their habit. The technicians reported sightings of the Jaguar, the Puma and the Ocelot. The jaguar inhabits swampy lowland habitat while the puma can be normally found in higher elevations. All three species are wide ranging and their presence in any area depends on the abundance of prey species.

- Mustelidae (Weasel Family)

The giant otter reaches a length of approximately two meters with a flattened tail taking up one third of its total body length. The body is long with a flat head, webbed feet and soft pelt. They feed mainly on fish; they are diurnal and can be seen in groups of four or more. Several groups with juveniles were recorded feeding along the Essequibo and Berbice Rivers.

5. *Order Perissodactyla*

- Tapiridae (Tapirs)

Tapirs are heavy-bodied animals that forage in a variety of habitats, but prefer swampy lowlands. They are excellent swimmers and often take refuge in water from predators. They are solitary and nocturnal. Their presence was detected by their tracks and their faeces in streams.

6. *Order Artiodactyla*

- Tayassuidae (Peccaries)

The family Tayassuidae – the collared peccary and the white-lipped peccary are widespread in tropical lowland forests. They are free-ranging and gregarious. Peccaries are omnivorous but rely heavily on plant

materials for their diet. Both species are known to inhabit the study area, many tracks and feeding signs were observed.

- Cervidae (Deer)

Members of this family are mainly browsers that feed on leaves, grasses and fallen fruits. They are found in dense lowland forests and forest edge habitats. Deer is prized game for forest inhabitants and commercial hunters.

7. *Rodentia (Rodents):*

- Dasyproctidae – Agoutis; Agoutidae-Paca,

Two species familiarly known as the agouti (*Dasyprocta sp.*) and the labba (*Agouti paca*) were observed. The agouti is the most common forest animal; they can be seen along forest trails or feeding on fallen fruits and seeds. The labba is nocturnal and is mostly found near water courses, when disturbed or threatened they seek refuge in nearby streams. Both animals are hunted for food and both species contribute to seed dispersal and seed predation.

- Hydrochaeridae - Capybara

A large stocky pig-like rodent (see Figure 19), found in lowland rainforest, grasslands and along grassy streams; like the labba, they seek refuge in nearby streams when disturbed or threatened. They are much sought after for food within their home range. They are the world's largest rodent.



Figure 19: Photos showing examples of fauna encountered within the concession area

Left-Juvenile Armadillos (*Pridontes maximus*) left) and right, two Capybaras (*Hydrochaeris hydrochaeris*).

The assessment of the non-volant mammals of Sherwood Forest indicates a biologically diverse structure of non-volant mammals; which includes eight of the nine primate species found in Guyana. There has been documentation of the existing positive relationship between primate species richness and habitat heterogeneity. This relationship is thought to be driven by the greater number of ecological niches in diverse habitats. Also healthy populations of *Pteronura brasiliensis* were recorded for the area. Large herbivores and felids, were also recorded. A high carnivore population is usually a good indicator for the mammalian community structure in specific areas, as these large carnivores would be dependent on the smaller herbivores for their survival. The occurrence and levels of use of the area by *Pteronura brasiliensis* also gives a positive status of the ecosystem functions including soil erosion and nutrient cycling (food chain balance).

The surveys of the area have shown that there are relatively healthy populations of many large non-volant mammals which can be categorized endangered, rare and threatened species. Many of these species are threatened throughout their range by habitat loss and fragmentation, which is further worsened by unregulated hunting for trade and in other instance when human/animal /livestock conflicts occur. It is necessary that mitigatory actions are planned and to ensure that the planned logging operations do not negatively impact these species.

Actions should also be taken to severely reduce any erosion and subsequent siltation of water bodies, which may result as a result of the planned logging activities. This can affect the water quality which then affects the fish population which is key for the survival of the Giant Otter *Pteronura brasiliensis* which occur in the area.

Commercial hunting or collecting of wildlife should be prevented by staff of the company.

There is need for additional data for compartments that are towards to the Berbice sections of the concessions, for there to be a better understanding of the community structure of non-volant mammals for the entire concession area.

There is a possibility of changes in the use of the area within the concession with forest extraction. The habitat for many feline species will be fragmented. These concessions are relatively close to Apoteri and Rewa. It is important to monitor the movement of these feline territories, especially if they move closer to human settlements, which may result in human-animal conflicts.

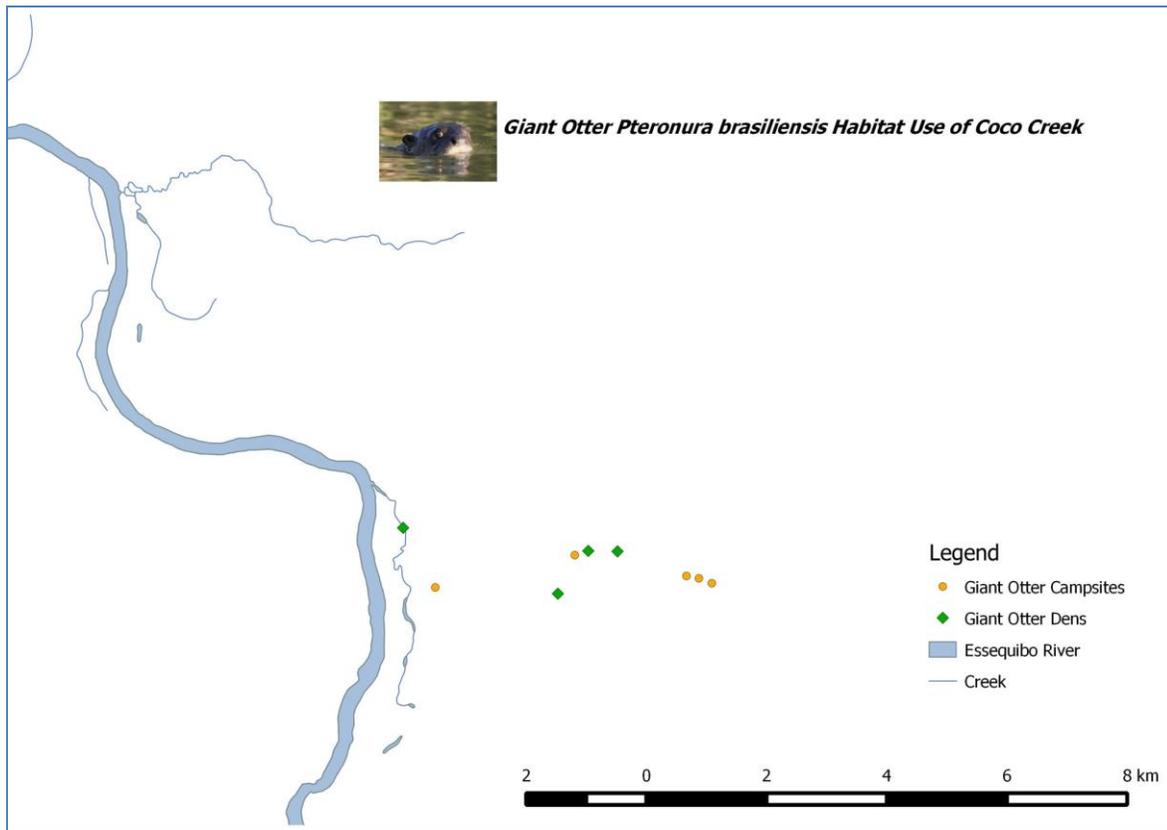


Figure 20: Map showing habitat of Giant Otter *Pteronura brasiliensis* along Cocoa Creek

8. Bats (Volant Mammals)

Although most people are familiar with larger charismatic mammals such as monkeys and cats, smaller mammals (bats, rats, and opossums) that are typically < 1 kg in body mass comprise approximately 75% of the mammalian species diversity in tropical lowland South America (Lim et al., 2005). They also are important components of the forest ecosystem because many are fruit, nectar, and insect feeders that are responsible for maintaining natural forest succession through seed dispersal and flower pollination, and others are controllers of insect populations. Inherently high levels of species diversity and relative abundance make them an ideal group for studying environmental impacts. Therefore, this group of mammal can be used as good complements for establishing baseline monitoring studies that will be useful for assessing environmental impact from natural resources extraction and monitoring changes over time. Approximately one hundred and twenty one (121) species of bats have been reported from Guyana (Lim et al., 2001). Areas with relative proximity to the study site, including the Iwokrama Forest and the Kanuku Mountains has chiropteran species richness of eighty two (82) and eighty nine (89) species respectively.

Bats were captured with mist nets (12 m in length by 2.6 m in height) set in a variety of forest microhabitats to a height of 3 m above the ground. They were set where bats were expected to be in high concentrations because of roosting sites or food resources such as swamps, rocky areas, dry creek beds, rivers, vine tangles, tree hollows, and fruiting or flowering trees. Nets were opened from 18:00 to 23:00 h when bat activity is highest, for the first night, however, the decision was made to extend the netting hours, because of the moon phase (full moon- bright moonlight) during the survey period. However, nets were closed in cases of heavy continuous rainfall.

There were three (3) transect locations on the Sherwood Forest concession (Figure 20). On each transect there were 4-5 netting stations; each netting station was comprised of two (2) nets set in the T-shaped formation as prescribed for netting bats.

Netting Station 1 (NS1) – Set along the forest edge along the river.

Netting Station 2 (NS2) – Set in a relatively open area, along the bank of a small creek.

Netting Station 3 (NS3) – Set in the forest understory within the forest transect.

Netting Station 4 (NS4) – Set along an incline within the forest transect.

Netting Station 5 (NS5) – Set in a small swamp within the forest transect.

A total of twenty one (21) species of bats were recorded during these surveys (Table 11). All species netted belonged to the family Phyllostomidae (Annex X). Visual observations were made *Rhynchonycteris naso* (Proboscis bats- Family Emballonuridae) roosting on overhanging tree trunks in creeks, and alongside the banks of Cocoa Creek. There were no netted individuals of this species. The remaining twenty (20) species were represented by one hundred and fifteen (115) individuals which were captured in nets.

The most dominant specie recorded for the netting activities along the Sherwood Forest transects were *Artibeus planirostris* (18), *Artibeus obscurus* (15) and *Artibeus lituratus* (10). For the Sherwood Forest transects *Chrotopterus auritus*, *Mesophylla macconelli*, and *Choeroniscus minor* were each represented by one (1) individual. Species of note that were captured by the nets include *Chrotopterus auritus* – Woolly False Vampire Bat and *Trachops cirrhosus* – Frog-eating bat. These are large carnivorous bats which are usually found in dense forest. *Glyphonycteris daviesi* was captured in the concession. The ecology of this species is yet to be fully understood (Clarke & Racey, 2003; Sampaio, 2008). The low

activity and relatively low captures may be directly linked to the occasional heavy rainfall during the survey period at some of transects which resulted in the nets being closed early in some instances.

The guilds recorded for the Sherwood Forest transects were as follows: the frugivorous bats were the most commonly captured bats, accounting for 78.75% of captures, the second most represented guild were the gleaning animalivores (18.75.8%), followed by the carnivorous bats (*Chrotopterus auritus*) – 1.25% and nectarivores 1.25%.

According to Kalko, 1998; Patterson Willig and Stevens, 2004, mist netting studies in Neotropical forest have found that fruit-feeding bats are the most abundant bats encountered. 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.

The Woolly false vampire bat (*Chrotopterus auritus*) and the Frog-eating bat (*Trachops cirrhosus*) were typically captured in nets set close to small creeks to opportunistically feed on small vertebrates including frogs and lizards that the survey team found to be relatively abundant at these locations. The relative abundance of gleaning animalivores and carnivorous bats in the survey area suggests that the forest is pristine and supports a high diversity of invertebrates and small vertebrates.

The species composition and trophic structure of the bat assemblage of the study area is similar to that which was documented for the SSILI forest concession and the nearby Kwitaro River (Lim and Norman, 2002). The CI bat surveys found the large fruit-eating bat (*Artibeus planirostris*) to be the most abundant species, this was also the case for the Sherwood Forest transects.

TABLE 11: BAT SPECIES ENCOUNTERED WITHIN THE SHERWOOD FORREST INC.

| Species | Common Name | IUCN Status |
|-----------------------------------|-------------------------------------|---|
| Phyllostomidae | | |
| <i>Artibeus gnomus</i> | Dwarf Fruit-Eating Bat | Least Concern; Population trend - Unknown |
| <i>Artibeus obscurus</i> | Dark Fruit-Eating Bat | Least Concern; Population trend - Unknown |
| <i>Artibeus lituratus</i> | Great Fruit-Eating Bat | Least Concern; Population trend - Stable |
| <i>Artibeus concolor</i> | Brown Fruit-Eating Bat | Least Concern; Population trend - Stable |
| <i>Artibeus planirostris</i> | Flat-faced Fruit-eating Bat | Least Concern; Population trend - Stable |
| <i>Uroderma bilobatum</i> | Tent-Making Bat | Least Concern; Population trend - Stable |
| <i>Carollia brevicauda</i> | Silky Short-Tailed Bat | Least Concern; Population trend - Stable |
| <i>Carollia perspicillata</i> | Seba's Short Tailed Bat | Least Concern; Population trend - Stable |
| <i>Glyphonycteris daviesi</i> | Davies's Big-Eared Bat/ Bartica Bat | Least Concern; Population trend - Unknown |
| <i>Lamproncycteris brachyotis</i> | | Least Concern; Population trend - Stable |
| <i>Lophostoma schulzi</i> | White-Throat Round-Eared Bat | Least Concern; Population trend - Unknown |
| <i>Chrotopterus auritus</i> | Peter's Woolly False Vampire Bat | Least Concern; Population trend - Stable |
| <i>Mimon crenulatum</i> | Striped Hairy-Nosed Bat | Least Concern; Population trend - Stable |
| <i>Tonatia saurophila</i> | Stripe-headed Round-eared Bat | Least Concern; Population trend - Stable |
| <i>Mesophylla macconelli</i> | MacConnell's Bat | Least Concern; Population trend - Unknown |
| <i>Trachops cirrhosus</i> | Fringe-Lipped Bat | Least Concern; Population trend - Stable |
| <i>Choeroniscus minor</i> | Lesser Long-Tailed Bat | Least Concern; Population trend - Unknown |

| | | |
|----------------------------|------------------------|---|
| <i>Phylloderma stenops</i> | Pale-Faced Bat | Least Concern; Population trend - Stable |
| <i>Vampyrum spectrum</i> | Spectral Bat | Near Threatened, Decreasing |
| <i>Rhinophylla pumilio</i> | Dwarf Little-Fruit Bat | Least Concern; Population trend - Unknown |

There were no records of bats which are classified as endangered species (IUCN Red Listed as Critically Endangered, Endangered or Vulnerable); however *Vampyrum spectrum* is listed as Near Threatened, with a decreasing population trend. There were no 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. It is important to highlight the impact of forest disturbances and logging on gleaning animalivores as this is well documented (Fenton et al. 1992; Brosset et al. 1996).

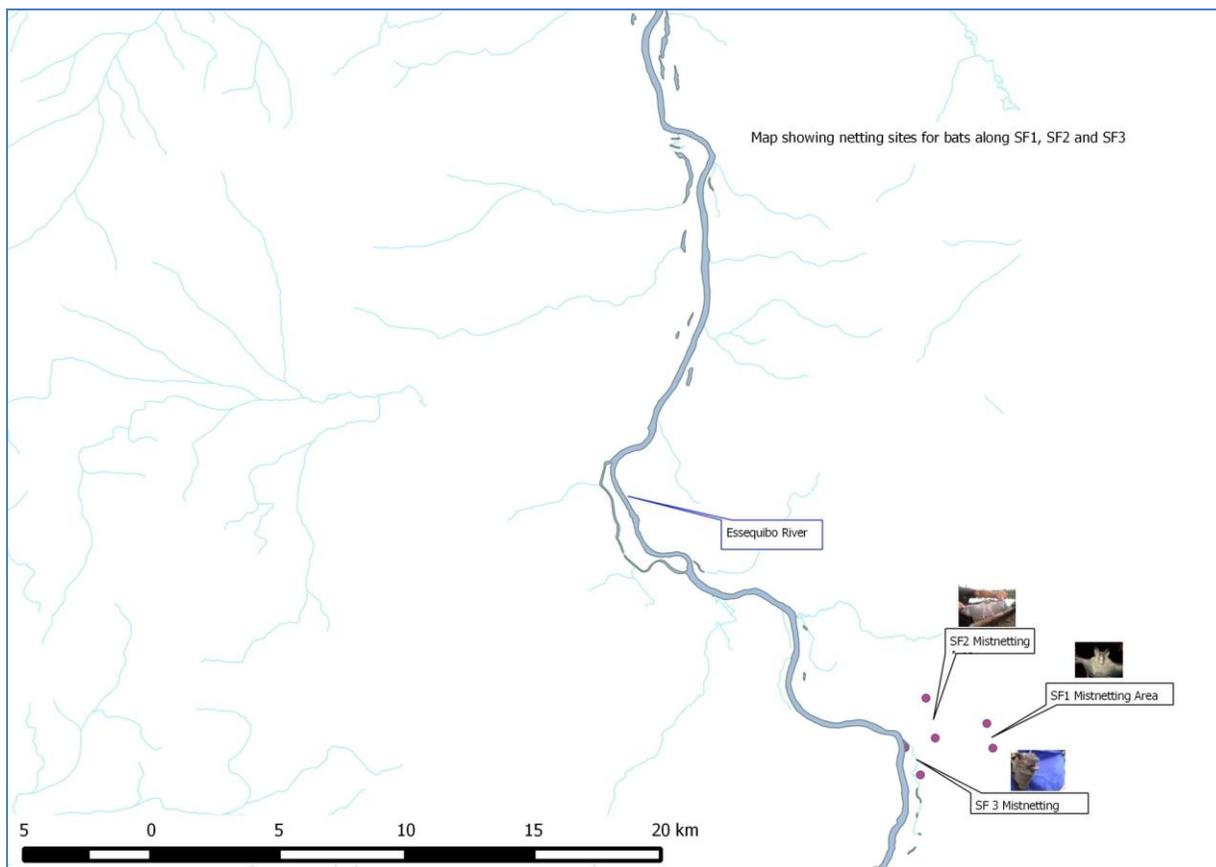


Figure 21: Map showing mist-netting sites for Bats along Sherwood Forest Transects

5.3.1.2.2 Birds (Avifauna)

Birds are probably the most studied vertebrates because of their diversity, their considerable influence on the environment and their historical and cultural values. In all communities, even those dominated by man, birds are important consumers and predators. In particular, they help in controlling insect populations, including agricultural pests. In many environments, birds are key seed dispersal agents after feeding on a wide variety of fruits, while a few are exclusive plant pollinators. In the study area the many layered canopy provides a variety of habitats for the avian fauna. The distribution and abundance of birds in general depends on the following factors: nesting, habitat preference, feeding habit, the abundance of food and degree of disturbance by man.

Birds are included in biodiversity assessments as they are ecologically diverse, relatively common, well studied, relatively easy to sample and identify, and able to respond relatively rapidly to environmental changes that may arise from road construction and operation.

Three methods were used to sample birds: mist-netting, VES along transects and opportunistic sightings. Birds observed via VES and or their vocalizations (Audio Encounter Survey-AES) were recorded along the established transects. Each transect was surveyed (walked) once in the early morning starting around 07:00 hours and again the same day in the late afternoon starting around 15:00 hours. Each transect typically took two hours to walk.

Six mist-nets were opened twice per day; from 07:00 to 11:00 hours and from 15:00 to 18:00 hours and were set to sample understory birds at netting 'spots' established within each transect. Nets were left open for 7 hours, typically between 06:30 and 11:00 hours (4 hours), and again from 15:30 to 18:00 hours (2.5 hours). The dimensions of mist nets (length by height) were 12 x 2.6m. To capture birds, mist-nets 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 six (6) nets were set along trails in pairs set perpendicular to each other. Before being released birds were photographed and identified to species using checklists and field guides for the birds of Guyana and the Neotropics (Hilty 2003; Braun et al. 2007). All birds were released unharmed within 10 minutes of capture following identification to species at the site of capture.

In total, seventy-four (74) species of birds representing twenty-six (26) families were recorded (Annex X) for the three transects within the Sherwood Forest concession. This included the one-hundred and two (64) individuals of twenty-one (21) species recorded via mist-netting. Eleven (11) species were recorded exclusively via mist-netting and included; Lined Forest-Falcon (*Micrastur gilvicollis*), Tawny-bellied Screech-Owl (*Megascops watsonii*), Eastern Long-tailed Hermit (*Phaethornis superciliosus*), American Pygmy Kingfisher (*Chloroceryle aenea*), White-chinned Woodcreeper (*Dendrocincla merula*), Wedge-billed Woodcreeper (*Glyphorhynchus spirurus*), Olive-sided Flycatcher (*Contopus cooperi*), Amazon Royal Flycatcher (*Onychorhynchus coronatus*), Cinnamon-crested Spadebill (*Platyrinchus saturatus*), White-throated Manakin (*Corapipo gutturalis*) and White-crowned Manakin (*Pipra pipra*).

The following bird families were particularly well-represented in terms of numbers of species and individuals: *Thamnophilidae* (15 species), *Tyrannidae* (8 species), *Psittacidae* (8 species), *Cracidae* (5 species), *Dendrocolaptidae* (4 species), *Picidae* (4 species), *Alcedinidae* (3 species), *Ramphastidae* (1 species) and 4 species of raptors. The most commonly observed bird was the Screaming Piha (*Lipaugus vociferans*), followed by the Black-chinned Antbird (*Hypocnemoides melanopogon*), Scaled-back Antbird (*Willisornis poecilinotus*), Black Curassow (*Crax alector*), Wedge-billed Woodcreeper (*Glyphorhynchus spirurus*) and Long-winged Antwren (*Myrmotherula longipennis*) which were recorded in all transects.

A few bird species can be considered as ERT species. The large understory birds such as the Black Curassow (*Crax alector*) and other cracids are sensitive to an increase in hunting pressure that often arises when access roads are constructed to open up forest for logging and mining operations. Elsewhere in the Guianas and populations have been decimated by unrestricted hunting (Ridgley and Agro 1998). All psittacines (parrots), toucans, cracids and trumpeters within the study area can be regarded as ERT species. Psittacines and toucans are CITES Appendix II.

The Black Curassow was recorded in the Sherwood Forest concession. Elsewhere in this species' geographical range it is known to occur in humid "terra firme" forest and gallery forest, preferring

thickets along rivers or forest borders to gallery forest. This large understory bird, other cracids and the Grey-winged Trumpeter (*Psophia crepitans*), are especially sensitive to an increase in hunting pressure that often arises when new roads are constructed through forest. Elsewhere in the Guianas populations of curassow have been decimated by unrestricted hunting (Ridgley and Agro 1998). In Guyana, the Black Curassow is common only found where there is intact habitat and generally no non-indigenous hunting (BirdLife International 2012a).

ERT Species Observed

During this Rapid Biodiversity Assessment exercise, at least ten (10) species of birds can be regarded as ERT species. These species are shown in the tables below along with their conservation status.

TABLE 12: ERT SPECIES DOCUMENTED

| Scientific Name | Common Name | ERT Status ¹ | Impact of Logging |
|--------------------|---------------------|---|--|
| 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 & Toucanets | Potentially threatened by over-collecting | |
| Psophidae | 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) | Curassows & 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. |

TABLE 13: MAIN ERT SPECIES OBSERVED

| Common Name | Scientific Name | Conservation Status |
|-----------------------|------------------------------|------------------------------------|
| Ornate Hawk-Eagle | <i>Spizeatus ornatus</i> | CITES Appendix II |
| Scarlet Macaw | <i>Ara macao</i> | IUCN Vulnerable; CITES Appendix II |
| Red-and-Green Macaw | <i>Ara chloropterus</i> | CITES Appendix II |
| Blue-and-Yellow Macaw | <i>Ara ararauna</i> | CITES Appendix II |
| Red-shouldered Macaw | <i>G. nobilis</i> | CITES Appendix II |
| Mealy Parrot | <i>Amazona farinosa</i> | CITES Appendix II |
| Orange-winged Parrot | <i>Amazona amazonica</i> | CITES Appendix II |
| White-throated Toucan | <i>Ramphastos tucanus</i> | CITES Appendix II |
| Channel-billed Toucan | <i>Ramphastos vitellinus</i> | CITES Appendix II |
| Black Curassow | <i>Crax alector</i> | CITES Appendix II |

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; CITES Appendix III - contains species that are protected in at least one

country, which has asked other CITES Parties for assistance in controlling the trade. All the Psittacines birds (Macaw and Parrot Family) are classified as CITES Appendix II.

The Ornate Hawk-Eagle can be considered as locally rare, though this species has a large geographical distribution and cannot be considered threatened. There are unconfirmed reports of a Harpy eagle (*Harpia harpyja*) observed in the project area. This species is listed by IUCN as Near Threatened because it is suspected to be declining moderately rapidly owing to hunting and habitat loss (BirdLife International 2012a).

Most of these ERT species are known to be wide-ranging and therefore likely to occur throughout the project area, which is fairly homogenous with respect to vegetation and habitats.

5.3.1.2.3 Fish

Like all other animals, fishes are key components of Amazonian rain forest ecosystems (Lowe-McConnell 1995; Lundberg 2001). They are very valuable to humans as food, recreation activity, medicinal purposes, pollution indicators etc. and they play an important role in the ecosystem.

An assessment of the fish fauna for the study areas for Sherwood was chosen based on their location, habitat type and accessibility. All the accessible creeks, ponds, inlets and main river channel of both concessions were sampled. Different methods were used to capture fishes in order to ensure that the maximum number of species was recorded (Figure 22). Collection of fishes was done using hook and lines, a dip-net, a cast-net and gill nets. Sampling was conducted both during the day and night to ensure thorough sampling was done that capture species that are active at different times. Informal interviews were conducted with assistants Jerry Milton and Ozias James, both of Apoteri village in order to find out species that are found in the area since they use the area regularly. All the different species collected were photographed and were classified following the taxonomic classification of Watkins *et al.* (2004).

In the Sherwood Forest Concession a total of twenty seven (27) species from thirteen (13) families with the most abundant family being Characidae. All the species recorded are very commonly found in the area and are used mainly as food or for sport fishing purposes.



Hook and line used to catch fish



Fishes being removed from gill nets

Figure 22: Photos showing Fish Catching within Sherwood Forrest Inc.

5.3.1.2.4 Reptiles and Amphibians

Herpetofauna play pivotal roles in ecosystems as secondary consumers in many food chains. They range from herbivorous to omnivorous and are also prey items for both invertebrates and vertebrates. Reptiles and amphibians comprise an important component of vertebrate fauna in tropical rainforest regions. They exhibit high diversity and extreme ecological specialization and habitat preferences. Adult amphibians are the best biological pest controllers. Because of their importance in ecosystem, decline or extinction of their population has significant impact on other organisms along with them.

Amphibians are regarded as good ecological indicators, because of their high levels of sensitivity, throughout their life cycle. They respond to very slight changes within the environment. Such responses are key in early indication of habitat fragmentation, ecosystem stress, impact of introduced chemicals and other anthropogenic activities.

Reptiles and amphibians comprise an important component of vertebrate fauna in tropical rainforest regions. They exhibit high diversity and extreme ecological specialization and habitat preferences. Surveys on reptiles depend mainly on visual searches while frogs can be detected by their vocalizations.

Amphibians, including frogs and toads, are numerous and diverse and occupy a wide range of habitats. Amphibians are strongly influenced by the distribution of water usually in the form of precipitation which influences the breeding of many species. Terrestrial adults typically move to suitable aquatic habits – including riverine habitats, pools of surface water and in bromeliads- to breed.

Frogs are smooth-skinned, many live near or around water and they tend to have slender elongated bodies and long legs. Toads are warty-skinned creatures living in damp places. Both species reach their greatest abundance in tropical regions and possess complex life cycles-an aquatic larval stage and terrestrial adult stage that are unique among vertebrates.

The herpetofauna diversity of much of Guyana had been largely unknown and was usually paralleled from studies conducted in French Guiana, Surinam and other areas within the Guiana Shield (e.g. Starace, 1998). There has not been any published information on the herpetofauna of the Upper Berbice. There are now a number of studies which have focused on the amphibians and reptiles of Guyana (Cole *et al*, 2013, Kok and Kalamandeen, 2008; Pires, 2005; Senaris and MacCulloch, 2005; Noonan and Bonett, 2003; Kok, 2006; Kok, 2006; Means and Savage, 2007; Means and Kalamandeen, 2007; Kok and Castroviejo-Fisher, 2008; Donnelly *et al*, 2006).

The following results represent a rapid assessment of the herpetofauna of the Sherwood Forest concession ShF T1, ShF T2, and ShF T3. Fieldwork in this survey phase was conducted during October 2013 (dry season) and May 2014 (wet season) to assess the biological diversity of amphibians and reptiles in the Study Area. Day and night visual encounter surveys, auditory encounter surveys, leaf litter plots, patch sampling, and surveys at water bodies were used to identify the presence of amphibians and reptiles within Sherwood Forest and other areas of interest. Forty one (41) species of herpetofauna were documented during surveys of three transects within the forest concession as well as along Coco Creek which is one of the boundaries for the concession. These include 25 species of amphibians and 16 species of reptiles (terrestrial and semi-aquatic). The dominant amphibians observed were *Hypsiboas boans*, *Osteocephalus leprieuri*, and *Rhaebo guttatus*. Commonly encountered reptiles include the Teiid lizards; *Ameiva ameiva* and *Kentropyx calcarata*, the Yellow Footed Tortoise *Chelonidis denticulata*, and endangered species including the Black Caiman *Melanosuchus niger*, and the Giant River Turtle *Podocnemis expansa*.

The general area comprised primarily of undulating terrain with Mixed Forest. Visual and audio encounter surveys were conducted along forest transects, around various water bodies within the sample area, and 2km long.

The approach used for the assessment of the herpetofauna was that of the systematic sampling survey, as employed and recommended by Scott (1992), when there is a short term sampling regime as in this case. According to Scott (1992) this technique was employed by Terborg (1989) and Hurbert (1971) for short term avifaunal studies and proved to be suitable for other faunal short term assessments of areas.

Visual Encounter Surveys (VES) and Auditory Encounter Surveys (AES) were conducted each day along transects to determine species presence, distribution and relative abundance. Each day Patch Sampling of habitats was conducted in the morning and afternoon. Nocturnal VES and AES were conducted each night in areas surveyed during the day, as well as other suitable habitats for amphibians and reptiles. Microhabitats were located for intensive sampling within each of the sites with an objective of finding the following – accessible epiphytes (for breeding amphibians), loose bark (hiding places for both amphibians and reptiles), rock/boulder crevices (many of the sites had locations that had a high percentage of boulders/loose rock for amphibians and reptiles), swamps (for amphibians), puddles (for breeding amphibians) and trenches (man-made cut-ins in the forest and ground for amphibians and reptiles), streambeds (amphibians and reptiles), areas with compacted and more loose leaf litter (for amphibians and reptiles) and in tree hollows (for reptiles and amphibians). General searches for amphibians and reptiles around the campsites were also carried out. In the majority of instances, species observed visually were photographed.

Amphibians - Forty one (41) species of herpetofauna were documented during surveys of three transects within the forest concession as well as along Coco Creek which is one of the boundaries for the concession. These include 25 species of amphibians and 16 species of reptiles (Annex X).

All amphibians observed were Anurans. A total of one hundred and fifty seven (157) individuals representing twenty five (25) species from seven (7) families were documented from transects within the Sherwood Forest concession during the survey period. The most abundant species were *Hypsiboas boans* (21), *Osteocephalus leprieurii* (17) and *Rhaebo guttatus* (16). The species that were represented by one (1) individual each were *Adenomera hylaedactyla*, *Leptodactylus lineatus*, *L. pentadactylus*, *Phyllomedusa bicolor*, and *Pipa pipa*. Additionally, there were four (4) species of frogs belonging to the Dendrobatidae family; these include *Allobates femoralis*, *Ameerega picta*, *A. trivittata*, and *A. hahneli*. The most species diverse families recorded during the surveys were Hylidae (9 species) and Leptodactylidae (7 species).

The transect with the greatest species diversity and abundance was transect ShF T 3 (62 individuals, 20 species). ShF T1 and ShF T2 were represented by sixteen (16) and thirteen (13) species respectively. Most of the species observed were close to pools of water that resulted as a result of periods of rainfall, close to the bank of Coco Creek, and in areas that have a higher groundwater discharge. Several large males for example *Rhaebo guttatus*, and *Hypsiboas boans* could be heard calling next to water at most sites. *Hypsiboas calcaratus* and *Osteocephalus leprieurii* were also recorded calling after periods of sporadic rainfall.

There were no endangered, rare or threatened species of amphibians documented. However the four species of poison frogs recorded are important in the pet trade and are all CITES Appendix II listed species, with regulations for trade. Other notable species include the Tukeit Hill Frog, *Allophryne ruthveni*, and the fossorial frog; *Ctenophryne geayi*.

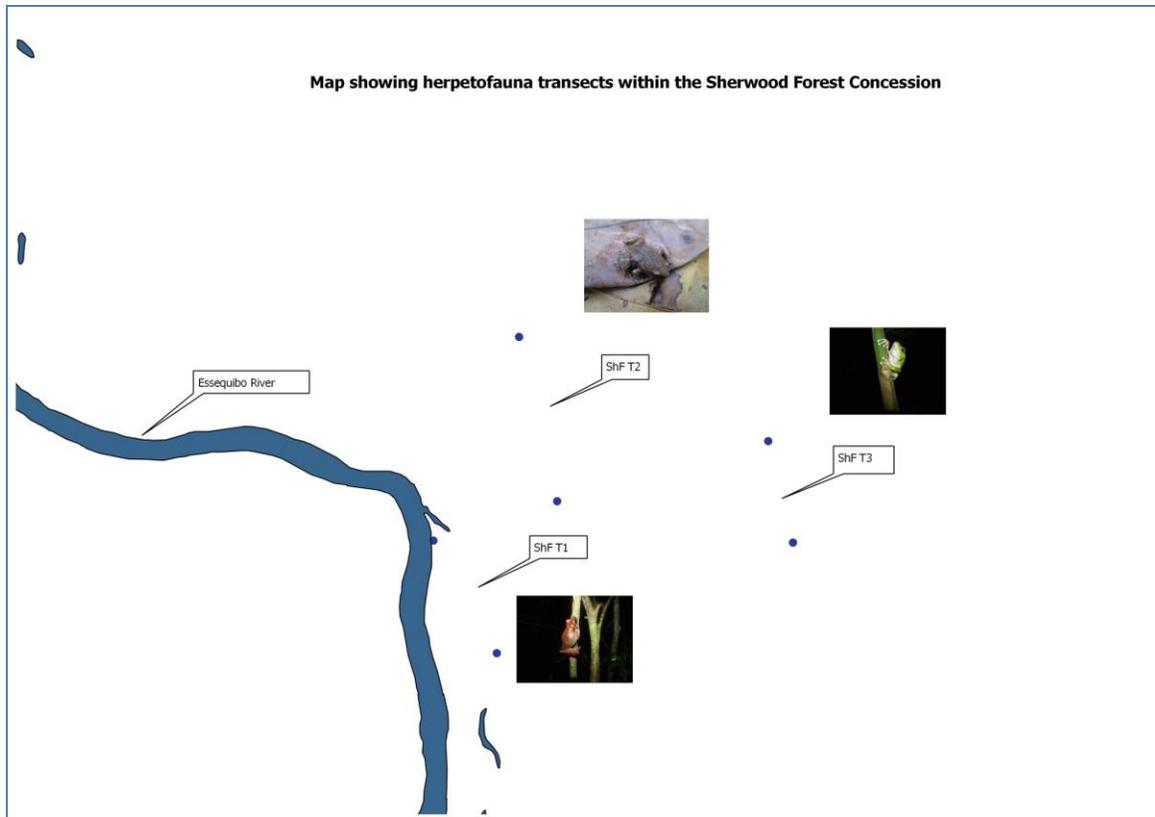


Figure 23: Herpetofauna within Sherwood Forrest Concession

Reptiles - One hundred and eleven (111) individuals belonging to fourteen (14) species of reptiles representing eleven (11) families were recorded.

For the reptilian species, the findings will be presented and discussed as those recorded on terrestrial transects and river transects. Sixty eight (68) individuals representing eleven (11) species were recorded on the terrestrial transects, while forty three (43) individuals representing five (5) species were recorded on the river transects.

The species most recorded on the terrestrial transects were the Teiid lizards; *Ameiva ameiva* (21), and *Kentropyx calcarata* (17). The only Serpentine species recorded in the Sherwood Forest Concession was Cook’s Tree Boa, *Corallus hortulanus*. There were no records of species belonging to the Viperidae and Colubridae families. This may be as a direct result of the very low levels of disturbance throughout the survey area, as well as the relative moist conditions which prevailed on the forest floor along the transects.

The endangered Black Caiman *Melanosuchus niger* (43 individuals) was the most represented species on the river transects. There were four river transects conducted along Coco Creek covering an approximate distance of 9 km. This is equivalent to approximately 4.7 caiman/km (Annex X). Other species recorded from the river transects include the Spectacled Caiman *Caiman crocodilus* (1), Giant River Turtle *Podocnemis expansa* (2), *Corallus hortulanus* (1) and *Uranoscodon superciliosus* (2).

Conservation Elements – ERT Species

Biogeographically, all the reptile species recorded within the survey period are widespread throughout Guyana and the wider Guiana Shield region. They can be found in tropical moist forest in and other biogeographically similar areas throughout the Guianas (Kok and Kalamandeen, 2008;; Starace, 1998; Lescure and Marty, 2000; Smithsonian Institute, 2000; Donnelly *et al.*, 1998; Pires, 2005; Senariset *al.*, 2008). The IUCN Red List of Threatened (2013) species, highlights the Yellow Footed Tortoise *Chelonoidis denticulata* as Vulnerable (to be updated), *Melanosuchus niger* as Endangered; Lower Risk, Conservation Dependand and *Podocnemis expansa* as Endangered; Lower Risk, Conservation Dependand. *M.niger* is also listed as a CITES Appendix I species which restricts its trade, while *C.denticulata* and *P.expansa* is a CITES Appendix II species.

5.3.1.2.5 Lepidoptera (butterflies) and other Macro-invertebrates

Different types of waterways (creeks, rivers etc.) and wetlands are home for many kinds of small animals that are called macro invertebrates. These animals generally include insects, crustaceans, mollusks, arachnids and annelids. The term macro invertebrate describes those animals that have no backbone and can be seen with the naked eye. Some aquatic macro invertebrates can be quite large since these animals spend all or part of their lives in water, their survival is related to water quality, and hence they serve as good indicators for pollution or change in water quality. They are an important part of the food chain since larger animals such as fish and birds rely on them as a food source.

Survey of the macro invertebrates was done by visual encounter surveys (VES) and a light trap. VES was done by walking along the floral transect lines and observing all the species present and also by observing at the aquatic sites that were used for fishing. This was done during the day and night. A butterfly net was used to catch butterflies and other insects and macro invertebrates. A light trap was set up by placing a light to reflect on a white piece of cloth so as to attract insects, which was set up from 6pm to 9pm and checked every hour to collect the different species. All species collected were photographed and the number of individuals recorded.

Insects and other macro-invertebrates were observed and collected along the floral transect lines and aquatic transects. VES along a 2km transects was carried at each floral transect in the different concessions. VES was also done along the sites for aquatic transects (fishes) and all other opportunistic sightings were recorded. During this survey the species that were collected comprised of 14 orders (Appex X). The Lepidoptera consisted of five families; the Lepidoptera, Aranae, Orthoptera, Diptera were the dominant orders observed.

Although species from fourteen orders were recorded a large number of individuals representation of different species were not observed or collected which may have been because there were not many flowering or fruiting trees on which these species can feed.

6.0 SOCIO-ECONOMIC ENVIRONMENT BASELINE CONDITIONS

6.1 Background

Historically, the SFEP area was 'considered' territory of the Taurama People and more recently the WaiWais, Caribs, Macushi and Wapishiana¹⁶. Traditionally, these nomadic Amerindian peoples traversed large distances for food and periodic dwelling places. The nomadic lifestyles evolved into a more settled pattern after the influence of European cultures via a combination of religious, medical and cultural factors.

Research by UG (1993) indicates that the hardships facing women and children in particular include:

- a) The hardships concomitant upon the climate and the natural environment of the area: the long rainy season, lasting almost six months, during which time the rivers, creeks and trails become almost impassable and settlements face isolation;
- b) The limited opportunities for income generation;
- c) The inadequacy of essential social services: health, education, food distribution etc.

The advent of the Iwokrama International centre for Rain Forest Development and Conservation and the Linden-Lethem Road have energised the North Rupununi District. Hundreds of people traverse the North Rupununi via Linden-Lethem Road every year. Consequently communities there are more enterprising economically with eco-tourism being a major income earner.

Amerindians in the North Rupununi frequently leave their permanent dwellings to undertake fishing and huntingtrips over extensive areas. It is very common for them to establish small farms wherever they spend a short time, and these old farms are visited from time to time. For example, near Primus Inlet, right bank Essequibo River, there is a small plot of plantain trees (*Musa spp*). Expeditions may involve the entire family or just groups of males.

6.2 Stakeholder Assessment

The primary goal of SFI is to acquire a forest concession agreement that grants rights to engage in the sustainable production of value added timber products for the local and export markets. SFI interprets 'sustainable' to include the concerns of stakeholders impacted by logging and ancillary operations within the SFEP area.

The primary responsibility for the management of State forests and forest concession administration lies with the GFC. The EPA has the mandate for environmental management and the GLSC & the Ministry of Amerindian Affairs become involved in claims for titled lands by Amerindian Communities. GGMC governs the rights to subsurface minerals.

Initial investigations of the project have led to the identification of GFC, GMC, EPA, NRDDDB and the communities of Apoteri, Rewa and Crash Water as **primary** stakeholders. These are initially the agencies, individuals or groups whose interest in the project will be recognized in order for the project to be

¹⁶CI-G: *Social Impact Assessment for the proposed Conservation Concession Area in Guyana's Rupununi Region*, CI-G, Georgetown, 2002

successful. The community of Apoteri will be either positively or negatively affected during the project; their interest and support for the project and their participation in reconnaissance and management level inventory work to date is a major boost for SFI's activities. Since the residents of Apoteri, Rewa and Crash Water share many common interests, the residents of Crash Water and Rewa are also primary stakeholders (see Map 1 attached).

The **secondary** stakeholders, who do not necessarily have a great effect on the project's success, include CI and Iwokrama. SFI has an interest in the manner in which Simon & Shock, holders of another SFEP south west of SFI's SFEP, plan to develop their concession. SFI would wish to consult them on several developments such as the sustainable utilization of forest resources, the conservation of biodiversity generally and fauna in particular and road corridor management practices. SFI expects to cull useful lessons from the current activities of those entities and hope to have these agencies share its forest management approaches. SFI will also involve them in any capacity building training actions it implements. Further, many of the persons who would potentially be employed from Apoteri, Rewa and Crash Water have already received some kind of training from CI or Iwokrama via the NRDDB.

The **tertiary** stakeholders, who are not necessarily involved in or affected, but can influence opinions either for or against the project, include environmental NGOs, Amerindian based NGOs, Regional Administrations, miners, commercial hunters, and commercial fishermen. Again, SFI will endeavour to provide information on its plans, via documents submitted to the EPA or the GFC, which such stakeholders could peruse. SFI thinks that the security agencies are also major tertiary stakeholders.

The status of some stakeholders will change over time. For example, Apoteri residents will exert considerable influence in the preliminary exploratory phase of work. Later on, when the access road linking the concession with Kwakwani is constructed, stakeholders in the lower Berbice-Corentyne Watershed, especially loggers, and the Kwakwani Community will assume greater importance; there may be much lesser contact with the communities in the North Rupununi. The consultants studied impacts as they relate to the primary stakeholders at Apoteri, Rewa and Crash Water.

6.2.1 Approach used to determine stakeholders' concerns

The socio-economic study generally followed the Rapid Rural Assessment (RRA) Methodology utilising a mix of appraisal and data gathering techniques, inclusive of interviews, meetings, discussions, administered questionnaires and observations. The information guiding the study was gathered over an extended period of time and also in consultation with existing publications on the socio-economic dynamics of the area. The consultants actually visited Rewa and Crash Water in September 2009 and November 2009, while Apoteri was visited on numerous occasions between October 2009 and February 2010. Informal interviews and discussions were held with community members. Community members were advised of the issues under discussion and were also provided with information on the project in order for them to process and then provide a response. Formal meetings were held with the Sector Agencies and NGO's identified as stakeholders in the process. Additional information was gathered using email and telephone interviews.

In the more formal setting of community meetings, the issue of forest concessions were discussed in relation to the increased demand for new resources. Residents in all the communities were interviewed in February 2010 in order to gather additional information on the baseline conditions of the project beneficiaries.

6.2.2 Socio-economic status of stakeholder communities

6.2.2.1 Description of the general socio-economic environment

The project site is located in intact forests within the Essequibo-Corentyne Watershed. All neighbouring communities lie west of the Essequibo River. In the conservation concession to the south, there is the occasional presence of CI staff. The communities in the North Rupununi currently manage the Arapaima fish resources. The youth work at the Iwokrama Field Centre, in the lower Essequibo and the lower Berbice. Much of the older folk, however, are engaged in farming, fishing and hunting.

The King William Waterfall in the upper Essequibo River is a major historic tourist attraction: at that location, one cannot travel by boat anymore; the boat must be hauled over the fall. In addition, the remnants of cocoa plots on the right bank of the Essequibo River, attracts a lot of curiosity. Tourism is a small but growing economic sector, increasing revenues for tourism operators and increasing the demand for skilled locals to manage eco-lodges, conduct tours and supply handicrafts.

6.2.2.1 Apoteri Village

Apoteri is currently the nearest village to the project site (see Map 1). Apoteri Track A and Track B are located approximately 10 km and 30 km respectively west of Sherwood's concession. The village was formally founded in the 1940's as immigrants of Wapishana and Macushi tribes moved east to work with the Guyana Balata Company. The balata economy collapsed (due to competition from plastic materials) and the community suffered an economic decline. In 2001, the village recorded sixty three (63) households totalling three hundred and two (302) persons, of which six persons (6) were employed on a full time basis¹⁷. In 2009, the village had forty nine (49) families totalling two hundred and sixty nine (269) residents after many residents of Apoteri migrated mostly to Fairview Village. In 2006, the official number of electors was 113¹⁸.

The villagers are mainly Amerindians with a single East Indian male who migrated by marriage to the village. There are also a few members of mixed decent living in the village. The village remains significantly local with over 95% of all residents being Amerindians.

The education level in Apoteri is generally low with very few persons completing a high school education. In 2002, there were ninety eight persons (98) with some degree of secondary school education, with one person having further education. In 2010, the situation improved with one hundred and twenty eight (128) residents having secondary school education.

More than half of the adult male population are skilled in forestry related activities including chainsaw milling, river navigation, tree felling, forest inventory, carpentry, masonry, tour guiding, driving, operators of heavy duty machinery, etc. The men are skilled hunters and fishers who supply a seasonal fish market as determined by market demand.

Seven (7) persons are employed on a full time basis in the village: these include two school teachers for the nursery/primary school, three workers for the Conservation Concession and two Community Health Workers. In addition, several persons work full time outside of the village employed by Iwokrama, Tiger

¹⁷Conservational International-Guyana 2002; **Management Plan for Conservational International's Proposed Conservation Concession in the Upper Essequibo: 2002-2006**, CI-G, Georgetown, Guyana.

¹⁸GECOM, 2006/ <http://www.gecom.org/ole/District09.pdf>

Woods Inc., Bina Hill Institute and Demerara Timbers Limited. Workers earn between G\$ 35,000 to 60,000 per month for their services.

There are a few small shops. Most residents produce crab oil, cassava bread, farine, casareepand dried fish for sale. The village has its resident church of which many villagers frequent. From time to time, some villagers seek seasonal employment in the savannas, with loggers and miners, and others seek short term jobs in Brazil.

The village has a tourism centre which has the capacity to house up to sixteen persons in moderate accommodations. The Centre is connected to a kitchen and powered by a portable generation set. It has running water, shower and a flush toilet. Communications by radio and e-mail is possible with the outside world via CIG’s Ranger Station which is located next door to the Centre. The Centre is managed by a single employee and employs the service of a cook depending on the availability of guests.

TABLE 14: POTENTIAL FOR INCOME EARNING OF APOTERI RESIDENTS, 2009

| Female – 58 (≥ 19 years) | | | | Male – 48 (≥ 19 years) | | | | | |
|--------------------------|-------|---------------|-------|------------------------|---------|-------|----------------|---------|-------|
| Farming | Craft | Trained (Job) | Other | Hunting | Fishing | Craft | Skilled Worker | Trained | Other |
| 58 | 50 | 12 | 8 | 48 | 48 | 48 | 35 | 4 | 6 |
| 100% | 86% | 20% | 14% | 100% | 100% | 100% | 73% | 16% | 12% |

Houses at Apoteri are a merge of modern and traditional materials and design inclusive of zinc roofs and elevated flooring. The tourism centre has a flush toilet. Residents of all other buildings or domiciles utilise pit latrines. A few villagers have TV and music which is shared with immediate neighbours and other families. A popular activity within the community is the preparation of an alcoholic drink from cassava used mostly for festive occasions.

The village of Apoteri occupies a key strategic location at the confluence of the Rupununi and Essequibo Rivers. It is the main access point to the upper Essequibo River and the community could emerge as a major economic hub as developments occur in the Upper Essequibo; it was the major business hub during the heyday of the balata trade. Apoteri also has an airstrip that can accommodate all models of aircraft used by the domestic aviation industry.

6.2.2.2 Rewa

Rewa, located approximately 40km west of SFI’s concession, was founded in 1959 due in part to the scarcity of arable land in the savannahs and because of the advantages of the location. It is occupied predominantly by Macushi people with thirty five (35) households totalling one hundred and seventy eight (178) persons in 2001 of which five (5) had full time employment in the village.

In Rewa today, there are approximately two hundred and fifty three (253) residents who are mainly employed in traditional lifestyles with full time employment in the government, timber, mining, and tourism entities. GECOM¹⁹ electors’ list for 2006, show 75 persons.

The upper Rewa River is reputed to be biologically rich and an important region for threatened lowland rain forest boast and riparian fauna (Pickles, McCann and Holland, 2009). For this reason, Rewa has invested in an Eco Lodge.

¹⁹ <http://www.gecom.org/ole/District09.pdf>

6.2.2.3 Crash Water

Crash Water, derived from *Kulashe-Wata*²⁰ (*the site place of the birds called Kulashies*) is a relatively new village, located approximately 70km west of SFI's concession, was settled in 1998 mainly by Macushi peoples, with thirty one (31) families- totalling one hundred and eighty one (181) persons in 2001; only three (3) of these had full time jobs. Today the village has grown to approximately two hundred and fifty (250) persons who are mainly employed in hunting, farming and ecotourism.

6.2.2.4 North Rupununi-Annai & satellite villages, Surama, Fairview

Annai extension is located approximately 70 km westwards of SFI's concession, while Fairview, as well is located approximately 70km but northeast of the concession.

The North Rupununi continues to develop in its population and its economic activities due in part to tourism ventures and its alignment with Iwokrama. In 2005, there were 4,386 recorded residents in the sixteen communities of the North Rupununi²¹. In February 2008, there were approximately 4,735 people living in 15 villages south of the Forest in Region 9, about 98% of whom are Amerindian²². Led by the NRDDDB and developed by the BHI and its partners, the people are paving new paths in inclusive governance, community natural resource management and environmental governance.

Developments in oil exploration, the Linden-Lethem Road, ancillary businesses linked to these two developments and the availability of electricity are likely to transform livelihoods in the area.

The consultants gathered that the people in the north Rupununi want development, but they also want to exercise control over the pace and intensity of such development. For this reason the Bina Hill Institute, in collaboration with various partners, including Iwokrama, FTCl, and CI is fostering training for young people, so that they could be educated about the issues affecting their welfare and address these in a proactive manner.

6.2.3 Stakeholder issues and perspectives: General Comments

Preliminary observations by the field team have detected no signs of any activity *within* the concession. It is expected that the opening up of access roads to the area would lead to an expansion of traditional hunting and farming activities and to new economic ventures in mining; because this has been the case with all new roads such as the Linden-Mabura Road and the Buck Hall Road. The current study has identified a number of impacts arising from the proposed developments by SFI.

6.2.3.1 Economic activities (Upper Essequibo)

The *SFEP* area was used by the local peoples during the balata trade; the administration of the trade was done at Apoteri. Currently, there are no recorded claims for land or extension of lands *within* the concession area. (This issue of land claims could develop in the future).

The community of Apoteri has an interest in the land between the left bank Berbice River and the right bank Essequibo River and the consultants observed at least one small untended agricultural plot with plantain trees (*Musa sp.*) near Primus Inlet. The Scoping Meeting revealed that while people are familiar

²⁰<http://www.stabroeknews.com/2008/opinion/letters/06/10/amerindian-names-should-be-accurately-spelt/>

²¹ NRDDDB 2005

²² NRDDDB Population Data, 2009

with the area, not many would have visited it due to the distance, and the fact that people appear to have been able to meet their hunting and farming requirements without going there.

Areas near Cocoa creek may be visited by fishermen who have commercial Arapaima (*Arapaima gigas*) fishing interests. These fishing expeditions (if any) are not expected to create challenges for SFI, because actual logging operations will occur far away from the Essequibo River. (The area between the Berbice River and the Essequibo River presents a huge buffer zone between logging operations and the Essequibo River. In any case SFI respects lawful and traditional user rights.

There is currently a small tourism trade in the Upper Essequibo, mainly targeting visits to the King William waterfall.

6.2.3.2 Training & Employment

SFI will need to hire persons for jobs such as construction workers, machine operators, medics (establishment of medical facilities) and data entry clerks etc. Females would be employed to do jobs such as data entry, tree spotting, forest inventory and timber harvest planning.

SFI will prioritise the training and employment of its employees, including those from the North Rupununi. Many residents of the North Rupununi are already skilled forest workers in full time or part time employment with various companies in the area. The inflow of large volumes of cash within the communities could lead to both negative and positive benefits.

6.2.3.3 Residents cultural comfort zone

It is expected that with the investments and increases in cash flow to the communities that there will be behavioural changes within the affiliated communities. Competition for employment and the supply of services may disrupt or even change local traditions in the short term. Workers will bring to their communities the practices learnt at the work 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. Residents want to see a rigid education and awareness program as part of the overall work program to combat negative social behaviours.

6.2.3.4 River hazards and security issues

It is not expected that there will be any significant increase in river traffic as most movement will take place overland. Appropriate signs will be placed along the river route to advise/warn boat captains of any risks.

Currently residents feel very secure in their use of the river, feeling free to camp anywhere and to leave their assets-including outboard engines and fuel 'lying around the camp' untended without fear of theft or damage. Any other way could be very stressful to residents.

6.2.3.5 Waste generation and disposal

Communities hope that their environment will remain pristine and that the quantity and diversity of fauna commonly seen during river trips will be conserved and that they do not suffer from pollutants of any description.

6.2.3.6 Cultural heritage/legacy

The project site and its environs are rich with cultural history dating back to the balata trade. There is no record of any indigenous assets within the concession area but residents want assurances that any assets uncovered will be preserved. (Information in this regard will most probably be gathered or verified during the 100% pre harvest inventories. SFI will notify the relevant authorities once any such artefacts or indigenous assets are discovered. If any significant sites are located, SFI will grant access to authorised persons).

6.2.3.7 Health & Safety Concerns

There will be positive and negative consequences arising out of the development. Residents will benefit from the medical services offered by the company. Monthly visits will be made by a physician to the operation from which residents can benefit. In the event of an emergency, residents can rely on the company to lend its assistance as far as possible to the victim.

The opening of the road and the influx of workers into the district could create an undesirable situation for the community. Special attention will be paid to any emerging trade in alcoholic beverages. So far, the heavy flow of persons traversing the Linden Lethem Road or the Upper Essequibo River has not been associated with any major health problems for the communities. SFI expects that any such health impacts will be minimal, especially as the Ministry of Health is quite active in its vaccination initiatives, health education programmes, and in developing the local capability to detect Malaria. For example, the Medical facility at Apoteri can conduct smears and detect Malaria among residents and visitors.

It is anticipated though that SFI will contribute to health care delivery within the north Rupununi District once its field operations start. Residents also expect that SFI will take measures to restrict inappropriate behaviour among its own employees.

6.2.4 Stakeholder Perspectives: Public Agencies, Communities & NGOs

6.2.4.1 Guyana Forestry Commission

The GFC was engaged throughout the process and guidance was often requested in the development of the ESIA. The Commissioner and the Deputy Commissioner were contacted on several occasions. The Commissioner agreed with the findings of the consultant that the development will create employment for Guyanese, increase the foreign exchange earnings and attract additional investment to Guyana and the forestry sector. The Commission does not foresee any *major* negative environmental or social impacts from this development, given the rigour of its internationally acclaimed forest concession administration systems and procedures.

6.2.4.2 Environmental Protection Agency

The EPA has been the lead agency in the ESIA process and is therefore aware of the issues relating to the development and concerns raised by stakeholders. The consultants have continually requested guidance from the Director of Environmental Management Division of the EPA in the development of the assessment.

The EPA was confident that as long as the *mandatory* guidelines for development and operations are followed all negative impacts will be contained to acceptable levels.

6.2.4.3 Guyana Geology & Mines Commission

One consultant met with Mrs. Livan, the head of the GGMC's Environmental Division and discussed briefly the potential social issues expected to evolve as the development takes its course. GGMC was supportive of the new development citing it as a positive developmental initiative for Region 6. GGMC is confident that the positive benefits from the development will outnumber any negative impacts as long as the development follows the suggested guidelines:

- a) Work with miners and neighbouring concessionaires to reduce any conflict, forging a spirit of cooperation;
- b) The development must be guided by the government's regulations and more recently its attempts to harmonise the mining and forestry sectors via the *Report of the Special Land Use Committee*; and
- c) Be adaptive to the national initiatives of the government such as the Low Carbon Development Strategy and Reduced Emissions from Deforestation and Forest Degradation (REDD) program.

6.2.4.4 RDC Region #6

The office of the RDC Region #6 expressed full confidence that the governmental offices overseeing the process will ensure that it is carried out properly. The RDC had no major concerns and expressed the general desire to collaborate with enterprises on any major developments in Region 6.

6.2.4.5 RDC Region #9

One consultant met with the Chairman of the RDC Region #9 in February 2010 in order to discuss project matters. The office of the RDC was very supportive of the project and does not see any major negative social impact emerging from the development. The Chairman was confident that as long as the development followed the existing management guidelines for the Forestry Operations there should be no major negative impacts to society and/or the environment. Security for the residents of Region 9 is a matter of very general concern for the Regional Administration; however security issues are overarching and need to be addressed at another level.

6.2.4.6 Conservation International (Guyana) Inc.

CIG had a *conservation concession* immediately south of the project site. The objectives of the two concessions are different but not in conflict. The consultant requested from the Conservation Concession Manager information regarding their perception of SFI's proposed development. CIG was very cooperative in the process.

CIG is willing to engage SFI in building capacity to enable best practices in its timber operations. CIG is confident that by following the best practices for timber harvesting, the human impacts on the ecosystems will be reduced and the carbon footprint will be minimised.

CIG is also concerned about the presence of archaeological artefacts in the area which need to be carefully preserved and documented. CIG insists that the government must take into careful consideration the impacts of opening up new roads in virgin areas. The roads generally create opportunities for actions by people not concerned with conservation of the environment.

6.2.4.7 Apoteri Residents

There was a mixed response to the news of the logging company being granted an SFEP. Of the thirty five (35) adults villagers interviewed, over 75% of the residents were supportive of the development and hoped to benefit from the development through employment of youth and income from sale of fruits, vegetables, fish and cassava products.

A few residents were not fully supportive of the development seeing it as opposed to the conservation principles as already practiced by the village. One resident was not sure of where the concession issituatedand was more concerned that the logging activity could encroach on community lands.

Interestingly, a few residents were concerned with the harmonization of development and the LCDS. One resident sees the logging as destructive and leading to climate change. To counter the point, another resident was confident that once logging follows the RIL methodology, there will be no major harm to the environment and minimal contribution to global warming.

Another *resident* was concerned with the micro impact as loggers moved to Apoteri, capitalising on the employment opportunities but bringing a destructive culture to their forests. There were some concerns with water pollution as river water is used for domestic purposes.

6.2.4.8 Other Stakeholders

Communities were invited to share their concerns at the Public Scoping Meeting (see Annex II(a)) and also in interactions with the consultant dealing with socio economic matters. Some residents were suspicious of the development as *few developers have delivered on their promises*. They generally supported the development but had some reservations related to wages, health, long stay away from their families and the potential impacts on the wetland ecosystem of the Essequibo River Basin.

Representatives of the *NRDDB and BHI* were supportive of the development and hoped it will be balanced with environmental protection as a strict criterion. They also advocated that the residents of the North Rupununi be given first priority in employment.

A tour guide was concerned about the development citing as his reason, the impact on birds from even selective logging. He supported logging but cautioned that it must be done under strictest conditions with nature given its proper priority in the operations.

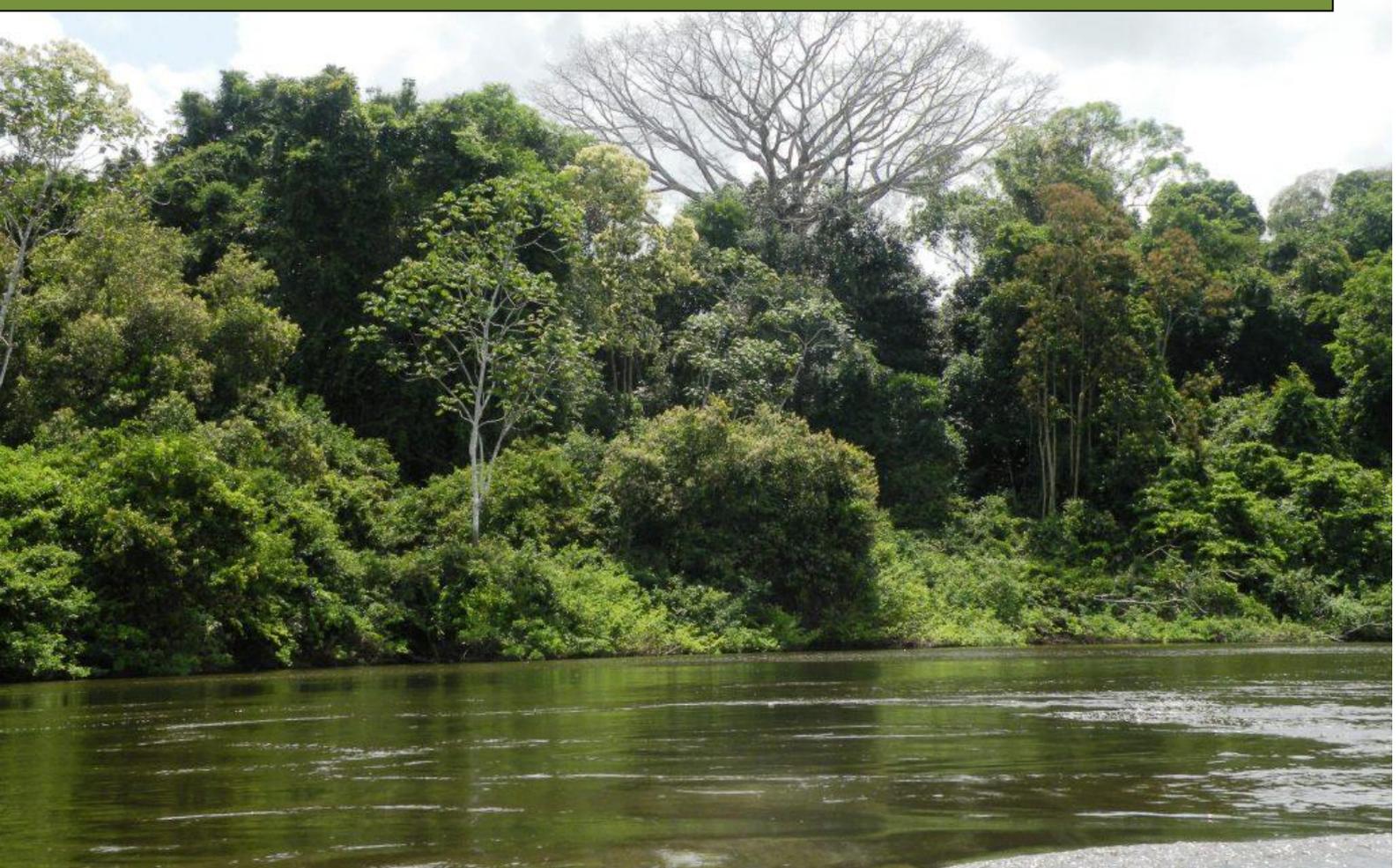
6.3 Recommendations

The general thrust of stakeholders is that the development is expected to have more positive impacts than negative ones, making this project a very desirable and economically and socially positive one for the region.

The following recommendations, summarised from general feedback during consultations with stakeholders, seek to foster a strategy for benefit sharing, ensure stability at the community level, and the management of risks or negative impacts resulting from the actions of the developer:

- 1) The operations must have a strong education and awareness component (with guidance from existing entities such as Iwokrama and CIG) in order to educate its employees and reduce the hazards and negative impacts associated with logging;
- 2) All artefacts and other indigenous assets 'discovered' must be documented and mapped;
- 3) The access to the site from Apoteri must be reopened for the convenience of people from the North Rupununi who will avoid taking the long route via the planned access road to access the concession;
- 4) The developer in collaboration with the Ministry of Natural Resources and the Environment must strongly lobby the government to establish a police checkpoint in close vicinity to the area to address security matters;
- 5) The company must engage its employees in health education relating to HIV/AIDS, TB and Malaria prevention and treatment;
- 6) The company must be able to provide professional training courses and on-the-job training for the residents of the North Rupununi who are desirous of entering the industry;
- 7) The company must be willing to coordinate with leaders in conservation in order to build its workers' capability for environmental and forest management best practices;
- 8) Logging operations are often disastrous to the stability of families due to the long time workers stay away from their homes. It is recommended that the company develops an optimum rotation system enabling workers to complete a fair number of work days and turn around days. A suggested rotation of twenty days on and ten days off may be economically feasible as well as socially desirable; and
- 9) The company must recognise and reward local knowledge in the implementation of its operations.

CHAPTER 3: ENVIRONMENTAL IMPACT ASSESSMENT



7.0 ENVIRONMENTAL ASSESSMENT OF IMPACTS

7.1 Introduction

The purpose of this section is to assess the potential positive, negative, direct and indirect impacts that the proposed project activities will have on the physical, ecological, socio-economic environment. *Direct impacts* are characterised as those that affect the physical, biological and socio-economic environment. *Indirect (secondary) impacts*, defined as impacts that occur later in time or further removed in distance from direct impacts, are also considered where appropriate.

The impacts have been identified for the three main phases of the project, namely: pre-operation, operation and post-operation. The assessments are presented in three stages:

- 1) Preliminary Environmental Assessment Matrix – provides a quick overview of the activities and the parameters that are impacted (Table 15).
- 2) Environmental Impact Assessment Evaluation Matrix – Using the Rapid Impact Assessment Matrix (RIAM), this matrix evaluates the impacts based on specific criteria and scaling them to record values for the important, magnitude, permanence, reversibility and cumulative impacts of each of the project activities in all three phases (Table 17).
- 3) Descriptive Impact Table – This table gives a description of the anticipated direct and indirect impacts on the various environmental components of SFI's proposed activities as was highlighted in the preliminary assessment matrix (Table 18).

7.2 Preliminary Environmental Impact Assessment

Table 15: Preliminary Environmental Impact Assessment (below) identifies the components of the physical, biological and socio-economic environment which could be impacted by the various activities in the pre-operational, operational, and post-operational phases of SFI's operations.

TABLE 15: PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT OF ACTIVITIES RELATING TO SFI'S OPERATIONS

| PRE-OPERATION ACTIVITIES | | | | | | | | | | |
|---|----------|-------|-----|-------|--------------|-------|--------------------------|----------------|----------|-------------------------|
| Environmental components | Physical | | | | Biodiversity | | | Socio-Economic | | |
| Phases of Project/ Subcomponents | Soil | Water | Air | Noise | Flora | Fauna | Ecological-relationships | Social | Economic | Archaeological/Heritage |
| Phase 1: Preparatory activities | | | | | | | | | | |
| 1. Gathering baseline data on topographic attributes of the general area, geology and soils, biodiversity, and social issues within the concession area | X | X | | | X | X | X | X | X | |
| 2. Identifying and recruiting relevant personnel | | | | | | | | X | X | |
| Phase 2: Planning for development of the access road, concession area and organizing timber harvesting operations | | | | | | | | | | |
| 3. Quantifying road alignments and construction works required for the access road, for the concession based primary road network (as a function of the topographic parameters of the area), and mapping and laying out of skid-trails. | X | X | X | X | X | X | X | X | X | X |
| 4. Zoning of the concession area to establish areas designated for <i>production</i> and for <i>protection</i> respectively | X | X | | | | X | X | X | X | X |
| 5. Estimation of the commercial stock of timber (pre harvesting inventory) | X | X | | | X | X | X | X | X | |

| | | | | | | | | | | |
|---|-----------------|-------|-----|-------|---------------------|-------|--------------------------|-----------------------|----------|-------------------------|
| | | | | | | | | | | |
| 6. Sourcing, deployment and storage of fuels and lubricants | X | X | X | | | | | X | X | |
| OPERATION ACTIVITIES | | | | | | | | | | |
| Environmental components | Physical | | | | Biodiversity | | | Socio-Economic | | |
| Phases of Project/ Subcomponents | Soil | Water | Air | Noise | Flora | Fauna | Ecological-relationships | Social | Economic | Archaeological/Heritage |
| Phase 3: Construction of infrastructure to facilitate logging and logging operations | | | | | | | | | | |
| 7. Construction of access road and the road network-including bridges and culverts, skid trails | X | X | X | X | X | X | X | X | X | X |
| 8. Construction and Operations of the Main Base Camp and establishment of log markets for temporary stockpiling of logs | X | X | X | X | X | X | X | X | X | |
| 9. Felling trees, bucking and extracting of logs to log markets | X | X | X | X | X | X | X | X | X | X |
| 10. Loading and transporting of logs by truck from log markets to the timber processing facility | X | | X | X | | | | X | X | |
| 11. Processing | X | X | X | X | X | X | X | X | | |

| POST-OPERATION ACTIVITIES | | | | | | | | | | |
|---|----------|-------|-----|-------|--------------|-------|--------------------------|----------------|----------|-------------------------|
| Environmental components | Physical | | | | Biodiversity | | | Socio-Economic | | |
| Phases of Project/ Subcomponents | Soil | Water | Air | Noise | Flora | Fauna | Ecological-relationships | Social | Economic | Archaeological/Heritage |
| Phase 4: Post harvesting operations | | | | | | | | | | |
| 12. Assessment of the effectiveness of timber harvesting practices on the removal of all trees felled | X | X | | | X | X | X | X | X | |
| 13. Implementation of remediation measurements: - Road Closure After Harvesting | X | X | | X | X | X | X | X | X | |
| 14. Implementation of remediation measurements: - Post-harvest silviculture operations | X | X | | X | X | X | X | X | X | |

7.3 Environmental Impact Assessment using RIAM

7.3.1 Introduction to the RIAM

The Environmental Impact Assessment was evaluated using the Rapid Impact Assessment Matrix (RIAM)²³ developed by DHI Water & Environment²⁴. This system is based on the knowledge that certain specific criteria are common to all impact assessments, and by scaling these criteria it becomes possible to record the values of the assessments made. RIAM works with both negative and positive impacts.

RIAM allows full transparency of the decisions made in an EIA. RIAM provides a holistic investigation covering four categories of environmental components:

- 1) **Physical/chemical:** Covering all physical and chemical aspects of the environment, including finite (non-biological) natural resources, and degradation of the physical environment by pollution.
- 2) **Biological / ecological:** Covering all biological aspects of the environment, including renewable natural resources, conservation of biodiversity, species interactions, and pollution of the biosphere.
- 3) **Sociological / cultural:** Covering all human aspects of the environment, including social issues affecting individuals and communities; together with cultural aspects, including conservation of heritage, and human development.
- 4) **Economic / operational:** To qualitatively identify the economic consequences of environmental change, both temporary and permanent, as well as the complexities of project management within the context of the project activities.

The RIAM is suited to EIA where a multi-disciplinary team approach is used, as it allows for data from different sectors to be analysed against common important criteria within a common matrix, thus providing a clear assessment of the major impacts. The discipline imposed by using the matrix allows the assessors to rapidly record their judgements. Objectivity is ensured by means of the defined criteria set on scales, which provide a figure on the judgement made.

7.3.2 Rapid Impact Assessment Matrix

The Rapid Impact Assessment Matrix (RIAM) describes a system of scoring within a matrix that has been designed to allow subjective judgements to be quantitatively recorded, thus providing both an impact evaluation and a record that can be re-assessed in the future.

The RIAM method is based on a standard definition of the important assessment criteria as well as the means by which semi-quantitative values for each of these criteria can be collated to provide an accurate and independent score for each condition. The impacts of project activities are evaluated against the environmental components and for each component a score (using the defined criteria) are determined, which provides a measure of the impact expected from the component.

²³<http://www.dhigroup.com/~media/Publications/Solution%20Software/RIAM/IntroductionToRIAM.ashx>

²⁴<http://www.dhigroup.com/MIKECUSTOMISEDbyDHI/RIAM.aspx>

To note, not all criteria can be given the same weight, and so the criteria are divided into two groups: those which individually are important in their impact; and those that collectively important. By a simple formula the values ascribed to these criteria can be combined to produce a score for the component being assessed.

Scores by themselves cannot be used to separate, or scale impacts, as they are still attributable to subjective assessments. Thus ranges have been defined, with set conditions for the maximum and minimum scores in each range, and the final result is represented by the range value so derived.

The important assessment criteria fall into two groups:

(A) Criteria that are of importance to the condition, and which can individually change the score obtained.

(B) Criteria that are of value to the situation, but individually should not be capable of changing the score obtained.

The value ascribed to each of these groups of criteria is determined by the use of a series of simple formulae. These formulae allow the scores for the individual components to be determined on a defined basis.

TABLE 16: EVALUATION SYSTEM SHOWING THE CRITERIA THAT WAS APPLIED TO THE IDENTIFIED IMPACTS

| Group (A) criteria | Group (B) criteria |
|--|--|
| <p>Importance of condition (A1) A measure of the importance of the condition, which is assessed against the spatial boundaries or human interests it will affect. The scales are defined: 4 = important to national/international interests 3 = important to regional/national interests 2 = important to areas immediately outside the local condition 1 = important only to the local condition 0 = no importance.</p> <p>Magnitude of change/effect (A2) Magnitude is defined as a measure of the scale of benefit/dis-benefit of an impact or a condition: + 3 = major positive benefit + 2 = significant improvement in status quo + 1 = improvement in status quo 0 = no change/status quo - 1 = negative change to status quo - 2 = significant negative dis-benefit or change - 3 = major dis-benefit or change.</p> | <p>Permanence (B1) This defines whether a condition is temporary or permanent, and should be seen only as a measure of the temporal status of the condition 1 = no change/not applicable 2 = temporary 3 = permanent</p> <p>Reversibility (B2) This defines whether the condition can be changed and is a measure of the control over the effect of the condition. 1 = no change/not applicable 2 = reversible 3 = irreversible.</p> <p>Cumulative (B3) This is a measure of whether the effect will have a single direct impact or whether there will be a cumulative effect over time, or a synergistic effect with other conditions. The cumulative criterion is a means of judging the sustainability of a condition. 1 = no change/not applicable 2 = non-cumulative/single 3 = cumulative/synergistic</p> |

This evaluation system was applied to assess the environmental impact via the matrix presented below (Table 17) which was developed for this project.

TABLE 17: ENVIRONMENTAL IMPACT ASSESSMENT OF SHERWOOD FORREST INC. LOGGING OPERATIONS USING THE RIAM

| Activity | Importance of condition (A1) | Magnitude of change/ effect (A2) | Permanence (B1) | Reversibility (B2) | Cumulative (B3) | Interpretation (by application of the Rapid Assessment Matrix by DHI) |
|--|------------------------------|----------------------------------|-----------------|--------------------|-----------------|---|
| Pre-operation Activities | | | | | | |
| Phase 1: Preparatory activities | | | | | | |
| 1. Gathering baseline data within the concession area | 4 | 3 | 3 | 3 | 3 | Major positive change/impact |
| 2. Identifying and recruiting relevant personnel | 4 | 3 | 3 | 2 | 3 | Major positive change/impact |
| Operation Activities | | | | | | |
| Phase 2: Planning for development of the access road, concession area and organizing timber harvesting operations | | | | | | |
| 3. Quantifying road alignments and construction works required for the access road, for the concession based primary road network (as a function of the topographic parameters of the area), and mapping and laying out of skid-trails | 4 | -1 | 2 | 2 | 2 | Moderate negative change/impact |
| 4. Zoning of the concession area to establish areas designated for <i>production</i> and for <i>protection</i> respectively | 4 | -1 | 2 | 2 | 2 | Moderate negative change/impact |

| | | | | | | |
|---|---|----|---|---|---|---------------------------------|
| 5. Estimation of the commercial stock of timber (pre harvesting inventory) | 3 | -1 | 1 | 1 | 1 | Slight negative change/impact |
| 6. Sourcing and deployment of fuels and lubricants | 3 | -1 | 2 | 2 | 2 | Negative change/impact |
| Phase 3: Construction of infrastructure to facilitate logging and logging operations | | | | | | |
| 7. Construction of access road and the road network-including bridges, culverts and skid trails | 4 | -1 | 3 | 2 | 2 | Moderate negative change/impact |
| 8. Construction and Operations of the Main Base Camp and establishment of log markets for temporary stockpiling of logs | 4 | -1 | 2 | 2 | 2 | Moderate negative change/impact |
| 9. Felling trees, bucking and extracting of logs to log markets | 4 | -1 | 3 | 3 | 2 | Moderate negative change/impact |
| 10. Loading and transporting of logs by truck from log markets to the timber processing facility | 3 | -1 | 2 | 2 | 2 | Negative change/impact |
| 11. Processing | 2 | -1 | 3 | 3 | 2 | Negative change/impact |
| Post-Operation Activities | | | | | | |
| Phase 4: Post harvesting operations | | | | | | |

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| 12. Assessment of the effectiveness of timber harvesting practices on the removal of all trees felled | 4 | 1 | 2 | 1 | 2 | Moderate positive change/impact |
| 13. Implementation of remediation measurements: - - Road Closure After Harvesting | 4 | 1 | 3 | 2 | 2 | Moderate positive change/impact |
| 14. - Post-harvest silviculture operations | 4 | 1 | 3 | 3 | 2 | Moderate positive change/impact |

7.3.3 Results of Assessment Evaluation

From the Environmental Impact evaluation conducted using the RIAM (Table 13), it is shown that the pre-operation and post-operation activities has a moderate to major positive impact; however, operation activities impacts ranges from negative to moderate negative. Preparatory activities, such as gathering baseline data and identifying and recruiting relevant personnel have major positive impacts while post harvesting operations have moderate positive impacts associated with them. In the operational phase, activities relating to the construction of the access road and road network, base camp, log markets, and the felling, bucking and extracting of logs have moderate negative impacts associated with them. Estimation of the commercial stock of timber (pre harvesting inventory) has a slight negative impact, while sourcing and deployment of fuels and lubricants, loading and transporting of logs by truck from log markets to the timber processing facility, and the limited processing SFI would be involved in were evaluated to have negative impacts.

The Environmental Management Plan presented in the next chapter prescribes relevant mitigation measures which could be applied to reduce the negative to moderate impacts which could be associated with activities of SFI’s operations, namely activities relating to the construction of the access road and road network, base camp, log markets, and the felling, bucking and extracting of logs (having moderate negative impacts), sourcing and deployment of fuels and lubricants, loading and transporting of logs by truck from log markets to the timber processing facility, and the processing (having negative impacts).

7.4 Description of the Direct and Indirect Impacts of the Proposed Operations

Table 18 below gives a description of the anticipated direct and indirect impacts to the physical, biological and socioeconomic environment for the activities of the various phases of the proposed operations. This table describes the impacts which were identified in the Preliminary Environmental Assessment Matrix (Table 11).

TABLE 18: DESCRIPTION OF THE DIRECT AND INDIRECT IMPACTS OF ACTIVITIES RELATING TO SFI'S PROPOSED OPERATIONS

| PRE-OPERATION ACTIVITIES | |
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| Phase 1: Preparatory activities | |
| 1. Gathering baseline data on topographic attributes of the general area, geology and soils, biodiversity, and social issues within the concession area | |
| <p><u>Direct Impact</u></p> <p>There are no moderate to severe negative impacts that baseline data collection will have on the physical, biodiversity and socioeconomic environment. On the contrary, the impact will be positive since information previously not existing of this area, will be acquired.</p> | <p><u>Indirect Impact</u></p> |
| 2. Identifying and recruiting relevant personnel | |
| <p><u>Direct Impact</u></p> <p>SOCIOECONOMIC</p> <p>1) SFI requires a number of skilled and unskilled operatives to take forward its logging, milling and transport operations. SFI has already committed itself to assisting local communities by employing suitable persons and training them as far as practicable.</p> <p>2) Positive socio-economic impacts can occur whenever loggers make it a policy to employ people who live within or near to the concession area. This project is likely to result in significant increases in <i>per capita</i> income for those residents who can capitalize on the emerging economic</p> | <p><u>Indirect Impact</u></p> <p>SOCIOECONOMIC</p> <p>1) Increased employment opportunities and skills development could make it feasible for people already residing in the lower Rupununi district to remain there. Once sufficient people remain in the area, there is the opportunity for the Government to improve the level and range of social services that could further enhance the welfare of the residents in the North Rupununi and adjacent areas. This would lead to rural development and reduce the incidences of people migrating to urban centres on the coastland.</p> |

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| <p>opportunities. The additional income and skills sets energise the communities, improve their welfare, and provides the youth and sometimes women with employment and a chance to learn a new skill.</p> <p>3) New skills and an increased access to income will become available to community members that have not been able to work in a formal atmosphere before. There could also be new exemplary behaviour patterns cultivated which inspire other community members.</p> <p>4) However, in the <i>absence</i> of complementary investments and mitigation measures, for example medical outreaches, the project could result in negative impacts relating to health (accelerated introduction and transmission of diseases) crime, and social problems (principally related to drugs and alcohol). In addition, there could be impacts on the <i>independent</i> status and culture of some Amerindian communities. Negative impacts can also occur if traditional lifestyles including farming are neglected or abandoned.</p> | |
| <p>Phase 2: Planning for development of the access road, concession area and organizing timber harvesting operations</p> | |
| <p>3. Quantifying road alignments and construction works required for the access road, for the concession based primary road network (as a function of the topographic parameters of the area), and mapping and laying out of skid-trails.</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <p>1) There is potential for an impact on the Guyana/Norway agreement under the LCDS in quantifying the number of roads and skid trails that will be required for clearing of forested areas.</p> <p>2) Considering the reducing of roads to be constructed would impact the air (refer to section on Construction of roads in 'operation').</p> <p>BIODIVERSITY</p> | <p><u>Indirect Impact</u></p> |

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| <p>3) In quantifying the access roads, it is possible that sensitive habitats will be affected.</p> <p>SOCIOECONOMIC</p> <p>4) Quantification of access roads will impact the socioeconomic landscape of the area. This is further discussed in section on Construction of roads in 'operation'.</p> | |
| <p>4. Zoning of the concession area to establish areas designated for <i>production</i> and for <i>protection</i> respectively</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <p>1) Residents in the area engage in fishing and hunting activities will be most affected by zoning in the concession area. Signposts on the perimeter of the concession area and on the perimeter of compartments will be established.</p> <p>BIODIVERSITY</p> <p>2) Additionally, the zoning of the forest concession into productive and non-productive areas, the need to conserve biodiversity reserves, and the need to push roads and skid trails along specific routes, will all unintentionally restrict hunting and fishing activities.</p> <p>SOCIOECONOMIC</p> <p>3) Hunters who traditionally hunted within or near the concession area and sold wild meat to vendors at Lethem or Annai would be affected by the zoning of the concession area. The inability to hunt would reduce income to hunters, in turn affecting the 'wild meat' market.</p> <p>4) SFI will have a large number of assets, including heavy duty tractors, trucks, generators, water-pumps, lumber and fuel and the company must</p> | <p><u>Indirect Impact</u></p> <p>SOCIOECONOMIC</p> <p>1) A number of assets of considerable cultural significance or of archaeological interests may occur within the concession area. SFI intends to preserve such assets to the maximum extent possible. Any such assets are expected to be discovered during pre-harvest inventories and SFI will ensure that crews are trained to identify such assets (petroglyphs, caves, old tombs, old utensils or artefacts).</p> <p>2) SFI will consult and collaborate with agencies such as the GFC, the Ministry of Amerindian Affairs, the National Parks Commission and the EPA if any object or feature of interest is discovered.</p> <p>3) Logging operations could potentially destroy assets of indigenous or archaeological value.</p> <p>4) Major information on Guyana's early history could be lost forever with grave implications for a shared understanding of Guyana's history.</p> |

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| <p>take measures to protect its assets. The company also needs to safeguard its primary resources, standing trees, from illicit operations.</p> <p>5) Transport crews, hunters, fishermen and other residents will be restricted from entering or using areas occupied by SFI’s workforce. Such restrictions could lead to conflicts with persons who have ‘traditionally’ used such areas.</p> | |
| <p>5. Estimation of the commercial stock of timber (pre harvesting inventory)</p> | |
| <p><u>Direct Impact</u></p> <p>There are no moderate to severe negative impacts that the estimation of commercial stock of timber will have on the environment. This information will in fact provide critical information towards the other planning and operational aspects of the project.</p> | <p><u>Indirect Impact</u></p> |
| <p>6. Sourcing, deployment and storage of fuels and lubricants</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <ol style="list-style-type: none"> 1) Fuel and/or oil spill from the operation of heavy-duty; 2) machines can cause soil contamination; 3) Spills/accidents can also occur because of improper storage of fuels, waste oil and lubricants. <p>BIODIVERSITY</p> <ol style="list-style-type: none"> 4) Pollution of creeks from waste oils, fuel, lubricants and wood treatment chemical associated with the logging operations within the concession and | <p><u>Indirect Impact</u></p> <p>PHYSICAL</p> <ol style="list-style-type: none"> 1) As a result of a spill, fuel, oil and lubricants can be transported further into the environment (rivers) by run-off. <p>BIODIVERSITY</p> <ol style="list-style-type: none"> 2) Indirect impacts of contamination by fuel and fuel products will affect the quality of water in turn affecting organisms in waterways. <p>SOCIOECONOMIC</p> <ol style="list-style-type: none"> 3) No moderate to significant impacts identified. |

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| <p>activities.</p> <p>SOCIOECONOMIC</p> <p>5) The risk of fire and injury to persons close to the site is possible.</p> | |
| <p>OPERATION ACTIVITIES</p> | |
| <p>Phase 3: Construction of infrastructure to facilitate logging and logging operations</p> | |
| <p>7. Construction of access road (KCCR : Kwakwani-Cocoa Creek Road) and the road network-including bridges and culverts, skid trails</p> | |
| <p><u>Direct Impacts</u></p> <p>PHYSICAL</p> <p>1) Roads, skid trails and clearings are essential to the logging activity. Soil erosion, mass movement of earth material on slopes, sedimentation and altered stream flow are the most common impacts. The construction <i>and the regular maintenance</i> of logging roads will entail the need for grubbing, cut and fills, side ditches, super elevation, and bridge and culvert construction. These activities lead to scarification of the soil surface, exposure of sub-soils, erosion, degradation of soil structure and compaction-with corresponding changes in the soils capacity to absorb water in the short term.</p> <p>2) Trees of various sizes will be removed during road and skid trail construction respectively. Tree felling is unavoidable. The removal of vegetative cover, the drying out and loosening of the soil, create conditions for the soil to be eroded, especially on slopes, in the event of rainfall. Some soils, when denuded of trees, are leached severely by rainfall.</p> <p>3) Sediment entering streams alters water conditions in terms of dissolved</p> | <p><u>Indirect Impacts</u></p> <p>PHYSICAL</p> <p>1) <u>Migration</u>: New roads can allow rural folks to migrate to the coastland, increasing the pressure on social services (for example medical care, expansion of schools, waste management). On the other hand, more commonly in Guyana (for example the Kartabu-Puruni Road, the Linden-Kurupukari Road), new roads allow people to migrate in an unorganized manner to once isolated, intact areas forcing planners to plan the provision of basic services (education, health, security) for them.</p> <p>2) <u>Agriculture</u>: New roads can frequently take up large tracts of lands suitable for agriculture, while on the other hand, new roads facilitate access to fertile lands that were once isolated. Depending on the nature of the agricultural practices, the activity can produce major <i>unplanned</i> changes in land use. For example, setting out pasture for cattle, or for crops such as corn, beans, or cocoa requires the clearing of large tracts of land.</p> <p>3) Indirect impacts occur when loose or eroded soil is washed down into waterways, affecting water temperature, water turbidity, water pH, and</p> |

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| <p>oxygen, turbidity, water temperature and pH, creating shock and stress for riverine fauna, and possible death to fingerlings, crabs and juvenile animals that cannot migrate fast enough from the zone affected.</p> <p>4) Sediment entering streams increases the turbidity of the water, alter the profile of the stream bed (many times reducing the cross sectional area of the stream), reducing the volume of water flow, and causing water to back up, leading to surface overbank inundation, stress and the death of trees subjected to extended flooding.</p> <p>5) Excessive turbidity in rivers and creeks restricts the value of the water for human consumption, if not treated, which incurs addition costs.</p> <p>6) The repeated passage of heavy machines over bare ground, results in compacted soils which reduces soil permeability and makes it difficult for natural regeneration of trees to occur. In the case of soils with low permeability, some rutting and ponding of water could also occur, unless care is taken to maintain a cross sectional gradient.</p> <p>7) The use of heavy equipment during the construction phases will require the use of large quantities of oil, which, if not managed properly, may alter soil aeration, soil humidity and soil pH parameters.</p> <p>8) Impacts would also come from road use: the higher the intensity of traffic, the higher the rate of erosion. It may be possible too that the more diverse the types of vehicles (number of axles, wheel base, loaded weight) using the road, the higher the rate of erosion.</p> <p>BIODIVERSITY</p> <p>9) These changes will kill some types of flora immediately.</p> <p>10) Additionally, the repeated passage of heavy machines over bare ground results in a compacted soil which, beyond reducing soil permeability, also makes it much more difficult for natural regeneration of trees to occur. In the case of soils with low permeability, some rutting and ponding of</p> | <p>dissolved oxygen levels.</p> <p>4) The impacts would be more obvious near <i>new</i> bridges and culverts. Normally, the mass of vegetation at road sides filter out most sediments, the same function is served by the mass of plant debris on the forest floor; for this reason logging is restricted on the margins of rivers and buffer zones are put in on the banks for water courses.</p> <p>BIODIVERSITY</p> <p>5) <u>Hunting and poaching</u>: Roads built by loggers and miners provide access for hunters. The hunting of wildlife and fishing are common practices that loggers, miners and other forest dwellers engage in. For the commercial hunters, roads allow them to reach hunting grounds much faster, increasing the frequency of hunting expeditions and also the intensity of the hunt.</p> <p>6) While probably favouring other types of fauna, water ponding promotes the breeding of mosquitoes and of certain reptiles such as frogs. Frequent sediment loads lead to the migration of riverine fauna to other areas, most likely up stream.</p> <p>7) New vegetative growth at the sides of roads and clearings such as Cecropia spp. support deer, tapir and agouti. For this reason, there is normally a high population of fauna in logged over areas. (Jaguars can be observed in most logging areas and also large herbivores).</p> <p>8) No diminution of fish stocks is anticipated for downstream communities.</p> <p>SOCIOECONOMIC</p> <p>9) <u>Economic growth and development</u>:</p> <ul style="list-style-type: none"> - New roads and skid trails lead to better (easier) access to forest resources, creating conditions for new economic or cultural opportunities. |
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| <p>water could also occur, unless care is taken to maintain a cross sectional gradient.</p> <p>11) These activities lead to scarification of the soil surface, exposure of sub-soils, erosion, degradation of soil structure and compaction-with corresponding changes in the soils capacity to absorb water, sustain micro-fauna or support regeneration of trees in the short term.</p> <p>SOCIOECONOMIC</p> <p>12) Construction of the roads will lead to improved accessibility for communities.</p> <p>CUMULATIVE IMPACTS</p> <p>The need to transport lumber to Kwakwani, when added to the requirements of other fuel users, would lead to more business for oil companies, fuel transport, riverine craft, and retailers. The increase in the volume of fuel transported could result in:</p> <ul style="list-style-type: none"> a) employment opportunities for more people; b) the risk of spillage and its consequences. | <ul style="list-style-type: none"> - For example, many waterfalls, caves, minerals and wildlife that promote eco-tourism have been discovered as a result of forest inventories and the subsequent layout of skid trails. -New roads facilitate a variety of <i>legal</i> businesses that facilitate hinterland development. -New roads allow consumer goods and building materials for example to reach interior areas much faster, fostering businesses, including that by the transporters. -Roads also allow vital materials such as fuel, books, teaching aids and medical supplies to reach hinterland communities much faster and probably cheaper. -New roads could lead to the discovery of exotic landscapes that foster ecotourism ventures. -New roads also lead to the discovery or revelation of indigenous and archaeological assets of immense value to local peoples and even the global community. In the colonial era, the Dutch spent considerable periods in the Berbice-Corentyne District and several items of cultural value probably remain hidden in the area; their discovery could be of immense value to historians and archaeologists. <p>10) <u>Human health and safety:</u></p> <ul style="list-style-type: none"> - Roads increase connections between communities resulting in the increased potential for the spread of communicable diseases such as HIV/AIDs and tuberculosis. Unpaved roads generate dust and noise that affect local communities. Poorly designed roads lead to water logged conditions that increase the risk of mosquito borne diseases such as malaria. - An influx of new people to an area normally creates security fears |
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| | <p>among local residents.</p> <p>- Incidences of Malaria are prevalent in a number of forestry areas where earthworks are not appropriately managed. This mainly occurs in areas where there is accumulation of still water/poor drainage. Malaria also affects human populations over extensive areas.</p> <p>11) There is the probability of accidents, in view of the hazards that will prevail along the access road.</p> <p>12) The use of the road by SFI's vehicles could lead to the establishment of small enterprises or businesses such as tyre repair shops, restaurants, mechanical shops along the road side. Such enterprises could introduce adverse social-environmental activities, for which SFI may be blamed.</p> |
| <p>8. Construction and Operations of the Main Base Camp and Establishment of log markets for temporary stockpiling of logs</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <ol style="list-style-type: none"> 1) Loss of land through direct land takes for project components. Removal of vegetation, where necessary, to facilitate construction of project facilities, thus, may contribute to erosion. 2) Surface runoff to creeks from construction and rehabilitation activities: culvert, bridge & road rehabilitation; base camp, log pond and wharf construction resulting in discoloration and sedimentation. 3) Improper disposal of solid waste within and around the base camp. Solid waste could also alter the quality of natural water in creeks, especially after rainfall. (The prescriptions of the CoP²⁵ will be followed in managing domestic waste). | <p><u>Indirect Impact</u></p> <p>SOCIOECONOMIC</p> <ol style="list-style-type: none"> 1) Inadequate supervision/attention of male members of the family to children and females 2) In the <i>absence</i> of complementary investments and mitigation measures, for example medical outreaches, the project could result in negative impacts relating to health (accelerated introduction and transmission of diseases) crime, and social problems (principally related to drugs and alcohol). 3) In addition, there could be impacts on the <i>independent</i> status and culture of some Amerindian communities. 4) The upgrading of the health facility and the airstrip at Apoteri would be |

²⁵Code of Practice for Timber Harvesting 2nd Ed.2002: Chapter VIII-Camp Hygiene.

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| <p>4) Untreated waste near waterways can also lead to pollution of the waterways.</p> <p>5) Domestic garbage includes a mix of bottles, bags, cans, boxes, Styrofoam packets, plant residues, excess food and old clothing, paper, and paint; these items can choke or injure animals.</p> <p>6) Waste water from domestic sources will be generated everyday and such water is laced with detergent and other chemicals that could alter the water quality in streams. Residual liquids from domestic activities also represent waste. These will be drained into pits where the water will be allowed to soak into the ground; domestic effluent will not be allowed to flow directly into water courses. Pit latrines will be used at forward camps, while for the main administrative base septic tanks will be constructed for blocks of houses.</p> <p>7) Waste from machinery, including: discarded tyres, filters, rags, seals, tubes, and plugs. These have the potential to injure animals and pollute waterways, and will be properly disposed of, by burying in pits.</p> <p>BIODIVERSITY</p> <p>8) Vegetation removal and destruction facilitate construction activities.</p> <p>9) Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.</p> <p>10) Altered water quality may impact the health of aquatic plants and animals</p> <p>11) Untreated waste has a potentially potent mix comprising carbohydrates, inorganic solutions, sulphur compounds, methanol, and nitrogen oxides, all with the potential to pollute the environment.</p> <p>SOCIOECONOMIC</p> | <p>major boosts for the development of the community. Assistance in other areas would depend on the community.</p> <p>5) Potential for positive development in community based on improved health care available to the community.</p> <p>6) The attraction to 'paid employment' in communities whose main economic activity is farming, could lead to a reduction in the scale of local and traditional farming activities and more dependence on non-traditional food supplies. In many instances, 'paid employment' implies extended absences of males (and fathers) from their homes, which could lead to inadequate supervision of children.</p> <p>7) Improved community health services that will benefit community members having positive implications for general community health</p> <p>8) SFI is likely to purchase large quantities of ground provisions, meat, vegetables and fruits from residents in the North Rupununi, providing a guaranteed market for agricultural produce and other <i>managed</i> production of goods such as Arapaima meat.</p> <p>9) Timber harvesting requires the uses a variety of machines, fuel and lubricants. This necessitates the employment of security, which adds new operational costs but also provides employment for unskilled labour.</p> |
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| <p>12) SFI's logging operations could attract a number of opportunists who will introduce health hazards and conduct unbecoming behaviour among field operatives. As a consequence, the productivity of field operatives will be affected.</p> <p>13) Increased risk of crime and robberies.</p> <p>14) Decomposing garbage produces unpleasant odours. Improper treatment of solid waste fosters the breeding of flies, mosquitoes and rats which are all vectors spreading various diseases.</p> <p>15) Water contaminated with oil and debris may cause several gastro-intestinal diseases. Artificial ponding of water could lead to an increase in the mosquitoes that cause Dengue fever and Malaria.</p> <p>16) When garbage traps water, there is an increase in the risk of typhoid, malaria and dengue fever.</p> | |
| <p>9. Felling trees, bucking and extracting of logs to log markets</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <p>1) A considerable amount of the vegetative mass in the crown comprises leaves and twigs which decompose quickly and deposit minerals into the soil.</p> <p>2) A decline in soil fertility because in nutrient poor soils, a substantial reservoir of nutrients occurs only in the live vegetation.</p> <p>3) The overall impact will be short term and negligible as logging will occur systematically be concentrated on very small areas for a limited time (due to the systematic method of working). Further logging will be selective, about four trees taken per hectare, which in itself will not cause damage of any major magnitude. Experiences with new logging areas show that</p> | <p><u>Indirect Impact</u></p> <p>PHYSICAL</p> <p>1) Accelerated surface runoff generally occurs whenever there are logging operations on undulating terrain. Accelerated run-off normally carries sediments into the water courses, (unless there are special traps to filter out the sediments). Sediments in waterways affect water turbidity, pH and oxygen bearing capacity.</p> <p>2) Accelerated runoff also results in less water infiltrating to the sub-soil; lower infiltration rates has an effect on the sustainability of small stream flow. Intensive logging therefore results generally in a more erratic stream flow in the short term.</p> |

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| <p>vegetation soon covers denuded areas and that within one year some gaps have been covered entirely with vegetation, for example initially with Congo Pump (<i>Cecropia spp.</i>) and Blood wood (<i>Vismia spp</i>) and later on with Kabukalli (<i>Goupia glabra</i>) and Tauroniro (<i>Humiria balsamifera</i>).</p> <p>4) If adult trees are felled close to one another, gaps will occur that alter micro-climatic conditions (in terms of humidity, light, wind speed and temperatures in the understorey)</p> <p>5) SFI will use heavy duty equipment that in total will consume some 1,000 litres of fuel per day. One may reason that 1,000 litres of potentially toxic exhaust fumes will be produced as well. The use of stoves by field operatives and the burning of garbage and debris will also produce smoke or other gas. Dust will be produced at logging and sawmill sites. During the dry season, dust will be found along road corridors each time a vehicle passes. The creation of forest gaps after tree fall will lead to changes in air quality in the under-storey.</p> <p>6) Any gas from engine exhausts or from fires under normal tropical forest conditions dissipates very quickly, and is hardly noticeable after a few minutes. SFI's logging operations will occur in stages, at specific locations, and at specific times; and therefore the volume of gas and dust produced relative to the total concession area is negligible.</p> <p>7) Smoke and dust create shock for fauna. A look at the vegetation along road corridors (such as the existing UNAMCO Road) indicates that no plants have died from being showered with dust on a regular basis. It is known of course that plants do absorb nutrients through their leaves. Fire, including those started by lighted cigarette butts, are more a hazard than dust.</p> <p>8) Dust and smoke provoke changes in microclimate at work sites and along road ways, especially in the dry season. However, such impacts are considered negligible, relative to the total mass of air prevailing at the concession. (The concession has an area of about 167,066 hectares).</p> | <p>BIODIVERSITY</p> <p>3) Reduced biodiversity because many merchantable tree species of high commercial value occur at very low densities (number of individuals/square kilometre). Genetic erosion of some species, because trees of good form (and by assumption excellent genetic constitution) will be removed from the tree population;</p> <p>4) Timber harvesting reduces the number of large stems per hectare and will allow for winds of higher speed to pass through the canopy. This could provoke a higher than normal incidence of wind thrown trees. Field teams engaged in logging may leave debris (boxes, food containers, old filters, pieces of chain, machine parts, etc.) on the forest floor, which spoils the aesthetic values of forests and possibly injure wildlife.</p> <p>5) Forest inventory and tree felling brings field operatives in contact with patches of fertile soil which they could cultivate unless restricted from doing so. Such cultivation represents a conversion of small patches of forest to agricultural lands.</p> <p>6) There is evidence that wildlife benefits from the human presence. Field operatives tend to establish farms as they move through the forest concessions and abandoned farms seem to provide wildlife with new sources of food. Deer in particular are quite fond of foraging in active and abandoned agricultural plots. New growth at road sides and gap edges produce food for many herbivores; for example, tapirs are very fond of young <i>Cecropia</i> (Congo pump) trees. Jaguars are known to have a strong preference for foraging along forest roads where it's relatively easy to detect the tracks of large herbivores.</p> <p>7) Many field operatives capture live fish suitable for aquaria, reptiles, some birds (parrots and macaws preferred) and the young of animals such as <i>Agouti paca</i> for commercial trade. This represents a very useful form of income and once legal can improve the quality of life of field</p> |
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| <p>Apart from dust and smoke, there is a drastic change in microclimates (mainly in temperature, light and humidity), every time a tree is felled or a clearing produced.</p> <p>9) The burning of garbage and plant debris produces smoke that <i>temporarily</i> affects air quality. These impacts will occur regularly but their effect will be negligible because of the high relative humidity and low wind speed within forests.</p> <p>10) The concession has a drainage density of 1km/620 hectares (see also Section 4.2.2). SFI will take advantage of the numerous streams to source water for <i>domestic</i> purposes, wherever it is practical to do so.</p> <p>11) Likewise people who travel through the concession area and fauna use this water. Once SFI starts to do logging, there will be some incremental but temporary increases in sediment loads in waterways, depending on the soil type being 'worked'. SFI will put in place mechanisms to monitor water quality.</p> <p>BIODIVERSITY</p> <p>SFI's concession contains hundreds of species of fauna and flora respectively. However, the relationships between species, and between species and the physical environment, are not always apparent to the observer. These relationships are the essence of luxurious plant growth that provides a variety of commercial timber species, the basis for sourcing the forest concession. The interventions into the timber resources need to be planned with great care, for while there is the opportunity to acquire substantial economic gains, there is the opportunity to destroy the ecological relationships and ecological functions that these forests provide.</p> <p>12) To a major extent, the magnitude and extent of the impacts of logging depends on the stocking. There will be many areas where less than one tree per hectare would be felled whereas in others up to four or five trees per hectare could be felled. Even with directional felling there will be</p> | <p>operatives considerably.</p> <p>SOCIOECONOMIC</p> <p>8) Could potentially impact cultural livelihood activities and communal practices such farming and hunting.</p> <p>9) The project will present opportunities for employment and skills transfer to residents, enabling them to take up paid employment with the company.</p> |
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| <p>damage to the crowns of some trees and to trees in the under-storey.</p> <p>13) A major concern for the environmental community in relation to logging is to what extent the forest may be fragmented. Forest fragments are not a normal feature of the landscape in forested regions of Guyana, due in part to the selective nature of felling, the low yield (~8m³/hectare), the uniform temperature, and the abundant sunshine and precipitation (rainfall and dew).The harvesting of mature trees creates gaps that allow surviving and protected juvenile trees in the vicinity of the fallen tree, to utilize the gaps for accelerated growth, due to the increase in light conditions.</p> <p>14) Timber harvests alter ecological relationships (plant-plant, plant-animal, and animal-animal) and generally puts one or the other at a disadvantage. Tree felling alters conditions in the under storey and jeopardize some fauna and flora; for example plants that thrive in shade (shade tolerant trees, or shade demanders) will lose vigour and probably die from shock if suddenly exposed to light.</p> <p>15) Post harvest canopy gaps are a major consideration. Small gaps facilitate the development of juvenile trees and ensure the survival of trees that were protected in the first place. Excessive size of gaps, allow a large amount of sunlight into the understorey which kills some juvenile trees from shock and allow the growth of vines and lianas which smother and kill seedlings.</p> <p>16) Similarly, an increase in light may result in an increase in the regeneration of non-commercial tree species in gaps created by tree felling. Animal-animal predation is likely to increase after logging, due to less cover for prey.</p> <p>17) It is not possible at this time to quantify the value of biodiversity as well as the forest functions that produce, support and maintain such biodiversity. Neither is it possible to establish with any certainty the cultural or spiritual consequences of the loss of such biodiversity. Therefore logging forests is a serious risk with possibly serious potential</p> | |
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| <p>cumulative impacts.</p> <p>18) Mortality of seedlings and of juvenile trees in the case of emergent trees, the possible destruction of niche habitats (such as for Harpy eagles)</p> <p>19) It is apparent from the list of fauna mentioned (see Annex IX), that fauna occupy all strata and niches along the vertical tree storeys, from sub-surface (holes in the ground, for example labba, armadillos) through the ground layer (turtles, powis) regeneration to emergents (harpy eagle).</p> <p>20) Large carnivores and large terrestrial herbivores are particularly vulnerable to human impacts (Primack and Corlett, 2005).No hunters or hunting activity were observed within the concession area (and SFI will discourage hunting by its field operatives within the concession area). Forestry activities however tend to facilitate terrestrial animals through the opening up of trails and roads and new browsing at road margins and gap edges. Logging potentially puts some arboreal animals at risk although RIL practices require fellers to scan trees they are about to cut down²⁶.</p> <p>21) During the typical logging operation, there is the modification of animal habitats arising from:</p> <ul style="list-style-type: none"> a) the removal of trees and consequent changes in micro-climate; b) the removal of food sources and cover; c) artificial ponding in previously dry areas; and d) changes in ecological relationships (for example predator-prey ratios). <p>22) Logging and other human activities create noise and vibrations that alter air quality which lead to the temporary emigration of fauna, from their habitats. There is evidence though that for most of the common animals, any such discomfort is very temporary. In fact in logged over areas, most</p> | |
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²⁶Note that Variety Woods and Greenheart Limited shut down operations in an area of 150 hectares at its Charabaru concession after observing a young harpy eagle being tended there.

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| <p>large herbivores and common birds such as powis and Warakabra are very common.</p> <p>SOCIOECONOMIC</p> <p>23) Many persons from the local community will receive training from SFI's training programme, this will increase the likelihood of engagement throughout the life of the project.</p> <p>24) The project will have both positive and negative effects related to the distribution of income within the North Rupununi during the first few years in particular, and within lower Region 6 in the long term.</p> <p>25) The direct benefit to persons will be the significant increases in per capita income for those residents who can capitalize on the emerging economic opportunities.</p> <p>26) SFI intends to assist Apoteri to upgrade its health services to cater for additional work from SFI since the Apoteri Health facility would be the nearest to SFI's administrative base in the short term.</p> <p>27) Similarly, SFI could support improved surfacing and navigational aids for the Airstrip at Apoteri which it would have to use until the company completes its access road.</p> | |
| <p>10. Loading and transporting of logs by truck from log markets to the timber processing facility</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <p>1) Loading and transport of the logs from the log markets have the potential to make dust airborne due to ongoing movement</p> <p>2) The consistent movement on trails will also result in compaction of soil</p> | <p><u>Indirect Impact</u></p> <p>PHYSICAL</p> <p>1) Decreased soil permeability will decrease the likelihood of growth of vegetation.</p> <p>BIODIVERSITY</p> <p>2) There are no anticipated impacts on biodiversity as a result of this</p> |

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| <p>leading to decreased impermeability of soil and loss of soil nutrients.</p> <p>3) Transportation along the routes will also create noise levels during the loading and transporting process. This is not anticipated to a major problem as it will occur periodically.</p> <p>BIODIVERSITY</p> <p>4) There are no anticipated impacts on biodiversity as a result of this activity</p> <p>SOCIOECONOMIC</p> <p>5) This activity will require persons to be employed to load and transport the logs to the markets. Opportunities will be provided for persons to be employed in this regard.</p> <p>6) The transport of logs to the timber processing facility will provide greater capital for both the processing facility and SFI. Persons employed in the timber processing facility will also benefit from additional work.</p> | <p>activity</p> |
| <p>11. Processing</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <p>1) During the primary processing of logs (using a portable mill), there are several physical parameters that will be impacted; there will be a noise generated due to the operation of the mill. Additional noise will be contributed by the operation of a generator.</p> <p>2) The operation of all the portable mill and generator will create fumes affecting the air quality in the locale.</p> <p>3) Processing of the timber will also create a significant amount of dust/waste that may be transported by heavy wind.</p> | <p><u>Indirect Impact</u></p> <p>PHYSICAL</p> <p>1) No indirect impacts have been identified for this activity.</p> <p>BIODIVERISTY</p> <p>2) No indirect impacts have been identified for this activity.</p> <p>SOCIOECONOMIC</p> <p>3) Workers being exposed to high levels of dust from processing over a long period of time may also develop acute/chronic lung disease and conjunctivitis.</p> |

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| <p>BIODIVERISTY</p> <p>4) Noise from the use of a portable mill for primary processing will temporarily scare the animals away from the location, thus displacing them and hindering their access in this area.</p> <p>SOCIOECONOMIC</p> <p>5) The processing aspect of the operations will require once again addition employment.. Personnel will be trained in the operation of all the machinery and most importantly the relevant occupational safety and health guidelines.</p> <p>6) In addition to accident risks, workers involved in processing will be exposed to high noise levels.</p> | |
| <p>POST OPERATION ACTIVITIES</p> | |
| <p>Phase 4: Post harvesting operations</p> | |
| <p>12. Assessment of the effectiveness of timber harvesting practices on the removal of all trees felled</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <p>1) It is not anticipated that the assessments/inspections will have any sort of physical impact whether direct/indirect on the environment.</p> <p>BIODIVERSITY</p> <p>2) Biodiversity will in no way be impacted by the assessments.</p> <p>SOCIOECONOMIC</p> | <p><u>Indirect Impact</u></p> <p>SOCIOECONOMIC</p> <p>1) The results and conclusions of the assessment will play a pertinent role in determining whether the concession area will be used again in the near future and/or how it will be used. Additional usage of the concession for its timber and NTFP's will have tremendous economic implications for the former workers of the concession and many others.</p> |

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| <p>3) A few workers who were previously employed during the operational phase may be employed as guides and aides during the post operational assessment.</p> | |
| <p>13. Implementation of remediation measurements:</p> <p>- Road Closure After Harvesting: Road closure practices can include ripping the surface and planting short rotation tree crops, shrubs or tall grass, re-sharpening borrow pits, draining of pools (ponding)</p> | |
| <p><u>Direct Impact</u></p> <p>PHYSICAL</p> <p>1) The closure of roads within the concession area will have to take the views and needs of all stakeholders (the GoG, GFC, nearby residents, etc) into consideration.</p> <p>2) If it is determined that there is need for the closure of roads then SFI will take responsibility for such an initiative. The physical environment will not be disturbed any further than it already was during the pre-operational and operational phases of the project. The same precautionary measures which were taken during the pre-operational and operational phases with respect to heavy duty machinery will once again be implemented at this stage, to safeguard the physical environment e.g. solid waste and hazardous waste disposal.</p> <p>3) A detailed closure plan will be prepared before the completion of the operational phase.</p> <p>BIODIVERSITY</p> <p>4) Biodiversity will not be infringed any further than what previously occurred under the operation and pre-operational phases. In fact, biodiversity stand to benefit positively from the closure of roads, as this will limit the access of unwanted persons into the area.</p> | <p><u>Indirect Impact</u></p> <p>PHYSICAL</p> <p>1) There will no longer be the presence of heavy duty equipment or large numbers of human personnel within the concession area. This will allow for the regeneration of the physical environment due to the lack of man-made disturbances.</p> <p>BIODIVERSITY</p> <p>2) Biodiversity will thrive and regenerate due to the lack of man-made disturbances.</p> |

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| <p>SOCIOECONOMIC</p> <p>5) Employment opportunities will be created during this stage. Some employees from the pre and post operational phases of the operation (including residents from nearby settlements) will be further employed during the closure phase.</p> <p>6) The closure of roads will have a negative impact on the persons external to SFI, whom wish to utilize the resources within the concession area. Hence, the need for stakeholder consultation before the closure of roads.</p> | |
| <p>14. Implementation of remediation measurements:</p> <p>- Post-harvest silviculture operations</p> | |
| <p><u>Direct Impact</u></p> <p>It is important that silvicultural practices are employed in the post operation/harvest period to ensure that felled species are able to regenerate sufficiently. Silviculture can be costly for the concessionaire but is left to be determined by SFI after consultation with the GFC, whether they will proceed with this method or simply let the area self-regenerate. If silviculture is employed, there will be impacts on the environment.</p> <p>PHYSICAL</p> <p>1) Enrichment planting: This entails the replanting of nursery bred seedlings or forest transplants.</p> <p>2) Release weeding: Cleaning of undergrowth is necessary in some cases to limit competition to seedlings whether they are nursery raised or as a result of seedfall.</p> <p>3) Liberation cutting: To ensure that seedlings are given access to adequate sunlight it may be necessary to cut dense stands of trees.</p> <p>The natural environment will be impacted through the above mentioned</p> | <p><u>Indirect Impact</u></p> <p>PHYSICAL</p> <p>1) Landscape shift is imminent as gaps in the forest cover are closed due to the emergence of lost species.</p> <p>BIODIVERSITY</p> <p>2) The re-introduction of felled species can impact the flora/fauna which may depend on the emergent species of trees which now occupy the space of the felled trees. Considering that selective felling would have been used in the operational phase, it is unlikely that there would be any significant negative impacts on the ecosystems within the area.</p> <p>SOCIOECONOMIC</p> <p>3) The concession will be in good standing to be re-harvested once sufficient time has passed for the regeneration of felled species. This will provide employment for hundreds of individuals and also inject lots of revenue into the region.</p> |

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| <p>silvicultural activities. This will only be temporary as the aim of the entire process is to restore the environment to a condition it was prior to harvesting.</p> <p>BIODIVERSITY</p> <p>4) New species which would have grown in the gaps created by felled trees may have to be removed to make way for new seedlings. In the long run the biodiversity will return to a level close to what it was prior to harvesting.</p> <p>SOCIOECONOMIC</p> <p>5) Workers will gain immense knowledge on silvicultural practises in the forestry industry, which they will carry with them long after the post-operational phase has concluded. Residents of nearby and surrounding villages will also have the opportunity to gain employment during this period.</p> <p>6) Many workers who would have worked during the operational phases of the concession will have to be let off as the concession will no longer require their services.</p> | <p>4) With the sufficient regeneration of the concession area it is possible that NTFP's can be exploited.</p> |
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7.5 PROJECT ALTERNATIVES

The following alternatives have been identified as an alternative to the project/alternative options to operations in the project:

i. Alternative technologies:

Alternative technologies such as harvesting timber by helicopter or the use of aerial cables are not feasible in Guyana at this time. There is always the option of building a huge 'Mabura or Buck Hall or Wineperu type complex: this would require massive resources to generate energy for processing and domestic use and encourage satellite villages which SFI or even the authorities would find tedious to control. Needless to say, the impact on fauna would be disastrous.

Saw pit operations using chainsaw milling technology may be considered in areas where there is good merchantable stocking on fragile soils or steep slopes or where access is difficult but the company has no specific interest in this.

Other options

SFI believes in the concept of **multiple uses of forest resources**, especially as **reduced impact logging is compatible** with many other forest resource based activities, including wildlife management, watershed management and the conservation of biodiversity.

SFI is mindful of the value of the Conservation Concession to the south of the concession area and will be working with CI-Guyana, the GFC and other parties to

ii. Alternative Project Locations

The current concession area is situated in the upper Berbice-Corentyne Watershed (see Annex IV) in Region 6. The concession area lies immediately north of the SFEP held by Simon & Shock International Logging, and the TSA (a *conservation concession*) held by CI on the right bank of the Essequibo River. While there may be other locations that could be considered for this kind of operations, SFI has already obtained the necessary permit from the Guyana Forestry Commission to operate in this area.

To consider other project locations, the environmental, social and economical impacts of the operation at a secondary site would need to be compared to the site that is being proposed. SFI would ideally like to continue on the proposed site as a similar operation is being carried out in by Simon and Shock International Logging.

iii. Alternative Project Scale

To reduce the scale of the project and operations in the concession area is an alternative that could be considered. However, at this time SFI is not prepared to reduce the extent of operations as it would not be feasible to implement a smaller project in an area such as this.

iv. No Project

The area in which SFI is proposing the project is a pristine forested location and access to this site is easier from the use of the Essequibo River. To forego the project completely would result in no changes to the area, leaving it in its current state. From the perspective of SFI, this will entail the loss

of an investment of millions of dollars and foregoing the contribution to the economy and other positive impacts that the project may have once implemented.

CHAPTER 4: ENVIRONMENTAL MANAGEMENT PLAN



8.0 ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

This section which presents the Environmental Management Plan (EMP) identifies activities to be undertaken in an effort to mitigate the principal adverse effects of the project. The EMP 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 implementation of the project.

All activities to be conducted for the implementation of this project will be done in compliance with the legislation and guidelines outlined in Section 4.4 and the Environmental Permit to be granted by the EPA. 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, principles of Reduced Impact Logging (RIL) and Sustainable Forest Management (SFM) guidelines.

The Environmental Management Plan is complemented by the following:

- (a) The mitigation measures targeted
- (b) Monitoring Plan
- (c) Emergency Preparedness and Response Plan
- (d) Capacity building measures
- (e) SFI's Occupation Health and Safety Procedures
- (f) Fire Prevention and Response Plan
- (g) Oil Spill Prevention and Response Plan
- (h) Conceptual Closure Plan

The activities relating to this project which were evaluated to have negative to moderate negative impacts associated with them (Table 13) were targeted to have mitigation measures identified to prevent, minimize and manage the environmental impacts that were described in Table 14. These activities, the negative impacts to be mitigated and associated recommended mitigation measures are outlined below in Table 19.

SFI has a social and environmental responsibility to implement this EMP along with all other environmental requirements. The Forest Manager will be the person responsible for implementing the Environmental Management Plan and he will be assisted by a Coordinator for stakeholder relations. The EMP outlined below sets out a number of prescriptions to guarantee that SFI is in a position to be effective in discharging its responsibilities.

TABLE 19: PROPOSED MITIGATION MEASURES FOR POTENTIAL NEGATIVE ENVIRONMENTAL IMPACTS ASSOCIATED WITH SFI’S OPERATIONS

| Potential Environmental Impact | Proposed Mitigation Measures | Lead Agency | Time frame for implementation |
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| * General: As a consequence of SFI’s activities and operations: | | | |
| Land use conflict with other resource users allocated by the State, with traditional resource users and impacts on Guyana’s commitments under the LCDS | <ul style="list-style-type: none"> - SFI 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; - SFI intends notify authorities of any emerging issues and work with public agencies to address same; - 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; - SFI does not intend to prevent Amerindians from accessing the Concession area. - The communities would be kept abreast of the development plans of the project. | SFI | During the entire time frame for the project. |
| Social Conflicts: restrictions of access, perceived alienation of rights. | <ul style="list-style-type: none"> - SFI will respect the legal, social and ecological integrity of all Amerindian lands; - Engage staff/communities/residents in discussion and consultations to address mutual concerns, whether these relate to SFI’s operations or not. | SFI | As required |
| Socioeconomic: Employment - 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 SFI; - SFI will ensure women are included in its workforce; - A rotational system of employment to be implemented; - Adequate medical and insurance coverage to be made available to all employees. | SFI | As required |
| PRE-OPERATION ACTIVITIES: Planning for development of the access road, concession area and organizing timber harvesting operations | | | |
| Sourcing, deployment and storage of other goods: fuels and lubricants, etc. | | | |
| <u>Soil</u> Contamination of soil from fuel spills/ waste oil | <ul style="list-style-type: none"> - 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; - Ensure fuel and lubricants are stored within a bunded area with an impervious surface. | SFI | During the entire time frame for the project. |
| <u>Water</u> | <ul style="list-style-type: none"> - Locate fuel storage area at least 100m from work areas and 200m from any stream. | SFI | During the |

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| <p>Contamination of water resources from fuel spills/waste oil.</p> | | | <p>construction phase of the fuel storage area.</p> |
| <p>Quantifying road alignments and construction works required for the access road, for the concession based primary road network (as a function of the topographic parameters of the area), and mapping and laying out of skid-trails.</p> | | | |
| <p>All Environmental Components</p> | <ul style="list-style-type: none"> - Plan road alignments, for the shortest road route possible to minimise environmental impacts which would be associated with the construction of the access road and road network and to minimise its carbon footprint in support of Guyana’s LCDS. - Plan road alignments, bridges and culverts using topographic maps; - Road planning and ground surveys will minimise the area of forest clearance to construct roads; - Avoid stream crossings as far as practicable to minimise impacts to water ways and biodiversity; - Plan road alignment to avoid sensitive ecosystems to prevent/reduce impacts to the ecological environment/biodiversity; - Avoid swamps, rocky outcrops, fragile areas and other potential hazards; - Plan road alignment to maximise use and/or upgrade of existing roads; - Plan skid trails on the basis of stock maps. - 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 to reduce the possible reduction of stream flow from the installation of bridges and culverts. | <p>SFI</p> | <p>During the planning phase of the project.</p> |
| <p>OPERATION ACTIVITIES: Construction of infrastructure to facilitate logging and logging operations</p> | | | |
| <p>Construction of access road and the road network-including bridges and culverts, skid trails</p> | | | |
| <p>Soil Earthworks grubbing, cut and fills, scarification of soil surface, sub-soil exposure, erosion, soil compaction from the operation of heavy-duty</p> | <ul style="list-style-type: none"> - Use appropriate machines for all earth works to reduce the time taken to complete each activity. Less machine time implies less compaction, less noise and less vibration; - Consider the weather pattern before initiating major earthworks: earthworks should be avoided during periods of heavy rainfall; - Designate routes for heavy duty equipment to prevent compaction of soil; | <p>SFI</p> | <p>During the entire time frame for the project.</p> |

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| <p>machines, water logging;</p> <p>Degradation of natural landscapes from the construction of roads, borrow pits.</p> | <ul style="list-style-type: none"> - If ponding is observed it may be necessary to scarify the topsoil; - Plan the location of borrow pits; - use excavators for borrowing material: <ul style="list-style-type: none"> - plan all machine use; - use compacters; - Construction waste which includes materials remaining from the construction of culverts, bridges and roads, etc. will be sorted and reused as much as possible. | | |
| <p><u>Water</u></p> <p>Possible reduction of stream flow from the installation of bridges and culverts; Sedimentation and discoloration of streams due to surface runoff /erosion (increases in turbidity); potential degradation of aquatic habitat</p> <p>Oil and fuel spilling into stream beds could alter water quality;</p> | <ul style="list-style-type: none"> - Implement erosion control measures; - Construct bridges and culverts in accordance with the GFC’s Code of Practice for Timber Harvesting Operations; - Strict adherence to RIL principles and the use of buffer zones along waterways; - Establishment of buffer zones around, rivers, creeks and lakes; - Temporary water-crossings to be decommissioned after usage to ensure that they do not collapse and block stream flow; - Stop road construction /maintenance works in the rainy season; - Include side drains to restrict the velocity of water flows on the road; avoid side drains leading water directly into water courses; - Maximum care to be taken to ensure all vehicles and machinery are in a proper functional state. | <p>SFI, GFC</p> | <p>During the entire time frame for the project.</p> |
| <p><u>Air</u></p> <p>Dust and exhaust smoke from soil exposure and the frequent traversing of heavy machines, vehicles and logging trucks; minor changes in microclimate.</p> | <ul style="list-style-type: none"> - Plan the use of all machines so that they are used only when required. - Plan machine routes to make machine use as short as practicable. - Use personal protection equipment, specifically dust masks and goggles. Vehicles should travel slowly <25 km/h whenever they pass worksites, homesteads or communities. - During dry periods it may be necessary to soak routes traversed by vehicles and equipment, especially in close proximity to the Base Camp; - Driver training re sensitivity to dust nuisance; - Personnel working within dusty environments should be required to use dust masks. | <p>SFI</p> | <p>During the entire time frame for the project.</p> |
| <p><u>Noise</u></p> | | <p>SFI</p> | <p>As required</p> |

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| <p>Exposure to excessive noise from the operation of machines for construction</p> | <ul style="list-style-type: none"> - Use equipment according to manufacturer’s specifications; - Use of protective gear by workers; - Control noise emission at source, by the installation of silencers/ mufflers as necessary. | | |
| <p><u>Biodiversity/ecological relationships</u></p> <p>Direct lost of vegetation from land clearing, possible habitat loss/destruction</p> <p>Wildlife: potential-destruction of habitats; loss of wildlife from hunting and conflicts with humans</p> | <ul style="list-style-type: none"> - 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; - Employee education and notification will be implemented to reduce vehicle-wildlife collisions and conflicts. | <p>SFI</p> | <p>During construction phase of project.</p> |
| <p><u>Socio-Economic</u></p> <p>Road safety and accidents avoidance</p> <p>Threat to Community Values: Inappropriate interaction with communities, possible rise in crime rate, use of alcohol and other disagreeable behaviour</p> | <ul style="list-style-type: none"> - SFI will ensure adequate road signs along the road especially in the vicinity of sharp turns, bridges and steep slopes and near populated area; - SFI will work with stakeholders to manage checkpoints at designated locations. - Make sure that each vehicle is in a full functional state prior to its use on the roadways, within and outside of the concession area. For logging trucks, ensure adequate cables for strapping the logs onto the bunkers; all logging trucks should carry a rotating amber light on top of the cab; - Promote proper skills set among drivers through training; - Stop using the road during times of poor visibility: keep low beam headlamps on at all times. - SFI to ensure workers interference with the communities is minimal; - SFI to ensure that personnel are properly informed on the correct protocol for interaction with the local communities; - Work with support of Public Institutions (Police, Ministry of Health, Ministry of Human Services and Social Security, Ministry of Environment and Natural Resources, Ministry Local Government and Regional Development in Regions 6, 9) and other forest/mining concessionaires in the Berbice district to address emerging issues; - Keep proper records of emerging problems and pass these on to the appropriate agencies (GFC, Min of Human Services, etc.); - Drugs and alcohol use by workers within the Concession should be prohibited; - SFI will work with other agencies to implement a system of random and routine | <p>SFI</p> | <p>During the entire time frame for the project.</p> |

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| | monitoring to address issues as they emerge. | | |
| <p>Archaeological Resources</p> <p>Possibility of exposing sites of archaeological and anthropological significance with the consequences being damage and desecration</p> | <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; - SFI will make contact with the Walter Roth Museum and the National Trust of Guyana immediately; - SFI will coordinate with the relevant personnel to determine the significance of the findings and assess appropriate mitigative options. | SFI | During the entire time frame for the project. |
| Construction and operations of the Main Base Camp and establishment of log markets for temporary stockpiling of logs | | | |
| <p>Soil</p> <p>Removal of vegetation, to facilitate construction of project facilities, thus exposing the soil and rendering it susceptible to erosion</p> <p>Soil contamination from the improper disposal of waste generated</p> <p>Contamination of soil from fuel spills/ waste oil</p> | <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. - 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 waste such as paper and cardboard from the office buildings and stores, empty plastic bottles, cans, etc. 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 and recycling. - Scrap metals will be scavenged by the operations. Excess metal will be sold to scrap metal dealers. - 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. - 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; | SFI | <p>During construction phase of project.</p> <p>During the entire time frame for the project.</p> |

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| | <ul style="list-style-type: none"> - Ensure waste oil is collected and stored in covered containers on a bunded and impervious surface. - Waste oil generated should be collected and stored in covered containers in a bunded area with an impervious surface 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 should not be disposed in the environment. They should be collected and returned to the suppliers to be shipped for recycling or if significant quantities are generated SFI can explore the possibility of selling directly. - The quantity of oily waste to be generated would be minimal and can be burned in small quantities in a controlled manner in a pit. | | <p>During the entire time frame for the project.</p> |
| <p><u>Water</u> Contamination of water resources from improper disposal of waste</p> | <ul style="list-style-type: none"> - No dumping of waste into water bodies; - Dispense or change lube oil only in designated areas; - EPA’s Brochure on Water conservation to be placed at all public points around the concession; - Regular briefing sessions for field staff should be formalised; - Specific camp hygiene measures set out in the COP will be followed: specifically solid waste will be buried, liquid waste will be channelled into pits duly protected with rocks or pieces of wood or brush, and pit latrines will be provided for each house hold which should be constructed in accordance to the Public Health Ordinance of 1953. - Bark will be buried in shallow pits or put into natural depressions to degrade naturally and add to the organic content of the soil. To reduce the risk of potentially poisonous extractives²⁷, the barks from several species will be mixed together before being buried. Wood ends may be used for domestic cooking. - Wastewater from kitchen and bathing facilities should be channelled 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 regularly and the materials recovered should be buried. - Liquid waste will be generated from the housing facility. Sewage will be disposed of via | <p>SFI</p> | <p>During the entire time frame for the project.</p> |

²⁷Some species, for example Aromata (Diplotropis purpurea) have barks containing extractives poisonous to humans (and other animals).

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| <p>Sedimentation and discoloration of streams due to surface runoff /erosion; potential degradation of aquatic habitat</p> | <p>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.</p> <ul style="list-style-type: none"> - Avoid discharge of storm water directly into nearby water course. Discharge should be channeled through vegetative areas which will serve as a natural filter; - Bunding of stockpiles should be considered if storage is required for an extensive period. | | |
| <p>Air Dust and exhaust smoke from soil exposure and the frequent traversing of heavy machines, vehicles and logging trucks; minor changes in microclimate. Dust from the improper disposal of wood waste (sawdust)</p> | <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; - No open dumping of wood waste should be done; - Sawdust should not be allowed to accumulate; | <p>SFI</p> | <p>During the entire time frame for the project.</p> |
| <p>Noise Noise generated from the operation of heavy-duty machines and generator</p> | <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. | <p>SFI</p> | <p>As required</p> |
| <p>Biodiversity Direct loss of vegetation from land clearing; habitat loss, destruction, fragmentation due to land clearing and noise</p> | <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; - 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. | <p>SFI</p> | <p>During construction phase of project.</p> |

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| <p>Socio-Economic Exposure to vector borne diseases</p> | <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. | <p>SFI</p> | <p>During the entire time frame for the project.</p> |
| <p>Socio-Economic Mechanical Workshop and employees safety</p> | <ul style="list-style-type: none"> - Employ a medical personnel (medic) to be stationed at the Base Camp and workers trained in first aid should be present at all campsites; - Well equipped first aid kits would be provided at all work sites; - All personnel within workshops must use appropriate safety gear for the task in which engaged. - Adequate signage should be erected, especially in hazardous areas; all flammable liquids or corrosive substances such as battery acid should be clearly labelled. - 'SAFETY FIRST' notices will be posted at prescribed points within workshops. - The workshop should be well lighted. - The workshop should be organised in such a manner that flammable substances shall be put in specific locations away from points of heavy traffic. - Ensure workers are properly oriented to the safety and health rules and guidelines; - The Emergency Response Plan would be made aware to all relevant personnel and the necessary training and resources required should be provided; safety briefings on the storage and handling of hazardous substances shall be held once every three months. | <p>SFI</p> | <p>As required</p> |
| <p>Socio-Economic Waste management: potential of illnesses resulting from a polluted environment</p> | <ul style="list-style-type: none"> - A protocol for the management of solid waste will be elaborated-for example: covered refuse bins will be placed at each house and bottles and tin cans shall be stored separately from other household refuse; - Hold frequent briefing sessions with staff to ensure a shared understanding of the consequences of poor control over waste management; - Distribute and put up EPA's brochure on waste management at all camps. | <p>SFI</p> | <p>Monthly</p> |
| <p>Socio-Economic Security: Robberies, loss of equipment and parts etc.</p> | <ul style="list-style-type: none"> - Restrict movement in and out of the Concession to staff and authorized personnel and maintain records of movement of vehicles and personnel; - SFI to conduct in-house training for staff on safety and security procedures; - SFI to employ and maintain its own security personnel; - Ensure all communication equipment are adequately maintained. | <p>SFI</p> | <p>During the entire time frame for the project.</p> |
| <p>Felling trees, bucking and extracting of logs to log markets</p> | | | |
| <p>Water Contamination from possible</p> | <ul style="list-style-type: none"> - Use of reduced impact logging practices; - When handling fuel, care should be taken to prevent spillage and leaks; - Spill kits should be made available in the event of spillages; | <p>SFI</p> | <p>During extraction of logs and</p> |

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| <p>chemical, oil and fuel spilling into waterways</p> | <ul style="list-style-type: none"> - Care taken to avoid excessive spillage of borax (disodium tetra borate) solutions if used at all to treat (some species of) timber. | | <p>storage at log markets.</p> |
| <p>Noise Exposure to excessive noise from the operation of machines</p> | <ul style="list-style-type: none"> - Use of protective gear by workers; - Control noise emission at source. | <p>SFI</p> | <p>As required</p> |
| <p>Soil; Biodiversity/ecological relationships Timber harvesting: destruction of juvenile trees; genetic erosion of species; decline in soil fertility due to death of soil fauna; increased potential for blow downs disruption of faunal habitats</p> <p>Reduction in number of certain species (particularly in commercial and/or keystone tree species)</p> | <ul style="list-style-type: none"> - The selective harvesting of mature trees will be the core activity in which SFI will be engaged. All logging activities should be done in accordance with the GFC’s Code of Practice for Timber Harvesting Operations, including RIL and SFM practices such as the use of directional felling techniques for felling trees. As is typical of approved logging operations, only trees of good form that have a diameter at breast height greater than 35 cm will be felled; - 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; - Implement a system for conducting pre-harvest inventories and preparing stock maps; - 4.5% of the concession of the productive forest will be retained in an undisturbed, pristine state as biodiversity reserves. An additional 25% of concession in-operable forests on high hills and steep slopes will be retained in an undisturbed state; - Use winching techniques; - Use heavy duty machines that are fully functional; - Train all field operatives in RIL practices; - Implement measures to prevent forest fires; - Keystone, endemic and rare woody plant species and snags will be retained. - | <p>SFI</p> | <p>During the entire time frame for the project</p> |
| <p>Noise; Biodiversity/ecological relationships Wildlife: modification, -destruction of habitats; loss of wildlife from hunting and conflicts with humans; fragmentation due to land clearing and noise; forced alteration in feeding and mating habits; distress from noise and vibration forcing the</p> | <ul style="list-style-type: none"> - A minimum of 4.5% of the concession 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 25% of concession of un-usable and in-operable forests on high hills and steep slopes, and swampy areas, will be retained in an undisturbed state. - Ensure a systematic manner of timber harvesting so that once a block is harvested, the operation moves on (and animals can return). Avoid re-entering blocks. - Avoid re-entering blocks, once post harvest monitoring has been completed. | <p>SFI</p> | <p>During the entire time frame for the project.</p> |

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| <p>depletion in the number of species/km²</p> | <ul style="list-style-type: none"> - Take care not to leave debris on the forest floor that could injure animals. Absolutely no bottles, tin s nor cans should be left lying on the forest floors. Similarly, old tires that can harbour water, batteries, filters, plastic materials, and other material foreign to the forest floor should be removed. - Unique ecosystems, habitats and species could be conserved, by restricting logging in areas where they occur. - Ensure that mechanisms provided on machines to control noise and/or vibration levels remain functional at all times. - Measures will be taken to avoid machines ‘idling’ beyond a reasonable time. - Refuges will be created in areas where ERT species are known to exist or are encountered during operations, for example, where it’s apparent that any animal, especially harpy eagles, has a nest in any tree earmarked for felling, as far as possible, that tree would not be felled. - Restrict hunting activities by placing advisory notices at strategic points in and around the concession area. - Employee education and notification to be implemented to ensure workers are aware of the need to preserve wildlife and to reduce wildlife/roadway conflicts - Workers of SFI would be prohibited from hunting, trapping, killing, harming or capturing of any wildlife - Any occurrences of wildlife trapping and trading observed will be reported to the EPA and Wildlife Management Authority | | |
| <p><u>Biodiversity/ecological environment</u> Ecological relationships: Modifications of ecological relationships; Increased potential for pests.</p> | <ul style="list-style-type: none"> - Plan all interventions into the forest resource; - Avoid all unnecessary cutting or removal of vegetation; - Avoid animal mortality at all costs; for example avoid killing snakes and insects to the maximum extent possible. | <p>SFI, GFC</p> | <p>During the entire time frame for the project.</p> |
| <p><u>Socio-Economic</u> Risk of accidents from the operation of heavy-duty machines, portable mill and chainsaws, logging activities, etc</p> | <ul style="list-style-type: none"> - Ensure workers are properly oriented to the safety and health rules and guidelines; - 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; - Well equipped first aid kits would be provided at all work sites; - 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. | <p>SFI</p> | <p>As required</p> |

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| <p>Indigenous, archaeological assets: Possibility of exposing sites/ indigenous assets. of archaeological & anthropological significance</p> | <ul style="list-style-type: none"> - Identify and isolate any assets encountered and post appropriate advisory signs and notices; - Ensure such sites are placed on all stock maps; - Build fences around assets and place appropriate signs after consultation with MOAA, EPA, GFC, etc. - Consult with the Amerindian Affairs Ministry and the Walter Roth Museum on collaborative efforts to protect any assets discovered; - Collaborate with communities to address the conservation of existing and emerging assets; - Offer training & incentives where appropriate. | <p>SFI</p> | <p>As required</p> |
| <p>Loading and transporting of logs by truck from log markets to the timber processing facility</p> | | | |
| <p>Air Dust from soil exposure and the traversing of vehicles and logging trucks</p> | <ul style="list-style-type: none"> - Personnel working within dusty environments should be required to use dust masks; - During dry periods it may be necessary to soak routes traversed by vehicles and equipment, especially in close proximity to the Base Camp. | <p>SFI</p> | <p>During the entire time frame for the project.</p> |
| <p>Processing</p> | | | |
| <p>Soil Disposal of wood waste (sawdust)</p> | <ul style="list-style-type: none"> - No open dumping of wood waste should be done. - Sawdust 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. - Waste wood ends and strips 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. | <p>SFI</p> | <p>As required.</p> |
| <p>Air Dust from the operation of chainsaws and portable mill</p> | <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. | <p>SFI</p> | <p>During the entire time frame for the project.</p> |
| <p>Noise Noise generated from the operation of processing equipment</p> | <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. | <p>SFI</p> | <p>During the entire time frame for the project.</p> |

8.2 MONITORING PLAN

The mitigation measures outlined in the EMP require that active monitoring of the physical, biological and socio-economic environment be done to ensure compliance. This will ensure that SFI's operation does not have any long-term detrimental effect on the physical, biological and socio-economic environment.

The monitoring plan is intended to address the mitigation measures in a timely and consistent manner. It identifies the parameters to be monitored and the frequency and location where the monitoring will take place. SFI needs to collaborate with several agencies to ensure that the mitigation measures are addressed in a meaningful and realistic manner. Table 20 reflects this and provides details of monitoring activities, Table 21 provides a checklist for monitoring activities and Table 19 provides a budget for monitoring the environmental management plan.

TABLE 20: MONITORING PLAN FOR SFI

| Parameter | Frequency of monitoring | Institution (s) Responsible | Location of monitoring |
|--|-------------------------|-----------------------------|---|
| Physical Environment | | | |
| Earthworks: <ul style="list-style-type: none"> - Field operatives have stock maps - Field operatives have copy of the Code of Practice - All roads, skid trails, sawmill sites, log markets and borrow pits are marked - Machines are in a proper functional state | Quarterly | SFI, GFC | Sites where earthworks are occurring, field camps |
| Water Quality: <ul style="list-style-type: none"> - Surface water drainage off roads, log markets and other clearings; - Cleaning of drainage structures (bridges, culverts) along roads and skid trails; - Observance of the integrity of buffer zones along water ways - Temperature (oC) - pH (6.5-8.5) - Conductivity (µs/cm) - Turbidity (ntu) - Oil & Grease (mg/l) - TDS (mg/l) - Dissolved Oxygen (mg/l) | Quarterly | SFI, GFC | Areas being logged; primary roads and associated drainage structures. |
| | Annually | SFI, EPA | The Essequibo River 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. |
| Air Quality: <ul style="list-style-type: none"> - Evidence of dust accumulation and suspended particles through visible observation | Daily | SFI | Operational areas within the concession including haul roads and Base Camp |
| Noise <ul style="list-style-type: none"> - Decibel (100dB – daytime, 80dB night-time) | Biannually Annually | SFI, EPA | Base Camp, active logging compartments |
| Waste Management <ul style="list-style-type: none"> - Compliance with mitigation measures outlined in EMP - Littering - Waste accumulation & waste disposal procedures - Apparent increase in vectors (rats, roaches & flies) | Weekly Annually | SFI, EPA | Field camps, presence of waste receptacles, disposal practices, storage areas. |
| Biological/Ecological Environment | | | |

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| <p>Timber harvesting</p> <ul style="list-style-type: none"> - Canopy openings, - Retention of seed and keystone trees, - Integrity of Biodiversity Reserves. - Quality of stock maps | Quarterly | SFI, GFC | Active logging areas, permanent sample plots and biodiversity reserves within the Concession |
| <p>Wildlife Trapping /hunting</p> <ul style="list-style-type: none"> - Trade in wild meat - Traps, firearms, shells - Movement of live animals away from the concession area - Presence and distribution and impacts of logging on ERT species | Random checks | SFI | Kwakwani crossing, Concession area: logged compartments pre- and post- harvesting and undisturbed forest, including biodiversity reserves |
| <p>Ecological Relationships:</p> <ul style="list-style-type: none"> - Unusual trends, for example accelerated plant mortality, pollution of streams, dead fishes or other fauna | On observance | SFI, GFC | Concession area |
| Socioeconomic Environment | | | |
| <p>Conflicts:</p> <ul style="list-style-type: none"> - No. of mining camps, type of mining, vehicle movements, - Complaints lodged with the company - Complaints lodged with the RDC or other public agency | Quarterly | SFI, GFC, RDC #9, GGMC, Ministry of Reg. Dev., Min. of Human Services | Concession area, Kwakwani Crossing, RDC |
| <p>Social & Employment issues:</p> <ul style="list-style-type: none"> - Number of persons recruited from the North Rupununi district - Number of persons trained - Increase/decrease in number of families within the concession area - Rate of absence from work - Drunken persons - Disciplinary measures taken | Biannually | SFI | Concession area |
| <p>Road safety:</p> <ul style="list-style-type: none"> - Number of accidents/records - Number of fatal accidents/records - Number, type and position of advisory road signs/records | Quarterly | SFI | Kwakwani Police Station |
| <p>Health and Safety:</p> <ul style="list-style-type: none"> - Emergency Response Plans, - Health and safety committees, - Status of first aid kits, fire extinguishers - Implementation of OHS practices & the regular use of safety gear - Health conditions of staff, with particular interest to respiratory ailments | Quarterly/ Biannually | SFI, GFC, Ministry of Labour | Entire operation areas: field locations, housing quarters |

| | | | |
|---|---------------------------------------|----------|---|
| <p>Employment and Social Benefits:</p> <ul style="list-style-type: none"> - Number of residents employed from the surrounding areas - Number of persons trained - Extent of staff turnover | Annually | SFI | Entire operation |
| <p>Land Use:</p> <ul style="list-style-type: none"> - Illegal land use within and around Concession - Mining activities - Vehicular travel within Concession | Ongoing | SFI, GFC | Entire project area |
| <p>Indigenous/Archaeological assets:</p> <ul style="list-style-type: none"> - Auditing of archaeological and anthropological resources | On observance (Quarterly if observed) | SFI | Logging operations [blocks] and sawmill complex |

TABLE 21: GENERAL CHECKLIST FOR MONITORING OPERATIONS

| Item | Status (Y-OK/ R-Require Attention) |
|---|---------------------------------------|
| <p>Office Area/Field Camps/Sawmill sites:</p> <ul style="list-style-type: none"> - Emergency Response Plan posted and visible - First Aid box complete and clean | |
| <p>Personnel :</p> <ul style="list-style-type: none"> - Records of issue of safety gears - All personnel have and are using safety equipment | |
| <p>Fuel Storage Tanks and Fill Point – Transit Log Yard and Camp</p> <ul style="list-style-type: none"> - Fire extinguishers and other fire fighting aids available nearby - Physical condition of storage tanks, hoses, valves (evidence of leaks) | |
| <p>Communication Equipment</p> <ul style="list-style-type: none"> - Check base station radio set is in working order and signal strength is good with base and with handset for field personnel - Check all field hand sets are in working order and fully charged | |
| <p>Fire Fighting Equipment and Emergency Equipment</p> <p>(Every fire extinguisher is given a code number and placed in a designated position. Each code number and the corresponding position should be placed on a map or site plan of the location. Biannual inspection of fire extinguishers should be carried out by a competent authority (either the fire service or the vendor of the extinguisher. (See Box 2).</p> <ul style="list-style-type: none"> - Check that all fire extinguishers are present at the designated station/fire point/wall bracket - Check whether there are any signs of damage or whether the extinguisher has been discharged - Check whether the safety pins or tamper seals have been disturbed , are missing or broken - If there are gauges fitted to the extinguisher, check that the dial is in the normal segment - Check for evidence of corrosion, dents and leaks - Check sand buckets are full of dry sand | |

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| <ul style="list-style-type: none"> - Check contents of First Aid canisters are all present and correct | |
| <p>Warning/Advice Notices</p> <ul style="list-style-type: none"> - Check all notices and signs are posted as required, are undamaged, clean and legible at Transit Log Yard and Camp and on secondary roads | |
| <p>Soak away/Filter at Transit Log Yard and Camp</p> <ul style="list-style-type: none"> - Soak away filter is clear of all solid particles - Drains are not blocked or full | |
| <p>Stock maps</p> <ul style="list-style-type: none"> - Updated stock maps are available for use by all field crews | |
| <p>Basic equipment</p> <ul style="list-style-type: none"> - Compass, clinometers, flagging tapes and GPS are available for use by staff - Equipment tailored for the needs of specific departments (fire extinguishers-workshop; flasks for water collection-forest management division; etc.) | |
| <p>Vehicles</p> <ul style="list-style-type: none"> - All vehicles equipped with horns, lights and rotating amber lights - All vehicles are equipped with appropriate tools, first aid kits - All trucks/lorries are equipped with basic communication equipment - All vehicles have chains, rope or straps as appropriate, each truck should carry a small chainsaw - Maintenance schedules for vehicles are in force. | |
| <p>Security</p> <ul style="list-style-type: none"> - All employees have a security badge, carry and display them on their uniforms | |
| <p>Camp Hygiene</p> <ul style="list-style-type: none"> - All camps are provided with potable water - All camps are cleaned regularly, equipped with fires extinguishers, lights and pesticides, other supplies - Waste disposal practices/mechanisms are monitored | |
| <p>COMPLETED BY: <i>(signature and date)</i></p> | |

TABLE 22: SFI BIENNIAL CHECK SHEET FOR FIRE EXTINGUISHERS

| FIRE EXTINGUISHER RECORD OF INSPECTION | | | | | |
|---|--------------------|-------|------------|-----------|-----------|
| Name of Location: | | | | | Code # |
| Type of Extinguisher | Extinguisher Class | | | | |
| | A [] | B [] | C [] | D [] | OTHER [] |
| Number of Extinguishers | | | | | |
| <i>The person carrying out the inspection should place their signature and date of inspection and make any notes in the space provided.</i> | | | | | |
| Month/Year | Signature | | Month/Year | Signature | |
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| Notes: (include: location of the fire extinguishers (designated station/fire point/wall bracket); whether the safety pins or tamper seals have been disturbed, are missing or broken; whether the dial for any gauges fitted is in the normal (green?) segment; whether there is evidence of corrosion, dents and leaks, etc.) | | | | | |

TABLE 23: ANNUAL BUDGET FOR EFFECTING MITIGATION MEASURES

| Impact | Actions | Equipment/tools | Duration | Annual cost (G\$) |
|----------------------|--|--|------------------------------------|-------------------|
| 1. Earthworks & soil | Field visits, briefing sessions, review of stock maps & other records; review of SOPs | Stock maps, GPS, Compass, Clinometers, vehicle | 3 days every three months | 200,000 |
| 2. Air quality | Review of medical records of field operatives; consult medical personnel | | 2 days every three months | 200,000 |
| 3. Water quality | Review of medical records of field operatives; consult medical personnel Biannual monitoring of water quality | | 2 days every three months | 200,000 |
| | | | One day every six months | 400,000 |
| 4. Timber Harvesting | Visits to field crews to verify the use of stock maps, CoP, etc | Vehicle | 3 days every three months | 100,000 |
| 5. Wildlife | Recruitment of wild life expert; physical check for traps and shells along frequently used concession roads | Vehicle, camera | One week, about six times per year | 500,000 |
| 6. Eco-relationships | Recruitment of a | Vehicle, camera | One week, about six | 500,000 |

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| | consultant; field tour across logged over sites within the concession area | | times per year | |
| 7. Conflicts | Discussions with community leaders, representatives of miners, public officials (RDC) | Vehicle, camera | 2 days every three months | 200,000 |
| 8. Employment | Review of company records | | 2 days every six months | 150,000 |
| 9. Social problems | Discussions with public officials (Police, RDC) and community leaders | Vehicle, camera | 2 days every six months | 100,000 |
| 10. Occupational Health & safety | Verify the use safety gear, Sops; check on the frequency of briefing sessions | Vehicle, camera | 2 days every six months | 150,000 |
| 11. Road safety | Install, replace and rehabilitate road signs; review safety records | Vehicle, camera, carpentry tools | 3 days every three months | 200,000 |
| 12. Fire equipment | Verify the state of all fire fighting equipment | | 2 days every six months | 150,000 |
| 13. Training | Review performance of trained personnel, identify new training opportunities | | 2 days every six months | 1,000,000 |
| 14. Archaeological sites, indigenous assets | Replace or rehabilitate signs, fences or remove debris. | Vehicle, camera, carpentry tools | Approximately 3 days every three months | 300,000 |
| 15. Contingencies | | | | 500,000 |
| Total | | | | 4,850,000 |

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

9.0 EMERGENCY PREPARENESS AND RESPONSE PLAN

9.1 Capacity Building

Introduction

SFI intends to build capacity to address obligations emerging from this EIA Report, to better implement approved forest management prescriptions, and to address the requirements of lead agencies. The objective is to ensure that each worker at the company takes responsibility for good environmental behaviour generally and good forest management practices in particular.

Training content

Training for selected staff will be as set out in Table 24. SFI will conduct a training needs analysis to develop a more detailed training programme.

TABLE 24: INITIAL TRAINING OPTIONS IDENTIFIED FOR CAPACITY BUILDING

| No. | Target group | Subject areas | Agencies |
|-----|---|---|------------------|
| 1 | Senior staff | Reduced Impact Logging (Decision Makers Course) | FTCI |
| 2 | Senior Staff | Conflict Management | To be determined |
| 3 | Forest Managers, Block Inspectors, Senior Supervisors | Reduced Impact Logging Foundation Course | FTCI |
| 4 | Technicians | Timber Grading Course, tree identification, forest mensuration. | GFC |
| 5 | Technicians | First Aid | Guyana Red Cross |

Mechanisms for providing training

A variety of mechanisms will be used to build capacity, including:

- a) Workshops (Trainers conduct workshops for groups of participants; course duration will be usually three to fourteen days);
- b) Academic coursework (employees with proven aptitude will be given scholarships to study mechanical engineering and forestry at local institutions);
- c) Field tours to other logging enterprises with exemplary, effective models in place
- d) Onsite internship or field work;
- e) Training of trainers courses for staff'
- f) Training materials: audio-visual aids, videos, computers; and
- g) Briefing sessions.

9.2 Occupational Safety and Health

Recommended safe working procedures would be documented and posted at strategic points. A system of incentives would be implemented for adherence to the procedures.

OSH Committee

An Occupational Safety and Health Committee of not more than 12 members would be established. Half of the members would represent the management and the other half selected from workers' representatives from each major work-group, unit or department.

Terms of reference for OSH Committees

The Terms of Reference for the OSHC would include:

- a) Promoting a safe working environment, via standard operating procedures known to each employee and the regular use of safety equipment
- b) Developing procedures for medical and emergency evacuation
- c) Providing for access to Para-medical services and treatments on a 24 hour basis,
- d) Providing safety training for staff
- e) Carrying out internal investigations of major accidents and making appropriate recommendations
- f) Enforcing safety rules and discipline
- g) Reviewing safety rules and safe work or operating procedures.
- h) Reviewing accidents and forwarding reports to the competent authorities

OSHC Agenda, Meeting & Minutes of Meeting

OS&H Committees must meet at least once every quarter. However any work-group, unit or department may, through its representative member in OSHC, request a special (unscheduled) meeting, citing pertinent/urgent reasons, issues or agenda for such meeting.

Industrial Accident Reports

Every incident with serious industrial implications or resulting in fatality, or temporary or permanent disability, or requiring hospitalization due to injury or trauma, or resulting in major equipment/facility damages/losses) whether or not involving any third party would be immediately reported by the unit/departmental head or the safety officer to the forest manager within 24 hours. The forest manager shall make further reports to the police and medical authorities as necessary. An internal investigation (irrespective of whether or not a police investigation is conducted) would be carried out within 7 days of the incident. The investigation team would comprise of the Chairperson, Committee Member(s) from the work-group or unit where the incident occurred, and the Unit or Departmental Head concerned.

The purpose of the internal investigation would be to identify probable causes, and to recommend any necessary review of work procedures/processes or any additional measures to prevent recurrence of similar accidents.

Recommended personal protection gear (PPG)

Personal safety gear would be issued to all workers: the minimum will be a safety (high visibility) vest and a safety helmet. Chainsaw operators, machine operators and some machine operators will be issued with safety shoes, gloves, ear muffs and goggles. Every worker issued with PSG must use and wear them at work; failure to do so shall be liable to disciplinary actions.

It is observed in Guyana, in particular the mining sector, that forced use of safety gear (for example, a worker can only report for work attired in the appropriate safety gear) is a very effective way of ensuring use of safety gear.

Fire Fighting Assets

Fire extinguishers, sand buckets and first aid kits would be placed at strategic locations within easy reach in and around work places. Safety equipment such as fire extinguishers and the contents of first aid boxes with specific shelf-lives would be replaced or replenished before the *expiry date*. It is highly recommended that near-expiry equipments be used for training and refresher training rather than discarded, replaced or replenished.

General Health and Hygiene

The OSHC would also look into issues of hygiene, including garbage and waste disposal, quality of drinking water, meals provided in company mess halls, provision of mosquito nets, general site hygiene and access to Para-medical care and treatments. A small medical facility would be set up at the base camp to serve employees. The facility will be equipped to treat cuts, burns, mild fractures, and testing capability for Malaria.

Fuel and lubricating oils

Diesel and gasoline fuels in bulk quantities, lubricating oils and hydraulic fluids in drums will be used by crews to support the field operations. Diesel fuel in bulk quantities will be stored within a *bunded area* in steel tanks sitting on a concrete base with an *impervious surface*. The fuel depot should be sited a safe distance from any river or stream, offices, work areas and living accommodations (at least 100m from work areas and 200m from any stream). Site location, designs and specifications of the bulk fuel depot should be approved by an authority. Gasoline, lubricating oils and hydraulic fluids will be stored within a *bunded area* in steel drums and kept in a well ventilated shed, preferable next to the bulk fuel depot away from rivers/stream, offices, work areas and living accommodations.

All waste oils and used engine oils will be kept in drums clearly labelled and held in secure storage for disposal or reuse. The proper protective gear must be used at all times.

Storage facilities will be placed in small depressions, so that in the event of any leakage, there is no immediate overland flow.

9.3 Emergency Response Plan

The Emergency Response Plan (ERP) for SFI is intended for use by SFI personnel and is based on potential incidents that may arise during its logging operations. Cuts, fractures and burns resulting from vehicular accidents, tree fall, or misuse of chainsaws and other tools are the more typical matters of concern in the forestry sector. Less common, but equally fatal, are snake bites and stings from bees and scorpions.

The ERP specifically provides information and guidance to assist Company personnel in either preventing accidents or managing the response to accidents that do occur. It also sets out responsibilities and a chain of command for responding to emergencies (see Figure 12, Box 1).

Purpose

The purpose of the Emergency Response Plan is:

- 1) To sensitise field operatives about the need to take preventive measures at all times, to protect themselves from accidents and prevent loss of life and damage to property and the environment;
- 2) To set out procedures to be followed in case of emergencies;
- 3) To establish a command chain in responding to emergencies.

Policies

All personnel must be aware of, and take steps to manage hazards in their work area. In addition, all personnel are expected to alert security in case of an emergency. Response procedures shall be posted at strategic points in all work areas and the attention of staff shall be drawn to the notices during regular briefing sessions.

All field crews will be trained to respond to medical emergencies, mostly life threatening injuries. Communication between field crews and base camps and between vehicles and base camp will be put in place.

All incidents and emergencies will be recorded in the Accident and Emergency Record Book.

Responsibilities/ Chain of Command

(1) Forest Operations Manager

- 1) Ensure implementation and maintenance of this plan;
- 2) Report to relevant authorities in case of an emergency;
- 3) Review event analysis reports with relevant line managers/ supervisors and the Administrative Manager.

(2) Security

1. Get as much information as possible on the nature of the emergency from the worker reporting the incident;
2. Ensure that the most senior persons are immediately alerted and given the information obtained on the emergency.

(3) Line Managers or Supervisors

1. Ensure subordinates are aware of the potential hazards within their work area and take the necessary precautions as they carry out their tasks;
2. Ensure subordinates are familiar with, and trained in, emergency response procedures;
3. Ensure all personnel are provided with and use the prescribed safety equipment to carry out their duties safely;
4. Ensure that oil and other petroleum products used by staff are labelled, safely stored and handled in accordance with the guidelines provided by the Company;
5. Ensure that all incidents of fire are reported in accordance with this plan.

(4) Administrative Manager

1. Provide on-going safety training and briefing sessions for staff related to operational hazards.
2. Oversee and conduct regular inspections of all emergency response/ clean up equipment to ensure they are in working order.

(5) All personnel

1. To be aware of the potential hazards of the work area and take precautions to prevent them from occurring in the course of carrying out duties;
2. To follow good housekeeping practices to prevent accidents, fires and other emergencies;
3. To be alert for fire, oil or chemical spills in the work area;
4. To sound the alarm and call security immediately upon notice of any fire;
5. To follow the emergency response procedures set out in this document.

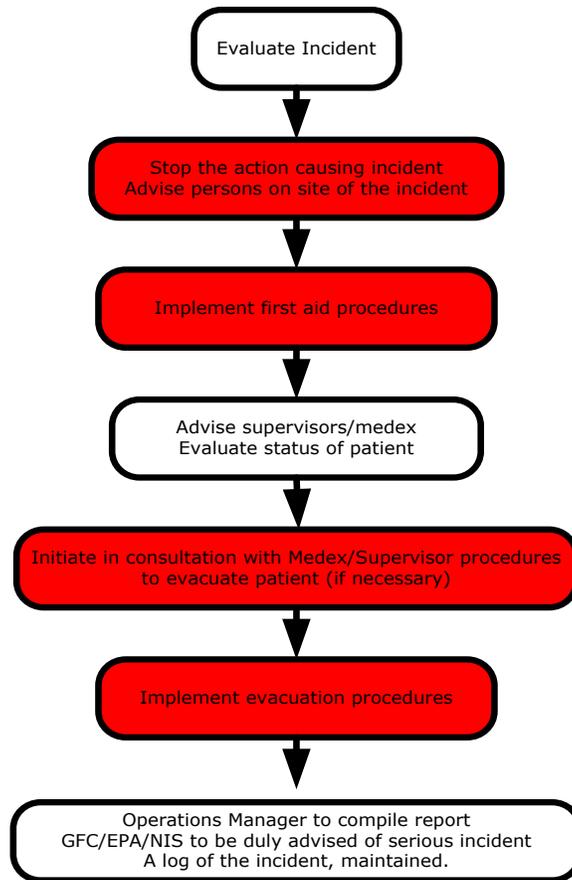


Figure 24: Emergency Response Procedures

9.4 Fire Prevention and Response

Potential Fire Hazards

Fires can be prevented if potential hazards are identified and managed. Good housekeeping is a major factor in prevention of fires. Discarded combustible material should not be allowed to accumulate. Each work area should be provided with a sufficient number of non-combustible waste or trash receptacles. Use of flammable cleaning solvents to clean floors, walls, furniture and equipment should be avoided.

Some potential fire hazards to be avoided are listed below:

1. Overloaded electrical circuits, unsafe wiring and defective extension cords;
2. Improper disposal of smoking material e.g. throwing cigarette butts on the ground;
3. Improper use, handling and storage of flammable material e.g. gasoline, waste oil, paint;
4. Improper housekeeping resulting in accumulation of flammable material e.g. paper, cardboard boxes, oil-soaked rags, flammable liquids;
5. Improper use of welding torches and batteries.

Types of Fires and Fire Extinguishers

There are different types of fires and these determine the type of extinguisher to be used in an emergency. Fires can be classified into four general categories based on the type of materials or fuels involved:

- a) Class A Fires: involve ordinary combustible material such as wood, paper, rags, rubbish and other solids.
- b) Class B Fires: involve flammable or combustible liquids such as gasoline, fuel oil, paint and hydraulic fluids.
- c) Class C Fires: involve electricity or electrical equipment
- d) Class D Fires: involve combustible metals such as magnesium

Classes A, B and C fires are the ones of major concern.

Fire Response Procedures

If there is a fire, employees would be required to:

1. Activate the fire alarm;
2. Call security and report the location of the fire (security will contact a senior officer);
3. Ask for help if someone needs rescuing;
4. Confine the fire by closing doors, windows and other openings if time permits and if possible;
5. Evacuate the area and wait in the nearest designated waiting and meeting area;
6. Provide as much information as possible to the emergency response personnel.

9.5 Oil Spill Prevention and Response

Storage of Oil

Mismanagement of waste oil can lead to the contamination of water and soil. Many components of oil are toxic to living organisms. Contamination from waste oil results mainly from improper storage or disposal. Waste oil must therefore be carefully stored.

In keeping with the Environmental Management Plan, the following practices should apply:

1. Waste oil must be stored in drums. Use of rusting drums must be avoided as they are susceptible to leaks over time. Each drum must be labelled with the date that the accumulation started as well as the terms "Hazardous Waste" and "Waste Oil".
2. All drums containing waste oil must be stored in the waste oil storage area which will have retaining walls (bunded) and floor made of material which is impervious to the flow of oil. The storage area must have a clearly legible sign stating: "Waste Oil." The storage area must also be protected from the weather by a shed. The drums will be stored off the ground on raised pallets to facilitate detection of any leakage.
3. Weekly inspections of the waste oil storage area must be carried out to check for any leakage or potential leaks. During these inspections the condition of the drums must be checked. The floor and the pallets must be checked for any sign of oil leakage.

Oil Spill Response Procedures

In the event of an oil spill the following steps must be taken:

1. Evacuate the area and warn others as necessary
2. Contact security immediately
3. Ask for help if anyone is injured and/ or needs rescuing
4. Visually inspect the site of the oil spill to obtain enough information to describe the situation to security and response personnel (see Figure 25). Be careful, be alert and keep clear if any hazardous chemical may be involved. The following minimum information should be gathered :
 - a) Spilt material (e.g. used oil or gasoline)
 - b) Estimated quantity of spilt material (or surface area covered or rate of flow)
 - c) Location and direction of the spilt material and direction of flow
 - d) People involved, injuries
5. Help to direct response personnel to location of the spill

Only relatively small oil spills can be expected to occur since less than 5,000 gals of fuel will be in storage at any one time, much of which will be stored in drums so that the fuel can be taken to the various work sites. SFI will utilise rags to sap up oil or fuel leaking from containers; such rags will be put into defective containers and buried, so that the oil does not saturate the soil and kill micro-fauna. A degreaser would then be applied to the contaminated area to further break down the remaining oil residue.

| SHERWOOD FORREST INC | | | | |
|----------------------------|--|------------------|---------|--------|
| OIL/FUEL SPILL REPORT FORM | | | | |
| 1 | Date/Time discovered: | | | |
| 2 | Name of Responder: | | | |
| 3 | First reported by: | | | |
| 4 | Reported injuries: | | | |
| 5 | If 'YES', Medical Team despatched: | Yes [] | | No [] |
| 6 | Fire Hazards: | | | |
| 7 | If 'YES', Medical Team despatched: | | Yes [] | No [] |
| 8 | Type of Oil or Fuel discharged/spilled | | | |
| 9 | Estimated quantity spilled (gals) | | | |
| 10 | Location of spill | | | |
| 11 | Is the substance flowing? | Is it contained? | | |
| 12 | Weather conditions: | | | |
| 13 | Ground conditions: | | | |
| 14 | Action Taken: | | | |

Figure 25: Oil/fuel spill report form

10.0 CLOSURE PLAN

10.1 Introduction

The nature of SFI's logging project activities, should not have lasting negative impacts on future economic usage, biodiversity, water quality and the socio-economic development of the residents nearest to the concession nor impose any permanent constraints on any future beneficial use of the area. SFI is committed to using only sustainable and reduced-impact logging throughout the life of its operation. Closure of operations will affect the physical and socio-economic environment.

The expected life of the project is 25 years following which the company could exercise the option of requesting a renewal of their TSA for another 25 years. During its logging operations, each block will be closed progressively after logging.

For all practical purposes, closure means the suspension of all interventions in terms of road works, felling and skidding operations. However, the company will be monitoring the areas, checking for unlawful occupation or trespassing or illegal felling operations within these areas or trespassing of any nature.

The concession is divided into compartments and each compartment is subdivided into 100ha blocks. Blocks will be closed when the permitted quota of 833m³ would have been met and compartments will be closed when the quota for each block has been harvested. 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.

At this stage, SFI has not prepared a detailed Closure Plan though consideration has been given to actions to be taken. A detailed Closure Plan will be prepared two years prior to the closure of operations. These considerations are outlined below:

10.2 Factors that may lead to the closure of SFI operations

The following factors could potentially lead to the closure of SFI's operations:

- 1) If the GFC does not grant an extension of the TSA, after its expiry (after twenty-five years);
- 2) If the commercial species required by the company are exhausted;
- 3) If the Access Road to Kwakwani deteriorates or its use becomes too problematic (given the increasing number of stakeholders) to such an extent that timber transport is no longer feasible;
- 4) If there is an increase in mining activities within the compartments, or the mining activities in the compartments make the situation untenable and unprofitable for SFI to continue logging operations;

- 5) If, for any reason there is heightened threat to the safety and security of employees, crime and illegal activities;
- 6) If massive assets of archaeological value are revealed in the process of development of the area;
- 7) If SFI is unable to maintain its financial viability;
- 8) If market demand/price of logs decreases to an unfeasible level.

10.3 Closure Actions

The principal objectives of closure actions are to:

- 1) Conclude all contractual agreements with employees (and their Unions);
- 2) Conclude all obligations to the Government of Guyana (taxes, royalties, fees, etc.);
- 3) Decommissioning and removal of all fixtures and structures, equipment, machinery, and other infrastructure from the concession;
- 4) Clean up all debris (tyres, machine parts, oil drums, etc.) from the forest floor.

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

Socio-Economic:

- 1) In event of the Company's closure, the GFC, the employees, the Trade Union, RDC and relevant Government authorities, institutions and organisations should be notified. The notification should be given six (6) months prior to the closure of the field operations;
- 2) If the Company should ever change ownership, or transfer it to any other entity, the employees, their Trade Union, and relevant Government authorities, institutions and organisations should be notified. The notification should be provided six (6) months prior to the change in ownership;
- 3) NIS and PAYE contributions for staff will be discontinued; employees should be advised of the status of their payments, that is, whether all the appropriate contributions have been handed over to the NIS and GRA respectively;
- 4) Severance Pay for Employees/Workers will be paid as well as other monies due to them as required by Labour Act and the Termination and Severance Payment Act (TESPA);
- 5) Acreage fees, royalties and taxes of all descriptions required by the Laws of Guyana shall be honoured;
- 6) Disposition of social infrastructures of the Company will be managed in collaboration with the GFC and the NRDDDB;
- 7) Expatriate staff will be repatriated in accordance with national immigration procedures;
- 8) In the event of Company's closure the relevant Government Authorities and the Employees/Workers and local communities will be informed at least three months in advance;
- 9) The Company should transfer employees/workers to associated logging enterprises where feasible.

Physical:

- 1) All secondary roads leading into concession will be closed;
- 2) The base camp and all other infrastructure will be demolished and debris removed or destroyed;
- 3) All machinery will be removed from the concession;
- 4) After consultation with regional authorities and the Government of Guyana, it will be decided whether the main access road will be closed or not.

11.0 CONCLUSION

SFI believes its project is feasible. There is a good market for timber produced by companies that display responsibility in addressing the legal, technical, environmental and social challenges of forest concession administration generally and sustainable forest management practices in particular. The company is committed to supporting the Low Carbon Development Strategy through the REDD+ mechanism and sustainable use of Guyana's forests.

The impacts that have been identified within this study can be mitigated; the measures are detailed in the Environmental Management Plan. With the use of this plan, the company aims to utilize modern sustainable foresting techniques, to add economic and social value to the forests within the concession area and the appropriate continuous monitoring by both the Environmental Protection Agency and the Guyana Forestry Commission.

In addition to this, the company has adopted several key policies to ensure that worker safety is a priority amongst all stages of its operations. Added to this, the company is confident that it can contribute significantly to the social, environmental and economic benefits once the operations maintain its high standards and guidelines set out by the relevant authorities.

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13.0 APPENDICES

Annex I: Terms of Reference for the ESIA Study

SHERWOOD FOREST INCORPORATED TERMS OF REFERENCE FOR ESIA

1. Introduction and objectives

The Objective of the Environmental and Social Impact Assessment study is to comply with the requirements of Part IV of the Environmental Protection Act 11 of 1996, EIA Guideline Volume 5-Forestry, ancillary legislation and guidelines and the concerns of stakeholders to the maximum extent possible.

Specifically, the ESIA Report will:

- 1) Present the full scope of all the technological considerations involved in the project (at the level of the access road and timber harvesting operations on the concession area itself), citing feasible alternatives and risks where appropriate;
- 2) Incorporate an environmental appraisal of project impacts for all aspects of the logging project and the primary access road and ancillary operations (such as the construction of bridges and culverts), and impacts on other land uses in and around the concession area and provide recommendations for managing and mitigating negative impacts;
- 3) Establish and describe the social impacts of the project, and measures to mitigate negative impacts and foster positive impacts;
- 4) Establish mechanisms, capacity requirements and costs for implementing and monitoring mitigating or remedial actions;
- 5) Establish mechanisms for addressing the concerns of stakeholder;
- 6) Describe partnerships for ensuring conservation of the environment to the maximum extent possible.

2. Scope of ESIA study

The content of the ESIA study will include the following (see section 4 as well):

- 1) A review of all relevant legislation and agencies that set the context for logging and sawmilling projects and major hinterland roads;
- 2) A detailed description and analysis of the variables and technology that constitutes the start-up and implementation phases of logging project (and sawmilling project) of the main access road;
- 3) Reviewing baseline data from the concession area and its immediate environs (including land use activities) and assessing their consequences for the project;
- 4) Potential sources of environmentally significant impacts through start-up and implementation phases of the logging project;
- 5) Potential receptors of impacts
- 6) Potential environmental impacts and their significance
- 7) Mitigation measures and mechanisms to implement them
- 8) Mechanisms to address contingencies with grave environmental & social implications

3. Methodology for developing the ESIA Study

The Consulting team will, *in the main*, carry out the following tasks in preparing the ESIA study:

- 1) Consulting with the developers to establish the full nature and scope of the project, the feasibility of alternatives, and the construction and management of the primary access road;
- 2) Reviewing all relevant legislation pertaining to logging, sawmilling and road projects as contemplated by the developer;
- 3) Reviewing the nature and scope of all projects occurring in the vicinity of the area under SFEP and *assessing* the impacts of these of the proposed logging operation (as well as how the proposed logging operation by Sherwood Forrest Inc may impact on land use activities on the perimeter of the SFEP area.
- 4) Visiting the area under SFEP to collect information including but not limited to:
 - The physical environment (topographic attributes of the area and its environs, geology and soils, current infrastructure in terms of roads, trails, waterways and hydrology and drainage density, meteorological data, cyclic features of water flows and weather patterns and assessing the consequences of the physical attributes of the SFEP area for the project;
 - The biological environment-fauna and flora, forest structure and forest types), ecological attributes of the vegetation (in terms of endemism, etc.) and assessing the consequences of the biological attributes of the SFEP area for the project;
 - The socio-economic environment-land use on the concession area and within the general north-east Rupununi and the Corentyne-Essequibo Watershed, indigenous peoples and their livelihoods, indigenous assets within the concession area, actual timber and non-timber utilization of the concession area and environs, and impacts related to the conservation concession (held by Conservation International Guyana) and assessing the consequences of the socio-economic situation of stakeholders for the project;
- 5) Estimating timber stocks, their commercial potential and the engineering considerations required to harvest timber;
- 6) Studying access road routes to the concession area and the impacts and implications of the access road;
- 7) Analysing risks associated with project taking into consideration the elements of a) to f) above;
- 8) Consulting stakeholders, including miners and communities at Apoteri, Rewa and Crash Water, and relevant Government and non-Government organizations and exploring general partnerships that could lead to responsible use of the environment generally, and the management of the access road in particular;
- 9) Carrying out environmental and social impact assessments relating to all variables, technology and phases of the logging project, including considerations for the access road, and sawmilling activity within the SFEP area.

- 10) Developing an environmental impact statement; developing a forest management plan, environmental management plan, emergency response and monitoring plan; developing an implementation plan detailing mechanisms for action in relation to the various plans cited;
- 11) Participating in the scoping studies organized by the EPA/GFC
- 12) Responding to concerns or comments on the draft ESIA report

4. Structure of the ESIA Report

The ESIA Report outline will set out or contain the following:

1. Executive summary

2. Introduction: the forestry sector (a brief overview of recent developments in the forestry sector, issues of REDD+ and the LCDS, Sherwood Forrest Inc.'s SFEP, the company's objectives and their obligations under the SFEP, geographic location of the SFEP area, brief description of the status of land-use activities on the perimeter of the concession area);

3. The Nature and Scope of the Project

- a. The nature of the logging project (the cycle of inputs required, the cycle of activities contemplated, the outputs expected and the manner of removal of outputs via access roads); details of the variables involved in logging operations, the phases of the logging/sawmilling operations and the manner in which these impact on the physical, biological and socio-economic environments.
- b. The feasibility of the Project (estimating the economic potential of the timber stocks of the area, considering GFC's guidelines relating to felling cycles and annual allowable cut, and stakeholder concerns).
- c. Partnerships for development (describing and reviewing the nature of the partnerships at the district and regional level required for carrying out the logging activities, including matters linked to the access road, in a responsible and environmentally responsible manner).

4. The Legal framework and Policy Context for the Project:

Describing in detail the legal framework, policy context and agencies involved generally with natural resources and land use generally, and logging in particular, including but not limited to forestry policies and legislation, the EPA Act 11 of 1996, other Acts, publications and guidelines by the National Bureau of Standards and the EPA.

5. The forest environment

- 4.1 Key geographic attributes of the area (drainage density and hydrology, special sites, indigenous assets, forest stocks, etc.).
- 4.2 The Ecological parameters of the area (in terms of its flora and fauna resources, and the meteorological, geological and edaphic attributes of the concession area and neighbouring concessions-if appropriate).
- 4.3 Current land use within and on the perimeter of the concession area

6. Physical Environment (characterising the baseline conditions for various parameters such as water quality, evidence of pollution, fragile or vulnerable areas, and establishing parameters for measuring or estimating changes in those conditions).

7. Environmental impacts analysis

- a. Reviewing significant positive and negative, direct and indirect, and short term, intermediate and long term impacts;
- b. Identifying and reviewing impacts that are unavoidable or irreversible;
- c. Quantifying and assigning economic values to environmental damage wherever practicable
- d. Characterising and assessing the extent and quality of available data, indicating major information deficiencies or lack of knowledge that would prevent the prediction of impacts, and identifying areas where additional information would be needed and how the data could be collected.
- e. Reviewing the significance of impacts (with regard to the relevant environmental regulations, standards and human values governing environmental quality, the health, safety and welfare of those likely to be affected, protected areas, protected species, land use management, and conflicts of interest with existing developments).

8. Project Alternatives (alternative technologies that may achieve the same objectives; impacts associated with the alternatives, and evaluating those impacts in terms of the whether they are *irreversible* or *unavoidable* and whether they can be mitigated and at what cost).

9. Socio-economic Impact Analysis

- a) Base line information (an analysis of the interests, needs and problems of people in the area (who are the people that will be involved or affected by the project, their differing socio-economic situations, their differing needs and interests, preferences for tree species, reasons for current forest practices).
- b) Review of existing tenure and usufruct rights (the way these impact on the use of forests in the area of interest).
- c) The baseline (pre-project) situation (with respect to current forest practices: what products are harvested and by whom, what products are processed and marketed and by whom, what role do forests play in subsistence or income earning).
- d) Nature of the social impacts
 - *Positive impacts* (in terms of poverty alleviation, promotion of socio-economic status of people, including women, fostering human development, through access to better vocational education, improving levels of participation in local forestry developments)
 - *Negative social impacts*-effects on the people affected by the project (developments that lead to higher levels of poverty, introduce new elements of disadvantage or discrimination, prevent or stifle participation, counteract efforts towards promotion of human development, introduce top-down decision mechanisms).
- e) Scope of the social Impact

- *Social impacts on defined groups of people* (Social impacts on the indigenous peoples of Apoteri, Rewa and Crash Water; the communities in the North Rupununi and communities at Fairview and Kurupukari)
- Social impacts on other (unorganized groups) such as hunters, fishermen, tourists
- *Directness of social impacts*: effects on persons affected directly by interventions resulting from project activities.
- *Indirect social impacts*: effects on persons affected by the project, as an indirect consequence of project activities
- *Cumulative impacts*

10 Management Plan to Mitigate Negative Impacts

- a) Management plan (Identification of the impacts; feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable levels; and costs of those measures to mitigate them including proposed work programmes, budget estimates, schedules, staffing, training requirements, and other necessary support services to implement the mitigation measures).
- b) An Environmental Monitoring Plan: a plan that will be developed and used for monitoring the implementation of mitigation measures and the impacts of the project during implementation. This will include an estimate of the capital and operational costs and a description of other inputs such as training and institutional strengthening needed to carry it out.
- c) An emergency response plan (setting out standard procedures for addressing contingencies, especially those actions or mishaps or incidents with potential for polluting or altering the environment)
- d) A plan detailing specific measures to implement the plans mentioned above in an efficient, cost effective manner and assigning specific responsibilities for each action.

11. Inter-Agency and NGO/Public Involvement

A description of the extent to which inter- agency and NGO/Public views were consulted. For example Forestry authority (GFC) and Environmental Authority (EPA), other public agencies and NGOs; the donor community; and communities likely to be affected by the project.

12. A Closure Plan summarising steps to be taken in the event of the closure of the Project or any phase of the project.

5. Duration

The Company is already engaged in a forest inventory within the concession area and has garnered information to support the ESIA report and a forest management plan for the concession area. The team of consultants has already benefitted from consultations at Annai and in Georgetown with several stakeholders. Consultations are already well advanced regarding social aspects of the ESIA.

For these reasons, the team of consultants expect to complete the first draft of the ESIA Report within two weeks of the EPA's approval of the TOR.

6. ESIA Report Submission

The Consulting Team will provide the EPA with electronic copies and a minimum of eight duly signed hard copies of the ESIA Report.

**Annex IIa: Minutes of Scoping Meetings-February 4, 2010-Annai,
Region 9**

**Sherwood Forrests Incorporated - Proposed Logging Project, Right Bank Lysles River, Left Bank
Corentyne River, Right Bank Essequibo River, Right Bank Berbice
River, Region No. 6**

Public Scoping Meeting (Annai)

Date: February 04, 2010

Time: 10:30 hours

Venue: Annai Benab, Annai Region 9

Objectives:

- (i) To hold a scoping exercise for the Environmental and Social Impact Assessment 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 EIA study.

EPA Representatives:

1. Ms. Geeta Devi Singh - Director, Environmental Management Division
2. Ms. Asma Sharief-EO II (M&F), Environmental Management Division
3. Ms. Nalissa Persaud - EO I (M&F), Environmental Management Division

Representatives from Sherwood Forrest Incorporated:

1. Dr. Patrick Williams - Representative

Representatives from EIA Consultant Team:

1. Mr. Godfrey Marshall - EIA Team leader
2. Mr. Mike Tamessar - Biodiversity Specialist (Flora)

Environmental Assessment Board (EAB) Representative:

1. Dr. Ashok Sookdeo - Member, EAB
2. Ms. Vanessa Benn,- Member, EAB

Representatives from Sector Agencies

1. Guyana Forestry Commission (Mr. James Singh - Commissioner)
2. Conservation International
3. Iwokrama
4. Guyana Energy Agency

The Public Scoping Meeting for Sherwood Forrest Incorporated Proposed Logging and Sawmilling Project commenced at 09:15 hours in Annai, Region #9.

The Toshao of the Annai Village, Mr. Michael Williams, provided opening remarks and thanked members of the public for attending the meeting. He then led the gathering in a prayer, the National pledge, followed by a welcome in the Macushi language.

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 relating to the proposed Logging and Sawmilling Project of Sherwood Forrest Incorporated. She highlighted EPA's mandate based on the EP Act to oversee environmental management, and further provided 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 TOR for the EIA study. The Chair then invited Mr. Lucas, RDC Chairman, Region No. 9, to give a welcome. He indicated the importance of the exercise and added that careful consultation is required. He reiterated that it was important that Rewa and Apoteri raise issues, since Annai and North Rupununi are considerable distances away from project. He then raised the issue surrounding mining with reference to the Bartica protest that was going on and added that when the LCDS consultations were conducted, the concerns of the protesters were not answered; hence, take a forum such as this to be serious. He added that they would like development however, not at the expense of other things.

The Chairperson then invited Mr. James Singh, Commissioner of GFC, to the floor. He indicated that the GFC, and GoG, the representatives for management of state forest (13 million hectares), as part of sustainable forest management, have to think about transparent allocation. To this effect, in 2006, advertisements were made in the newspapers for the award of a State Forest Exploratory Permit (SFEP) so that anyone could apply once they can provide evidence of financial ability and technical ability. Sherwood Forrest was awarded in 2007 after it was dealt with at the internal level of GFC and then at the technical sub-committee level. The SFEP does not allow for any commercial logging only for the forest inventory, the EIA, and the forest business plan. The Company would normally have three years to complete these activities.

He also clarified the misunderstanding about the LCDS. He stated that in terms of the mining, it has been rumoured that the Government, because of the agreement with Norway, plans to stop mining due to the LCDS, and REDD. This is not true since mining and forestry will continue, however, miners would be required to give six months notice to GGMC, which would then provide this information to GFC so that foresters can extract commercial trees. He stressed the importance mining operations having to be done in compliance with guidelines.

Ms. Asma Sharief - EO II (M&F), EPA, was then invited by the Chairperson, to give a brief presentation on the EIA process and the role that the public plays in this process.

Dr. Patrick Williams was then invited to provide an outline of the proposed project. He indicated that the Company was incorporated in 1996, and the SFEP was granted in 2007 and is a consortium of local and expatriate investors. In terms of the project, only the logging operations would be the focus now. The Company plans to extend the UNAMCO road by 120 Km to connect to the concession and to rehabilitate and upgrade sections of the existing UNAMCO road. On the concession, the Company plans to construct workers quarters and other building facilities, sanitation facilities, etc. also, to procure equipment both local and overseas. He foresees major benefits to close communities such as Rewa, Apoteri, and Crash Water and indirect benefits for those further away.

He added that the Company would need to hire local persons for jobs such as; construction workers, machine operators, establishment of medical facilities and data entry to mention some. Females would be employed to do jobs such as, data entry and other light jobs. The Company would provide transportation for the village when they are bringing supplies from Georgetown to Sherwood and medical facilities. They would also be providing training for heavy duty equipment and would also require young people with technical skills to function in certain positions. He reiterated that persons employed in the project would be employed under the labour laws of Guyana, and health and sanitation issues, would be dealt with in accordance.

Mr. Marshall from FTCl - indicated at this time, that the Company was involved in inventory of the area. Sherwood Forrest which is east of Annai and the nearest community to the project is Apoteri. The project is bounded by other forest concessions and the Corentyne River as seen on map. He also indicated that there was no evidence of human interference in the area since the Concession issued to Simon and Shock (SSI) is still to be developed whilst Conservation International (CI) has no logging activities being carried out. Also, there are social and economical issues that have to be looked at, although on one currently lives around the project, however, a notice board indicated a gold mining claim had been staked was observed. Conservation International indicated that they observed rum bottles on the concession but no human activity. He further stated that the inventory team was on site since November 18-19, 2010 and would be there until February 20, 2010, to determine where the camp should be located. The team would then determine if anyone is located on site, they indicated that the sound of an engine was heard in a distance; however this could not be verified as yet. It was also indicated that based on the location of the concession (Right Bank Berbice River) the proposed road for the logging operations would go north of the concession and employees for the concession would come from the surrounding communities.

Questions/Comments/Suggestions

1. **Mr. Fred Allicock** - Surama, indicated that:
 - i. He understood what Mr. Marshall was saying, however, there is a line running parallel to the Berbice River opposite Coco Creek which is leading away from the community but if the Company would be using the UNAMCO road, persons employed from the community would not want to go all the way around to get to their homes.; they would prefer to cut across. He mentioned that after looking at the issues of the EIA, he hopes that there is no aftermath backlash since promises are made like marriage and they would have to look at the aftermath of activities.
 - ii. The second issue is that whilst the President is busy negotiating the LCDS, there is an Organization in the country that is giving away a huge concession for logging.
2. **Dr. Patrick Williams** - responded to Mr. Allicock's first issue. He agreed that agreements are made and are sometimes not kept. However, the Company has to keep up with the rules of GFC who have a monitoring team residing in the area. The Company would have to follow the GFC Code of Practice and regulations of the EPA.
3. **Mr. James Singh** - responded to Mr. Allicock's second issue. He indicated that through the use of remote sensing done during 2005-2009, the rate of change of forest cover in Guyana has decreased. Whilst many would agree there has been an increase in mining

activities, large forest concessions have to submit a management plan before operating and there are fines in place for any breaches which may be up to 1/6 of the market value and if fined again could be as much as 2/3 the market value. Also, for 2009, there was 30% monitoring for large-scale concessions and 10% for SFP's. For this, year, there is 100% monitoring of all concessions. He also indicated that as a country we are well below the annual allowable cut. He further added that there should be no issue of non compliances once guidelines are followed. Further, sustainable management does not conflict with the LCDS. It was added that the pillars of the LCDS are: investing in low carbon economic infrastructure and adaptation priorities, facilitating investment and employment in low carbon economic sector, and generally enhancing the nation's human capital and creating new opportunities for forest dependent and other indigenous communities. The Toshao of Annai, Mr. Michael Williams, then translated what was being said into the Macushi language.

4. **Mr. Alphonso Ford** indicated that he would like to know how the EIA would be developed, what method would be used, how often would it be done, and as development goes on, would it be done as changes arise?

5. **Ms. Geeta Singh** - indicated that the EIA study is conducted to see what is there and what impacts would arise before an Environmental Permit is granted which is valid for a maximum of five years, after which a revisit is done to check compliance with Permit conditions. Monitoring is done from time-to-time to check compliance. After the five year period is up, the developer then reapplies for the Permit to be renewed.

6. **Mr. G. Marshall** - indicated that the EIA is done in consultation and in two phases:

Phase 1 - addresses what is happening in the concession, and based on stocking, the road network is then determined.

Phase 2 - the socio-economic side, this is done through consultations by interacting with persons in the area and hearing their concerns. All issues and concerns are taken into consideration to determine what mitigation measures are to be put in place. Once the concession is acquired, and all agreements are made, a Forest Management Plan has to be developed to address issues. This is separate from the annual management plan that is derived from the five year management plan where operational plans are addressed.

7. **Mr. Alphonso Forde** - added that, what may affect the concession, may not affect the community.

8. Mr. Marshall explained that the EIA report would be available for communities to comment and the annual plan would address issues that arise.

9. Ms. G. Singh - added, that when the EIA document is prepared, it would be redistributed to communities to determine if all issues raised are addressed. She further added that the EPA would only approve the document once all issues are addressed.

10. **Mr. Sydney Allicock** - raised three additional issues:

Issue 1 -- he raised concerns about the location of the market, and road alignment, particularly highlighting the fact that persons employed from Apoteri would want to take the shortcut home and not the long road through to Kwakwani. He added that most times roads are from the forest

to the community to allow movement of persons employed from that community. He further added that for security reasons on the new road, GFC's monitoring would be needed. He used the example of when roads to DTL and Iwokrama opened up, fishermen and hunters from other areas traversed the area, utilizing natural resources and putting pressure on locals by competing with them instead of purchasing from them. He further inquired if it was economical to truck westward and north westerly through to the UNAMCO road and added that the economics and time would have to be considered.

Issue 2 - he would like to know if the approach by Conservation International is a workable one and could work or if an alternative to logging could be tourism?

Issue 3 - he added security, since it could be a new concession with a proposal for new road construction (UNAMCO trail). Although persons have not been seen around, there has been the sound of an engine in the distance and in the past, there were illegal gold mining activities in the New River Triangle that caused much gold to be lost when it was invaded. He further added that we have to look at the present security and occupy the land for security purposes. As the road opens up, it would present opportunities for development, both legal and illegal. He also stated that the project sounds healthy and would produce employment opportunities for communities. He suggested that the Company looks at training, especially for women and that he appreciates that there is an agenda to employ women from Region No. 9. He concluded by saying that we needed to monitor invaders that come to deplete the Country's natural resources. As for the engine that is heard in the distance, we are to inform the security forces. Additionally, he wondered if there were any employment opportunities for communities in the North Rupununi District.

11. **Dr. Williams** - informed the gathering that the project would be the eyes and ears of the Government and that the Company would work fully with the Toshias. He further added that for the initial work, Mr. Marshall worked with the Toshao of Apoteri.

12. **Mr. James Singh** - informed the meeting that 85% of Guyana was forested, and although the forest is used for socioeconomic activities, through the LCDS, if Countries give sufficient financial incentives to not cut forest then one could take the route of CI. He further added that CI's arrangement dates back years where they paid uncut royalty, since then, things have changed especially the value rate of the forest. He added that we now have to think about the opportunity lost due to not logging. Also that sustainable management of forest enhances biodiversity.

13. **Mr. Sydney Allicock** - inquired whether there were any opportunities for the Communities in the North Rupununi District. He then recommended that the Community Development Officer and the District Development Officer work closely with the GFC to provide training. He also inquired of GFC, if their Office could work with the NRDDDB as a team to have better understanding and cooperation. He *also* asked if the community could get a map that could be photocopied and sent to the villages. The map included in the draft ToR is not clear as Apoteri should be shown clearly. He also requested that more time be given to properly review important documents such as the draft ToR they recently received.

14. **Mr. G. Marshall** - responded that the Company has to submit a business plan taking into consideration stocking within the Concession. If stocking is rich then it may be economically viable however, if it is low, the Company may face problems.

Concerning the issue of the route, if persons are employed from Rewa and Apoteri, they would not want to go all the way around and would need a shortcut.

15. **Mr. Kenneth Forde** - Aranaputa - informed that he had seen maps about a line falling just around Apoteri. He asked the question as to where the fourth parallel lies for the Community and is it constitutional to issue a concession south of the fourth parallel.

16. **Mr. G. Marshall** -- responded to Mr. Kenneth Forde stating that part of the concession falls below the fourth parallel however, although there were discussions on this matter (in the past), it was not formalized.

He also responded to a previous comment relating to Community involvement stating that during the initial stages of the Company's consultation, it was done in conjunction with the Ministry of Amerindian Affairs where it was decided that after the application to Ministry of Amerindian Affairs for permission to work within the Communities, the Village Captain and the Toshias have to give permission too.

17. **Mr. James Singh** - indicated that no concession was allocated in the New River Triangle, although Suriname is making claims to which Guyana objected:

18. Michael Williams - Toshao Annai

Indicated that, employment would be given to nearby Communities as the previous speaker indicated, and that he agreed that the construction of the proposed road would create negative impacts which would have to be minimized. Since the LCDS he added, this is the first Concession to be issued and if handled correctly, could demonstrate how the LCDS can work. Further to this he added, that it is only Iwokrama that is trying to demonstrate sustainable forestry practices. He also mentioned added that he hopes the employees are given contracts that are to be signed with benefits and proper payment system. Also, there is currently no road from Concession to anywhere and we are still seeing some negative impacts. He said that he was happy for the medical and transportation facilities, but this cannot be done without a road and that Toshias should take note that while the project is far, it could be accessed with a road and this could also allow other companies to access the area.

19. **Mr. Sydney Allicock** - indicated that a road is already there just above the Primus inlet that was cut by the Guyana Lands and Survey approximately nine years ago and is in excellent terrain with no creeks, etc. and that road should be upgraded, and be established for medical emergency use since it is about 30 minutes from Primus inlet to Apoteri and this would prevent persons from having to going the long way around.

20. **Dr. Patrick Williams** -- indicated that the Company would want to use the existing road if and when the time comes; the Company would return and have persons from Apoteri who know the road guide them.

21. **Glendon Allicock - Surama** - commented that members of Surama are taking note of the combination of the mining and forestry sectors and the conflicts that are arising between the two sectors. He then added that Toshao Michael Williams mentioned contracts for workers, to which he added that some Companies take persons on then send them back with no pay and persons have to be running to the village council for help. He inquired if the same arrangement could be made as how the Toshao sits on the Iwokrama Board to represent employees if the Company could have the Toshao sit on the Board and that they also need a map at the North Rupununi District Development Board (NRDDB).

22. **Dr. P. Williams** - indicated that they would have one.
23. **Ms. Leonie Ewell** - Fair View - inquired about what types of jobs females would have.
24. **Mr. G. Marshall** - responded that the type of jobs for female would include inventory, tree data, data entry for Company and mapping.
25. **Lisa Grand - Volunteer** - had several queries as follows:
- how many persons were employed with the Company?
 - what markets the Company has in other countries, and what countries?
 - would the Company export processed wood?
 - would the Company be going for sustainability in that is it going to get a label?
 - An explanation as to the expatriates and further added that the consultation notice of two weeks was too short and that more time was needed and more consultation needed before a decision could be made.
26. **Mr. James Singh** - informed that SSI has been issued with an SFEP that would be reprocessed since there have been constant breaches of guidelines. As for the job contracts, he added that the Ministry of Amerindian Affairs and the GFC are encouraging persons to sign contracts however, persons are not willing to sign contracts because of NIS and income tax and this is a breach of the Occupational Health and Safety Laws of Guyana.
27. **Dr. P. Williams** - Added that market information could only be generated when inventory is done and based on that the Company would know if to process logson site. However, the principle markets are the Caribbean and China.
28. **A. Roopsind - Assistant Forest Manager Iwokrama** - inquired in terms of sustainable development, if the Company plans to go for Forest Stewardship Council (FSC) certification. Also does the Company see the FSC certificate as a marketing tool? He also wanted clarification as to the meaning of disco in the TOR second page, second to last paragraph; whether there would be one. He later added that there was no mention of the influx of diseases and violence.
29. **Dr. P. Williams** - indicated that FSC is a long-term goal and the initial plan is to follow the guidelines of GFC and other regulating bodies.
30. **Mr. James Singh** - Added that though the FSC certificate is a marketing tool it does not increase profitability.
31. **Mr. Marshall** informed that there will be no discos on project site. Entertainment would be provided on site but not in the form of disco and all developments would depend on the scale of operation decided on and it is too early to determine this. He further added that under the social impacts, it is implied that persons and not the Company would move into the area and start shops, selling groceries, and move into alcohol and discos.
32. **Dr. Patrick Williams** - In response to how many persons would be employed he indicated that there is no exact number at this time however; approximately 150- 200 persons would be needed to start road construction followed by construction of living quarters. As the project moves from that phase to the operation phase, additional persons would come on board, both skilled and

unskilled. He also, indicated that some areas of employment would not require secondary education, for example chainsaw operators.

33. **Mr. Rodney Davis - Aranaputa** - Inquired if the Company would put in a plan to sponsor youths from the NRDDDB to further their education in Forestry since the education of youths is only to a certain level and this would build the Company.

34. **Dr. Patrick Williams** - indicated that Company would take this suggestion into consideration and that training would be practical on site as well as ongoing.

35. **Mr. James Singh** - indicated that he was in agreement with Dr. Williams and that there is a need to train persons to occupy varying levels within the Company.

36. **Ms. Jacqueline Allicock** - inquired who was the owner of the Company?

37. **Dr. Patrick Williams** - informed that it is a locally registered Company, whose investors are based in Guyana, USA, and China.

38. **Mr. Ivor Daniels - Senior Councillor, Annai** - Enquired whether there was an opportunity of employment for youths trained at the NRDDDB with a forestry background. He later added that some youths of the Villages drink more alcohol than work.

39. **Mr. G. Marshall** - Responded by saying that it was possible for youths with technical skills.

40. **Patrick Honorio** - Toshao, Rewa - Indicated that the three villages do not have many educated persons and he agrees with Senior Council from Annai. He also indicated that his village has two persons with secondary education.

41. **Mr. Matthew Alvin** - Deputy Toshao, Rewa - Added that in Rewa, there are men with compass and inventory skills who have worked for Iwokrama. However, these were practical skills that needed upgrading and training on site.

42. **Ms. Vanessa Ben - EAB** - Indicated that she was not sure if the question from the floor concerning who were the Principals of the Company was clear.

43. **Dr. Patrick Williams** - Informed that there were three Principles these included: Yvonne Bell of the USA, who is a Guyanese, residing in the USA for approximately 40-45 years; Dr. Gary Clarke; and Mr. Chu Hong Bo, the Chinese Principal. Dr. Williams is also an advisor. He further added that when the Company begins recruitment, it would be done through Councillors and NRDDDB, and that there would be training of forest workers in interpersonal skills, and alcohol abuse in a forestry operation. On a more serious side he added, the Company would have a strict policy about alcohol abuse.

44. **Mr. G. Marshall** - added that the map was initially in colour but for distribution purposes, it was photocopied and this was done in black and white.

45. **Ms. G. Singh** - Indicated that the comments would be incorporated into the ToR and this would be

distributed to the Sector Agencies.

46. **A. Roopsind - Iwokrama** - Asked the question if there was a time line for the EIA, and if, when the EIA is completed, would there another opportunity to meet with the public.

47. **Ms. G. Singh** - indicated no other meeting.

48. **Ms. V. Benn** - Informed that after the first draft, if there is scope to have another meeting with the public, if deemed necessary, the EAB could request it.

49. It was noted that most persons commented on the time frame to review documents stating that it was too short in order to make proper comments and that more time is needed for documents of such nature to be properly reviewed by the Communities.

50. The Chair then thanked the persons for attending and with no other business, the meeting concluded at 11:35 hours.

Members of the Public in Attendance –Scoping Meeting-February 4, 2010

| # | Name | Agency/Village | Designation | Tel. #/ Fax# | Address / Email Address |
|----|----------------------|-----------------------|--------------------------|-------------------|---|
| 1 | Geeta Devi Singh | EPA | Director, EMD | 225-0506 Ext. 21 | 7, Broad & Charles Streets, Charlestown ; geeta.singh.d@gmail.com |
| 2 | Asma Sharief | EPA | EO II (M&F) | 225-0506 Ext. 26 | 7, Broad & Charles Streets, Charlestown; asmasharief@gmail.com |
| 3 | Nalissa Persaud | EPA | EO I (M&F) | 225-0506 Ext. 24 | 7, Broad & Charles Streets, Charlestown |
| 4 | Dr. Ashok Sookdeo | EAB | Member | 621-3778 | Lilliendaal asookdeo@yahoo.com |
| 6 | Godfrey Marshall | FTCI | Director/Consultant | 225-5432 223-5062 | 143, Pike Street, Kitty gmar@guyana.net. gy |
| 7 | James Singh | GFC | Commissioner | 225-3898 | 1, Water Street, Kingston -commissioner@forestry.gov. gy |
| 8 | Dr. Patrick Williams | Sherwood Forrest Inc. | Advisor | 223-0218 | 44, D' Andrade Street, Newtown Nayarha2002@yahoo.co.uk |
| 9 | Michael Williams | Annai Village Council | Toshao | | michaelhealis@yahoo.com |
| 10 | Clarindo Lucas | RDC | Regional Chairman | 772-2018 | Lethem |
| 11 | Anand Roopsind | Iwokrama | Assistant Forest Manager | 225-1504 | 77, High Street, Kingston; aroopsind@iwokrama.org |
| 12 | Ann-Marie Forde | Iwokrama | Special Projects | 225-1504 | 77, High Street, Kingston -c.ford@iwokrama.org |
| 13 | Vanessa Benn | EAB | | | Vanbl388@yahoo.com |
| 14 | Renita Gregory | | | | Bina Hill Institute (B.H.I) Shellygregroy2010@hotmail.com |
| 15 | Linzie Moses | | | | B.H.I |
| 16 | Victor Captain | | | | B.H.I |
| 17 | Vivienne Augustine | | | | B.H.I |
| 18 | Grace Albert | | | | B.H.I - grace-beautyalbert@yahoo.com |
| 19 | Monique Ambrose | | | | B.H.I - ambrose.monique@gmail.com |
| 20 | Davelon Forde | | | | B.H.I |
| 21 | Earnest Merriman | | Councillor | | Massara |
| 22 | Marlon Haynes | | | | Bina Hill |

| | | | | | |
|----|-------------------|--|---------------------|--|---|
| 23 | Mabel Captain | | | | B.H.I |
| 24 | Andrea Saba | | | | B.H.I |
| 25 | Elias Cambridge | | | | B.H.I - okriminal@hotmail.com |
| 26 | Victorine Mack | | | | B.H.I |
| 27 | Jim George | | | | B.H.I |
| 28 | Ann Mario | | | | B.H.I - AnnMario1990@hotmail.com |
| 29 | Orika Stephen | | | | B.H.I |
| 30 | Victor Captain | | | | Surama |
| 31 | Gordon Joseph | | Senior Councillor | | Kwatamang |
| 32 | Dowdan Joel | | Villager | | Annai |
| 33 | Alicia Franscipio | | Coucillor | | Kwatamang |
| 34 | Kenneth Forde | | Village Chairman | | Aranaputa |
| 35 | Alphonso Forde | | Tourism Coordinator | | NRDDP - - alphonsoforde@yahoo.com Skype: alphonso.Forde |
| 36 | Lalita Moses | | | | Kwatamang |
| 37 | Marine Johnny | | | | B.H.I |
| 38 | Karen Thomas | | | | B.H.I |
| 39 | Rosetta Jacobs | | Councillor | | Annai |
| 40 | Shurland Davis | | Student | | Karasabai |
| 41 | Iona Stephen | | Student | | Parishana |
| 42 | Nanda Lall | | Student | | B.H.I |
| 43 | Ovid Peterson | | Villager | | Kwatamang |
| 44 | Ronick Elliot | | Senior Councillor | | Rupertee |
| 45 | Neville Augustine | | Toshao | | Calm Water |
| 46 | Denise Sandy | | Villager | | Annai Village |

| | | | | | |
|----|---------------------|--|-------------------|----------|--|
| 47 | Julie Scipio | | Villager | | Annai Village |
| 48 | Lorna Oswald | | Villager | | Annai Village |
| 49 | Colleen Mack | | Villager | | Annai Village |
| 50 | Ivor Daniels | | Senior Council | | Annai Village |
| 51 | Fitzroy Moses | | Councillor | | Annai Village |
| 52 | B.I. Thomas | | Deputy | | Apoteri Village |
| 53 | Clement Joseph | | Toshao | | Apoteri |
| 54 | William Bremner | | Deputy | | Yakarinta |
| 55 | Eula Williams | | Villager | | Annai |
| 56 | Audrey Simon | | Councillor | | Rewa |
| 57 | Sydney Allicock | | Councillor | 668-9874 | Surama - Sydneyallicock@yahoo.com |
| 58 | Nelson Henry | | | | Crash Water |
| 59 | Etamilfar | | Councillor | | Annai Village |
| 60 | Martin Roberts | | Councillor | | Kwaismatta - Koolbay-982000@yahoo.com |
| 61 | Sampson Bartholomew | | Toshao | | Masara - Sampsonbartholomew@gmail.com |
| 62 | Leonie Ewell | | | | Fair View |
| 63 | Paulette Allicock | | | | Surama |
| 64 | Desmond Michaels | | Toshao | | Katoka |
| 65 | Priscilla Jones | | Councillor | | Wowetta |
| 66 | R. F. Willicock | | Council of Elders | | Surama |
| 67 | Anthony Andres | | Councillor | | Surama |
| 68 | Jacqueline Allicock | | Senior Council | | Surama - jacqueline.allicock@hotmail.com |
| 69 | Glendon Allicock | | | | Surama - glendonallicock@yahoo.com |
| 70 | Lisa Grund | | Volunteer | | Surama - lisagrund@gmail.com |

| | | | | | |
|----|-------------------|-----------------------|-----------------------------|----------|---|
| 71 | N. Williams | | | | Annai |
| 72 | Frank Parks | FTCI | Community Forest Officer | | Surama |
| 73 | Rodney Davis | | Chairman Aranaputa Forestry | | Aranaputa - heightsmanrd@gmail.com |
| 74 | Emelia Lawrence | | Student | | Shuliuab |
| 75 | Inderie Edwards | | Student | | K/Mang. |
| 76 | Michael Tammessar | | Consultant | 222-7574 | 8, Airstrip Road, Ogle. -miketamessar@live.uk |
| 77 | Pratesh Satram | Sherwood Forrest Inc. | Lawyer | 225-1155 | 55, Seaforth Street, C/Ville |
| 78 | Nigel John | CIG | Conservation Officer | | Apoteri - rjohn@con.org |
| 79 | Lewis Joseph | CIG | Conservation Officer | | Apoteri- ljoseph@con.org |
| 80 | Matthew Alvin | | Deputy | | Rewa |
| 81 | Vladimir Laurindo | | Deputy Forester | 772-9291 | Yupukari |
| 82 | Rudolph Roberts | | Toshao | 772-9291 | Yupukari - anthonyroberts@gmail.com |
| 83 | Michael D'Kindron | | Toshao | | Toka |
| 84 | Fermin Calistro | GFC | Ranger | 772-9280 | Annai |
| 85 | Franklin Greaves | | Agri. Field Assistant | | Annai |
| 86 | Clive Edwards | | Senior Councillor | | Kwaimatta Village |
| 87 | Kenard Taurindo | | Councillor | | Kafoka Village |
| 88 | Ricardo Cabral | MYC | Market Manager | | Surama |
| 89 | Orla Cabral | | | | Surama |
| 90 | H. Haynes | | | | Kwatamang |
| 91 | Sarah George | | Councillor | | Fair View |
| 92 | Norbort Salty | | Translator | | Kwatamang |
| 93 | Sandra Britton | GEA | Head EESO | 2266993 | Georgetown |
| 94 | Eleanor Joel | | Coucillor | | Annai |
| 95 | Patrick Honoro | | Toshao | | Rewa |

Annex IIb: Minutes of Scoping Meeting-February 8, 2010-Georgetown,
Region 4

Sherwood Forrests Incorporated - Proposed Logging Project, Right Bank Lysles River, Left Bank Corentyne River, Right Bank Essequibo River, Right Bank Berbice River, Region No. 6

Sector Agency Scoping Meeting

Date: February 8, 2010

Time: 10:00 hours

Venue: GFC Boardroom, 1, Water Street, Kingstown

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. Mr. Hance Thompson - SEO (Auth), Environmental Management Division
3. Ms. Asma Sharief -EO II (M&F), Environmental Management Division
4. Mr. Cleavon Cameron -EO II (M&F), Environmental Management Division
5. Ms. Nalissa Persaud - EO I (M&F), Environmental Management Division

Representatives from Sherwood Forrests Inc. (Sherwood):

1. Dr. Patrick Williams

Representatives from EIA Consultant Team:

1. Mr. Godfrey Marshall – EIA Consultant.

Representatives of Sector Agencies and Forest Concessionaires:

1. Ms. Nadia Madho -Research & Documentation Officer, National Trust of Guyana
2. Mr. Amarnauth Maraj - Principal Environmental Health Officer, Environmental Health Unit, Ministry of Health
3. Mr. Quacy Bremner- Deputy Commissioner of Forests (a.g.), Guyana Forestry Commission
4. Ms. Karen Small - Technical Officer, National Parks Commission
5. Mr. Eustace Alexander - Ecosystem Coordinator, Conservation International
6. Mr. G.A. Norton- Chief, Guyana Organisation of Indigenous Peoples
7. Mr. Charles Thorn - Chairman, Upper Berbice Forest and Agricultural Producers Association
8. Mr. Cort Simeon -- Vice Chairman, Upper Berbice Forest and Agricultural Producers Association

9. Mr. P.D. Allan - Vice President, Simon & Shock International Incorporated.
10. Mr. Monty Niamatali -- Managing Director, Variety Woods and Greenheart Limited
11. Mr. S.K. Chan - Chief Executive Officer - Demerara Timbers Limited

Environmental Assessment Board (EAB) Representative:

1. Ms. Vanessa Benn- Member, EAB

The Sector Agency scoping meeting for the Sherwood Forrests Inc. proposed logging project was held in the GFC Boardroom, Kingstown, Georgetown. The meeting commenced at 10:00 hours.

The Chairperson, Mr. Thompson, welcomed and thanked representatives from the Sector Agencies for attending the meeting and introduced the head table. He stated the mandate of the EPA and the Agency's role in authorizing the project. Mr. Thompson gave a brief outline of the project background and noted that the application was submitted on September 01, 2009. He also provided a brief description of the project. He further proceeded to explain the purpose of the meeting, which was to provide a forum for the Sector Agencies to outline any concerns they may have about the project so that they can be included in the final Terms of Reference (TORs) for the EIA. He gave a brief overview of the stages of the EIA process leading to the scoping meetings.

Mr. Thompson then invited a representative of Sherwood Forrests Incorporated, Dr. Patrick Williams, to give a summary of the project. Dr. Williams informed the gathering that the Company applied to the Guyana Forestry Commission under the name of Sherwood Forrests Incorporated for a State Forest Exploratory Permit (SFEP) for an area of 167, 066 hectares, extending between the Berbice and Corentyne Rivers. He stated that the project would be executed in two phases and that the Company's intention is to initially focus on the first phase. He indicated that phase one would entail solely logging whilst in phase two a wood processing facility would be established. He mentioned that the project site is currently not accessible by road. However, the Company would use the existing UNAMCO to access the site. As such, part of phase one of the projects would entail realigning and refurbishing the road.

The distance from the end of the UNAMCO road to the concession is approximately 120 km. Thus, a new road would be constructed from the project site leading northwards through uninhabited areas to meet the UNAMCO Road. The road would eventually reach the existing trail to Linden. The initial investment for the project amounts to US \$500 Million and about 300 persons would be employed. The monies would be spent on various aspects of the project such as road building; medical facilities and a heavy part of the investment would be used for training of employees. A majority of the employees is expected to come from Apoteri and Rewa. The Company has already recruited villagers to provide guidance in accessing the site such as the Toshao of Apoteri, who took members of the Company to the site. The Toshao had also shown the Company the existing lines leading to the project site. The Company expects to work closely with these communities. This was previously communicated with the Ministry of Amerindian Affairs by Mr. Godfrey Marshall and as such this Ministry is aware of the intentions of the Company. He mentioned that the Company would abide by the rules and regulations as stipulated by the GFC for logging, and also other salient laws. This would also extend in terms of training, which would be continuous.

Mr. Godfrey Marshall, representing the EIA team of consultants, was then invited to give an overview of what the EIA study would entail. He first identified the project site on a map and indicated the current access route to the site which is down the Rupununi River, into the Essequibo River upstream, thence

along a cut line to the site. He informed that the team is firstly finding out the attributes of the forest and that currently a team from the Forestry Training Centre Incorporated is in the area undertaking an inventory. The only evidence the team found of humans being in the area was from a cut line which was established by the Guyana Defence Force. He stated that the Company is in possession of a State Forest Exploratory Permit and that a relevant process needs to be followed before it is converted into a Concession. The Company would first have to determine the type of trees in the area and to decide whether it was feasible to undertake logging. They would need to also explain how the logs would be transported out of the project site.

He also indicated that the key issues that would need to be addressed would be that of social impacts. He reiterated that there was no evidence of people in the area. Conservation International is in possession of a Concession adjacent to the area of the Company's State Forest Exploratory Permit but since the Concession is kept for solely conservation purposes, there is not much human activity there. As such, the focus is on the closest communities such as Apoteri. This community had expressed concerns on whether their coca plantations on the Right Bank of the Essequibo River would be affected by the Project. When the Company decides on whether to acquire the concession, then they would decide on where the employees would be sourced. The people of Rewa and Apoteri are very anxious to secure jobs. The Company would generally employ these villagers as logging operators. He mentioned that it is the opinion of the people from Apoteri that employees for the project from that area may use the current access line to the site instead of the route that would be established from the project site to the UNAMCO Road. Mr. Marshall then added that construction of the road may introduce miners and other individuals into the area. However, use of the proposed new route is necessary because transportation of logs from the project site along alternative routes such as via the Corentyne and Rupununi Rivers would be very difficult. Transport along the Corentyne River would have to be done in three cycles due to tides and the wet and dry seasons. The Rupununi River is not very navigable. He restated that since being in the area, no one was observed around the site. The only evidence of people previously being in the area is the existing line currently used to access the site, which was cut by the Guyana Defence Force. He mentioned that the EIA team is required to find out who and what would be affected by the project. With regard to the closest community to the site, Apoteri, permission has to be sought from the Village Council, by anyone who needs to pass through the community. Whilst signs informing of mining activities were observed along the Right Bank of the Essequibo River, there were no mining concessions in the area. He closed by restating that there was no human inhabitants in the area.

At that point, the Chairperson then invited representatives from various sector agencies and forest concessionaires to make any suggestions and comments on the project as well as any issues or concerns they may have.

Questions/Comments/Suggestions

1. **Mr. G.A. Norton- Chief, Guyana Organisation of Indigenous Peoples** raised a number of issues:
 - i. He directed his first question to Dr. Williams inquiring whether the Company would undertake logging prior to establishing the sawmill complex. Dr. Williams replied that phase one of the project, logging would be undertaken first. Mr. Norton then repeated his question whether the Company would start felling trees before construction of the sawmill and Dr. Williams answered in the affirmative.

- ii. He inquired whether the Company would use the existing trail to Linden to transport logs and Mr. Marshall gave a positive answer, stating that the use of this road would also be addressed in the EIA.
- iii. Mr. Norton wanted clarification on the project's location on the Right Bank Essequibo River. Mr. Marshall demonstrated the project site on a map.
- iv. He inquired whether Conservation International was different from Iwokrama and Mr. Marshall verified this. Mr. Norton asked this question because he was not certain that it was feasible to cross the Rupununi River in the rainy season since it floods.
- v. He referred to Mr. Marshall's comments on the rehabilitation of the road which may introduce shops, mining and other land uses to the area and expressed his opinion that the project may not lead to this situation. Mr. Marshall explained that when a road is opened in an area, other businesses usually follow, giving an example of the Mazaruni area. Mr. Norton asked whether this would result from the Company's activities. Dr. Williams stated that this situation is characteristic of once inaccessible areas, in which roads are established. He gave an example of the Linden to Lethem road where stalls and shops can be observed along it, and mentioned that this can further be observed along many other such roads.
- vi. Mr. Norton referred to Mr. Marshall's comments on the absence of people in the area. He said that because of the manner the Amerindian peoples hunt and fish, it is not expected that they would be noticeable. Maybe the activities of the Company and that of the Amerindians do not coincide, which would explain why they are not seen in the area. Mr. Marshall agreed, but stated that the Essequibo River is not very navigable in that area and much skill is needed to traverse the area. He said that the very few people who go to the area would be noticed by the villagers of Apoteri, since they may have to stop there for fuel and other items for the journey. He further said that the people of Apoteri usually hunt and fish along the Right Bank of the Essequibo River but not as far as the project site. Mr. Norton then asked whether the logging project would affect these livelihood activities and Mr. Marshall replied that that would be evaluated in the EIA study.

2. Mr. P.D. Allan - Vice President, Simon & Shock International Incorporated -

Enquired about the ownership of the road. He asked whether the road would be built by Sherwood Forrests Incorporated and whether it would be a private road or whether there would be a system of shared cost by other road users.

Dr. Williams responded that the road would not be private and that the Company would find out whether other stakeholders may be interested in maintaining the road. The intention of the Company is to collaborate with other concessionaires around the area in maintaining the road such as Simon & Shock International Incorporated whose Concession is located adjacent to the project site. Mr. Allan then asked that apart from his Company, who else may use the road.

Mr. Thompson then intervened saying that he is not of the opinion that private roads are allowed since this is not permitted by law.

3. Mr. Charles Thom - Chairman, Upper Berbice Forest and Agricultural Producers Association - continued the discussion on the road.

- a. When UNAMCO's road was opened a lot of miners came into the area and about three individuals from Georgetown set up camps along the road, making a living by hunting

wildlife for trade. Dr. Williams stated that the Company would have to collaborate with the Wildlife Division to prevent such a situation. Security measures would have to be implemented to ensure that the road is not a "free for all" so that there should be no illegal hunting because hunting without a license is illegal.

- b. Mr. Thorn mentioned that within 64 -100 Km of the road, the soil type is sandy and difficult to traverse and they would be happy to partake in the maintenance of the road when initiated by Sherwood Forrests Inc.

4. Mr. Monty Niamatali - Managing Director, Variety Woods and Greenheart Limited - also commented on the construction of the road. He suggested that the company should approach the GFC in getting a commitment from potential and present stakeholders to maintain the road. While it is preferable that others be involved in road maintenance, they may not have all the equipment necessary to do so. Therefore thorough discussions have to be made to devise a plan for road maintenance. The Company may not be able to take out its produce if there is not enough money to maintain the road. A lot of money would have to be spent on surveys since the road would have to pass through difficult terrain.

Dr. Williams agreed saying that topographic maps of the area were examined and problem areas were identified. Mr. Niamatali stated that the situation on the ground is terrible and that the Company needs to meet with stakeholders to properly plan the rehabilitation of the road. Mr. Thorn stated that there are about four to five concessionaires who would welcome the rehabilitation of the UNAMCO road, including his association, since they encounter difficulty in using the road.

Dr. Williams informed the gathering of a concern of security which was raised at the public scoping meeting at Annai. The view was that if once inaccessible areas are opened, miners would enter those areas. However, it is of his opinion that Guyana needs to occupy some of its remote areas such as the New River Triangle for example, given the current border issue with Suriname. Guyana needs to occupy these areas to let others know that they are part of our territory. Mr. Niamatali then suggested that at various crossings proper security measures should be applied and there should be radio contact at the various crossings, from Georgetown, Linden, Ituni and Kwakwani. Dr. Williams added that communication would have to be maintained with Iwokrama since the Company would rely on Iwokrama to provide guidance in training of employees. Mr. Thompson then stated that the EPA would ensure that assessments of both direct and indirect impacts be incorporated in the Terms of Reference for the EIA study. Dr. Williams then added that the EIA would also identify mitigation measures for these potential impacts.

5. Mr. Eustace Alexander - Ecosystem Coordinator, Conservation International made several recommendations:

- i. He applauded the idea of collaboration, stating that this is very important for all stakeholders. He said that the Company should pursue the manifestation of a District Intelligence Committee at the Eve Leary Police Station, whereby there should be monthly meetings on observations of illegal activity in the area of the project site.
- ii. He stated that the project would fit neatly in the country's current national objectives of the LCDS and REDD+ and that the project should be undertaken in a manner that would portray good examples of these policies in practice.

iii. He expects that there would be collaboration among stakeholders on acquiring baseline conditions of the road to determine the alignment of the new and refurbished roads. For every road, a buffer zone is necessary. There are specific stipulations for buffer zones of roads as required by the Ministry of Public Works. While the required width may seem wide, which may be approximately 50 Km; this would fit in to the country's national objective.

iv. The issue of water quality is very important since the project site is located on a major watershed, that of the Essequibo River. Therefore the EIA should provide a thorough description on watershed management. Contact needs to be made with communities such as Apoteri since this community is located at the confluence of the Rupununi and Essequibo Rivers. The Company and these communities should work together to ensure that the water quality downstream is not compromised. The Essequibo River is a major river and activities upstream can have detrimental impacts on a wide geographic area.

v. He hopes that regulations are enforced to minimize social impacts such as the advent of discos and small townships in the area. On the other hand, this may not happen given the distance to the project site.

vi. He informed the gathering that the area is located close to a conservation zone and whatever Sherwood does, the company should not jeopardize the ecological integrity of the area and affect the use of the area by Amerindians. He hopes that the biological reserve of the area is not located in steep mountainous area and is actually representative of the forest of the project site. He hopes that the site is determined on a scientific basis. An Integrated Resource Management Plan should be developed since forest resources would be used by the Company and the community that would subsequently develop to support the logging activities. A social impact assessment should also be done to determine potential impacts on the nearby communities. The Company should not have the impression that the area is inaccessible since Conservation International visits the area to access their Concession and have noticed that Amerindians harvest Non Timber Forest Products such as palm products. In the dry season, the locals go into the area to hunt for turtle eggs. Mr. Alexander expressed his concern that the fish population in the area was once very high but has now significantly declined. Adequate buffer zones should be maintained along waterways to prevent contamination of these resources. It is his belief that Sherwood Forrests Incorporated is fortunate to have a Conservation Organisation as a Neighbour (the Conservation International Forest Concession). He stated that Conservation International would be willing to provide guidance to the Company in conducting the logging project in a sustainable manner. Dr. Williams stated that he agreed with most of what Mr. Alexander said. He reminded him that in terms of logging activities there are very strong guidelines stipulated in the GFC Code of Practice for Timber Harvesting, which would be followed. The Code of Practice stipulates buffer zones that need to be maintained along various waterways. The difficulty in management would be encountered outside of the Concession, to the north where the new road would be built and the existing roadway would be rehabilitated. This may result from a rush by individuals to occupy the newly accessible area. The area north of the Concession is unoccupied and sector agencies would have to meet and develop a plan to monitor this area that would now become accessible.

Mr. Thompson then informed the gathering that in addition to GFC's regulations, an Environmental Management Plan would have to be provided within the Environmental and Social Impact Assessment to deal with Environmental and Social issues and that the EPA would be regulating the implementation of this Plan. Within the Environmental Management Plan, a Monitoring Protocol would be included, detailing the approach that would be taken to monitor its implementation.

6. Ms. Nadia Madho - Research & Documentation Officer, National Trust of Guyana - requested that should Sherwood Forrests Inc. discover any archaeological deposits/historic artefacts, the Trust

should be notified immediately. Dr. Williams replied stating that having been on the Board of Directors for the National Trust, he is aware that this is mandatory.

7. **Mr. Eustace Alexander - Ecosystem Coordinator, Conservation International** -recommended that an archaeological survey be done along with the biological and ecological survey of the area, since the area was accessed years ago. Maybe old burial grounds and remnants of housing could be found. Mr. Marshall then stated that a coca plantation was observed within the project site, which was once managed by the Dutch, as he was informed by villagers of Apoteri. Mr. Alexander then informed him that there are also coca plantations at the bottom of the project site by the south western boundary. Dr. Williams also stated that there are coca plantations along the North Western section of the site and the elevated topography of these areas creates favourable conditions for these plants. Mr. Alexander replied that it is his understanding that the community of Apoteri had approached the North Rupununi District Development Board, regarding these coca plantations and so the operations of the project should not lead to their destruction. There should be collaboration with communities in managing these plantations, which would aid in improving their livelihoods. Dr. Williams also mentioned that in the northern section of the site, there are also cinchona trees which are used by the locals for medicinal purposes.

8. **Mr. Amarnauth Maraj - Principal Environmental Health Officer, Environmental Health Unit, Ministry of Health** - firstly inquired about the amount of employees that would be employed at the commencement of operations. Dr. Williams informed him that it is expected that 200-300 workers would be initially employed, and would be involved in road construction. He expressed the interest of the Company in obtaining support from the Ministry of Health. There may be the presence of malaria in the area, for example, and he therefore hopes that a medical facility would be established in the area to do smears and to also respond to potential accidents. The company would seek to collaborate with the Ministry of Health to retain a permanent Medex in the area to respond to health and safety issues and malaria. The Ministry of Health would be contacted in instances where such diseases emerge.

Secondly, he stated that the Company would need to look at the types of construction materials and carefully plan the construction of housing facilities, to ensure adequate ventilation. The source of drinking water and method of treatment should be included in the EIA. Sanitation too should be addressed. Dr. Williams stated that it may be necessary to sink a well, since water is currently sourced from the river bed. An impact assessment of the well would be done. Mr. Maraj then mentioned that solid waste and wastewater disposal would need to be addressed. This should be conducted in such a manner to prevent infestation of vectors. The impact of waste disposal on the soil type would also need to be indicated. With regards to food, the food processing area would have to be properly managed and persons working in this facility would need to be trained on a regular basis. For occupational health and safety, he expects that there would be a person on site, responsible for these activities. If pesticides are used in pest control, they should be used and stored, properly. A proposal on the management of these chemicals should be submitted to the Ministry of Health. He stated that before the company embarks on the project, he would send his comments to them. He also requested to view their Environmental Management Plan.

Mr. Thompson then informed him that the Environmental Management Plan would be provided as a section of the ESIA Report. When this document is submitted, it would be distributed to all relevant stakeholders.

9. **Mr. Monty Niamatali - Managing Director, Variety Woods and Greenheart Limited** - then recommended that the company consider the establishment of an airstrip for evacuation purposes in the event of an emergency. Dr. Williams stated that this was already being discussed with Mr. Marshall. Another alternative is to upgrade the existing trail to the Essequibo River towards Apoteri and to upgrade the airstrip there.

10. **Mr. S.K. Chan - Chief Executive Officer - Demerara Timbers Limited** - expressed concerns on the economic aspect of the project. While the environmental obligations are necessary, the project should be viewed in an economic sense as well. He is very concerned about the remoteness of the project site and the distance to its location and is sceptical whether it is economically viable to pursue. He viewed his opinion that there should be thorough discussions on project components to properly plan their execution. However, in implementing the project, plans may change due to the situation on site. During the project life, various undesirable elements may be encountered in the Concession, such as miners. As such, a Land Use Plan should be developed to delineate the respective land uses allowed for an area. Economics is the criterion that determines the feasibility of the project because if it is not considered, the project would be another that starts out well only to become unsuccessful, such the UNAMCO project. Dr. Williams thanked Mr. Chan for his comment and informed him that the Company is looking at the stocking of the site. In a few weeks, projections would be done on the stocks available against the various processes necessary to generate estimates which would determine the feasibility of the project.

11. **Ms. Karen Small - Technical Officer, National Parks Commission** - stated that logging would have negative impacts on the environment. She expressed concern on the zoning of the area and would like aspects such as skid trail alignment properly planned and documented. The biological baseline of the area should be properly documented and the location of the biodiversity reserve should be adequately justified in comparison to the area allocated for logging. Dr. Williams responded by saying that any economic activity would have negative environmental impacts and the key is to minimize these impacts by following the relevant regulations. The natural habitat has to be used to generate income and conservation has to be balanced with economics to reduce unemployment and crime, thereby generating revenue to be circulated in the country. Mr. Marshall then mentioned that once the Environmental Impact Assessment and the Environmental Management Plan are found to be acceptable by the EPA, the Company still has to produce a Business Plan, Forest Management Plan as well as an Annual Operation Plan to the GFC. Therefore, skid trails would have to be planned before they are constructed on site. As such, they would not be constructed anytime soon.

12. **Mr. Charles Thom - Chairman, Upper Berbice Forest and Agricultural Producers Association** - then expressed his concern and his hope that the regulatory agencies do not deter the project because over five thousand persons would be happy for the execution of the project. It would contribute to the improvement of the livelihood of the people in Region 10. Dr. Williams replied that the Company would be happy to see the project begin and they are keen on mobilizing phase two of the project which would contribute to the development of the livelihood of the people in the area in which it would be executed.

13. **Mr. P.D. Allan - Vice President, Simon & Shock International Incorporated** - stated that the forest is a natural asset that should be developed for the benefit of the country. The idea that everything should be saved and the forest should be preserved should not be encouraged. These resources should be utilized sustainably instead.

14. **Mr. Eustace Alexander - Ecosystem Coordinator, Conservation International** - agreed with the point that

economics is important and that it is not feasible to invest money if the project would not generate adequate economic returns. However, it is important to recognize that our country is under a Low Carbon Initiative under the Low Carbon Development Strategy. If we succeed in managing our forest and its ecological resources, we stand to benefit economically under this strategy. Within the Low Carbon Development Strategy; we are referring to mining and forestry as being executed sustainably and as such these activities have to remain in this manner. Since sustainable management of our forests would enable us to earn revenue, this resource should also be viewed as an asset in this regard.

15. **Mr. G. A. Norton- Chief, Guyana Organisation of Indigenous Peoples** -mentioned that even though there are existent regulations that should be enforced, the track record of compliance by companies is not outstanding. For large projects, the first casualties are the indigenous peoples. These economic activities would impact on the culture of these people. As such, this issue should be addressed in the EIA. If we are to gain economic benefits from the project and our forests, it should not compromise the use of the resource by the Amerindian people and their livelihood. Dr. Williams then informed him that he understood these sentiments and with the advent of the Low Carbon Development Strategy, the GFC is very involved in ensuring that the Strategy is properly executed.

16. **Mr. Eustace Alexander - Ecosystem Coordinator, Conservation International** -recommended that guidance for the execution of this project be sought from Iwokrama since they are undertaking sustainable logging in a section of their forest. The Sherwood Forrests Inc. project fits neatly into the time in which the Low Carbon Development Strategy is being initiated and could provide a framework that others can follow. The project needs to demonstrate that proper ecological management could occur concurrently with an economical activity, with the relevant regulatory agencies such as the GFC, EPA and stakeholders such as the North Rupununi District Development Board overseeing it. The project needs to be properly managed since in Region Nine, there exist sensitive ecosystems, such as wetlands and savannahs. Dr. Williams then referred to Mr. Chan's comments that a National Land Use Plan needs to be commissioned which would clearly indicate the suitability of a project within an area to determine whether it should be allowed.

17. **Mr. Monty Niamatali - Managing Director, Variety Woods and Greenheart Limited** - expressed his opinion that the forestry sector is receiving more scrutiny of recent. Even though the sector has improved in terms of environmental management, it is not recognized. He gave an example, whereby in the recent past, when a harpy eagle was noticed in a concession, the block in which it was cited was closed. The eagle was allowed to nest and subsequently eaglets were hatched. There is a great need for the project in Region 10 since it would greatly contribute to the livelihood of various families. It needs to be recognized that the number of responsible developers are increasing. However, there needs to be a balance between environmental management and the economic activity.

There being no other questions or concerns raised, Mr. Hance Thompson outlined the next steps of the EIA 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 EIA 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. He informed the gathering of the Environmental Assessment Board, which oversees the EIA process and functions to recommend to the EPA whether environmental authorization should be granted for the project. He urged the stakeholders present to review the EIA report and to submit comments to the

Agency. He thanked everyone for attending the meeting and expressed his gratitude to the GFC for facilitating the meeting in their boardroom.

The meeting concluded at 11:35 hours.

Annex III: List of Persons Consulted

| | Name | Affiliation |
|--|--------------------|-----------------------------------|
| | ALEXANDER, Eustace | Conservation International |
| | ALFRED, Elvis | Resident-Apoteri Village |
| | BOWEN, Defreitas | Resident-Apoteri Village |
| | JOHN, Fabian | Resident-Apoteri Village |
| | JOSEPH, Benedict | Resident-Apoteri Village |
| | JOSEPH, Clement | Resident-Apoteri Village |
| | JOSEPH, Tadius | Resident-Apoteri Village |
| | LIVAN, Karen | Guyana Geology & Mines Commission |
| | MATTHEWS, Bernard | Ex-Surveyor SLS |
| | PETERS, Desmond | Resident-Apoteri Village |
| | SINGH, Kellon | Resident-Apoteri Village |

Annex XX. Rapid Rural Appraisal Questionnaire

The consultant visited the communities of the Rupununi River and North Rupununi on two occasions in 2010 gathering socio-economic data. Villagers were selected for participation in order to cover all user groups within the communities. Participants were shown a map of the area indicating their location in relation to the project. Participants were not interviewed following the set questionnaire format but allowances were made accordingly to meet the needs of the participant while gathering the relevant information. The main object was to gather relevant information while keeping the exercise as simple as possible. Questions asked included:

1. What forest resources do you use?
2. Where do you gather these resources?
3. Are you familiar with your village area on the map shown?
4. Do you ever go into the area shown in the map to gather any resources? (consultant identifies Sherwood Project Site)
5. Are you aware of any resident who goes into the area shown on the map? (consultant identify Sherwood project Site)
6. Did you ever hear of Sherwood Forests before this interview?
7. Are you willing to work with this company should the opportunity be provided?
8. What is your current occupation?
9. Are you aware of sustainable logging practices?
10. Do you support logging by any village or company?
11. How will you like to see the North Rupununi develop?
12. How many members of your family are formally employed? How much do they make per month?
13. What health services are available in or in close proximity to your village?
14. Do you believe the company will make a difference to your village?
15. What is your level of education? How about that of your family members?
16. Do you own an outboard engine? What is your main method of transportation?
17. How often do you venture into the Essequibo River area for fishing or hunting?
18. Are there any sacred sites in your village?

In addition to the interviews data was gathered from published materials including the government's household census. Data was also collected from the community health workers and local schools.

Annex IV: Description of the boundaries of the area under SFEP

Right Bank Lysles River, left bank Corentyne River; right bank Essequibo River; right bank Berbice River;

Commencing at the mouth of the Lysles River, left bank Corentyne River, having approximate geographical coordinates of 0385694E, 0438270N;

thence up the left bank Corentyne River for an approximate distance of 48.1km to the mouth of an unnamed tributary having approximate geographical coordinates 0408956E, 0404077N;

thence up the left bank of this unnamed tributary to a point near its source having approximate geographical coordinates of 0400180E, 0397246N;

thence by a cut line in a north-westerly direction for an approximate distance of 5.78km to a point near the source of an unnamed tributary of a large unnamed tributary of Essequibo River having approximate geographical coordinates 0394486E, 0398782N;

thence down the right bank of this unnamed tributary to its mouth on the right bank of the large unnamed tributary of the Essequibo River having approximate geographic coordinates of 0383829E, 0396053N;

thence down the right bank of this large unnamed tributary to its mouth on the right bank Essequibo River having approximate geographic coordinates of 0357263E, 0400009N;

thence down the right bank Essequibo River for an approximate distance of 2.1km to the mouth of an unnamed tributary having approximate geographic coordinate of 0356924E, 0401565N;

thence up the left bank of this unnamed tributary for approximately 1.3km to a point opposite the mouth of a small unnamed tributary having approximate geographic coordinates of 0357469E, 0402572N;

thence across and up the left bank of this small unnamed tributary to a point near its source having approximate geographic coordinates of 0359103E, 0404367N;

thence by a cut line in a north easterly direction for an approximate distance of 4.4km, to a point near the source of an unnamed tributary of the Essequibo River having approximate geographic of 0362762E, 0406817N;

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 geographic coordinates of 0364850E, 0410130N;

thence across and down this unnamed tributary for about 1km to the mouth of another unnamed tributary having approximate geographic coordinates 0364246E, 0410832N;

thence up the left bank of this unnamed tributary to a point near its source having approximate geographic coordinates 0359816E, 0415284N;

thence by a cut line in a north westerly direction for an approximate distance of 3km to a point near the source of an unnamed tributary on the left bank Berbice River having approximate geographic coordinates 0357161E, 0416628N;

thence down the right bank of this unnamed tributary to its mouth on the left bank Berbice River having approximate geographic coordinates 0363302E, 0424193N;

thence across and down the right bank Berbice River for an approximate distance of 34km to the mouth of an unnamed tributary having approximate geographic coordinates 0359530E, 0442045N;

thence up the left bank of this unnamed tributary to a point near its source having approximate geographic coordinates 0376442E, 0431398N;

thence by a cut line in a north westerly direction for an approximate distance of 3.6 km to a point near the source of an unnamed tributary of the Lysles River having approximate geographic coordinates 0379491E, 0433381N;

thence down the right bank of this unnamed tributary to its mouth on right bank of the Lysles River having approximate geographic coordinates of 0380111E, 0435574N;

thence down the right bank Lysles River to its mouth on the left bank Corentyne River, this being the point of commencement; save and except all lands legally held; having an approximate area of 167,066 hectares; and incorporated in map sheets 62NE, 62NW, 62SE, 62SW, 63NW, and 63SW.

Coordinates have not been field tested and this description is subject to changes upon verification of the boundaries through ground surveys.

Annex V: FAO Forest Types (Wright, 1999)

1. Mixed forests on FAO/UNDP photo-mosaics
 - a) Mixed forests on undulating or hilly terrain
 - b) Mixed forest on flat to undulating terrain, generally on clay or loam 30m
 - c) Mixed forest on deeply dissected sloping terrain, often rocky, irregular 30m canopy
 - d) Liana forest; scattered trees of poor form, festooned with lianas, on heavier soils
 - e) Mixed forest on flat terrain with regular canopy on brown sand soils in Zone 4
 - f) Mixed forest on flat to undulating terrain; uniform, small-crowned in zone 1
 - g) Mixed forest on hilly and broken terrain in Zone 1
 - h) Mixed forest on moderate to steep slope, with exposed rocks
 - i) Low mixed forest on lateritic benches; large boulders
 - j) Mixed forest on flattish upland sites, associated with high hills
 - k) Low small crowned forest with Wallaba patches [Zone 4]
 - l) Low forest in type 1e, Zone 4

2. Wallaba and associated forests recognised on FAO/UNDP photo-mosaics
 - a) Clump Wallaba on flat v. Drained white sand ridges
 - b) Clump Wallaba with dispersed crowns on moister soils
 - c) Low, poor Wallaba-Dakama forest on flat white sands
 - d) Extreme form of 2c in Zone 4: scrub and bare white sand

3. Swamp and marsh forests recognised on FAO/UNDP photo-mosaics
 - a) River Levee forest, usually with a narrow Mora strip
 - b) Mora forest on flat alluvial clay
 - c) Marsh or swamp forest on flat terrain, + higher ground forest islands
 - d) Low, 'hog – wallowed' open swamp woodland
 - e) Swamp forest on permanent pegasse soils of coastal plain

4. Swamp and marsh forests recognised on FAO/UNDP photo-mosaics
 - a) Mangrove forest, bordering lower reaches of major rivers
 - b) Low, open mangrove woodland

Hawthorne points out that "Topography is one of the criteria in the classification – not simply forest appearance. Although these categories were undoubtedly very useful for enhancing the precision of subsequent inventory, and will relate in some cases very closely with any other 'biological' classification, the categories, especially of type 1, clearly leave much room for improvement. Moist forest is obviously complex, and seriously in need of a better treatment to subdivide it. A species ordination alone would probably be a far better basis for subdividing the country's forests; this may well reveal a significant difference between subtypes of Moist forest, but would more surely reveal several categories that would better merged or 're-dispersed' amongst others. Mild and Groot (1970) note that the same forest type in some cases differs from zone to zone – it is this fact that provide the keenest limitation on the value of the classification, particularly when coupled with the fact that inventory data for such conflicts can themselves not distinguish such variation. "

Annex VI (a): Classification of forests of Guyana (Ter Steege, 1998)

5 National Forest Inventories and Protected Areas

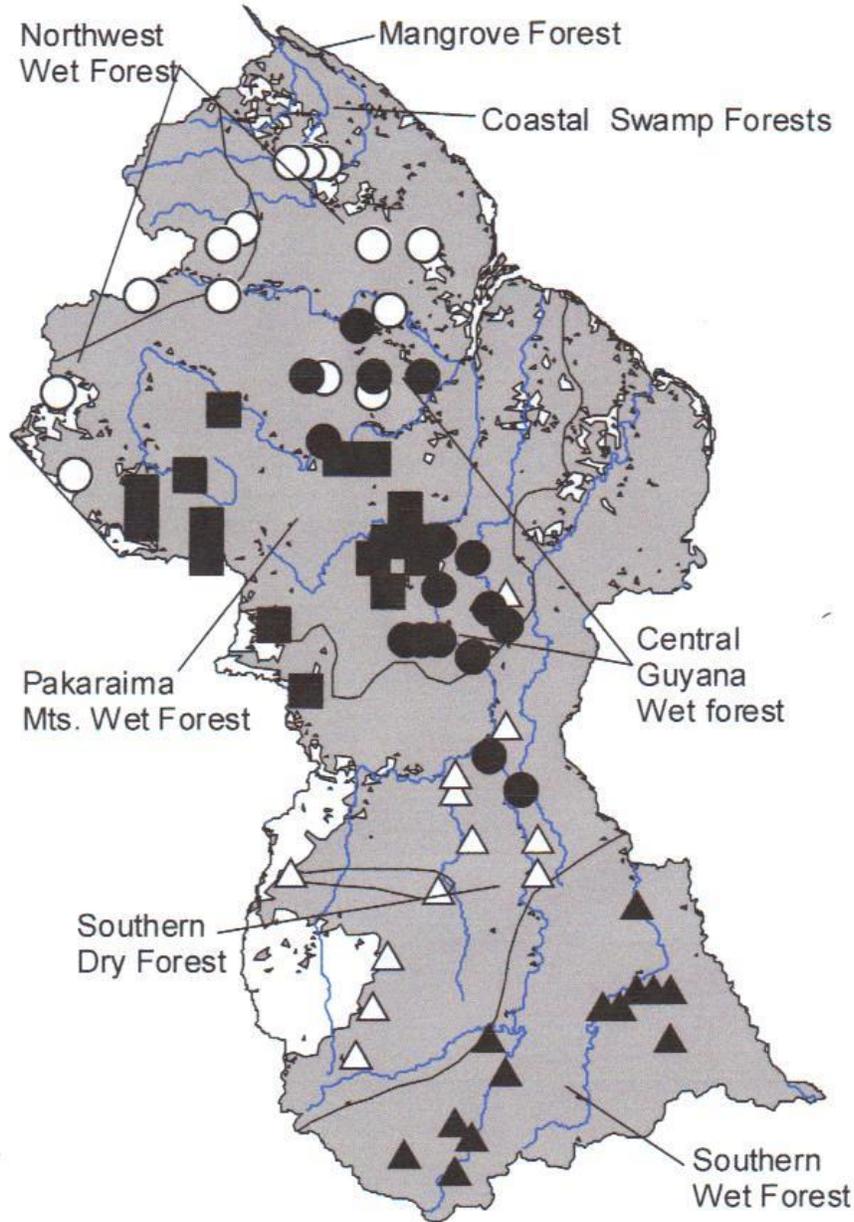


Figure 5.2 Geographical location of 72 forest locations in Guyana based on a standard (default parameters) TWINSpan classification (Table 1 for details). TWINSpan groups: ▲ Southern Wet Forests; ▽ Southern Dry Forests; ■ Pakaraimas Mts. Wet Forests; ● Central Guyana Wet Forest; ○ Northwest Guyana Wet Forests. Light grey areas: area under forest cover, based on NOAA-AVHRR satellite images of September 1992 (<http://edcdaac.usgs.gov/1KM/comp10d.html>). Thin lines: 2300 mm annual rainfall isohyeth (based on Persaud 1994, see Figure 6.3 for more information)

Annex VI (b) Presence and abundance of Selected Species by Forest Region (ter Steege, 1998)

5 National Forest Inventories and Protected Areas

Table 5.1 Synoptic table of Guyana's national forest regions. Presence is calculated as percentage of locations in a region in which the species is present. Abundance (between brackets) is given in #trees/100 ha as average for the region. (Presented are those species having at least a presence of 50% in one area) Species with abundance > 85% or density over 200/100ha are shaded.

| Forest region | South Wet | South Dry | Pakar. Mts. Wet | Central Wet | Northw. Wet |
|--|--------------|--------------|--------------------|----------------|----------------|
| No. of locations | 13 | 12 | 17 | 16 | 14 |
| total plot area (ha) | 25 | 25.7 | 60.4 | 50.4 | 23.6 |
| Species | | | | | |
| <i>Parkia pendula</i> | 69 (56) | | 12 (3) | | |
| <i>Geissospermum argenteum/sericeum</i> | 100 (240) | 33 (31) | 6 (2) | | |
| <i>Pourouma guianensis/tomentosa</i> | 85 (104) | 42 (27) | 18 (12) | 13 (4) | |
| <i>Parkia ulei</i> | 54 (64) | 42 (31) | 24 (7) | | |
| <i>Anacardium giganteum</i> | 23 (12) | 50 (27) | | 6 (4) | |
| <i>Strychnos/Glycidendron</i> | 54 (32) | 8 (4) | 18 (8) | 13 (4) | |
| <i>Licania/Pouteria</i> | 54 (56) | 42 (78) | 18 (7) | 19 (8) | |
| <i>Licania</i> 5spp. | 77 (88) | 50 (31) | 18 (12) | 13 (12) | 14 (8) |
| <i>Hevea pauciflora</i> | 54 (56) | 8 (4) | 47 (35) | | 7 (4) |
| <i>Brosimum guianense</i> | 69 (76) | 42 (58) | 24 (7) | 19 (10) | 14 (8) |
| <i>Pouteria coriacea</i> | 85 (128) | 17 (23) | 29 (15) | 13 (6) | 21 (13) |
| <i>Sclerolobium guianense/micropetalum</i> | 77 (100) | 75 (105) | 41 (20) | 38 (20) | 7 (4) |
| <i>Eschweilera coriacea/decolorans</i> | 100 (200) | 8 (4) | 65 (182) | 13 (8) | 21 (25) |
| <i>Tetragastris panamensis</i> | 77 (68) | 42 (70) | 59 (33) | 31 (14) | 7 (4) |
| <i>Pseudiptadenia suaveolens</i> | 69 (84) | 50 (35) | 41 (25) | 50 (18) | |
| <i>Ormosia</i> 6spp. | 77 (60) | 25 (23) | 53 (35) | 19 (10) | 21 (13) |
| <i>Macarobium</i> 3spp. | 54 (112) | 8 (4) | 24 (23) | 6 (4) | 21 (25) |
| <i>Lecythis holcogyne</i> | 62 (44) | 75 (74) | 53 (28) | 31 (22) | 14 (21) |
| <i>Parinari/Excellodendron</i> | 85 (116) | 83 (101) | 41 (13) | 38 (22) | 29 (21) |
| <i>Ocotea canaliculata</i> | 92 (128) | | 53 (30) | 19 (6) | 29 (21) |
| <i>Virola</i> spp. | 31 (20) | 50 (43) | | 31 (14) | 7 (8) |
| <i>Chamaecrista apoucouita</i> | 38 (44) | 8 (4) | 53 (46) | 13 (12) | 7 (4) |
| <i>Pithecellobium Elizabetha</i> | 46 (40) | 67 (70) | 71 (71) | 44 (24) | 7 (4) |
| <i>Swartzia</i> 9spp. | 85 (160) | 75 (58) | 71 (78) | 69 (46) | 21 (21) |
| <i>Trichilia rubra</i> | 54 (64) | 50 (93) | 29 (10) | 38 (20) | 29 (25) |
| <i>Terminalia dichotoma</i> | 62 (52) | 58 (74) | 71 (73) | 31 (14) | 36 (34) |
| <i>Pouteria filipes</i> | 77 (136) | 75 (54) | 18 (18) | 56 (36) | 50 (38) |
| <i>Parinari excelsa</i> | 23 (24) | 50 (27) | 6 (2) | 63 (22) | |
| <i>Inga alba</i> | 77 (84) | 83 (78) | 59 (50) | 63 (50) | 50 (59) |
| <i>Sloanea/Couepia</i> 10spp. | 69 (76) | 25 (16) | 76 (55) | 25 (20) | 43 (38) |
| <i>Ocotea floribunda</i> | 77 (104) | 50 (47) | 59 (33) | 56 (24) | 43 (38) |
| <i>Pouteria</i> 3spp. | 69 (92) | 50 (70) | 71 (45) | 56 (30) | 36 (42) |
| <i>Manilkara bidentata</i> | 31 (28) | 92 (128) | 47 (35) | 31 (14) | 36 (38) |
| <i>Vitex</i> 5ssp. | 15 (8) | 58 (47) | 18 (15) | 19 (8) | 21 (13) |
| <i>Cordia</i> 6spp. | 23 (16) | 25 (12) | 53 (25) | 19 (14) | 14 (21) |
| <i>Goupia glabra</i> | 92 (240) | 75 (144) | 76 (51) | 81 (56) | 57 (89) |
| <i>Couratari</i> 5spp. | 38 (20) | 92 (117) | 71 (36) | 44 (24) | 43 (34) |
| <i>Eperua grandiflora/jenmanii</i> | 85 (348) | 25 (152) | 65 (169) | 56 (89) | 50 (76) |
| <i>Licania</i> 6spp. | 85 (208) | 83 (109) | 88 (71) | 75 (73) | 64 (135) |
| <i>Aspidosperma/Casearia/Drypetes</i> | 54 (68) | 67 (74) | 35 (12) | 44 (28) | 50 (47) |
| <i>Apeiba/Annona</i> | 46 (32) | 42 (51) | 59 (35) | 38 (16) | 36 (42) |
| <i>Inga</i> spp. | 85 (84) | 42 (54) | 71 (91) | 63 (50) | 57 (148) |
| <i>Pouteria guianensis</i> | 69 (96) | 8 (4) | 65 (48) | 38 (32) | 43 (38) |

Plant Diversity in Guyana

Table 5.1 (continued)

| Forest region | South Wet | South Dry | Pakar. Mts. Wet | Central Wet | Northw. Wet |
|--|-----------|-----------|-----------------|-------------|-------------|
| <i>Licania</i> 3spp. | 69 (160) | 58 (43) | 100 (124) | 50 (95) | 57 (144) |
| <i>Lecythis corrugata</i> | 54 (44) | 33 (31) | 41 (20) | 50 (18) | 36 (25) |
| <i>Jacaranda copaia</i> | 46 (28) | 17 (16) | 59 (43) | 38 (16) | 29 (21) |
| <i>Mouriri</i> 8spp. | 54 (52) | | 18 (5) | 13 (8) | 43 (47) |
| <i>Pterocarpus</i> 4spp. | 69 (140) | 25 (19) | 41 (63) | 38 (52) | 57 (102) |
| <i>Chaetocarpus schomburgkianus/stipularis</i> | 62 (96) | 67 (117) | 53 (30) | 63 (46) | 57 (76) |
| <i>Pouteria calmito/jenmani</i> | 15 (12) | 33 (27) | 53 (31) | 19 (14) | 21 (13) |
| <i>Catostemma</i> 3spp. | 92 (148) | 75 (175) | 82 (257) | 100 (180) | 79 (199) |
| <i>Micropholis venulosa (melinonii?)</i> | 23 (20) | 42 (62) | 53 (31) | 38 (20) | 29 (17) |
| <i>Peltogyne</i> spp. | 31 (20) | 50 (39) | 47 (23) | 50 (26) | 36 (25) |
| <i>Moronobea coccinea</i> | 8 (12) | | 53 (33) | 25 (10) | |
| <i>Dicymbe alisonii</i> | | | 94 (475) | 13 (85) | |
| <i>Licania alba/majuscula</i> | 69 (168) | 50 (93) | 59 (58) | 75 (127) | 79 (220) |
| <i>Ormosia coutinhoi</i> | | | 76 (50) | 13 (8) | |
| <i>Chamaecrista adiantifolia</i> | | | 65 (48) | 13 (6) | |
| <i>Eschweilera potaroensis</i> | 8 (4) | | 59 (205) | 31 (22) | |
| <i>Sterculia rugosa</i> | 23 (16) | 50 (58) | 53 (23) | 50 (28) | 43 (68) |
| <i>Swartzia</i> 3spp. | 31 (44) | 25 (12) | 41 (27) | 25 (8) | 50 (42) |
| <i>Carapa guianensis/procera</i> | 38 (44) | 33 (51) | 94 (215) | 69 (129) | 57 (85) |
| <i>Lecythis zabucajo</i> | 38 (36) | 8 (4) | 53 (41) | 50 (32) | 50 (59) |
| <i>Swartzia leiocalycina</i> | 8 (4) | 50 (175) | 47 (124) | 100 (337) | 21 (25) |
| <i>Pithecellobium jupunba</i> | 15 (12) | 33 (19) | 35 (13) | 81 (30) | 29 (30) |
| <i>Chlorocardium rodiei</i> | 8 (4) | 8 (4) | 47 (96) | 81 (256) | |
| <i>Eperua falcata</i> | 38 (284) | 17 (16) | 94 (278) | 81 (220) | 86 (148) |
| <i>Eschweilera sagotiana/subglandulosa</i> | 23 (32) | 58 (113) | 94 (288) | 100 (440) | 100 (669) |
| <i>Tapirira obtusa</i> | 8 (4) | 17 (8) | 82 (73) | 19 (8) | 57 (47) |
| <i>Diospyros/Lissocarpa</i> | 23 (12) | | 59 (43) | 44 (16) | 57 (55) |
| <i>Mora gonggrijpii</i> | | 25 (78) | 59 (136) | 75 (250) | 36 (182) |
| <i>Clathrotropis brachypetala/macrocarpa</i> | | 17 (19) | 65 (61) | 63 (52) | 43 (42) |
| <i>Mora excelsa</i> | | 42 (198) | 76 (214) | 75 (392) | 93 (355) |
| <i>Protium</i> 3spp. | | | 82 (68) | 63 (56) | 71 (182) |
| <i>Pentaclethra macroloba</i> | | | 88 (252) | 56 (67) | 79 (131) |
| <i>Alexa</i> spp. | 8 (16) | | 65 (129) | 50 (103) | 86 (635) |
| <i>Unknown</i> spp. | 62 (120) | 42 (23) | 88 (197) | 63 (56) | 14 (21) |

Annex VII: Specimen of Field Forms used for Forest Inventory

(i)

Appendix * Summary Form for recording line and plot information

Booker (initials): *R Peters* Inventory name: *MANAGEMENT LEVEL LINE # 7*

General location: *SHERWOOD FOREST Coacoa Creek Upper Essequibi River* Time period: *09:45hrs* Form #: of

| Line number | GPS commencement at | | Plot number | Horizontal Distance along line (m) | Remarks | |
|-------------|---------------------|---------|-------------|------------------------------------|-------------------------------|---|
| | North | West | | | | |
| 07 | 0371815 | 0401769 | | 4+200m | marsh forest | |
| | | | | 4+100m | | |
| | | | | 4+000m | Lasia Palm | |
| | | | | 3+900m | | |
| | | | | 3+800m | | |
| 07 | 0370590 | 0402513 | Pl 05 | 3+400m | marsh forest | |
| | | | | | 3+300 | |
| | | | | | 3+200 | |
| 07 | 0370457 | 0402772 | Pl 04 | 3+100 | | |
| | | | | | 3+000 | CK impression at pt, Palm forest |
| | | | | | 2+900m | |
| | | | | | 2+800m | |
| | | | | | 2+700m | |
| | | | | | 2+600 | |
| | | | | | 2+500m | |
| | | | | | 2+400 | |
| | | | | | 2+300 | |
| | | | | | 2+200 | |
| 07 | 0369880 | 0403831 | Pl 03 | 2+100 | merabukca | |
| | | | | | 1+900m | merabukca forest |
| | | | | | 1+800m | |
| | | | | | 1+700 | |
| | | | | | 1+600 | merabukca forest |
| | | | | | 1+500m | |
| | | | | | 1+400 | |
| | | | | | 1+300 | High canopy forest |
| | | | | | 1+200m | Mixed forest, banyan sand |
| | | | | | 1+100m | Rapay bush, Loteria soil |
| 07 | 0369247 | 0405003 | Pl 01 | 1+000 | Rapay bush | |
| | | | | | 7+00m | |
| | | | | | 8+00 | Rat outcrop, seeming H ₂ O shed area |
| | | | | | 7+00m | Rapay bush |
| | | | | | 6+00m | low forest |
| 07 | 4.6 EPM | | | 5+00m | marsh forest white sand | |
| | | | | | 4+00m | marsh forest on white sand |
| | | | | | 3+00 | marsh forest, maricela palm |
| 07 | 0369011 | 0405440 | - | 1+00m | Mixed forest on white sand | |
| | | | | 0+00 | ubudi tree with fruited shrub | |

NOTE: Line should commence at point 0369000 0405300 at a point approx 12,600 m along line 06, and extends thence on a bearing of 155° towards Coacoa Creek.

(ii)



**GUYANA FORESTRY COMMISSION
MANAGEMENT LEVEL INVENTORY FORM – DEM – SFP's**

GFC's Booking Form for Sample Plots

11:15 hrs - 11:40 hrs

Part 1: Plot Information

Crew members (Initials): R. Peters, J. Kothu Date: 2010/02/13 General location: SHERWOOD FOREST
D. Bowen Cocoa creek
Upper Essequibo River

Line number: 07 Line Bearing (true): 155° Plot number: 01
GPS North: 0369250 West: 0405003 EPE: 4.6 Waypoint name: L7-P01

Slope %: 01 Slope aspect: 1 Soil type: White sand

Forest Type: Marsh Disturbance: 0 Canopy Closure: 2

Main Plot Observations: Low canopy forest occasional palms

Part 2: Main Plot: Plot radius (m): 18

a) Trees (all species) Minimum dbh (cm): 35

| Tree | Species | Dbh | Risk | Log length/m | Tree | Species | Dbh | Risk | Log length/m |
|------|------------------|-----|------|-----------------|------|---------|-----|------|-----------------|
| 1 | Lika pinnatifida | 65 | 0 | 8 | 22 | 0.33 | | | |
| 2 | Tiki bacoballi | 45 | 0 | 9 | 23 | 0.15 | | | |
| 3 | Cork wood | 57 | 0 | 4 | 24 | 0.25 | | | |
| 4 | Tiki bacoballi | 49 | 0 | 4 | 25 | 0.18 | | | |
| 5 | Simarouba | 41 | 2 | 8 | 26 | 0.13 | | | |
| 6 | Bacaballi | 41 | 0 | 7 | 27 | 0.13 | | | |
| 7 | Adaballi | 52 | 0 | 6 | 28 | 0.21 | | | |
| 8 | Tiki bacoballi | 37 | 0 | 6 | 29 | 0.10 | | | |
| 9 | Hurassa | 37 | 0 | 4 | 30 | 0.10 | | | |
| 10 | Umbellata | 45 | 2 | 6 | 31 | 0.15 | | | |
| 11 | | | | | 32 | 1.73 | | | |
| 12 | | | | | 33 | | | | |
| 13 | | | | | 34 | | | | |
| 14 | | | | | 35 | | | | |
| 15 | | | | | 36 | | | | |
| 16 | | | | | 37 | | | | |
| 17 | | | | | 38 | | | | |
| 18 | | | | | 39 | | | | |
| 19 | | | | | 40 | | | | |
| 20 | | | | | 41 | | | | |
| 21 | | | | | 42 | | | | |

b) Stumps Minimum diameter (cm):

| Stump | Species (if known) | Diam | @ Ht | Stump | Species (if known) | Diam | @ Ht |
|-------|--------------------|------|------|-------|--------------------|------|------|
| 1 | | | | 6 | | | |
| 2 | M. l | | | 7 | | | |
| 3 | | | | 8 | | | |
| 4 | | | | 9 | | | |
| 5 | | | | 10 | | | |

(All stump diameters and heights in centimeters)

(iii)

Stump/ logging observations:

2c) Main plot – NTFPs (plants, fruits, vines and orchids)

| # | Species | Host tree | Harvestable size? Y/N | # | Species | Host tree | Harvestable size? Y/N |
|---|---------------|-----------|-----------------------|----|---------|-----------|-----------------------|
| 1 | Kakerita Palm | | | 10 | | | |
| 2 | Nippi | | N | 11 | | | |
| 3 | | | | 12 | | | |
| 4 | | | | 13 | | | |
| 5 | | | | 14 | | | |
| 6 | | | | 15 | | | |
| 7 | | | | 16 | | | |
| 8 | | | | 17 | | | |
| 9 | | | | 18 | | | |

(Host tree – main tree on which NTFP is living on)

Part 3: Sub-Plot (all tree species) Plot radius: 8m Minimum dbh (cm): 10 cm

| Tree | Species | Dbh | Risk | Log length | Tree | Species | Dbh | Risk | Log length |
|------|------------------|-----|------|------------|------|---------|-----|------|------------|
| 1 | Baremalli seed | 34 | 0 | 8 | 22 | | | | |
| 2 | sweet heart tree | 16 | 0 | 3 | 23 | | | | |
| 3 | Guavabelli | 12 | 0 | 2 | 24 | | | | |
| 4 | Titiki bareballi | 34 | 0 | 6 | 25 | | | | |
| 5 | Haiaweballi | 16 | 2 | 3 | 26 | | | | |
| 6 | Baremalli | 31 | 0 | 7 | 27 | | | | |
| 7 | Kakaralli Black | 11 | 0 | 3 | 28 | | | | |
| 8 | Kakaralli Black | 13 | 0 | 3 | 29 | | | | |
| 9 | Barabara | 10 | 4 | 1 | 30 | | | | |
| 10 | Baremalli | 28 | 0 | 8 | 31 | | | | |
| 11 | Kakaralli | 25 | 0 | 7 | 32 | | | | |
| 12 | sweet heart tree | 13 | 0 | 6 | 33 | | | | |
| 13 | | | | | 34 | | | | |
| 14 | | | | | 35 | | | | |
| 15 | | | | | 36 | | | | |
| 16 | | | | | 37 | | | | |
| 17 | | | | | 38 | | | | |
| 18 | | | | | 39 | | | | |
| 19 | | | | | 40 | | | | |
| 20 | | | | | 41 | | | | |
| 21 | | | | | 42 | | | | |

Part 4: Presence of Animal (Mammal, Birds, Reptiles, Amphibian and Fishes)

| Type of animal | Seen (Y/N) | # of individual | Other indication | Animal name |
|----------------|------------|-----------------|------------------|-------------|
| Arboreal | | | | |
| Terrestrial | — | — | Sound | Macaw |
| Aquatic | — | — | — | — |

(Arboreal-animal living in tree; Terrestrial-animal living on land; Aquatic-animal living in water)

Annex VIII (b): Sustained Yield Report - Primary Merchantable Species

Total plan area, ha 167,066 Annual coupe, ha 6,683
 Felling cycle: 25 Minimum diameter: 35 Logging method: Reduced Impact

| Species | Abundance % of BA | Net Recruits n/ha | Net Stock n/ha | ---- on annual coupe ---- | | ---- on plan area ---- | |
|-------------------------|----------------------|----------------------|-------------------|---------------------------|---------------|------------------------|--------------|
| | | | | Harvest n/ha | Yield m3/h | Harvest n/yr | AAC m3/yr |
| Mora | 56.9% | 9.82 | 24.08 | 9.82 | 100.87 | 65,646 | 674,105 |
| Crabwood | 2.7% | 1.87 | 4.69 | 1.87 | 4.61 | 12,496 | 30,782 |
| Itikiboroballi | 1.1% | 0.62 | 1.43 | 0.62 | 2.11 | 4,120 | 14,075 |
| Wamara | 1.1% | 0.70 | 1.63 | 0.70 | 2.08 | 4,669 | 13,887 |
| Kabukalli | 1.1% | 0.22 | 0.61 | 0.22 | 1.56 | 1,492 | 10,451 |
| Cedar red | 1.0% | 0.42 | 1.22 | 0.42 | 1.41 | 2,777 | 9,431 |
| Baromalli | 0.8% | 0.83 | 1.22 | 0.83 | 2.27 | 5,558 | 15,167 |
| Wallaba soft | 0.6% | 0.54 | 1.02 | 0.54 | 1.38 | 3,598 | 9,249 |
| Kakaralli black | 0.6% | 0.54 | 1.02 | 0.54 | 1.29 | 3,598 | 8,626 |
| Maho | 0.4% | 0.31 | 0.82 | 0.31 | 0.65 | 2,040 | 4,314 |
| Darina | 0.3% | 0.10 | 0.20 | 0.10 | 0.66 | 680 | 4,405 |
| Silverballi yellow | 0.3% | 0.16 | 0.41 | 0.16 | 0.45 | 1,098 | 2,978 |
| Bulletwood | 0.2% | 0.13 | 0.41 | 0.13 | 0.40 | 842 | 2,678 |
| Burada | 0.1% | 0.07 | 0.20 | 0.07 | 0.18 | 497 | 1,193 |
| Baromalli sand | 0.1% | 0.11 | 0.20 | 0.11 | 0.27 | 751 | 1,831 |
| Cedar white | 0.1% | 0.06 | 0.20 | 0.06 | 0.11 | 383 | 704 |
| Simarupa | 0.1% | 0.05 | 0.20 | 0.05 | 0.10 | 347 | 663 |
| Silverballi brown | 0.1% | 0.10 | 0.20 | 0.10 | 0.17 | 654 | 1,119 |
| Wallaba ituri | 0.1% | 0.10 | 0.20 | 0.10 | 0.16 | 654 | 1,052 |
| Total harvested species | 67.8% | 16.74 | 40.00 | 16.74 | 120.71 | 111,899.1 | 806,711 |

Annex VIII (c): Sustained Yield Report - Lesser Used Species

Total plan area, ha 167,066 Annual coupe, ha 6,683
 Felling cycle: 25 Minimum diameter: 35 Logging method: Reduced Impact

| Species | Abundance % of BA | Net Recruits n/ha | Net Stock n/ha | ---- on annual coupe ---- | | ---- on plan area ---- | |
|-------------------|----------------------|----------------------|-------------------|---------------------------|---------------|------------------------|--------------|
| | | | | Harvest n/ha | Yield m3/h | Harvest n/yr | AAC m3/yr |
| Wadara | 2.8% | 1.58 | 2.45 | 1.58 | 8.79 | 10,580 | 58,764 |
| Corkwood | 2.7% | 1.82 | 4.08 | 1.82 | 4.14 | 12,169 | 27,699 |
| Unknown | 2.6% | 1.98 | 2.86 | 1.98 | 7.43 | 13,229 | 49,683 |
| Fukadi | 2.5% | 1.21 | 1.84 | 1.21 | 6.87 | 8,080 | 45,943 |
| Haiariballi | 2.2% | 0.79 | 1.43 | 0.79 | 5.07 | 5,304 | 33,886 |
| Iron Mary | 1.6% | 2.06 | 2.86 | 2.06 | 4.95 | 13,753 | 33,097 |
| Morabukea | 1.2% | 0.96 | 1.43 | 0.96 | 3.48 | 6,418 | 23,281 |
| Wadara fine leaf | 1.2% | 0.66 | 1.02 | 0.66 | 3.11 | 4,408 | 20,815 |
| Kakaralli others | 1.0% | 0.92 | 1.43 | 0.92 | 2.48 | 6,173 | 16,570 |
| Baromalli | 0.8% | 1.12 | 1.22 | 1.12 | 3.06 | 7,494 | 20,450 |
| Yaruru | 0.8% | 0.66 | 1.02 | 0.66 | 2.09 | 4,410 | 13,987 |
| Barakaro | 0.7% | 0.22 | 0.41 | 0.22 | 1.68 | 1,481 | 11,223 |
| Parakusan | 0.6% | 0.51 | 1.22 | 0.51 | 1.40 | 3,406 | 9,350 |
| Kurokai common | 0.6% | 0.56 | 0.82 | 0.56 | 1.77 | 3,744 | 11,837 |
| Wallaba soft | 0.6% | 0.73 | 1.02 | 0.73 | 1.87 | 4,851 | 12,471 |
| Haiahaia | 0.6% | 0.26 | 0.41 | 0.26 | 1.58 | 1,764 | 10,577 |
| Kakaralli black | 0.6% | 0.73 | 1.02 | 0.73 | 1.74 | 4,851 | 11,631 |
| Kaditiri | 0.5% | 0.42 | 0.82 | 0.42 | 1.12 | 2,811 | 7,476 |
| Dukali | 0.5% | 0.22 | 0.41 | 0.22 | 1.04 | 1,480 | 6,977 |
| Manniballi | 0.5% | 0.13 | 0.20 | 0.13 | 1.33 | 882 | 8,917 |
| Wamaradan | 0.5% | 0.26 | 0.41 | 0.26 | 1.32 | 1,764 | 8,853 |
| Manariballi | 0.5% | 0.26 | 0.41 | 0.26 | 1.25 | 1,764 | 8,347 |
| Manyokinaballi | 0.5% | 0.40 | 0.61 | 0.40 | 1.29 | 2,693 | 8,632 |
| Marishiballi | 0.5% | 0.30 | 0.61 | 0.30 | 0.92 | 1,981 | 6,176 |
| Maho | 0.4% | 0.41 | 0.82 | 0.41 | 0.87 | 2,751 | 5,817 |
| Haiawaballi | 0.4% | 0.27 | 0.41 | 0.27 | 1.11 | 1,834 | 7,443 |
| Kakaralli Wina | 0.3% | 0.20 | 0.20 | 0.20 | 1.38 | 1,323 | 9,203 |
| Kakarua | 0.3% | 0.46 | 0.61 | 0.46 | 1.09 | 3,087 | 7,252 |
| Serebebeballi | 0.3% | 0.46 | 0.61 | 0.46 | 1.08 | 3,087 | 7,226 |
| Warakaoro | 0.3% | 0.13 | 0.20 | 0.13 | 0.85 | 882 | 5,672 |
| Dalli | 0.3% | 0.20 | 0.41 | 0.20 | 0.62 | 1,312 | 4,128 |
| Silverballi white | 0.3% | 0.13 | 0.20 | 0.13 | 0.82 | 882 | 5,504 |

| Species | Abundance % of BA | Net Recruits n/ha | Net Stock n/ha | Harvest n/ha | Yield m3/h | Harvest n/yr | AAC m3/yr |
|-------------------------|----------------------|----------------------|-------------------|-----------------|---------------|-----------------|--------------|
| Ruri | 0.3% | 0.30 | 0.61 | 0.30 | 0.59 | 1,981 | 3,972 |
| Silverballi yellow | 0.3% | 0.22 | 0.41 | 0.22 | 0.60 | 1,480 | 4,015 |
| Warakosa | 0.2% | 0.10 | 0.20 | 0.10 | 0.47 | 660 | 3,154 |
| Tibicushe | 0.2% | 0.26 | 0.41 | 0.26 | 0.62 | 1,764 | 4,124 |
| Banyaballi | 0.2% | 0.20 | 0.41 | 0.20 | 0.43 | 1,349 | 2,850 |
| Moraballi | 0.2% | 0.31 | 0.20 | 0.20 | 0.85 | 1,364 | 5,678 |
| Monkey pot | 0.2% | 0.13 | 0.20 | 0.13 | 0.50 | 882 | 3,320 |
| Yurula | 0.2% | 0.13 | 0.20 | 0.13 | 0.48 | 882 | 3,210 |
| Kuyama | 0.2% | 0.13 | 0.20 | 0.13 | 0.45 | 882 | 2,989 |
| Dukuria | 0.2% | 0.21 | 0.20 | 0.20 | 0.68 | 1,364 | 4,527 |
| Kautaballi | 0.2% | 0.10 | 0.20 | 0.10 | 0.31 | 675 | 2,100 |
| Adebero | 0.2% | 0.11 | 0.20 | 0.11 | 0.31 | 740 | 2,092 |
| Kamakuti | 0.2% | 0.26 | 0.41 | 0.26 | 0.41 | 1,764 | 2,713 |
| Maporokon | 0.1% | 0.07 | 0.20 | 0.07 | 0.20 | 468 | 1,330 |
| Waiaballi | 0.1% | 0.11 | 0.20 | 0.11 | 0.27 | 740 | 1,831 |
| Suya | 0.1% | 0.11 | 0.20 | 0.11 | 0.31 | 741 | 2,075 |
| Kauta fine leaf | 0.1% | 0.13 | 0.20 | 0.13 | 0.33 | 882 | 2,182 |
| Dalli hill | 0.1% | 0.10 | 0.20 | 0.10 | 0.24 | 656 | 1,623 |
| Dalli swamp | 0.1% | 0.10 | 0.20 | 0.10 | 0.24 | 656 | 1,623 |
| Baromalli sand | 0.1% | 0.15 | 0.20 | 0.15 | 0.37 | 1,012 | 2,469 |
| Cedar white | 0.1% | 0.08 | 0.20 | 0.08 | 0.14 | 516 | 949 |
| Kauta | 0.1% | 0.13 | 0.20 | 0.13 | 0.27 | 882 | 1,821 |
| Huruasa | 0.1% | 0.15 | 0.20 | 0.15 | 0.32 | 1,006 | 2,127 |
| Hiriballi | 0.1% | 0.20 | 0.20 | 0.20 | 0.43 | 1,323 | 2,877 |
| Corkwood hill | 0.1% | 0.12 | 0.20 | 0.12 | 0.27 | 830 | 1,779 |
| Blackheart | 0.1% | 0.13 | 0.20 | 0.13 | 0.25 | 882 | 1,641 |
| Wallaba ituri | 0.1% | 0.13 | 0.20 | 0.13 | 0.21 | 882 | 1,418 |
| Plum | 0.1% | 0.13 | 0.20 | 0.13 | 0.19 | 882 | 1,280 |
| Total harvested species | 33.6% | 25.36 | 40.41 | 25.26 | 88.38 | 168,786.8 | 590,654 |

Annex IX: Forestry Inventory²⁸

| | <u>Compartment Name</u> | <u>Area in Hectares</u> | <u>Area (%) Percentage</u> |
|-------------------|-----------------------------|---------------------------|----------------------------|
| a) | North Berbice Compartment | =22,327 Hectares | 13 |
| b) | South Berbice Compartment | =26,257 Hectares | 16 |
| c) | East Berbice Compartment | =22,425 Hectares | 14.2 |
| d) | Essequibo Compartment | =27,167 Hectares | 12 |
| e) | North Corentyne Compartment | =15,859 Hectares | 18.2 |
| f) | West Corentyne Compartment | =31,020 Hectares | 13.8 |
| g) | South Corentyne Compartment | =22,011 Hectares | 17.8 |
| Total Area | | = 167,066 Hectares | 100% |

| # | Block | No. of trees | Volume (m3) |
|----------------|-------|--------------|-------------|
| 1 | 1G | 427 | 1,589.00 |
| 2 | 1H | 289 | 1,566.11 |
| 3 | 2E | 424 | 1,304.00 |
| 4 | 2F | 583 | 4,980.00 |
| 5 | 2G | 302 | 1,068.92 |
| 6 | 2H | 289 | 1,810.00 |
| 7 | 3E | 507 | 1,318.00 |
| 8 | 3F | 400 | 1,461.00 |
| 9 | 3G | 330 | 1,215.38 |
| 10 | 3H | 319 | 1,747.44 |
| 11 | 4E | 449 | 1,252.00 |
| 12 | 4F | 282 | 2,759.30 |
| 13 | 4G | 331 | 1,231.04 |
| 14 | 4H | 519 | 2,936.64 |
| 15 | 5E | 329 | 922.96 |
| 16 | 5F | 326 | 1,216.69 |
| 17 | 5G | 328 | 1,099.00 |
| 18 | 6E | 360 | 1,108.00 |
| 19 | 6F | 375 | 1,110.00 |
| 20 | 6G | 258 | 955.00 |
| Mean | | | 1,632.52 |
| STDEV | | | 952.26 |
| SE | | | 212.93 |
| Upper Boundary | | | 2,049.87 |
| Lower Boundary | | | 1,215.18 |

²⁸ SFI's FMP2013-2017

| # | Species | BI 1G | BI 1H | Blk 2E | BI 2F | BI 2G | BI 2H | BI 3E | BI 3F | BI 3G | BI 3H | BI 4E | BI 4F | BI 4G | BI 4H | BI 5E | BI 5F | BI 5G | BI 6E | BI 6F | BI 6G | Total | % |
|----|-------------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | Antswood | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 7 | 0.09 |
| 2 | Baradan | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0.04 |
| 3 | Baromalli | 3 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 2 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 3 | 6 | 2 | 25 | 0.34 |
| 4 | Brown Silvi | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| 5 | B-Shib | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| 6 | Bullet wood | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 22 | 0 | 0 | 0 | 0 | 0 | 9 | 34 | 0.46 |
| 7 | Burada | 2 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 4 | 6 | 0 | 22 | 0.30 |
| 8 | COFM | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | 0 | 0 | 0 | 7 | 0 | 0 | 3 | 2 | 0 | 0 | 1 | 28 | 0.38 |
| 9 | Cow wood | 1 | 1 | 24 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 4 | 0 | 40 | 0.54 |
| 10 | Crawood | 37 | 42 | 0 | 23 | 12 | 17 | 31 | 42 | 33 | 25 | 52 | 28 | 30 | 29 | 43 | 21 | 28 | 47 | 61 | 35 | 636 | 8.57 |
| 11 | Dali | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| 12 | Dara | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 3 | 0.04 |
| 13 | Darina | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.03 |
| 14 | H-Mani | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 8 | 0 | 0 | 2 | 22 | 0.30 |
| 15 | Hububalli | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0.03 |
| 16 | Kabukalli | 31 | 4 | 9 | 34 | 33 | 4 | 16 | 21 | 2 | 20 | 31 | 1 | 9 | 6 | 21 | 16 | 17 | 34 | 27 | 13 | 349 | 4.70 |
| 17 | Kereti | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| 18 | KKRB | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0.07 |
| 19 | KKRW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 5 | 0.07 |
| 20 | KRTB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 3 | 0.04 |
| 21 | Kuroki | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| 22 | Lemonaballi | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 0.05 |
| 23 | Locust | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 12 | 5 | 1 | 26 | 6 | 0 | 54 | 0.73 |
| 24 | Maho | 1 | 3 | 0 | 1 | 3 | 0 | 3 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 6 | 0 | 0 | 7 | 6 | 0 | 34 | 0.46 |
| 25 | Monkey pot | 5 | 2 | 7 | 4 | 5 | 1 | 8 | 8 | 3 | 4 | 20 | 13 | 5 | 6 | 16 | 3 | 1 | 20 | 26 | 1 | 158 | 2.13 |
| 26 | Mora | 298 | 171 | 371 | 466 | 170 | 253 | 412 | 308 | 265 | 178 | 254 | 224 | 257 | 413 | 137 | 242 | 216 | 62 | 157 | 165 | 5019 | 67.60 |
| 27 | Mora Buka | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0.13 |
| 28 | B-Mamu | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0.07 |
| 29 | R-Mamu | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 7 | 0.09 |
| 30 | Purpleheart | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 9 | 2 | 0 | 15 | 0.20 |
| 31 | Red Cedar | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0.05 |

| # | Species | BI 1G | BI 1H | Blk 2E | BI 2F | BI 2G | BI 2H | BI 3E | BI 3F | BI 3G | BI 3H | BI 4E | BI 4F | BI 4G | BI 4H | BI 5E | BI 5F | BI 5G | BI 6E | BI 6F | BI 6G | Total | % |
|-------|----------------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| 32 | Shibdhan | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 1 | 4 | 1 | 1 | 24 | 0.32 |
| 33 | Silverballi | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| 34 | Simarupa | 0 | 2 | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 15 | 0.20 |
| 35 | Soya | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 9 | 0.12 |
| 36 | Suradan | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.03 |
| 37 | Tatabu | 0 | 0 | 0 | 3 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0.08 |
| 38 | Ulu | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0.07 |
| 39 | Unkown | 1 | 8 | 3 | 3 | 4 | 0 | 7 | 1 | 2 | 7 | 7 | 0 | 0 | 1 | 12 | 2 | 5 | 31 | 15 | 3 | 112 | 1.51 |
| 40 | Uya | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 6 | 0 | 0 | 12 | 0.16 |
| 41 | Wadara | 1 | 1 | 2 | 13 | 0 | 2 | 4 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 5 | 6 | 8 | 24 | 14 | 10 | 93 | 1.25 |
| 42 | Wallaba | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 12 | 0.16 |
| 43 | Wamara | 13 | 44 | 5 | 28 | 61 | 8 | 20 | 0 | 13 | 56 | 63 | 11 | 13 | 39 | 65 | 18 | 31 | 68 | 28 | 11 | 595 | 8.01 |
| 44 | Washiba | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 4 | 0 | 0 | 6 | 11 | 0 | 33 | 0.44 |
| 45 | Wina Kakaralli | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.01 |
| 46 | WDCO | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 4 | 0.05 |
| Total | | 427 | 289 | 424 | 583 | 302 | 287 | 507 | 400 | 330 | 319 | 449 | 282 | 331 | 519 | 329 | 326 | 328 | 360 | 375 | 258 | 7425 | 100.00 |

Pictures showing different Vegetative structure surveyed at the Sherwood Forest Concession



Annex X: Fauna Recorded within the Concession Area

A. MAMMALIAN SPECIES RECORDED AT SHERWOOD FOREST CONCESSION – UPPER BERBICE RIVER (November 2009 to February 2010)

O: Observed; F.T.: Feeding and Tracks; R.: Reported by residents; C.I.T.E.S

| Common Name | Scientific Name | O | F.T. | R. | C.I.T.E.S |
|-------------------------------|--------------------------|---|------|----|-----------|
| Opossums | Marsupialia, Didelphidae | | | | |
| Brown four-eyed Opossum | Metachirus nudicaudatus | X | | | |
| Anteaters, Sloths, Armadillos | Xenarthra | | | | |
| Anteaters | Myrmecophagidae | | | | |
| Tamandua | Tamandua tetradactyla | | X | | |
| Pygmy Anteater | Cyclopes didactylus | | X | | |
| Sloths | Bradypodidae | | | | |
| Three-toed Sloth | Bradypus tridactylus | | | X | |
| Toed-toed Sloth | Choloepus didactylus | | | X | |
| Armadillos | Dasypodidae | | | | |
| Armadillo | Cabassus sp. | X | | | |
| Monkeys | Primates | | | | |
| Marmosets, Tamarins | Callitrichidae | | | | |
| Golden-handed Tamarin | Saguinus midas | | X | | 11 |
| Monkey | Cebidae | | | | |
| Squirrel Monkey | Saimiri sciureus | | X | | 11 |
| Brown Capuchin Monkey | Cebus paella | | X | | 11 |
| Wedge-capped Capuchin | Cebus olivaceus | | X | | 11 |
| Howler Monkey | Alouatta seniculus | | X | | 11 |
| Spider Monkey | Ateles paniscus | | | X | 11 |
| Carnivores | Carnivora | | | | |
| Coatis | Procyonidae | | | | |
| South American Coati | Nasua nasua | | X | | |
| Kinkajou | Potos flavus | | | | X |
| Cats | Felidae | | | | |
| Ocelot | Leopardus pardalis | | | | X 1 |
| Puma | Puma concolor | | | | X 1 |
| Jaguar | Panthera onca | | | X | X 1 |
| Tapirs | Perissodactyla | | | | |
| | Tapiridae | | | | |
| Tapir | Tapirus terrestris | | | X | X 11 |
| Peccaries, Deer | Artiodactyla | | | | |
| | Tayassuidae | | | | |
| Collared Peccary | Tayassu tajacu | | | X | X 11 |
| White-lipped Peccary | Tayassu pecari | | | X | X 11 |

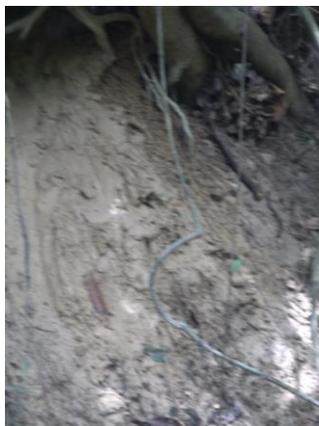
| | | | | | |
|--------------------|---------------------------|-----------|-------------|-----------|--------------|
| Deer | Cervidae | | | | |
| Red Brocket Deer | Mazama americana | X | | | |
| Common Name | Scientific Name | O. | F.T. | R. | CITES |
| Rodents | Rodentia | | | | |
| Squirrels | Sciuridae | | | | |
| Guianan Squirrel | Sciurus aestuans | X | | | |
| Pacas | Agoutidae | | | | |
| Paca or Labba | Agouti paca | | | | |
| Agoutis | Dasyproctidae | | | | |
| Red-rumped Agouti | Dasyprocta agouti | X | | | |
| | Hydrochaeridae | | | | |
| Capybara | Hydrochaeris hydrochaeris | X | | | |

MAMMALIAN SPECIES RECORDED AT SHERWOOD FOREST CONCESSION (May 2014)

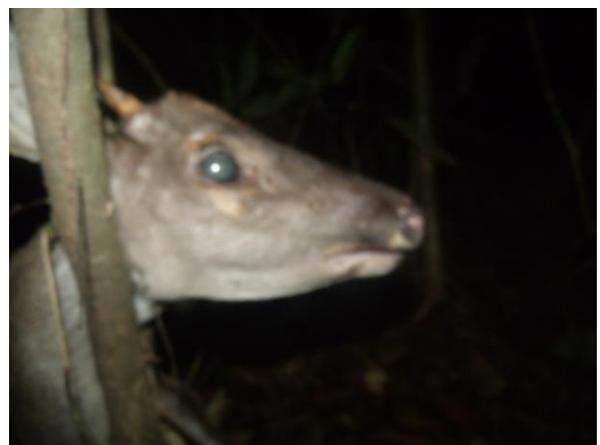
| Species | Common Name | SFI 1 | SFI 2 | SFI 3 | COCO CREEK | TOTAL SFI |
|------------------------------|-----------------------|-------|-------|-------|------------|-----------|
| CEBIDAE | | | | | | |
| <i>Cebus apella</i> | Brown Capuchin | 5 | | 2 | | 7 |
| <i>Cebus olivaceus</i> | Wedge-Capped Capuchin | | 3 | | | 3 |
| <i>Saimiri sciureus</i> | Squirrel Monkey | | 15 | | | 15 |
| ATELIDAE | | | | | | |
| <i>Ateles paniscus</i> | Black Spider Monkey | 2 | | 1 | | 3 |
| <i>Alouatta seniculus</i> | Red Howler Monkey | 5 | 2 | 6 | | 13 |
| PITHECIIDAE | | | | | | |
| <i>Chiropetes satanus</i> | Brown Bearded Saki | 7 | | | | 7 |
| <i>Pithecia pithecia</i> | White faced Saki | 6 | | | | 6 |
| CALLITRICHIDAE | | | | | | |
| <i>Saguinus midas</i> | Golden Handed Tamarin | | | 2 | | 2 |
| DASYPODIDAE | | | | | | |
| <i>Dasypus novemcintus</i> | Nine-Banded Armadillo | 1 | | | | 1 |
| <i>Priodontes maximus</i> | Giant Armadillo | | 1 | | | 1 |
| DIDELPHIDAE | | | | | | |
| <i>Didelphis marsupialis</i> | Common Opossum | 2 | | 1 | | 3 |
| <i>Philander opossum</i> | Four-eyed Opossum | | 1 | | | 1 |
| <i>Marmosa murina</i> | Murine Mouse Opossum | 1 | | 2 | | 3 |
| MYRMECOPHAGIDAE | | | | | | |
| <i>Tamandua tetradactyla</i> | Tamandua | | 1 | | | 1 |
| PROCYONIDAE | | | | | | |

| | | | | | | |
|-------------------------------|----------------------|-----------|-----------|-----------|----------|------------|
| <i>Potos flavus</i> | Kinkajou | | 2 | | | 2 |
| <i>Nasua nasua</i> | Coatimundi | 1 | | | | 1 |
| MUSTELIDAE | | | | | | |
| <i>Pteronura brasiliensis</i> | Giant Otter | | | | 7 | |
| <i>Lontra longicaudis</i> | Southern River Otter | | | | 1 | |
| FELIDAE | | | | | | |
| <i>Panthera onca</i> | Jaguar | 2 | 1 | | | 3 |
| <i>Puma concolor</i> | Puma | | | 1 | | 1 |
| <i>Leopardus pardalis</i> | Ocelot | | 1 | | | 1 |
| <i>Herpailurus yagourundi</i> | Jagourundi | | | | | |
| <i>Leopardus wiedii</i> | Margay | 1 | | | | 1 |
| CERVIDAE | | | | | | |
| <i>Mazama americana</i> | Gray Brocket Deer | 2 | | 1 | | 3 |
| TAYASSUIDAE | | | | | | |
| <i>Tayassu pecari</i> | Collared Peccary | | 5 | | | 5 |
| <i>Tayassu tajacu</i> | White Lipped Peccary | 15 | | | | 15 |
| TAPIRIDAE | | | | | | |
| <i>Tapirus terrestris</i> | Lowland Tapir | | 1 | | | 1 |
| CUNICILIDAE | | | | | | |
| <i>Cuniculus paca</i> | Agouti | 3 | 2 | 1 | | 6 |
| DASYPROCTIDAE | | | | | | |
| <i>Dasyprocta leporina</i> | Red Rumped Agouti | | 2 | | | 2 |
| Number of Individuals | | 53 | 37 | 17 | 8 | 107 |
| Number of Species | | 14 | 13 | 9 | | 29 |

Images of Mammals, Signs and Habitat Use



Pteronura brasiliensis entrance with tracks and rub marks



Mazama americana



Pteronura brasiliensis den



Marmosa murine

BAT SPECIES KNOWN TO OCCUR IN THE PROJECT AREA (November 2009 to February 2010)

| Common Name | Scientific Name |
|------------------|---------------------------|
| Bats | Chiroptera |
| Sac-winged Bat | Emballonuridae |
| Sac-winged Bat | Comuriabrevirostris |
| | Saccopteryx leptura |
| | Mormoopidae |
| Moustached Bat | Pteronotus parnelli |
| Moustached Bat | Pteronotus gymnotus |
| | Noctilionidae |
| Fishing Bat | Noctilio albiventris |
| | Phyllostomidae |
| Long-legged Bat | Macrophyllum macrophyllum |
| Big-eared Bat | Micronycteris megalotis |
| Hairy-nosed Bat | Mimom crenulatum |
| Spear-nosed Bat | Phyllostomus discolor |
| Frog-eating Bat | Trachops cirrhosus |
| Long-tongued Bat | Glossophaga soricina |
| Fruit Bat | Rhinophylla pumilio |
| Fruit Bat | Artibeus concolor |
| Large-fruit Bat | Artibeus planirostris |
| White-lined Bat | Platyrrhinus helleri |
| Tent-making Bat | Uroderma bilobatum |
| | Molossidae |
| Tree-tailed Bat | Molossus molossus |

BATS RECORDED AT SHERWOOD FOREST CONCESSION (May 2014)

| Species | Common Name | SFI 1 | SFI 2 | SFI 3 | SFI TOTAL |
|------------------------------------|----------------------------------|--------------|--------------|--------------|------------------|
| Phyllostomidae | | | | | |
| <i>Artibeus glaucus</i> | Dwarf Fruit-Eating Bat | 1 | 1 | | 2 |
| <i>Artibeus obscurus</i> | Dark Fruit-Eating Bat | 3 | 6 | 6 | 15 |
| <i>Artibeus concolor</i> | Brown Fruit-Eating Bat | 4 | | | 4 |
| <i>Artibeus lituratus</i> | Great Fruit-Eating Bat | 2 | 4 | 4 | 10 |
| <i>Artibeus planirostris</i> | Flat Face Fruit-Eating Bat | 4 | 9 | 5 | 18 |
| <i>Uroderma bilobatum</i> | Tent-Making Bat | | | | |
| <i>Carollia brevicauda</i> | Silky Short-Tailed Bat | 2 | | | 2 |
| <i>Carollia perspicillata</i> | Seba's Short Tailed Bat | 2 | | 2 | 4 |
| <i>Glyphoncycteris daviesi</i> | Davies's Big-Eared Bat | | 2 | | 2 |
| <i>Chrotopterus auritus</i> | Peter's Woolly False Vampire Bat | | | 1 | 1 |
| <i>Mimon crenulatum</i> | Striped Hairy-Nosed Bat | | 2 | | 2 |
| <i>Tonatia saurophila</i> | Stripe-headed Round-eared Bat | | 6 | | 6 |
| <i>Lophostoma schulzi</i> | Schulz's Round-Eared Bat | | | | |
| <i>Mesophylla macconnelli</i> | MacConnell's Bat | 1 | | | 1 |
| <i>Trachops cirrhosus</i> | Fringe-Lipped Bat | | | | |
| <i>Rhinophylla pumilio</i> | Dwarf Little-Fruit Bat | | 4 | 3 | 7 |
| <i>Lamproncycteris brachyotis</i> | Orange throated Big-Eared Bat | 2 | | | 2 |
| <i>Phylloderma stenops</i> | Pale-Faced Bat | 1 | 2 | | 3 |
| <i>Choeroniscus minor</i> | Lesser Long-Tailed Bat | 1 | | | 1 |
| <i>Vampyrum spectrum</i> | False Vampire Bat | | | | |
| Total Number of Individuals | | 23 | 36 | 21 | 80 |
| Total Number of Species | | 11 | 9 | 6 | 16 |

**B. BIRDS SPECIES RECORDED AT SHERWOOD FOREST CONCESSION, UPPER BERBICE RIVER
(November 2009 to February 2010)**

| Common Name | Scientific Name | C.I.T.E.S. |
|-----------------------|----------------------|------------|
| Tinamous | Tinamidae | |
| Great Tinamou | Tinamus major | |
| Little Tinamou | Crypturellus soui | |
| Vultures | Cathartidae | |
| King Vulture | Sarcoramphus papa | |
| Turkey Vulture | Cathartes aura | |
| Hawks, Eagles | Accipitridae | |
| Swallow-tailed Kite | Elanoides forficatus | |
| Bicolored hawk | Accipiter bicolor | |
| Roadside Hawk | Buteo magnirostris | |
| Gray Hawk | Buteo nitida | |
| Harpy Eagle | Harpia harpyja | 1 |
| Falcons, Caracaras | Falconidae | |
| Black Caracara | Daptrius ater | |
| Red-throated Caracara | Ibycter americanus | |
| Bat Falcon | Falco ruficularis | |
| Curassows, Guans | Cracidae | |
| Little Chachalaca | Ortalis motmot | |
| Marail Guan | Penelope marail | |
| Black Curassow | Crax alector | |
| Trumpeters | Psophiidae | |
| | Psophia crepitans | |
| Doves, Pigeons | Columbidae | |
| Ruddy Pigeon | Columba subvinacea | |
| Ruddy Quail Dove | Geotrygon Montana | |
| Gray-fronted Dove | Leptotila rufaxilla | |
| Ruddy Ground Dove | Columba talpacoti | |
| Parrots | Psittacidae | |
| Red and Green Macaw | Ara chloropterus | 11 |
| Scarlet Macaw | Ara macao | 11 |
| Red-bellied Macaw | Ara manilara | 11 |
| Blue-headed Parrot | Pionus menstruus | 11 |
| Dusky Parrot | Pionus fuscus | 11 |
| Yellow-headed Parrot | Amazona amazonica | 11 |
| Yellow-crowned Parrot | Amazona ochrocephala | 11 |
| Cuckoos | Cuculidae | |
| Black-bellied Cuckoo | Piaya cayana | |
| Hummingbirds | Trochilidae | |
| White-necked Jacobin | Florisuga mellivora | |

| | | |
|---------------------------|---------------------------|----|
| Blue-chinned Sapphire | Chlorestes notatus | |
| Long-tailed Hermit | Phaethornis superciliosus | |
| Reddish Hermit | Phaethornis ruber | |
| Toucans | Ramphastidae | |
| Red-billed Toucan | Ramphastos tucanus | 11 |
| Channel-billed Toucan | Ramphastos vitellinus | 11 |
| Black-necked Aracari | Pteroglossus aracari | 11 |
| Puffbirds | Bucconidae | |
| Black Nunbird | Monasa atra | |
| Spotted Puffbird | Bucco tomatia | |
| Jacamars | Galbalidae | |
| Paradise Jacamars | Galbula dea | |
| Green-tailed Jacamar | Galbula galbula | |
| Woodpeckers | Picidae | |
| Waved Woodpecker | Celus undulatus | |
| Chestnut Woodpecker | Celus elegans | |
| Woodcreepers | Thamnophilidae | |
| Great Antshrike | Taraba major | |
| White-plumed Antbird | Pithys albifrons | |
| Spot-backed Antbird | Hylophylax naevia | |
| Tyrant Flycatchers | Tyrannidae | |
| Forest Elania | Myiopagis gaimardii | |
| Ochre-bellied Flycatcher | Mionectes oleaginous | |
| Tropical Kingbird | Tyrannus melancholicus | |
| Piratic Flycatcher | Legatus leucophaeus | |
| Cotingas | Cotingidae | |
| Pampadous Cotinga | Xipolena punicea | |
| Screaming Phia | Lipaugus vociferans | |
| Purple-throated Fruitcrow | Querula purpurata | |
| Tanagers | Thraupidae | |
| Guira Tanager | Hemithraupis guira | |
| Magpie Tanager | Cissopis leveriana | |
| White-lined Tanager | Tachyphonus rufus | |
| Turquoise Tanager | Tangara mexicana | |
| Red-logged Honeycreeper | Cyanerpes cyaneus | |
| Blackbirds | Loteridae | |
| Crested Oropendola | Psarocolius decumanus | |
| Green Oropendola | Psaro colius viridis | |
| Yellow-rumped Cacique | Cacicus cela | |

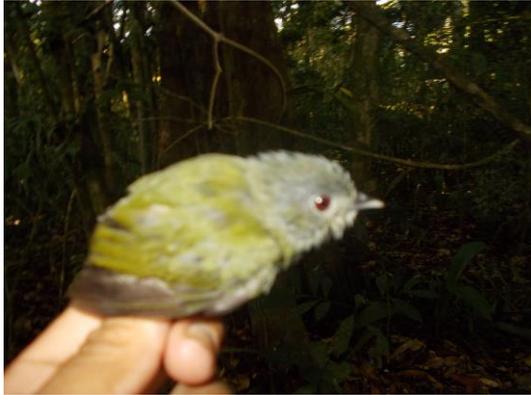
BIRDS SPECIES DIVERSITY AND ABUNDANCE AT SHERWOOD FOREST CONCESSION (VES, Point Count & mist-net data combined) (May 2014)

| BIRDS | | SFI 1 | SFI 2 | SFI 3 | SFI Total |
|----------------------------------|----------------------------------|-------|-------|-------|-----------|
| Tinamidae | TINAMOUS | | | | |
| <i>Tinamus major</i> | Great Tinamou | | | 1 | 1 |
| Cracidae | GUANS & CHACHALACAS | | | | |
| <i>Ortalis motmot</i> | Variable Chachalaca | | | 6 | 6 |
| <i>Penelope marail</i> | Marail Guan | 2 | 4 | | 6 |
| <i>Penelope jacquacu</i> | Spix's Guan | | 6 | | 6 |
| <i>Pipile cumanensis</i> | Blue-throated Piping-Guan | 4 | 4 | | 8 |
| <i>Crax alector</i> | Black Curassow | 2 | 4 | 6 | 12 |
| Ardeidae | HERONS & EGRETS | | | | |
| <i>Ardea cocoi</i> | White-necked (Cocoi) Heron | 2 | | | 2 |
| Threskiornithidae | IBIS & SPOONBILLS | | | | |
| <i>Mesembrinibis cayennensis</i> | Green Ibis | | 8 | | 8 |
| Accipitridae | HAWKS, EAGLES & KITES | | | | |
| <i>Leucopternis albicollis</i> | White Hawk | | | 1 | 1 |
| <i>Spizaetus ornatus</i> | Ornate Hawk-Eagle | | | 1 | 1 |
| Falconidae | FALCONS & CARACARAS | | | | |
| <i>Micrastur gilvicolis</i> | Lined Forest-Falcon | | | 1 | 1 |
| <i>Falco rufigularis</i> | Bat Falcon | | | 2 | 2 |
| Psophiidae | TRUMPETERS | | | | |
| <i>Psophia crepitans</i> | Gray-winged Trumpeter | | 12 | 8 | 20 |
| Columbidae | PIGEONS & DOVES | | | | |
| <i>Patagioenas subvinacea</i> | Ruddy Pigeon | | 2 | 8 | 10 |
| <i>Leptotila verreauxi</i> | White-tipped Dove | | | 1 | 1 |
| Psittacidae | PARROTS | | | | |
| <i>Ara ararauna</i> | Blue-and-yellow Macaw | 4 | | 2 | 6 |
| <i>Ara macao</i> | Scarlet Macaw | | | 4 | 4 |
| <i>Brotogeris chrysoptera</i> | Golden-winged Parakeet | 8 | | | 8 |
| <i>Pyrrhura picta</i> | Painted Parakeet | 14 | | | 14 |
| <i>Pionus fuscus</i> | Dusky Parrot | 12 | | 12 | 24 |
| <i>Amazona amazonica</i> | Orange-winged Parrot | 14 | | 12 | 26 |
| <i>Amazona farinosa</i> | Mealy Parrot | 4 | | 12 | 16 |
| <i>Derophtus accipitrinus</i> | Red-fan Parrot | | | 8 | 8 |
| Strigidae | OWLS | | | | |
| <i>Megascops watsonii</i> | Tawny-bellied Screech-Owl | | | 1 | 1 |
| Trochilidae | HUMMINGBIRDS | | | | |
| <i>Phaethornis superciliosus</i> | Eastern Long-tailed Hermit | 2 | 1 | 2 | 5 |

| | | | | | |
|-------------------------------------|-------------------------------|---|----|---|----|
| Trogonidae | TROGONS | | | | |
| <i>Trogon viridis</i> | White-tailed Trogon | | 1 | | 1 |
| Alcedinidae | KINGFISHERS | | | | |
| <i>Megaceryle torquata</i> | Ringed Kingfisher | | 2 | | 2 |
| <i>Chloroceryle inda</i> | Green-and-rufous Kingfisher | | 2 | | 2 |
| <i>Chloroceryle aenea</i> | American Pygmy Kingfisher | | | 2 | 2 |
| Bucconidae | PUFFBIRDS | | | | |
| <i>Monasa atra</i> | Black Nunbird | | 4 | 2 | 6 |
| Ramphastidae | TOUCANS | | | | |
| <i>Ramphastos vitellinus</i> | Channel-billed Toucan | 4 | | 2 | 6 |
| Picidae | WOODPECKERS | | | | |
| <i>Picus flavigula</i> | Yellow-throated Woodpecker | | 2 | 2 | 4 |
| <i>Celeus undatus</i> | Waved Woodpecker | | 1 | | 1 |
| <i>Celeus elegans</i> | Chestnut Woodpecker | | 1 | | 1 |
| <i>Dryocopus lineatus</i> | Lineated Woodpecker | 2 | | | 2 |
| Furnariidae | OVENBIRDS & ALLIES | | | | |
| <i>Xenops minutus</i> | Plain Xenops | | | 2 | 2 |
| Dendrocolaptidae | WOODCREEPERS | | | | |
| <i>Dendrocincla fuliginosa</i> | Plain-brown Woodcreeper | | 1 | | 1 |
| <i>Dendrocincla merula</i> | White-chinned Woodcreeper | | | 2 | 2 |
| <i>Glyphorhynchus spirurus</i> | Wedge-billed Woodcreeper | 2 | 4 | 6 | 12 |
| <i>Xiphorhynchus pardalotus</i> | Chestnut-rumped Woodcreeper | 1 | 2 | 2 | 5 |
| Thamnophilidae | ANTBIRDS | | | | |
| <i>Thamnophilus murinus</i> | Mouse-colored Antshrike | | | 4 | 4 |
| <i>Thamnomanes ardesiacus</i> | Dusky-throated Antshrike | | 10 | 8 | 18 |
| <i>Myrmotherula longipennis</i> | Long-winged Antwren | 2 | 5 | 4 | 11 |
| <i>Microrhoppias quixensis</i> | Dot-winged Antwren | | 2 | | 2 |
| <i>Herpsilochmus sticturus</i> | Spot-tailed Antwren | 2 | | | 2 |
| <i>Herpsilochmus stictocephalus</i> | Todd's Antwren | 6 | | | 6 |
| <i>Cercomacra tyrannina</i> | Dusky Antbird | | 6 | 6 | 12 |
| <i>Cercomacra cinerascens</i> | Gray Antbird | | | 4 | 4 |
| <i>Hypocnemis cantator</i> | Guianan Warbling-Antbird | 2 | | 2 | 4 |
| <i>Myrmeciza ferruginea</i> | Ferruginous-backed Antbird | | | 2 | 2 |
| <i>Myrmeciza atrothorax</i> | Black-throated Antbird | 2 | 9 | | 11 |
| <i>Hypocnemoides melanopogon</i> | Black-chinned Antbird | 6 | 6 | 5 | 17 |
| <i>Pithys albifrons</i> | White-plumed Antbird | | | 2 | 2 |
| <i>Gymnopithys rufigula</i> | Rufous-throated Antbird | 2 | 2 | | 4 |
| <i>Willisornis poecilinotus</i> | Scale-backed Antbird | 4 | 6 | 4 | 14 |
| Formicariidae | ANTTHRUSH | | | | |

| | | | | | |
|----------------------------------|----------------------------|----------------------------------|------------|------------|------------|
| <i>Hylopezus macularius</i> | Spotted Antpitta | | 2 | 2 | 4 |
| Tyrannidae | | FLYCATCHERS | | | |
| <i>Tyrannulus elatus</i> | Yellow-crowned Tyrannulet | | | 1 | 1 |
| <i>Lophotriccus galeatus</i> | Helmeted Pygmy-Tyrant | | | 2 | 2 |
| <i>Myiobius barbatus</i> | Whiskered Flycatcher | 2 | 3 | 2 | 7 |
| <i>Ramphotrigon ruficauda</i> | Rufous-tailed Flatbill | 2 | 1 | 1 | 4 |
| <i>Leptopogon superciliaris</i> | Slaty-capped Flycatcher | | 5 | 1 | 6 |
| <i>Contopus cooperi</i> | Olive-sided Flycatcher | 1 | | | 1 |
| <i>Onychorhynchus coronatus</i> | Amazon Royal Flycatcher | | | 2 | 2 |
| <i>Platyrrinchus saturatus</i> | Cinnamon-crested Spadebill | | 2 | 4 | 6 |
| Cotingidae | | COTINGAS | | | |
| <i>Lipaugus vociferans</i> | Screaming Piha | 2 | 4 | 12 | 18 |
| <i>Procnias alba</i> | White Bellbird | | 2 | | 2 |
| Pipridae | | MANAKINS | | | |
| <i>Corapipo gutturalis</i> | White-throated Manakin | 2 | 2 | | 4 |
| <i>Pipra pipra</i> | White-crowned Manakin | | 2 | | 2 |
| Vireonidae | | VIREOS | | | |
| <i>Hylophilus thoracicus</i> | Lemon-chested Greenlet | 2 | | 2 | 4 |
| Troglodytidae | | WRENS | | | |
| <i>Troglodytes aedon</i> | House Wren | 2 | 3 | | 5 |
| <i>Cyphorhinus arada</i> | Musician Wren | | 4 | | 4 |
| Cardinalidae | | GROSBEAKS & CARDINALS | | | |
| <i>Saltator grossus</i> | Slate-colored Grosbeak | 1 | | | 1 |
| <i>Caryothraustes canadensis</i> | Yellow-green Grosbeak | | 4 | | 4 |
| Icteridae | | ORIOLES & BLACKBIRDS | | | |
| <i>Cacicus cela</i> | Yellow-rumped Cacique | 2 | | | 2 |
| Number of Individuals | | 119 | 140 | 179 | 438 |
| Species Richness | | 32 | 37 | 47 | 74 |

Some Birds Species Observed within Sherwood Forrest Inc.



Dixiphia pipra



Juvenile white hawk



Ramphastos vitellinus



Royal flycatcher



Pigeon



Xiphorynchus guttatus

**C. REPTILIAN SPECIES RECORDED AT SHERWOOD FOREST CONCESSION, UPPER BERBICE RIVER
(November 2009 to February 2010)**

| Common Name | Scientific Name | Common Name | Scientific Name |
|----------------------|---------------------------------------|-----------------------------|--------------------------------------|
| Mata mata Turtle | Chelidae Chelus fimbriatus | | Serpentes Boidae |
| Side-necked Turtle | Pelomedusidae Podocnemis expansa | Boa constrictor Anaconda | Boa constrictor Eunectes murinus |
| River Turtle | Emydidae Rhinclemmys punctularia | Emerald Boa | Corallus caninus Colubridae |
| Red-foot Tortoise | Testudinidae Geochelone carbonaria | Parrot Snake Vine Snake | Chironius fuscus Oxybelis aeneus |
| Yellow-foot Tortoise | Geochelone dentriculata | Rainbow Boa | Epicrates cenchria |
| Spectacled Caiman | Crocodylidae Caiman crocodilia | Blunthead Tree Snake | Imantodes cenchoa Ahaetulla sp. |
| Dwarf Caiman | Paleosuchus palpebrosus | Yellow tail Snake | Drymarchon corias |
| Lubo Lizard | Gekkonidae Gonotodes sp. | Tree Labaria | Viperidae Bothriopsis bilineata |
| Forest Lizard | Teiidae Ameiva ameiva | Labaria | Bothrops atrox |
| Tegu | Kentropyx calcarata | Bushmaster | Lachesis muta Bufonidae |
| Anolis Lizard | Tupinambis nigropunctatus | | Bufo marinus Bufo guttatus |
| Plica Lizard | Iguanidae Iguana iguana | Barking Tree Frog | Hylidae Hyla boans |
| Collared Lizard | Polychrotidae Anolis sp | Tree Frog | Hyla crepitans |
| | Tropiduridae Plica plica | Tree Frog | Hyla granosa |
| | Tropidurus hispidus | Monkey Frog | Phyllomedusa bicolor Stefania sp. |
| | | Pipa Frog | Pipidae Pipa pipa |
| | | Poison Frog | Dendrobatidae Dendrobates sp. |
| | | Spotted leg Frog | Epipedobates pictus |

| REPTILIAN SPECIES RECORDED AT SHERWOOD FOREST CONCESSION (May 2014) | | | | | | |
|---|------------------------------|----------|----------|----------|-----------|----------|
| Terrestrial Transects | | | | | | |
| Species | Common Name | SFI 1 | SFI 2 | SFI 3 | TOTAL SFI | |
| Gekkonidae | | | | | | |
| <i>Gonotodes humeralis</i> | Bridled Forest Gecko | | 2 | 1 | 3 | |
| Iguanidae | | | | | | |
| <i>Anolis fuscoauratus</i> | | 3 | | | 3 | |
| <i>Anolis chrysolepis (nitens)</i> | Golden Scaled Gecko | 1 | 4 | 1 | 6 | |
| Gymnophthalmidae | | | | | | |
| <i>Lepasoma percarinatum</i> | | | 1 | | 1 | |
| Scincidae | | | | | | |
| <i>Mabuya nigropunctata</i> | Amazonian Skink | 2 | 4 | 1 | 7 | |
| Teiidae | | | | | | |
| <i>Ameiva ameiva</i> | South American Ground Lizard | 4 | 8 | 9 | 21 | |
| <i>Kentropyx calcarata</i> | Striped Forest Whiptail | 2 | 7 | 8 | 17 | |
| Tropiduridae | | | | | | |
| <i>Plica umbra</i> | | | 1 | | 1 | |
| <i>Uranoscodon superciliosus</i> | Brown Tree Climber Lizard | 2 | | 3 | 5 | |
| Testudinae | | | | | | |
| <i>Chelonoidis denticulata</i> | Yellow-Footed Tortoise | | 2 | 1 | 3 | |
| Boidae | | | | | | |
| <i>Corallus hortulanus</i> | Cook's Tree Boa | | | 1 | 1 | |
| Number of Individuals | | 14 | 29 | 25 | 68 | |
| Number of Species | | 5 | 7 | 7 | 11 | |
| River Transects | | | | | | |
| | | SF CCR 1 | SF CCR 2 | SF CCR 3 | SF CCR 4 | TOTAL SF |
| Crocodylidae | | | | | | |
| <i>Caiman crocodilus</i> | | | 1 | | | 1 |
| Alligatoridae | | | | | | |
| <i>Melanosuchus niger</i> | | 7 | 10 | 9 | 11 | 37 |
| Boidae | | | | | | |
| <i>Corallus hortulanus</i> | Cook's Tree Boa | | | 1 | | 1 |
| <i>Corallus caninus</i> | Emerald Tree Boa | | | | | |
| Podocnemididae | | | | | | |
| <i>Podocnemis expansa</i> | Giant River Turtle | | | 2 | | 2 |
| <i>Podocnemis unifilis</i> | Yellow-spotted River turtle | | | | | |
| Tropiduridae | | | | | | |
| <i>Uranoscodon superciliosus</i> | Brown Tree Climber Lizard | 1 | | 1 | | 2 |
| Number of Individuals | | 8 | 11 | 13 | 11 | 43 |

Visually Encountered Reptiles



Melanosuchus niger



Uranoscodon superciliosus



Gonotodes humeralis



Lepasoma percarinatum



Chelonoidis denticulata



Kentropyx calcarata



Corallus hortulanus

D. AMPHIBIANS OBSERVED DURING SURVEYS AT SHERWOOD FOREST CONCESSION (May 2014)

| Scientific Name | Common Name | ShF T1 | ShF T2 | ShF T3 | TOTAL ShF |
|-------------------------------------|----------------------------------|-----------|-----------|-----------|------------|
| ALLOPHRYNIDAE | | | | | |
| <i>Allophryne ruthveni</i> | Tukeit Hill Frog | | 2 | | 2 |
| BUFONIDAE | | | | | |
| <i>Rhaebo guttatus</i> | Cope Toad | 5 | 8 | 3 | 16 |
| <i>Rhaebo nasicus</i> | Werner's Toad | 1 | 2 | 5 | 8 |
| DENDROBATIDAE | | | | | |
| <i>Ameerega femoralis</i> | Brilliant-Thighed Poison Frog | | 7 | | 7 |
| <i>Ameerega trivittatus</i> | Three-Striped Poison Frog | 2 | | 1 | 3 |
| <i>Ameerega picta</i> | Spot-legged Poison Frog | 3 | | 2 | 5 |
| <i>Ameerega hahneli</i> | Pale-Striped Poison Frog | 4 | 1 | 2 | 7 |
| HYLIDAE | | | | | |
| <i>Dendrosophus minuta</i> | Lesser Treefrog | | 7 | 3 | 10 |
| <i>Hypsiboas boans</i> | Gladiator Treefrog | 7 | 10 | 4 | 21 |
| <i>Hypsiboas calcarata</i> | Troschel's Treefrog | 3 | | 4 | 7 |
| <i>Hypsiboas ornatissimus</i> | Ornate Treefrog | | | | |
| <i>Trachycephalus resinifictrix</i> | | 1 | 2 | | 3 |
| <i>Osteocephalus oophagus</i> | Oophagus Slender-Legged Treefrog | 3 | 2 | 5 | 10 |
| <i>Osteocephalus lepieurii</i> | Cayenne Slender-Legged Treefrog | 4 | 6 | 7 | 17 |
| <i>Osteocephalus taurinus</i> | Manaus Slender-Legged Treefrog | 1 | | 3 | 4 |
| <i>Phyllomedusa bicolor</i> | Giant Waxy Monkey Frog | | | 1 | 1 |
| <i>Phyllomedusa vaillanti</i> | White-Lined Monkey Frog | | | | |
| <i>Scinax boesemani</i> | Boeseman's Snouted Treefrog | | | | |
| <i>Scinax ruber</i> | Two-striped Treefrog | 3 | | 5 | 8 |
| MICROHYLIDAE | | | | | |
| <i>Ctenophryne geayi</i> | Brown Egg Frog | 1 | 2 | 5 | 8 |
| LEPTODACTYLIDAE | | | | | |
| <i>Leptodactylus knudseni</i> | Knudsen's Thin-Toed Frog | | 2 | | 2 |
| <i>Leptodactylus mystaceus</i> | White lipped thin-toed Frog | 1 | | 3 | 4 |
| <i>Leptodactylus pentadactylus</i> | Smoky Jungle Frog | | | 1 | 1 |
| <i>Leptodactylus rhodomystax</i> | Rose-Lipped Thin-Toed Frog | 1 | 3 | 2 | 6 |
| <i>Leptodactylus lineatus</i> | Gold-Striped Frog | | | 1 | 1 |
| <i>Leptodactylus pertersii</i> | Peter's Thin-Toed Frog | | | 4 | 4 |
| <i>Adenomera hylaedactyla</i> | | 1 | | | 1 |
| PIPIDAE | | | | | |
| <i>Pipa pipa</i> | | | | 1 | 1 |
| Number of Individuals | | 41 | 54 | 62 | 157 |
| Number of Species | | 16 | 13 | 20 | 25 |

Visually Encountered Amphibians



Hypsiboas boans



Allophryne ruthveni



Hypsiboas ornatissimus



Ctenophryne geayi



Osteocephalus leprieuri



Leptodactylus mystaceus



Rhaebo nasicus



Phyllomedusa bicolor



Ameerega trivittata



Trachycephalus resinifictrix



Rhaebo guttatus



Osteocephalus taurinus

**E. FISH SPECIES RECORDED AT SHERWOOD FOREST CONCESSION, UPPER BERBICE RIVER
(November 2009 to February 2010)**

| Common Name | Scientific Name |
|--------------------|-----------------------------|
| Stingray | Ostariophysi |
| Stingray | Potamotrygonidae |
| | Potamotrygon hystrix |
| | Potamotrygon motoro |
| | Osteglossidae |
| | Osteoglossum bicirrhosum |
| Pike Characin | Ctenoluciidae |
| | Boulengerella lucia |
| Yarrow | Erythrinidae |
| Yarrow | Erythrinus erythrinus |
| Huri | Hoplerythrinus unitaeniatus |
| Haimara | Hoplias malabaricus |
| | Hoplias macrophthalmus |
| Talking Catfishes | Doradidae |
| Talking Catfishes | Amblydoras hancocki |
| | Doras sp. |
| | Pseudoras niger |
| | Oxydoras niger |
| | Platydoras costatus |
| Wood Catfish | Auchenipteridae |
| Boots | Parauchenipterus galeatus |
| | Trachycorystes obscures |
| | Characiformes |
| | Anostomus sp. |
| Banded Leporinus | Leporinus alternus |
| Tailspot Tetra | Leporinus fasciatus |
| | Brycon falcatus |
| Biara | Astyanax biniaculatus |
| | Hydrolicus scomberoides |
| | Hypressobrycon spp. |
| Piranha | Serrasalmus rhombeus |
| | Triportheus rotundatus |
| Hatchet Fish | Gasteropelecidae |
| | Carnegiella strigata |
| Lukanani | Cichlidae |
| Dwarf – cichlid | Cichla ocellaris |
| Acara | Apistogramma sp. |
| | Acquidens sp. |
| | Siluriformes |
| Corydoras | Corydoras spp. |
| Bushymouth Catfish | Ancistrus hoplogenyis |
| Whiptail Catfish | Farowella sp. |
| Smoke Hassar | Hypostomus sp. |

FISH SPECIES RECORDED AT SHERWOOD FOREST CONCESSION (May 2014)

| TAXON | COMMON NAME | TOTAL NO. OF FISH SAMPLED AT SHERWOOD FOREST |
|--------------------------------------|----------------------------|--|
| Ageneiosidae | | |
| <i>Ageneiosus inermis</i> | dawala | 2 |
| Anostomidae | | |
| <i>Leporinus</i> spp. | daray | 1 |
| Auchenipteridae | | |
| <i>Trachycorystes trachycorystes</i> | boots | 3 |
| <i>Trachycorystes geleatus</i> | Wax fish | 1 |
| Characidae | | |
| <i>Myleus rubripinnis</i> | moonjaal | 2 |
| <i>Myloplus</i> spp | cataback | 7 |
| <i>Myleus setiger</i> | pacu | 23 |
| <i>Pristobrycon striolatus</i> | perai | 3 |
| <i>Pygocentrus nattereri</i> | 3 | 1 |
| <i>Serrasalmus rhombeus</i> | Black parai | 19 |
| <i>Tetragonopterus chalceus</i> | | 3 |
| <i>Triportheus roundatus</i> | | 1 |
| Cichlidae | | |
| <i>Boulengerella cuvieri</i> | swordfish | 3 |
| Curimatidae | | |
| <i>Psectrogaster</i> sp. | | 1 |
| Cynodontidae | | |
| <i>Hydrolycus tatauaia</i> | biara | 3 |
| <i>Hydrolycus armatus</i> | | 2 |
| Doradidae | | |
| <i>Platydoras armulatus</i> | Policeman/armoured catfish | 1 |
| <i>Pterodoras granulosus</i> | | 1 |
| Loricaridae | | |
| <i>Hypostomus</i> spp. | | 1 |
| Osteoglossidae | | |
| <i>Osteoglossum bicirrhosum</i> | arrowana | 1 |
| Pimelodidae | | |
| <i>Hemisorubim platyrhynchos</i> | butterfish | 2 |
| <i>Leiarius marmoratus</i> | tigerfish | 1 |
| <i>Practocephalus hemiliopterus</i> | Skeete/banana fish | 2 |
| <i>Pseudoplatystoma fasciatum</i> | cullet | 2 |
| Sciaenidae | | |
| <i>Plagioscion squamosissimus</i> | basha | 1 |
| Trichomycteridae | | |
| <i>Ochmacanthus</i> spp. | | 3 |
| <i>Vandiella beccarii</i> | | 5 |

Some Fish Species Caught within Sherwood Forrest Inc.



Leporinus fasciatus



Osteoglossum bicirrhosum



Hemisorubim platyrhynchos



Myleus setiger



Leiarius marmoratus



Cichla ocellaris

F. Lepidoptera (Butterflies) and other Macro-invertebrates Recorded at Sherwood Forest Concession (May 2014)

| Family /Group | Species | Common name | SFI |
|-----------------------------------|--------------------------------|-------------------------------------|-----|
| Chordeumida | | Giant millipede | U |
| | | Small millipede | U |
| Orthoptera | | grasshoppers | A |
| Diptera | | flies | C |
| | | mosquitoes | A |
| Aranae(spiders) | | spiders | A |
| | <i>Micrathena sp.</i> | | U |
| Coleoptera | | | |
| Scarabaeidae: Scarabaeinae | | Large dung beetle | U |
| | | Small dung beetle | U |
| Odonata(dragonflies, damselflies) | | dragonfly | A |
| | | damselfly | F |
| Phasmatidae (Stick-insects) | | | F |
| Hymenoptera | <i>Atta sp.</i> | Leaf cutter ants | C |
| | | Bullet ants | C |
| Isoptera | | termites | C |
| Blattaria | | roaches | C |
| Hemiptera | | Stink bugs | F |
| Gerridae | | Water striders | A |
| Homoptera | | (Leafhooppers, Cicada, Planthopper) | A |
| | | mantids | U |
| Lepidoptera | | | |
| Peridae: Coliadinae | <i>Phoebis argante argante</i> | Dark sulphur | C |
| | <i>Aphrissa statira</i> | Pale sulphur | A |
| Nymphalidae: Mophinae | <i>Opsiphames c. cassiae</i> | | C |
| | <i>Morpho helenor extremus</i> | | C |
| | <i>Dryadula phaetusa</i> | | C |
| Nymphalidae: Helicolinae | <i>Heliconia sp.</i> | | C |
| | <i>Posttaygetis penelea</i> | | C |
| Nymphalida Satyrinae: | <i>Cassia penelope</i> | | C |
| | <i>Taygetis thamyra</i> | | C |
| | <i>Lycorea halia halia</i> | | C |
| Nymphalidae: Danainae | <i>Chloreuptychia marcia</i> | Marcia ringlet | C |

Uncommon (U) - small numbers recorded
 Fairly common (F)-less than five individuals recorded for the day
 Common (C) - between 5-10 individuals recorded for the day
 Abundant (A) - more than 10 individuals recorded for the day

Photos of Lepidoptera (Butterflies) and other Macro-invertebrates Recorded at Sherwood Forest Concession



beetle



giant millipede



beetle



a hemiptera



spider



dragonfly



cicada



Micrathena sp

Annex XI: Threatened Species of Guyana (IUCN Red List 2008)²⁹

| Common Name | Latin name | Status |
|--------------------------------|--------------------------------|----------------------------------|
| Mammals | | |
| Black Spider Monkey | <i>Ateles paniscus</i> | Vulnerable |
| Oncilla | <i>Leopardus tigrinus</i> | Vulnerable |
| Margay | <i>Leopardus wiedii</i> | Near Threatened |
| Giant Anteater | <i>Myrmecophaga tridactyla</i> | Near Threatened |
| Venezuelan Fish-eating Rat | <i>Neusticomys venezuelae</i> | Vulnerable |
| Jaguar | <i>Panthera onca</i> | Near Threatened |
| Giant Armadillo | <i>Priodontes maximus</i> | Vulnerable |
| Giant Otter | <i>Pteronura brasiliensis</i> | Endangered |
| Bush Dog | <i>Speothos veneticus</i> | Near Threatened |
| Brazilian Tapir | <i>Tapirus terrestris</i> | Vulnerable |
| White-lipped Peccary | <i>Tayassu pecari</i> | Near Threatened |
| Spectral Bat | <i>Vampyrum spectrum</i> | Near Threatened |
| Birds | | |
| Blue-cheeked Amazon | <i>Amazona dufresniana</i> | Near threatened |
| Sun Parakeet | <i>Aratinga solstitialis</i> | Endangered |
| Red Siskin | <i>Carduelis cucullata</i> | Endangered |
| Rio Branco Antbird | <i>Cercomacra carbonaria</i> | Near Threatened |
| Olive-sided Flycatcher | <i>Contopus cooperi</i> | Near Threatened |
| Harpy Eagle | <i>Harpia harpyja</i> | Near Threatened |
| Crested Eagle | <i>Morphnus guianensis</i> | Near Threatened |
| Orinoco Goose | <i>Neochen jubata</i> | Near Threatened |
| Great-billed Seed-finch | <i>Oryzoborus maximiliani</i> | Near Threatened |
| Bearded Tachuri | <i>Polystictus pectoralis</i> | Near Threatened |
| Hoary-throated Spinetail | <i>Synallaxis kollari</i> | Endangered |
| Buff-breasted Sandpiper | <i>Tryngites subruficollis</i> | Near Threatened |
| Reptiles | | |
| Yellow-footed tortoise | <i>Geochelone denticulata</i> | Vulnerable |
| Black Caiman | <i>Melanosuchus niger</i> | LowerRisk/conservation dependent |
| Giant South American Turtle | <i>Podocnemis expansa</i> | LowerRisk/conservation dependent |
| Yellow-spotted Sideneck Turtle | <i>Podocnemis unifilis</i> | Vulnerable |

²⁹Cited from Pickles, McCann and Holland(2009)

Annex XII: List of Species encountered at SFI's Concession

| # | Species | Botanical Name | Family Name |
|----|----------------|--|------------------|
| 1 | Adabadan | <i>Ampelocera edentula</i> Kuhlm. | ULMACEAE |
| 2 | Adebero | <i>Paypayrola longifolia</i> Tul. | VIOLACEAE |
| 3 | Arara | <i>Guatteria atra</i> Sandw. | ANNONACEAE |
| 4 | Aromata | <i>Clathrotropis brachypetala</i> (Tul.) Kleinhoonte | PAPILIONOIDEAE |
| 5 | Asashi | <i>Rheedia benthamiana</i> Planhon & Triana. | GUTTIFERAE |
| 6 | Barabara | <i>Diospyros guianensis</i> Aublet. | EBENACEAE |
| 7 | Barakaro | <i>Ormosia coccinea</i> (Aublet) B. D. Jackson. | PAPILIONOIDEAE |
| 8 | Baromalli | <i>Catostemma commune</i> Sandw. | BOMBACACEAE |
| 9 | Banyaballi | <i>Eugenia awarakorum</i> Sandw. | MYRTACEAE |
| 10 | Bulletwood | <i>Manilkara bidentata</i> (A. DC.) Chev. | SAPOTACEAE |
| 11 | Burada | <i>Parinari campestris</i> Aublet. | CHRYSOBALANACEAE |
| 12 | Cedar, Brown | Pending identification | |
| 13 | Cedar, White | <i>Tabebuia insignis</i> (Miq.) Sandw. | BIGNONIACEAE |
| 14 | Corkwood | <i>Pterocarpus officinalis</i> Jacq.. | PAPILIONOIDEAE |
| 15 | Crabwood | <i>Carapa guianensis</i> Aublet | MELIACEAE |
| 16 | Dalli | <i>Virola surinamensis</i> (Rolander) Warb. | MYRISTICACEAE |
| 17 | Darina | <i>Parkia nitida</i> Miq. | MIMOSOIDEAE |
| 18 | Duka | <i>Tapirira marchandii</i> Engl. | ANACARDIACEAE |
| 19 | Dukali | <i>Parahancornia amapa</i> (Huber) Ducke | APOCYNACEAE |
| 20 | Dukuria | <i>Sacoglottis guianensis</i> Benth. | HUMIRICICEAE |
| 21 | Duru | <i>Apeiba echinata</i> Gaertner . | TILIACEAE |
| 22 | Fukadi | <i>Terminalia amazonia</i> (J. Gmelin) Exell. | COMBRETACEAE |
| 23 | Futui | <i>Jacaranda copaia</i> (Aublet) D. Don | BIGNONIACEAE |
| 24 | Guavaballi | <i>Eschweilera alata</i> A.C. Smith. | LECYTHIDACEAE |
| 25 | Hairiballi | <i>Alexa wachenheimii</i> Benoist. | PAPILIONOIDEAE |
| 26 | Huruasa | <i>Pithecellobium jupunba</i> (Willd) Urban. | MIMOSOIDEAE |
| 27 | Iwakushi | <i>Manilkara excelsa</i> (Ducke) Chev. | SAPOTACEAE |
| 28 | Itikiboraballi | <i>Swartzia davisii</i> Sandw. | PAPILIONOIDEAE |
| 29 | Iron Mary | <i>Clathrotropis paradoxa</i> Sandw. | PAPILIONOIDEAE |
| 30 | Kabukalli | <i>Goupia glabra</i> (Aublet) | CELASTRACEAE |
| 31 | Kaditiri | <i>Sclerolobium guianense</i> Benth. | CAESALPINOIDEAE |
| 32 | Kairiballi | <i>Licania heteromorpha</i> Benth. | CHRYSOBALANACEAE |
| 33 | Kakaralli, | <i>Escheilera sagotiana</i> Miers. | LECYTHIDACEAE |
| 34 | Kamakuti | <i>Bombax globosum</i> Aublet. | LECYTHIDACEAE |
| 35 | Karakakusin | <i>Swartzia jenmanii</i> Sandw. | PAPILIONOIDEAE |
| 36 | Kauta | <i>Licania guianensis</i> (Aublet) Griseb. | CHRYSOBALANACEAE |
| 37 | Kautaballi | <i>Licania alba</i> (Bernoulli) Cuatrec. | CHRYSOBALANACEAE |
| 38 | Kumaka | <i>Ceiba pentandra</i> (L.) Gaertner. | BOMBACACEAE |

| # | Species Name | Botanical Name | Family Name |
|----|------------------------|---|------------------|
| 39 | Kwarama | Jessenia bataua (C. Martius) Burret. | PALMAE |
| 40 | Kurokai | Protium decandrum (Aublet) Marchal | BURSERACEAE |
| 41 | Kuyama, Red | Xylopi pulcherrima Sandw. | ANNONACEAE |
| 42 | Madaburi | Clusia nemorosa G. Meyer. | GUTTIFERAE |
| 43 | Maho | Sterculia guinensis Sandw. | STERCULIACEAE |
| 44 | Manariballi | Pithecellobium corymbosum (Rich.) Benth. | MIMOSOIDEAE |
| 45 | Manyokinaballi | Geissospermum sericeum(Sagot) Benth. | APOCYNACEAE |
| 46 | Maporokon | Inga alba (Sw) Willd. | MIMOSOIDEAE |
| 47 | Marishiballi | Licania boyanii Tutin. | CHRYSOBALANACEAE |
| 48 | Monkey Pot | Lecythis zabucajo Aublet. | LECYTHIDACEAE |
| 49 | Mora | Mora excelsa Benth. | CAESALPINOIDEAE |
| 50 | Morabukea | Mora gonggrijpii (Kleinhoonte) Sandw. | CAESALPINOIDEAE |
| 51 | Moroballi | Talisia furfuraceae Sandw. | SAPINDACEAE |
| 52 | Okokunshi | Lacunaria jenmanii (Oliver) Ducke. | QUIINACEAE |
| 53 | Pakuri | Platonia insignis C. Martius. | GUTTIFERAE |
| 54 | Parakusan, Hill | Swartzia jenmanii Sandw. | PAPILIONOIDEAE |
| 55 | Plum | Spondias mombin L. | ANACARDIACEAE |
| 56 | Ruri | Chaetocarpus schomburgkianus (Kuntze) Pax & K. Hoffm. | EUPHORBACEAE |
| 57 | Sada | Zanthoxylum apiculata (Sandw.) Waterman. | RUTACEAE |
| 58 | Saka | Peltogyne venosa (Vahl) Benth.. | CAESALPINOIDEAE |
| 59 | Serebeballi | Vouacapoua macropetala Sandw. | CAESALPINOIDEAE |
| 60 | Shirada | Inga laterifolia Miq. | MIMOSOIDEAE |
| 61 | Simarupa | Quassia simaruba L. | SIMAROUBACEAE |
| 62 | Silverballi, Fine Leaf | Ocotea spp. | LAURACEAE |
| 63 | Silverballi, Kereti | Ocotea oblonga (Meissner) Mez | LAURACEAE |
| 64 | Silverballi, Yellow | Aniba hypoglauca Sandw. | LAURACEAE |
| 65 | Suya | Pouteria speciosa (Ducke) Baehni | SAPOTACEAE |
| 66 | Sweet heart | Talisia elephantipes Sandw. | SAPINDACEAE |
| 67 | Tibokushi | Brosimum guianense (Aublet) Huber. | MORACEAE |
| 68 | Ulu | Trattinickia burserifolia C. Martius | BURSERACEAE |
| 69 | Wadara | Couratari calycina Sandw. Ex Tutin | LECYTHIDACEAE |
| 70 | Waiaballi | Tapura guianensis Aublet | ANACARDIACEAE |
| 71 | Wallaba, Ituri | Eperua randiflora (Aublet) Benth. | CAESALPINOIDEAE |
| 72 | Wallaba, Soft | Eperua falcata (Aublet). | CAESALPINOIDEAE |
| 73 | Wamara | Swartzia leiocalycina Benth. | PAPILIONOIDEAE |
| 74 | Wamaradan | Dicorynia guianensis Amshoff | FABACEAE |
| 75 | Warakosa | Inga nobilis Willd. | MIMOSOIDEAE |
| 76 | Yarula | Aspidosperma excelsum Benth. | APOCYNACEAE |

Annex XIII: Results of Measurements of the Natural Baseline Physical Environmental Parameters within SFI

TABLE 25: NOISE LEVELS RECORDED WITHIN SHERWOOD FORREST INC.

| Sound Level (dB) | | | | | |
|--|--------------------------------|----------|-------|---------------|-----------|
| Sample ID | Coordinates | Time (h) | | Data | Wind |
| | | Start | End | Decibels (dB) | Direction |
| N1 | 21N - 0356471 UTM - 0401354 | 08:59 | 09:00 | 49.5 | NE |
| N2 | 21N - 0357001 UTM - 0400475 | 08:54 | 08:55 | 46.1 | NE |
| N3 | 21N - 0357515 UTM - 0399598 | 08:59 | 09:00 | 46.8 | NE |
| N4 | 21N - 0358514 UTM - 0399456 | 09:20 | 09:21 | 41.3 | NE |
| N5 | 21N - 0359011 UTM - 0399524 | 09:35 | 09:36 | 50.7 | NE |
| N6 | 21N - 0359837 UTM - 0400186 | 09:41 | 09:42 | 46 | NE |
| N7 | 21N - 0360869 UTM - 0400125 | 09:49 | 09:50 | 41.9 | NE |
| N8 | 21N - 0361854 UTM - 0399877 | 10:11 | 10:12 | 50.6 | NE |
| N9 | 21N - 0362763 UTM - 0399442 | 10:21 | 10:22 | 45.5 | NE |
| N10 | 21N - 0363782 UTM - 0399443 | 10:31 | 10:32 | 42.6 | NE |
| N11 | 21N - 0364742 UTM - 0399132 | 10:40 | 10:42 | 46.7 | NE |
| Comments: | | | | | |
| <p>Sample ID: Noise measurements were taken approximately N1: four kilometers (4 km), N2: 5 km, N3: 6 km, N4: 7 km, N5: 7.5 km, N6: 8 km, N7: 9 km, N8: 10 km, N9: 11 km, N10: 12 km, N11: 13 km north east of the Camp on the mid stream of Cocoa Creek.</p> | | | | | |

TABLE 26: AIR QUALITY WITHIN SHERWOOD FORREST INC.

| Total Suspended Particules (TSP) mg/m ³ | | | | | | | |
|---|--------------------------------|----------|-------|-------|------------|------------|----------------|
| Sample ID | Coordinates | Time (h) | | Data | | | Wind Direction |
| | | Start | End | TWA | Max. Conc. | Ave. Conc. | |
| A1 | 21N - 0356471 UTM - 0401354 | 08:59 | 09:00 | 0.000 | 0.005 | 0.000 | NE |
| A2 | 21N - 0357001 UTM - 0400475 | 08:54 | 08:55 | 0.001 | 0.016 | 0.000 | NE |
| A3 | 21N - 0357515 UTM - 0399598 | 08:59 | 09:00 | 0.001 | 0.001 | 0.002 | NE |
| A4 | 21N - 0358514 UTM - 0399456 | 09:20 | 09:21 | 0.002 | 0.010 | 0.000 | NE |
| A5 | 21N - 0359011 UTM - 0399524 | 09:35 | 09:36 | 0.003 | 0.003 | 0.001 | NE |
| A6 | 21N - 0359837 UTM - 0400186 | 09:41 | 09:42 | 0.024 | 0.029 | 0.026 | NE |
| A7 | 21N - 0360869 UTM - 0400125 | 09:49 | 09:50 | 0.014 | 0.030 | 0.009 | NE |
| A8 | 21N - 0361854 UTM - 0399877 | 10:11 | 10:12 | 0.000 | 0.003 | 0.000 | NE |
| A9 | 21N - 0362763 UTM - 0399442 | 10:21 | 10:22 | 0.003 | 0.020 | 0.001 | NE |
| A10 | 21N - 0363782 UTM - 0399443 | 10:31 | 10:32 | 0.000 | 0.008 | 0.000 | NE |
| A11 | 21N - 0364742 UTM - 0399132 | 10:40 | 10:42 | 0.010 | 0.037 | 0.000 | NE |
| <p>Comments:</p> <p>Sample ID: Air quality measurements were taken approximately A1: four kilometers (4 km), A2: 5 km, A3: 6 km, A4: 7 km, A5: 7.5 km, A6: 8 km, A7: 9 km, A8: 10 km, A9: 11 km, A10: 12 km, A11: 13 km thirteen kilometers (13 km) north east of the Camp on the mid stream of Cocoa Creek.</p> | | | | | | | |

TABLE 27: WATER QUALITY ANALYSIS WITHIN SHERWOOD FORREST INC. (DRY SEASON)

| 1. Measurements (Raw Data) | | | | | | | | | | | | | | | | | |
|--|--------------------------------|----------|-------|-------|-----------------------|------|--------------------------------------|---------------|-------------|----------------------|---------|----------------------|---------|---------------|--------------|-----------|-------------|
| Surface Water Quality Analysis (December 2013) | | | | | | | | | | | | | | | | | |
| Sample ID | Coordinates | Readings | Time | | Water Parameters Data | | | | | | | | | Flow Rate m/s | Oil & Grease | Wind | |
| | | | Start | End | Temp °C | pH | Conductivity $\mu\text{S/cm}$ 0-2000 | Turbidity NTU | DO mg/L 0.9 | NO ₃ mg/L | Cl mg/L | NH ₄ mg/L | Ca mg/L | | | Direction | Speed (fpm) |
| WQ1 | 21N - 0356471 UTM - 0401354 | 1 | 15:50 | 15:55 | 29.6 | 5.2 | 34 | 12.0 | 3.8 | 5.3 | 5.8 | 2.7 | 0.6 | 0.106 | ND | NE | 32 |
| | | 2 | 16:00 | 16:07 | 29.6 | 5.7 | 31 | 9.7 | 3.6 | 5.0 | 5.4 | 2.1 | 1.3 | 0.103 | ND | NE | 31 |
| WQ2 | 21N - 0357001 UTM - 0400475 | 1 | 16:18 | 16:26 | 29.6 | 5.9 | 36 | 11.1 | 3.5 | 5.1 | 5.0 | 2.6 | 1.9 | 0.075 | ND | NE | 27 |
| | | 2 | 16:22 | 16:29 | 29.0 | 6.0 | 36 | 10.3 | 3.8 | 5.1 | 4.9 | 2.4 | 5.9 | 0.089 | ND | NE | 36 |
| WQ3 | 21N - 0357515 UTM - 0399598 | 1 | 16:35 | 16:38 | 29.3 | 6.5 | 35 | 9.3 | 3.9 | 5.3 | 4.7 | 2.3 | 0.7 | 0.053 | ND | NE | 41 |
| | | 2 | 16:39 | 16:42 | 29.6 | 6.0 | 33 | 11.2 | 4.2 | 5.3 | 4.9 | 2.3 | 0.6 | 0.068 | ND | NE | 38 |
| WQ4 | 21N - 0358514 UTM - 0399456 | 1 | 16:51 | 16:55 | 29.1 | 5.92 | 36 | 13.0 | 4.3 | 5.4 | 4.9 | 2.3 | 0.7 | 0.065 | ND | NE | 36 |
| | | 2 | 16:56 | 16:59 | 29.7 | 5.9 | 38 | 15.3 | 4.2 | 4.7 | 4.8 | 2.2 | 0.8 | 0.067 | ND | NE | 38 |
| WQ5 | 21N - 0359011 UTM - 0399524 | 1 | 17:00 | 17:03 | 29.6 | 6.12 | 32 | 16.7 | 4.6 | 5.3 | 5.1 | 2.4 | 0.8 | 0.059 | ND | NE | 39 |
| | | 2 | 17:04 | 17:06 | 29.5 | 6.15 | 34 | 17.3 | 4.7 | 5.8 | 5.4 | 2.6 | 0.8 | 0.062 | ND | NE | 41 |
| WQ6 | 21N - 0359837 UTM - 0400186 | 1 | 17:09 | 17:11 | 29.6 | 7.1 | 39 | 19.2 | 4.2 | 5.9 | 3.5 | 2.7 | 9.1 | 0.052 | ND | NE | 44 |
| | | 2 | 17:10 | 17:16 | 29.6 | 7.1 | 35 | 21.2 | 4.5 | 6.1 | 3.1 | 2.6 | 10.5 | 0.032 | ND | NE | 32 |
| WQ7 | 21N - 0360869 UTM - 0400125 | 1 | 17:18 | 17:22 | 29.6 | 6.92 | 38 | 23.4 | 3.9 | 5.7 | 2.8 | 2.7 | 9.7 | 0.198 | ND | NE | 36 |
| | | 2 | 17:23 | 17:32 | 29.8 | 6.92 | 39 | 22.8 | 3.9 | 6.8 | 2.6 | 2.6 | 9.8 | 0.187 | ND | NE | 29 |
| WQ8 | 21N - 0361854 UTM - 0399877 | 1 | 17:33 | 17:35 | 29.7 | 6.9 | 30 | 29.7 | 4.1 | 5.4 | 2.3 | 2.5 | 10.6 | 0.195 | ND | NE | 35 |
| | | 2 | 17:44 | 17:53 | 29.8 | 6.32 | 30 | 32.7 | 3.8 | 6.2 | 2.2 | 2.4 | 7.8 | 0.200 | ND | NE | 42 |
| WQ9 | 21N - 0362763 UTM - 0399442 | 1 | 17:55 | 17:58 | 29.9 | 6.07 | 30 | 28.5 | 4.0 | 6.8 | 2.1 | 2.2 | 9.1 | 0.204 | ND | NE | 44 |
| | | 2 | 17:56 | 17:59 | 29.6 | 6.23 | 30 | 30.1 | 3.9 | 7.2 | 2.0 | 2.8 | 9.8 | 0.201 | ND | NE | 47 |
| WQ10 | 21N - 0363782 UTM - 0399443 | 1 | 18:01 | 18:05 | 29.5 | 6.57 | 30 | 31.7 | 3.9 | 7.9 | 2.3 | 2.9 | 11.3 | 0.213 | ND | NE | 51 |
| | | 2 | 18:06 | 18:09 | 29.4 | 6.24 | 30 | 33.1 | 3.5 | 8.0 | 1.9 | 2.1 | 6.8 | 0.211 | ND | NE | 49 |
| WQ11 | 21N - 0364742 UTM - 0399132 | 1 | 18:11 | 18:23 | 29.4 | 6.31 | 31 | 31.6 | 3.8 | 7.7 | 2.0 | 2.7 | 10.8 | 0.215 | ND | NE | 44 |
| | | 2 | 18:25 | 18:29 | 29.4 | 6.13 | 31 | 32.7 | 3.6 | 6.9 | 1.9 | 2.5 | 10.3 | 0.216 | ND | NE | 41 |

| 2. Comments | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <ul style="list-style-type: none"> The flow rates for the Cocoa Creek were taken at a depth of 1.2 meters (4 ft). Water samples were taken approximately WQ1: four kilometers (4 km), WQ2: 5 km, WQ3: 6 km, WQ4: 7 km, WQ5: 7.5 km, WQ6: 8 km, WQ7: 9 km, WQ8: 10 km, WQ9: 11 km, WQ10: 12 km, WQ11: 13 km north east of the Camp on the mid stream of Cocoa Creek. | | | | | | | | | | | | | | | | | |

TABLE 28: WATER QUALITY ANALYSIS WITHIN SHERWOOD FORREST INC. (WET SEASON)

| 1. Measurements (Raw Data) | | | | | | | | | | | | | | | | |
|---|---------------|----------|-------|-------|-----------------------|------|--------------------------------------|---------------|-------------|----------------------|---------|----------------------|---------|---------------|--------------|----------------|
| Surface Water Quality Analysis (May 2014) | | | | | | | | | | | | | | | | |
| Sample ID | Coordinates | Readings | Time | | Water Parameters Data | | | | | | | | | Flow Rate m/s | Oil & Grease | Wind Direction |
| | | | Start | End | Temp °C | pH | Conductivity $\mu\text{S/cm}$ 0-2000 | Turbidity NTU | DO mg/L 0.9 | NO ₃ mg/L | Cl mg/L | NH ₄ mg/L | Ca mg/L | | | |
| WQ1 | 21N - 0356471 | 1 | 14:15 | 14:20 | 27.2 | 6.43 | 33 | 15.1 | 4.6 | 0.1 | 4.4 | 0.2 | 0.5 | 0.115 | ND | NE |
| | UTM - 0401354 | 2 | 14:17 | 14:23 | 27.2 | 6.25 | 33 | 10.5 | 4.4 | 0.1 | 4.4 | 0.2 | 0.5 | 0.115 | ND | NE |
| WQ2 | 21N - 0357001 | 1 | 14:19 | 14:26 | 27.1 | 6.14 | 33 | 12.6 | 4.7 | 0.1 | 4.5 | 0.3 | 0.6 | 0.068 | ND | NE |
| | UTM - 0400475 | 2 | 14:21 | 14:29 | 27.1 | 6.08 | 33 | 13.7 | 4.6 | 0.1 | 4.5 | 0.3 | 0.6 | 0.068 | ND | NE |
| WQ3 | 21N - 0357515 | 1 | 14:23 | 14:32 | 27.1 | 6.16 | 34 | 17.1 | 4.5 | 0.1 | 4.3 | 0.2 | 0.8 | 0.068 | ND | NE |
| | UTM - 0399598 | 2 | 14:25 | 14:35 | 27.1 | 6.12 | 34 | 14.0 | 4.5 | 0.1 | 4.3 | 0.2 | 0.8 | 0.068 | ND | NE |
| WQ4 | 21N - 0358514 | 1 | 14:27 | 14:38 | 27.0 | 6.22 | 34 | 15.7 | 4.5 | 0.2 | 4.6 | 0.2 | 0.9 | 0.068 | ND | NE |
| | UTM - 0399456 | 2 | 14:29 | 14:41 | 27.0 | 6.27 | 34 | 21.5 | 4.4 | 0.2 | 4.6 | 0.2 | 0.9 | 0.068 | ND | NE |
| WQ5 | 21N - 0359011 | 1 | 14:31 | 14:44 | 27.1 | 6.32 | 33 | 24.3 | 4.8 | 0.2 | 4.5 | 0.3 | 0.8 | 0.068 | ND | NE |
| | UTM - 0399524 | 2 | 14:33 | 14:47 | 27.1 | 6.35 | 33 | 23.7 | 4.7 | 0.2 | 4.5 | 0.3 | 0.8 | 0.068 | ND | NE |
| WQ6 | 21N - 0359837 | 1 | 14:35 | 14:50 | 27.0 | 7.00 | 37 | 36.6 | 4.5 | 1.0 | 2.7 | 0.1 | 10.5 | 0.068 | ND | NE |
| | UTM - 0400186 | 2 | 14:37 | 14:53 | 27.0 | 7.00 | 38 | 37.1 | 4.5 | 1.0 | 2.7 | 0.1 | 10.5 | 0.068 | ND | NE |
| WQ7 | 21N - 0360869 | 1 | 14:39 | 14:56 | 27.1 | 7.01 | 30 | 29.5 | 4.1 | 1.2 | 1.5 | 0.1 | 11.5 | 0.218 | ND | NE |
| | UTM - 0400125 | 2 | 14:41 | 14:59 | 27.1 | 7.01 | 31 | 32.4 | 4.1 | 1.2 | 1.5 | 0.1 | 11.5 | 0.218 | ND | NE |
| WQ8 | 21N - 0361854 | 1 | 14:43 | 15:02 | 27.0 | 6.93 | 30 | 29.7 | 4.2 | 1.2 | 1.6 | 0.1 | 12.7 | 0.218 | ND | NE |
| | UTM - 0399877 | 2 | 14:45 | 15:05 | 27.0 | 6.93 | 30 | 32.7 | 4.2 | 1.2 | 1.6 | 0.1 | 12.7 | 0.218 | ND | NE |
| WQ9 | 21N - 0362763 | 1 | 14:47 | 15:08 | 27.0 | 6.27 | 30 | 28.5 | 4.2 | 1.3 | 1.8 | 0.1 | 13.2 | 0.218 | ND | NE |
| | UTM - 0399442 | 2 | 14:49 | 15:11 | 27.0 | 6.27 | 30 | 30.1 | 4.2 | 1.3 | 1.8 | 0.1 | 13.2 | 0.218 | ND | NE |
| WQ10 | 21N - 0363782 | 1 | 14:51 | 15:14 | 26.9 | 6.27 | 30 | 31.7 | 4.3 | 1.3 | 1.6 | 0.1 | 14.5 | 0.356 | ND | NE |
| | UTM - 0399443 | 2 | 14:53 | 15:17 | 26.9 | 6.27 | 30 | 33.1 | 4.3 | 1.3 | 1.6 | 0.1 | 14.5 | 0.356 | ND | NE |
| WQ11 | 21N - 0364742 | 1 | 14:55 | 15:20 | 26.9 | 6.35 | 31 | 31.6 | 4.2 | 1.2 | 1.6 | 0.1 | 15.5 | 0.309 | ND | NE |
| | UTM - 0399132 | 2 | 14:57 | 15:23 | 26.9 | 6.34 | 31 | 32.7 | 4.2 | 1.2 | 1.6 | 0.1 | 15.5 | 0.309 | ND | NE |

2. Comments

- The flow rates for the Cocoa Creek were taken at a depth of 1.2 meters (4 ft).
- Water samples were taken approximately **WQ1**: four kilometers (4 km), **WQ2**: 5 km, **WQ3**: 6 km, **WQ4**: 7 km, **WQ5**: 7.5 km, **WQ6**: 8 km, **WQ7**: 9 km, **WQ8**: 10 km, **WQ9**: 11 km, **WQ10**: 12 km, **WQ11**: 13 km north east of the Camp on the mid stream of Cocoa Creek.

Annex XIII: Consultant's Response to EPA's Comments on the Third Revised Environmental and Social Impact Assessment Report for Sherwood Forrest Inc. – Logging and Sawmilling Project

The following guide is provided to assist in the review of this document by highlighting how previous comments by the EPA and EAB have been addressed in this revised document:

1. In response to EPA's original comment on the first draft ESIA Report, "*Page 45: the final paragraph states that SFI will work with communities in the North Rupununi and other to develop enterprises based on non-timber resources. Within the ESIA, it should be stated how this will be achieved*", the Consultant responded that "*This framework already exists between NRDDDB and Iwokrama. SFI will merely review the model for its possible adoption. However, the section has been revised to refer to the Arapaima Projects, North Rupununi and the Honey Project aligned with the Mangrove Restoration Project Conducted by NAREI*". More information on partnership with Communities regarding NTFP and models of such framework that are available and reference for the document Allicock, 2003 has now been included on pages 71 -72 of this report.
2. In response to EPA's original comment on the first draft ESIA Report, "*Page 48: 2nd paragraph – More details are needed on the technology that will allow the Company to utilize non-traditional species and what marketing studies were carried out by the Company for them*", the Consultant responded that "*SFI will use its vast international network to carry out tests on non-traditional species. Note that GFC is already pioneering research on the use of lesser used species; SFI will simply **support** the process. Once the company is aware of the technological and utilization properties of the timbers, marketing is the next step*", however, this response was not included in the revised report. This has now been addressed on page 71 of this report.
3. As it relates to the Company's Application for Environmental Authorisation which indicated that they "*would be engaged in the harvesting of timber and the processing of value added timber products for the local and export markets...*", please be informed that it is the Company's intention to harvest timber within the SFI Concession and do basic primary processing (as is necessary). However, the processing of value added timber products will be done at the BaiShanLin Wood Processing Facility at Fitz Hope, Linden-Soesdyke, a separate Environmental Authorisation for which is currently being processed by the EPA.
4. Additional baseline data has been included in the report. Kindly refer to *Chapter 5: Natural Environment Baseline Conditions*.
5. Details to address the comments related to the Road Alignment has been provided on pages 31 – 34.
6. Additions were made to the Closure Plan to include closure of blocks and compartments within the concession as logging progresses. Kindly refer to page 162.
7. Kindly note while Table 4: Activity Schedule has been further updated in this revised document, SFI had continued and continues with its preparation activities for operations at the Concession, and therefore the schedule is reflective of activities past and on-going.