Strategic Five (5) Years Forest Management Plan Of:

Geblo Logging Incorporated (FMC "I")



BITAR Compound 14th STREET, Sinkor MONROVIA, LIBERIA

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Acronyms

- AC Annual Coupe
- AOI Area of Interest
- AOP Annual Operational Plan
- CHP Code of Harvesting Practices
- DBH Diameter at Breast Height
- DCL Diameter Cut Limit
- EIS Environmental Impact Statement
- EMP Environmental Management Plan
- EMS Environmental Management Standard
- EPAL Environmental Protection Agency of Liberia
- EPL Environmental Protection Law
- EPML Environmental Protection & Management Laws of Liberia
- ESIA Environmental Social Impact Assessment
- FAO Food & Agriculture Organization
- FC Forest Compartment
- FDA Forestry Development Authority
- FMC Forest Management Contract
- FMP Forest Management Plan
- GIS Geographic Information Systems
- GSV Gross Standing Volume
- Ha Hectare
- ICC International Consultant Capital
- MDCL Minimum Diameter Cut Limit
- NTFP Non-Timber Forest Product
- SFMP Strategic Forest Management Plan
- 5YFMP Five Year Forest Management Plan
- UTM Universal Traverse Mercator
- VPA Voluntary Partnership Agreement
- FLEGT Forest Law Enforcement Governance and Trade

1. Document Record Sheet

Name and contact address of contract holder	Geblo Logging Incorporated Bitar Compund, 14th Street,
	SInkor, Monrovia, Liberia
Contract reference number	FMC #006

SFMP reference number	Geblo/SFMP/C1/V2
Contract effective date	August 25, 2009
Strategic Forest Management Plan date of approval	February, 2019
Annual Operational Plan reference number	AOP Numbers: 01-02-03-04-05
Period covered by Annual Operation Plan	2015/16-2016/17-2017/18-
	2018/19-2019/20
Date of submission of SFMP to FDA for approval	Monday, February 8, 2019
Date of SFMP approval by FDA	
Signature: Cesare Colombo	

2. Executive Summary

This <u>Strategic Five Years Forest Management Plan</u> of Geblo Logging Inc., as required under the National Forestry Reformed Law of 2006, Forest Management Contract, Section B3.11, and Regulation 105-07, Section 51 provides direction and guidance to the entire operation of Geblo Logging Incorporated.

Geblo Logging Incorporated is a registered Liberian Company which has been awarded Forest Management Contract (FMC) for forest concession area "Area I" located in Grand Gedeh and Sinoe Counties by the Government of the Republic of Liberia through the Forestry Development Authority (FDA).

The Forestry Reformed Law of 2006 and the Environmental Protection Law requires that prior to the commencement of all forestry operations the operator shall undertake an environmental impact assessment and subsequently produce an environmental impact statement (EIS) and an environmental and forest management plan for those activities, phases and components of the project that may have any significant impact to the environment. In keeping with these mandates set forth by the Forestry Development Authority (FDA) and the Environmental Protection Agency of Liberia (EPAL), Geblo Logging Incorporated conducted a sensitivity analysis on the Area of Interest (AOI) and an EIA study of the concession for the purpose of satisfying the FDA and EPA requirements and obtaining an Environmental Permit and Harvesting Certificate prior to the commencement of activities.

This report indicates based on the baseline data collected from specific locations in the concession area that ESIA conducted in order to assess the status of the environment at present, and also to determine those potential impacts likely to occur during the company's operations, did not reveal any significant impact to water, air, soil, flora and fauna, and human life; however, several environmental impacts such as disturbance of biodiversity, deforestation, surface water contamination, soil erosion, vehicular traffic and public safety, and community subsistence farming were identified.

Mitigating measures for these impacts includes strict policies on clearing of vegetation, hunting, proper fuel storage, vehicle and earth-moving equipment maintenance, and the implementation of the Code of Forest Harvesting Practices (CHP) produced by the Forestry Development Authority (FDA). Adherence and implementation of the social agreement signed between Geblo and the local communities will also ensure that there be no significant impacts, but if they do occur, they will be minimized.

The Strategic Forest Management Plan addresses description of monitoring programmes (clearly indicating the linkages between identified impacts, measurement indicators, detection limits, and definition of thresholds that will signal the need for corrective actions); assignment of responsibilities for plan implementation; management strategy to correct larger than predicted changes; implementation and reporting procedures; estimate of cost of carrying out mitigation measures and sources of funds; and the efficiency of the mitigation measure. Procedures governing the EIS analysis practice in Liberia are defined in administrative rules implementing the Environmental Protection & Management Laws of Liberia (EPML), approved in November 2002. This law requires an EIS to be prepared for any action taken by individuals (s) or institution that may significantly affect the quality of the human environment. The EIS was written to meet the requirements of this statute and the administrative rules and regulations implementing these laws adopted by local governments and decision-making ministries or agencies.

Two governmental agencies serve as lead agencies for this EIS: The Forestry Development Authority (FDA) and the Environmental Protection Agency of Liberia (EPA). This Strategic Five (5) Years Forest Management Plan was prepared in response to applications for Environmental Permit and Harvesting Certificate to commence logging activities in Forest Management Contract Area "I" submitted to the FDA and EPA. The scope of this Strategic Forest Management Plan includes actions, alternatives, and

analyses that would be considered in by the FDA in order to fulfill its regulatory responsibilities. Preparation for this project provides a coordinated and comprehensive analysis of potential environmental impacts. Additionally, this information will be used to establish the conditions necessary to operate the project.

This *Strategic Five* (5) *Years Forest Management Plan* of Geblo Logging Incorporated is based on realistic information from the <u>2015-2016, 2016-2017, 2017-2018, 2018-19, 2019-20</u> <u>*annual coupe*</u> areas of 29,732.110 hectare/73,469.347 acres and the enumeration results derived from One Hundred & Five (106) blocks.

The plan includes location and description of annual coupes. The pre-harvest enumeration results which highlight the methodology and criteria for the selection of harvestable trees are provided in the harvesting forecast for each block.

3. General Framework

Our goal is to participate in national developmental programs in Liberia, to restore hope to inhabitants in Sinoe and Grand Gedeh counties, by contributing to the forestry industry through production, processing, marketing of Liberia wood products and engage in Reforestation Programs of various tree species outside of the concession.

Objectives:

- To provide employment, income and livelihood to employees and communities
- Put in place legally accepted employment, remuneration scheme, while providing sustainable income for employees.
- Promoting the provision of sustainable livelihoods services for employees and communities
- To engage in extraction and exportation of round logs
- To engage in the processing of timber and timber products through value addition.
- To engage in the exportation of finished, semi finished and processed forest products (sawn timber, etc)
- Processing and packaging of processed timber for the international/local markets
- Construction of bio-generation facilities.

a. Implementation Strategy

Noting that management's operation policy is geared towards environmentally sound harvesting practices, better use of timber resources potential, efficient and safer logging and constant flow of raw materials through reforestation and better workforce performance, the following strategy is to be employed during harvesting:

- 1. A 100% aerial photography using GIS technology (pre felling survey and mapping of topography, sites and growing stock) will be carried out for all the areas to be harvested in order to provide the basic information for planning and preparation;
- 2. A 10% inventory (GROUND TRUTHING pre felling survey and mapping of topography, sites and growing stock) will be carried out for all the areas to be harvested in order to provide the basic information for planning and preparation;
- 3. Developing training programs and task descriptions for all the workforce;
- 4. Technical planning of access and extraction, including roads and drainage specification will be developed; the extraction will be done in two phases; firstly by harvesting trees from dbh60> and secondly harvesting from 50-59 dbh;

- 5. Road construction using Grader, CAT D7, dump trucks, compacter, front end loader and water tanker;
- 6. Skidding logs to the landing using wheeled skidder to the landing;
- 7. Prepare and load the logs using highly efficient loaders;
- 8. Transporting operations using trucks, load bed and trailers;
- 9. Processing of non export quality logs into sawn timber;
- 10. Value addition of sawn timber into finish or semi-finish products;

b. Processing Plan

In two (2) years time, the company will install a portable sawmill with a capacity of 30 meter cube per/day but hopes to increase to 500 cubic meters per day based on the installation of larger mill in time to come to produce sawn timber for the local and export markets. Massive and effective processing of timber is planned to start during the third year of operation. The sawmill facility will be located at a suitable site outside the concession area.

c. Labor Required Strategy

In keeping with the National Forestry Reform Law 2006, the best labor practices, and the Labor Laws of Liberia, the Company will recruit the requisite manpower needed to carryout sustainable management of the company's assets.

3.1 Company's Profile



Organizational Chart of Geblo Logging Incorporated

1. Principal Shareholders

Caesar Colombo

Madam Sherlay

	1		
Sr. No.	Name of Shareholder	Nationality	% of shares
1	Macdonald Wento	Liberian	30
2	Mark Wento	Liberian	30

Italian

Liberian

20

20

The sole initial shareholder for Geblo Logging Incorporated is herein below named:

2. Board of Directors

By the end of July A.D. 2015, Board of Directors for GEBLO Logging came into motion.

Capitalization:

3

4

The company will finance its operations from parent conglomerate companies both from United States of America and Europe. These groups of companies have adequate cash, assets and vast experience in the Timber Processing, Hydro carbon, Mining Equipment, Aviation as well as the Shipping and Oil Industries.

Name of Management Team's Position and Qualification

#	Position	Qualification
1	General Manager	MSc or its equivalent or PHD in General Management
		with at least 5 years working experience;

2	Administrative	Bachelors in Business/Management with at least 5				
	Manager/Accountant	years of experience in both logging and accountant				
	_	practices;				
3	Operation Manager	Bachelors or its equivalent with at least 10 years of				
		practical experience in logging operations;				
4	Production Manager	Bachelors or its equivalent with at least 10 years of				
		practical experience in logging operations;				
6	Human Resource	Bachelor of Arts in Public Administration; with at least				
	Manager	5 years of working experience				
9	Saw Mill Manager	Certificate or Bachelors with at least 5 years of				
		previous experience in saw milling				

Past Production (volume by species)

The data contained in the below table is based on six (6) of the Annual Coupe of 53 blocks

N	NUMBER OF STEMS PER SPECIES AND DIAMETER CLASS (IN CM)									
CLASS 'A' SPECIES										
ABRV.	SPECIES	55	65	75	85	95	105	115+	TOTAL STEM	
HAL	Abura	111	85	57	30	6	1	0	290	
CAN	Canarium/Aiele	30	56	61	1713	13	1	0	1874	
ANI	Aningre	1	3	0					4	
GUA	Bosse/Guarea	2	3						5	
CEI	Ceiba/Cotton Tree	6	7	3	3	1	1	3	24	
PIP	Dahoma	94	210	218	205	102	44	1	874	
AFZ	Doussie/Afzelia	14	7	4					25	
LOP	Ekki/Ironwood	95	155	141	95	61	23	1	571	
TES	Frake	7	8	4	1				20	
TEI	Framire/Emire	42	50	21	12	3		1	129	
CHL	Iroko/Odoum	69	48	9	8	1			135	
КНА	Khaya	1							1	
NAU	Bilinga/Kusia	63	58	16	6	1			144	
GIL	Limbali	45	24	9	2				80	
LOV	Lovoa	41	45	17	3	2			108	
THE	Makore/Baku		1	1	1	2	1		6	
DIS	Movingui	12	7	5	2	1			27	
TAR	Niangon/Whismore	364	93	11					468	
ENTCY	Sapele		2	3	1	1			7	
ENTU	Sipo/Utile	1	3	2		1			7	
TET	Tetra/Sikon	24	20	2	0	0			46	
ENTA	Tiama/Edinam	6	5	7	1	1			20	
	TOTAL	1,028	890	591	2,083	196	71	6	4,865	

NUMBER OF STEMS PER SPECIES AND DIAMETER CLASS (IN CM)										
CLASS 'B' SPECIES										
ABRV.	SPECIES	55	65	75	85	95	105	115+	TOTAL STEM	
PER	Afromosia	31	20	6	0	1	0	0	58	
CHR	Akatio	125	32	5	4	0	0	0	166	
ANT	Ako/Antiaris	8	8		3				19	
CYN	Apome	5	2	0					7	
НАР	Black Gum/Idewa	2	2		2				6	
BOM	Bombax	22	3	1	0	0	0	0	26	
DAN	Faro	7	6	2	2	0	0	0	17	
РҮС	Ilomba	73	68	21	6				168	
ANO	Kokoti/Anopyxis	30	36	26	17	3	0	0	112	
PTE	Koto	6	6	0	0				12	
MAM	Oboto/Mammea	8	4	1	3	0		1	17	
MAN	Mansonia/Bete	5	0	1	0	0			6	
OLD	Oldfieldia/Dantoue	27	10	7	2				46	
SAC	Ozoouga/Sacoglotti	154	148	136	68	30	13	1	550	
ERY	Tali/Sasswood	90	118	104	52	16			380	
	TOTAL	593	463	310	159	50	13	2	1,590	

NUMBER OF STEMS PER SPECIES AND DIAMETER CLASS (IN CM)									
	1		CLASS '	C' SPE	CIES				
ABRV.	SPECIES	55	65	75	85	95	105	115+	TOTAL STEM
СОМ	Abale	114	122	77	28	1	0	0	342
ONG	Anguek/Ongokea	25	29	7	2	0	0	0	63
ANH	Anthonotha	43	32	10					85
ARA	Araliopsis	19	5	2	1				27
CAL	Badio/Calpocalyx	30	18	7	2	0	0	0	57
DIA	Dialium	187	28	5	1	0	0	0	221
ALS	Emien/Alstonia	13	4	3					20
FAG	Fagara/Olondu	40	12	4	0	0	0	0	56
FUN	Futumia/Mutundu	55	4	1	0				60
HAN	Hannoa/Effeu	38	20	6	1	0		0	65
BEI	Kanda/Beilschmeidia	16	6	1	0	0			23
KLA	Eveuss/Klainedoxa	19	27	11	5				62
AMP	Lati/Amphimas	55	51	28	4	0			138
PAR	Parinari	138	115	47	15	2	1		318
РАК	Parkia	196	191	85	21	9			502
BER	Ebiara/Pocouli	26	9	1	0	0	0		36
UAP	Rikio/Uapaca	586	186	33	3	2			810
ALB	Albizia	20	8	2					30
AUB	Aubrevillei	3	1	0	1	0			5
CHI	Bala/Chidlowa	12	1	0		0			13
COU	Coula Edulis	35	1	0	0	0			36
CUD	Coula Bakalli	27	3	0	0	0			30
DAC	Dacryodes	11	1	1					13
НАР	Haplomorsia		1	1					2
IRV	Irvingia	2		1					3
LEO	Leocinary	9							9
MON	Monopetalanthus	6	3						9
MUS	Musanga	2							2
NET	Netonia	2							2
NFW	Newtonia	5							5
РАС	Pachystela/Bokulolo	4	1	1					6
PEN	Pentadesma	51	8						59
PENT	Pentaclethra	30	24	5	1	1			61
RIC	Ricinodendron	18	10	1	1				30
SAM	Samanea/Monkey pod	31	11	3	_				45
SYN	Symphonia	40	19	3	1	0			63
	Unknown	29	10	3	3	5			45
YAN	Yantanza		1						1
YT7	Yantandza	1	1						1
	TOTAL	1.697	873	330	84	14	1	_	2.999
		-,,,,,,,	<i></i>			± •	-		_,,,,,

B. VOLUME PER SPECIES PER DIAMETER CLASS												
	GROSS STANDING VOLUME PER DIAMETER CLASS (CM ³)											
CLASS 'A' SPECIES												
ABRV.	SPECIES	55	65	75	85	95	105	115+	TOTAL VOL.			
HAL	Abura	526.48	403.14	261.95	143.56	46.421	4.56	0	1386.111			
CAN	Canarium/Aiele	207.532	267.101	344.515	101.297	79.425	0	0	999.87			
ANI	Aningre	4.25	12.75	0					17			
GUA	Bosse/Guarea	6.903	10.416						17.319			
CEI	Ceiba/Cotton Tree	34.325	46.325	15.65	21.75	29.125	7.375	30.9	185.45			
PIP	Dahoma	572.814	1310.027	1763.144	1277.169	629.135	615.76	6.74	6174.787			
AFZ	Doussie/Afzelia	48.846	27.128	15.942					91.916			
LOP	Ekki/Ironwood	749.66	1383.9	1050.597	861.105	582.526	351.67	7.595	4987.053			
TES	Frake	32.45	36.175	17.975	0				86.6			
TEI	Framire/Emire	183.19	243.44	149.37	64.47	15.57		5.16	661.2			
CHL	Iroko/Odoum	277.859	194.921	40.696	31.904	4.05			549.43			
КНА	Khaya	3.3							3.3			
NAU	Bilinga/Kusia	275.676	253.989	66.019	30.927	4.439			631.05			
GIL	Limbali	205.138	166.116	30.276	8.444				409.974			
LOV	Lovoa	170.846	203.501	87.428	15.564	13.242			490.581			
THE	Makore/Baku		7.8	7.8	7.8	15.6	12.1		51.1			
DIS	Movingui	51.582	33.276	25.42	10.11	5.11			125.498			
TAR	Niangon/Whismore	709.644	239.216	28.85					977.71			
ENTCY	Sapele		10.433	17.499	5.833	5.833			39.598			
ENTU	Sipo/Utile	4.845	14.25	12.2		0	7.91		39.205			
TET	Tetra/Sikon	161.544	130.358	13.462	0	0			305.364			
ENTA	Tiama/Edinam	28.12	27.181	37.168	5.3	5.527			103.296			
	TOTAL	4,255	5,021	3,986	2,585	1,436	999	50	18,333			

	NUMBER OF VOLUME PER SPECIES AND DIAMETER CLASS (IN CM)										
	CLASS 'B' SPECIES										
ABRV.	SPECIES	55	65	75	85	95	105	115+	TOTAL VC		
PER	Afromosia	144.623	70.612	23.482	2.975	4.5	0	0	246.192		
CHR	Akatio	349.486	78.545	29.16	12.638	0	0	0	469.829		
ANT	Ako/Antiaris	39.09	39.472	10.966	5.666				95.194		
CYN	Apome	8.333	6	0					14.333		
HAP	Black Gum/Idewa	5.875	8.075	622	2				637.95		
BOM	Bombax	75.191	11.533	4.666	0	0	0	0	91.39		
DAN	Faro	31.208	27.782	9.954	9.954	0	0	0	78.898		
PYC	Ilomba	295.147	297.54	95.763	0	27.676			716.126		
ANO	Kokoti/Anopyxis	157.63	187.934	128.11	86.646	17.001	0	0	577.321		
PTE	Koto	19.532	3.166	0	0				22.698		
MAM	Oboto/Mammea	26.232	5.6	13.066	11.799	0		0	56.697		
MAN	Mansonia/Bete	16.6	0	3.4	0	0			20		
OLD	Oldfieldia/Dantoue	101.126	38.578	28.004	7.184				174.892		
SAC	Ozoouga/Sacoglottis	550.634	526.514	480.347	255.075	110.413	51.771	2.888	1977.64		
ERY	Tali/Sasswood	341.267	454.628	398.68	202.098	19.09	52.745		1468.51		
	TOTAL	2,162	1,756	1,848	596	179	105	3	6,648		

	NUMBER OF VOLUME PER SPECIES AND DIAMETER CLASS (IN CM)								
			CLASS			05	105	445.	
ABRV.	SPECIES	520 227	569 625	75	85	95	105	115+	101AL VOL.
		338.327	308.033	21.540	134.152	4.925	0	0	1808.713
	Anguek/Ongokea	106.958	126.9//	31.549	8.79	0	0	0	2/4.2/4
ANH	Anthonotha	203.282	145./12	/2.859	8.896	8.896	7.666		439.645
ARA	Araliopsis	54.993	14.645	6.296	3.22	25.166	7.666		111.986
CAL	Badio/Calpocalyx	94.972	59.368	25.166	7.666	0	0	0	187.172
DIA	Dialium	465.344	60.351	22.607	3.6	0	0	0	551.902
ALS	Emien/Alstonia	23.05	7.825	15.525					46.4
FAG	Fagara/Olondu	23.755	37.365	12.141	0	0	0	0	73.261
FUN	Futumia/Mutundu	142.429	10.711	2.638	0				155.778
HAN	Hannoa/Effeu	122.666	67.671	21.516	0	0		0	211.8526
BEI	Kanda/Beilschmeidia	46.732	18.866	2.5	0	0			68.098
KLA	Eveuss/Klainedoxa	77.413	126.35	53.013	40				296.776
AMP	Lati/Amphimas	190.339	201.109	118.205	16.4	0			526.053
PAR	Parinari	616.742	627.056	319.818	77.24	9.67	5.4		1655.926
PAK	Parkia	516.79	744.921	331.588	79.338	34.455			1707.092
BER	Ebiara/Pocouli	68.612	24.164	2.916	0	0	0		95.692
UAP	Rikio/Uapaca	1205.52	499.589	91.563	5.532	5.532			1807.736
ALB	Albizia	64.64	27.164	0	6.888				98.692
AUB	Aubrevillei	9.5	3.5	0	6.8	0			19.8
CHI	Bala/Chidlowa	28.312	2.576	0		0			30.888
COU	Coula Edulis	53.925	2.275	0	0	0			56.2
CUD	Coula Bakalli	48.696	6.292	0	0	0			54.988
DAC	Dacryodes	27.45	2.75	3					33.2
НАР	Haplomorsia		5.35	5.35					10.7
IRV	Irvingia	6		5					11
LEO	Leocinary	25.2							25.2
MON	Monopetalanthus	19.322	9.666						28.988
MUS	Musanga	4.6							4.6
NET	Netonia	6.1							6.1
NFW	Newtonia	12.2							12.2
PAC	Pachystela/Bokulolo	15.066	4.6	4.233					23.899
PFN	Pentadesma	147.016	27.551						174.567
PENT	Pentaclethra	73 989	67.003	17 161	3 82	36			165 573
	Ricinodendron	48 916	27 161	3 011	3 011	5.0			82 099
SAM	Samanea/Monkey pod	106 403	40 573	11 503	5.011				158 479
SVN	Symphonia	145 033	72 98	11.309	4	0			233 322
	Unknown	01 201	31 704	11.042	9 5/6	0			1/12 692
	Vantanza	2 2	51.704	11.042	J.J 4 0				\$ 2
	ΤΟΤΔΙ	3.3 4 703	3 3 9 3	1 603	300	80	13		0.3 10 770
		-,/00	5,565	1,070		07	15		10,279

	B. HARVEST FORECAST							
	TABLE VI FIELD RESULTS							
			CLAS	SS 'A' SPEC	IES			
					Gross	Net	Net	Commercia
			Total # of	Harvestable	Standing	Standing	Standing	l Total
ABRV.	SPECIES	DCL (Cm)	Trees	Trees	Volume	Volume	Volume/Ha	Volume
HAL	Abura	80	290	246	1386.144	1173.023	0.85	1173.023
CAN	Canarium/Aiele	80	178	151	999.8417	847.11	0.84	847.11
ANI	Aningre	60	4	4	17	16	0.94	16
GUA	Bosse/Guarea	60	5	4	17.13	13.84	0.74	13.84
CEI	Ceiba/Cotton Tree	90	24	20	185.45	154.4	0.83	154.4
PIP	Dahoma	80	937	796	4587.787	3892.44	0.84	3892.44
AFZ	Doussie/Afzelia	60	25	20	91.926	73.4	0.79	73.4
LOP	Ekki/Ironwood	80	570	484	4987	4236.1	0.084	4236.1
TES	Frake	70	20	15	86.6	64.95	0.75	64.95
TEI	Framire/Emire	70	129	109	661.2	558.08	0.84	558.08
CHL	Iroko/Odoum	80	135	114	549.43	462.84	0.84	462.84
КНА	Khaya	60	1		3.3			0
NAU	Bilinga/Kusia	80	144	129	631.05	565.02	0.89	565.02
GIL	Limbali	80	80	72	359.974	323.28	0.89	323.28
LOV	Lovoa	70	108	92	490.581	417.68	0.85	417.68
THE	Makore/Baku	80	6	4	51.1	34.04	0.66	34.04
DIS	Movingui	60	27	24	125.498	111.36	0.88	111.36
TAR	Niangon/Whismore	60	468	444	125.498	111.36	0.88	111.36
ENTCY	Sapele	90	7	5	39.598	28.25	0.71	28.25
ENTU	Sipo/Utile	100	7	4	39.205	22.4	0.57	22.4
TET	Tetra/Sikon	60	46	44	305.36	292.07	0.95	292.07
ENTA	Tiama/Edinam	90	20	12	103.29	61.92	0.59	61.92
	TOTAL		3,231	2,793	15,844	13,460	16	13,460

	B. HARVEST FORECAST									
TABLE VI. CLASS 'B' SPECIES										
				FIELD RE	SULTS		ASSESSMENT			
							Net			
					Gross	Net	Standing			
			Total # of	Harvestab	Standing	Standing	Volume/			
ABRV.	SPECIES	DCL(cm)	Trees	le Trees	Volume	Volume	На	TOTAL VOL.		
PER	Afromosia	70	58	40	216.192	148.8	0.13	148.8		
CHR	Akatio	60	166	132	469.829	373.56	0.2	373.56		
ANT	Ako/Antiaris	60	19	16	95.194	80.16	0.15	80.16		
CYN	Apome	60	7	4	14.333	8.16	0.43	8.16		
НАР	Black Gum/Idewa	60	6	3	20.175	10.08	0.5	10.08		
BOM	Bombax	70	26	18	91.392	63.18	0.3	63.18		
DAN	Faro	70	17	8	78.898	37.12	0.52	37.12		
РҮС	Ilomba	60	168	140	716.12	596.4	0.16	596.4		
ANO	Kokoti/Anopyxis	60	112	64	577.324	329.6	0.65	329.6		
PTE	Koto	60	7	4	22.698	12.96	0.42	12.96		
MAM	Oboto/Mammea	60	16	11	58.697	40.26	0.31	40.26		
MAN	Mansonia/Bete	60	6	2	20	6.66	0.66	6.66		
OLD	Oldfieldia/Dantoue	60	46	31	174.92	117.8	0.32	117.8		
SAC	Ozoouga/Sacoglottis	70	550	433	1977.642	1554.47	0.21	1554.47		
ERY	Tali/Sasswood	80	380	238	1468.508	919.63	0.37	919.63		
	TOTAL	960	1,584	1,144	6,002	4,299	5	4,299		

	B. HARVEST FORECAST								
	CLASS 'C' SPECIES								
			Total # of	Hereicate	Gross	Net	Net Standing		
			Troop	Harvesta	Standing	Standing	Volume		
ADRV.	Abale	60	3/2	241	1608 713	1132 7	/па 0.20	1132 7	
	Anguek/Ongokea	60	63	241	274 278	126.15	0.27	126.15	
	Anthonotha	60	85	35	439 645	120.15	0.54	120.15	
ARA	Araliopsis	60	27	15	79.79	44.32	0.44	44.32	
CAL	Badio/Calpocalvx	60	57	37	187.172	121.47	0.35	121.47	
DIA	Dialium	60	221	122	550.99	303.78	0.44	303.78	
ALS	Emien/Alstonia	70	20	13	46.4	30.16	0.35	30.16	
FAG	Fagara/Olondu	60	56	27	73.262	35.31	0.51	35.31	
FUN	Futumia/Mutundu	60	60	46	155.778	119.14	0.23	119.14	
HAN	Hannoa/Effeu	60	65	33	211.8423	107.25	0.49	107.25	
BEI	Kanda/Beilschmeidia	60	23	15	68.098	44.4	0.34	44.4	
KLA	Eveuss/Klainedoxa	60	62	47	256.77	194.58	0.24	194.58	
AMP	Lati/Amphimas	60	138	114	526.093	434.56	0.17	434.56	
PAR	Parinari	60	318	312	1655.936	1622.4	0.02	1622.4	
РАК	Parkia	60	502	389	1707.092	1322.6	0.22	1322.6	
BER	Ebiara/Pocouli	60	36	19	95.692	50.35	0.47	50.35	
UAP	Rikio/Uapaca	60	809	387	1807.74	864.55	0.52	864.55	
ALB	Albizia	60	30	13	98.692	42.64	0.56	42.64	
AUB	Aubrevillei	60	5	2	30.888	12.34	0.6	12.34	
CHI	Bala/Chidlowa	60	5	3	19.8	11.88	0.4	11.88	
COU	Coula Edulis	60	13	5	56.2	21.61	0.61	21.61	
CUD	Coula Bakalli	60	36	18	54.988	27.36	0.5	27.36	
DAC	Dacryodes	60	30	9	33.2	9.9	0.7	9.9	
HAP	Haplomorsia	60	2	2	10.7			0	
IRV	Irvingia	60	2	2	11			0	
LEO	Leocinary	60	3	3	25.2	0.((0.00	0	
	Muganas	60	9	3	28.998	9.00	0.00	9.00	
	Nusanga	60	2	2	4.0			0	
	Newtonia	60	5	Z	12.2	0.76	0.2	0 76	
	Pachystela/Bokulolo	60	5		23 800	15.02	0.2	9.70	
	Pentadesma	60	59	4	174 567	12.92	0.33	123.92	
	Pentaclethra	60	61	31	165 576	84.01	0.7	84.01	
RIC	Ricinodendron	60	30	8	82,099	21.84	0.13	21.84	
SAM	Samanea/Monkey pod	60	45	22	158 479	77 44	0.73	77 44	
SYN	Symphonia	60	63	27	233.322	99.9	0.57	99.9	
UNK	Unknown	60	45	15	143.683	47.85	0.66	47.85	
YAN	Yantanza	60	2	2	8	17100	0.00	0	
-	TOTAL	1,330	2,973	1,922	10,006	6,851	10	6,851	
			•						
			20						

A.

No.	Description	Quantity
001	Cat D7	1
002	Log truck & load bed 6X4	5
003	Excavator	1
004	Tractor Grader	1
005	Fuel/Gas (Tanker) 20000gal.	1
006	Dump Truck	2
007	Generator 40-80 KVA	2
008	Jeeps	3
009	Crane (at the Harper Port)	1
010	Cat 966	2
012	Skidder	3
013	Trucks	6
015	Front End Loader	1
016	Forwarder	1
017	Power Saw	15
018	Landing Craft (ship with log capacity of 2, 500	1
	tons	
019	Mobile Saw mill	1

B. EQUIPMENT FOR THE WOOD PROCESSING PLANT/FACTORY

No.	Description	Quantity
1.	Wood – Mizer	1
2.	Welding Machine	1
3.	Vertical Saw	1
4.	Small Saw	3
5.	Cross Cutter	2
6.	Saw blade Machine	1
7.	Saw Blade	4
8.	Pressure Pump	2
9.	Bundle Machine	2
10.	Crane Machine	1
11.	Mechanic Jack	2
12.	Greasing Machine	1
13.	Forklift	1
	Sub – Total	23

C. LOGISTICS

No.	Description	Quantity
1.	Jeeps	3
2.	Power Saw Chain (rolls)	10
3.	Power Saw accessories(bulk)	1
4.	Staff Compass	4
5.	Tool Box(Complete)	4
6	Power Saw(Sthil)	20
7.	GPS	5
8.	PDA	2
	Sub – Total	49

3.3 Description of the Forest Concession-<u>LOCATION AND EXTENT</u>

Forest Management Contract area "I"/Geblo Logging Incorporated, lies within Latitudes 5°36'0" - 6°0'0" North of the equator and Longitudes 8°12'0" - 8°36'0" West of the Greenwich meridian and it is located in Grand Gedeh and Sinoe Counties, Southeastern Liberia.

Forest Management Contract area "I"/Geblo Logging Incorporated is 315 miles accessible by primary motor road by way of Monrovia, Gbarnga, Ganta, Tappita and Zwedru, and is 83 miles accessible to the Port of Greenville.

Metes and Bounds

Starting from Jellue Town, (5°59'00.42"N - 8°15'46.50"W) thence a line runs N 46° W for 4,132 meters to the point of COMMENCEMENT. (6°00'33.90"N-8°17'23.58"W); thence a line runs S 10° E for 9,988 meters to a point (5°55'15.30"N-8°16'25.40"W); thence a line runs S 38° W for 6,458 meters to a point (5°52'31.38"N-8°18'35.86"W); thence a line runs S 68° E for 4,022 meters to a point (5°51'42.03"N-8°16'35.10"W); thence a line runs N 29° E for 6,245 meters to a point (5°54'38.29"N-8°14'55.50"W); thence a line runs S 57° E for 7,350 meters to a point (5°52'26.09"N-8°11'36.28"W); thence a line runs S 12° W for 3,203 meters to a point (5°50'43.86"N-8°11'59.20"W); thence a line runs S 78° E for 2,906 meters to a point (5°50'25.35"N-8°10'25.77"W); thence a line runs S 1° E for 6,468 meters to a point (5°46'54.71"N-8°10'22.42"W); thence a line runs S 28° W for 7,774 meters to a point (5°43'12.73"N-8°12'21.00"W); thence a line runs S 55° W for 1,449 meters to a point (5°42'46.25"N-8°13'00.11"W); thence a line runs S 21° W for 11,993 meters to a point (5°36'41.90"N-8°15'17.86"W); thence a line runs N 85° W for 1,634 meters to a point (5°36'46.32"N-8°16'11.71"W); thence a line runs N 2° E for 2,701 meters to a point (5°38'14.58"N-8°16'07.30"W); thence a line runs Due West for 7,245 meters to a point (5°38'15.46"N-8°20'04.76"W); thence a line runs S 14° W for 4,026 meters to a point (5°36'09.25"N-8°20'38.31"W); thence a line runs S 73° E for 4,379 meters to a point (5°35'28.65"N-8°18'21.48"W); thence a line runs Due South for 2,618 meters to a point $(5^{\circ}34'04.80"N-8^{\circ}18'24.13"W)$; thence a line runs Due West for 5,211 meters to a point $(5^{\circ}34'02.15"N-8^{\circ}21'14.50"W)$; thence a line runs N 42° W for 4,989 meters to a point $(5^{\circ}36'03.07"N-8^{\circ}23'03.08"W)$; thence a line runs N 87° W for 5,869 meters to a point (5°36'11.90"N-8°26'13.76"W); thence a line runs Due North for 2,999 meters to a point (5°37'48.98"N-8°26'13.76"W); thence a line runs S 72° W for 17,445 meters to a point (5°34'50.13"N-8°35'12.26"W); thence a line runs N 30° W for 5,650 meters to a point (5°37'29.28"N-8°36'41.64"W); thence a line runs N 9° E for 2,219 meters to a point (5°38'41.51"N-8°36'30.62"W); thence a line runs N 62° E for 3,894 meters to a point (5°39'41.49"N-8°34'42.87"W); thence a line runs N 5° E for 8,699 meters to a point (5°44'20.62"N-8°34'13.48"W); thence a line runs N 59° E for 8,672 meters to a point (5°46'43.85"N-8°30'13.49"W); thence a line runs N 79° E for 2,878 meters to a point (5°47'02.21"N-8°28'40.43"W); thence a line runs N 50° E for 2,916 meters to a point (5°48'03.43"N-8°27'30.64"W); thence a line runs N 31° W for 1,710 meters to a point (5°48'51.17"N-8°27'57.58"W); thence a line runs N 49° W for 2,565 meters to a point (5°49'43.81"N-8°29'01.25"W); thence a line runs S 81° W for 2,815 meters to a point (5°49'31.57"N-8°30'33.08"W); thence a line runs N 22° W for 2,203 meters to a point on the Proposed Protected Area boundary line (5°50'37.99"N-8°30'58.20"W); thence a line runs Due North for 5,412 meters to a point (5°53'33.21"N-8°30'56.48"W); thence a line runs N 52° W for 2,870 meters to a point (5°54'29.91"N-8°32'11.13"W); thence a line runs N 71° E for 244 meters to a point (5°54'32.79"N-8°32'03.65"W); thence a line runs S 76° E for 486 meters to a point (5°54'28.98"N-8°31'48.27"W); thence a line runs N 80° E for 534 meters to a point (5°54'32.04"N-8°31'31.16"W); thence a line runs N 39° E for 311 meters to a point (5°54'39.92"N-8°31'24.87"W); thence a line runs N 15° W for 373 meters to a point (5°54'51.57"N-8°31'28.02"W); thence a line runs N 33° E for 489 meters to a point (5° 55'04.93"N-8°31'19.46"W); thence a line runs N 89° E for 1,080 meters to a point (5°55'05.69"N-8°30'44.33"W); thence a line runs S 72° E for 860 meters to a point (5°54'56.97"N-8°30'17.66"W); thence a line runs N 57° E for 827 meters to a point (5°55'11.64"N-8°29'55.19"W); thence a line runs N 66° E for 480 meters to a point (5°55'18.09"N-8°29'40.94"W); thence a line runs N 45° E for 752 meters to a point (5°55'35.44"N-8°29'23.66"W); thence a line runs N 17° E for 474 meters to a point (5°55'50.19"N-8°29'19.22"W); thence a line runs N 68° E for 223 meters to a point (5°55'52.96"N-8°29'12.59"W); thence a line runs N 22° E for 823 meters to a point (5°56'17.68"N-8°29'02.62"W); thence a line runs N 74° E for 345 meters to a point (5°56'20.62"N-8°28'51.80"W); thence a line runs S 79° E for 981 meters to a point (5°56'14.33"N-8°28'20.61"W); thence a line runs N 78° E for 912 meters to a point (5°56'20.70"N-8°27'51.59"W); thence a line runs S 77° E for 537 meters to a point (5°56'16.68"N-8°27'34.49"W); thence a line runs S 60° E for 583 meters to a point (5°56'07.37"N-8°27'18.14"W); thence a line runs N 83° E for 363 meters to a point (5°56'08.63"N-8°27'06.48"W); thence a line runs S 61° E for 335 meters to a point (5°56'03.27"N-8°26'57.01"W); thence a line runs S 23° E for 423 meters to a point (5°55'50.70"N-8°26'51.56"W); thence a line runs S 68° E for 1,048 meters to a point (5°55'37.71"N-8°26'20.03"W); thence a line runs N 74° E for 693 meters to a point (5°55'43.74"N-8°25'58.23"W); thence a line runs S 53° E for 325 meters to a point (5°55'37.45"N-8°25'49.76"W); thence a line runs S 40° E for 435 meters to a point (5°55'26.56"N-8°25'40.79"W); thence a line runs S 68° E for 390 meters to a point (5°55'21.78"N-8°25'29.05"W); thence a line runs N 58° E for 2,079 meters to a point (5°55'57.90"N-8°24'31.87"W); thence a line runs N 83° E for 750 meters to a point (5°56'00.70"N-8°24'07.66"W); thence a line runs S 64° E for 428 meters to a point (5°55'54.75"N-8°23'55.15"W); thence a line runs N 70° E for 479 meters to a point (5°55'50.64"N-8°23'40.51"W); thence a line runs S 51° E for 479 meters to a point (5°55'50.64"N-8°23'28.62"W); thence a line runs S 38° E for 459 meters to a point (5°55'38.90"N-8°23'19.47"W); thence a line runs N 89° E for 2,972 meters to a point (5°55'40.87"N-8°21'42.67"W); thence a line runs Due North for 978 meters to a point (5°56'12.25"N-8°21'42.67"W); thence a line runs N 20° E for 8,635 meters to a point (5°56'12.23"N-8°19'00.59"W); thence a line runs N 20° E for 8,635 meters to the point of COMMENCEMENT (6°00'32.78"N-8°17'25.08"W); embracing (One Hundred and Thirty One Thousand Four Hundred and Sixty Six) 131,466 hectares of forest land and no more.

3.4 Description of the Forest Compartment (2013-2014 Annual Coupe)

The 2013-2014 Annual Coupe blocks boundary line commences at a point marked on the surface of the Earth Lat/Long (0577632 – 0624141); thence a line runs Due North for 1 kilometer to a point; thence a line runs Due West for 7 kilometers to a point; thence a line runs Due North for 2 kilometers to a point; thence a line runs Due West for 2 kilometers to a point; thence a line runs Due North for 1 kilometer to a point; thence a line runs Due East for 2 kilometers to a point; thence a line runs Due North for 1 kilometer to a point; thence a line runs Due East for 2 kilometers to a point; thence a line runs Due North for 1 kilometer to a point; thence a line runs Due West for 3 kilometers to a point; thence a line runs Due North for 1 kilometer to a point; thence a line runs Due East for 1 kilometer to a point; thence a line runs Due North for 1 kilometer to a point; thence a line runs Due East for 2 kilometers to a point; thence a line runs Due North for 1 kilometer to a point; thence a line runs Due East for 3 kilometers to a point; thence a line runs Due North for 1 kilometer to a point; thence a line runs Due East for 1 kilometer to a point; thence a line runs Due South for 7 kilometers to a point; thence a line runs Due East for 2 kilometers to a point; thence a line runs Due South for 3 kilometers to a point; thence a line runs West for 1 kilometer to the point of COMMENCEMENT, embracing 5,200 hectares of primary forest land and NO MORE.

The above fifty two (52) blocks within the annual coupe of Geblo concession area has a total gross area of 5,200 hectares 12,849 acres. Each block contains 100 hectares measuring 1000 meters x1000 meters, which is equivalent to1 square kilometer. This means that this GLI 2013-2014 annual coupe contains 52 square blocks.





Geographic Coordinates of the Forest Compartment (2013-2014 Annual Coupe)

Waypoints	Latitudes_UTM	Longitudes_UTM
768	576623.37966	634194.62424
769	575618.20582	634194.68216
823	572594.21596	633186.79914
824	573607.19206	633186.65415
825	574612.70527	633186.50924
826	575618.44477	633186.36490
827	576623.57666	633186.22022
851	576623.77349	632181.97475
852	575618.68285	632182.04150

853	574612.84240	632182.10900
854	573607.29563	632182.17651
855	572593.82645	632182.24400
856	571594.73446	632182.31081
857	570585.82386	632182.37836
904	569584.36111	631176.96966
905	570585.27948	631176.98590
906	571594.41893	631177.00208
907	572593.43696	631177.01817
908	573607.39950	631177.03440
909	574612.97980	631177.05041
910	575618.92207	631177.06666
911	576623.96963	631177.08291
932	576624.16534	630172.52607
933	575619.16037	630172.33948
934	574613.11696	630172.15269
935	573607.50330	630171.96594
936	572593.04731	630171.77830
937	571594.10291	630171.59276
938	570584.73555	630171.40644
939	569584.00030	630171.22049
987	570584.19107	629166.41144
988	571593.78821	629166.55895
989	572592.65791	629166.70491
990	573607.60723	629166.85322
991	574613.25409	629166.99962
992	575619.39887	629167.14658
993	576624.36233	629167.29304
1012	576624.55819	628162.62533
1013	575619.63734	628162.46489
1014	574613.39131	628162.30494
1015	573607.71124	628162.14463
1016	572592.26863	628161.98258
1017	571593.47289	628161.82381
1018	570583.64683	628161.66296
1019	569583.27958	628161.50402
1020	568576.66912	628161.34395
1065	568576.32200	627158.86306
1066	569582.92005	627158.94370
1067	570583.10399	627159.02433
1068	571593.15800	627159.10527

1069	572591.87992	627159.18586
1070	573607.81495	627159.26723
1071	574613.52808	627159.34796
1072	575619.87554	627159.42868
1073	576624.75452	627159.50951
1074	577631.89105	627159.59037
1075	578639.33751	627159.67143
1088	578639.51870	626155.10474
1089	577632.05491	626155.00917
1090	576624.95072	626154.91345
1091	575620.11395	626154.81805
1092	574613.66566	626154.72211
1093	573607.91884	626154.62671
1094	572591.49057	626154.53018
1095	571592.84314	626154.43549
1096	570582.56021	626154.33926
1146	570582.01617	625149.78726
1147	571592.52773	625149.75919
1148	572591.10128	625149.73148
1149	573608.02288	625149.70304
1150	574613.80285	625149.67521
1151	575620.35278	625149.64736
1152	576625.14741	625149.61909
1153	577632.21874	625149.59120
1154	578639.70035	625149.56299
1166	578639.88165	624141.12678
1167	577632.38301	624141.24624

3.5 Description of the Forest Compartment (2014-2015 Annual Coupe)

The 2015 Annual Coupe blocks boundary line of Geblo Logging commences at a point marked on the surface of the Earth, waypoint # 1,238, Lat/Long (0578640 – 0623208); thence a line runs Due North for 4,000 meters to a point; thence a line runs Due West for 2,000 meters to a point; thence a line runs Due West for 5,000 meters to a point; thence a line runs Due East for 7,000 meters to a point; thence a line runs Due South for 8,856 meters to the point on the Southern border of Geblo Forest Concession; thence a line runs S 20° W for 3,246 meters to a point; thence a line runs N 81° W for 1,634 meters to a point; thence a line runs Due West for 2,346 meter to the point of COMMENCEMENT, embracing <u>6,108 hectares</u> of primary forest land and NO MORE.

The above sixty one (61) blocks within the annual coupe of Geblo concession area has a total gross area of 6,108 hectares 15,093 acres. Each block contains 100 hectares measuring

1000 meters x1000 meters, which is equivalent to1 square kilometer. This means that this GLI 2015 annual coupe contains 61 square blocks.



Map of the Forest Compartment (2014-2015 Annual Coupe)

Geographic Coordinates of the Forest Compartment (2014-2015 Annual Coupe)

Waypoints	Latitudes_UTM	Longitudes_UTM
844	583650.08679	632181.50484
845	582646.30472	632181.57190
846	581642.38981	632181.63906
847	580648.16466	632181.70555
848	579643.90286	632181.77266
849	578638.43237	632181.83997
850	577631.07205	632181.90740
851	576623.77349	632181.97475
911	576623.96963	631177.08291
912	577631.23582	631177.09909
913	578638.61344	631177.11542
914	579644.07522	631177.13117

915	580648.22452	631177.14757
916	581641.75828	631177.16356
917	582646.00914	631177.17987
918	583650.06482	631177.19586
925	583650.04288	630173.82863
926	582645.71360	630173.64240
927	581641.12731	630173.45597
928	580648.28500	630173.27192
929	579644.24716	630173.08569
930	578638.79454	630172.89928
931	577631.39970	630172.71252
932	576624.16534	630172.52607
993	576624.36233	629167.29304
994	577631.56364	629167.44026
995	578638.97579	629167.58705
996	579644.41962	629167.73381
997	580648.34522	629167.88027
998	581640.49550	629168.02515
999	582645.41755	629168.17192
1000	583650.02091	629168.31839
1005	583649.99845	628163.74377
1006	582645.12183	628163.58377
1007	581639.86385	628163.42372
1008	580648.40522	628163.26600
1009	579644.59178	628163.10602
1010	578639.15689	628162.94597
1011	577631.72709	628162.78533
1012	576624.55819	628162.62533
1073	576624.75452	627159.50951
1074	577631.89105	627159.59037
1075	578639.33751	627159.67143
1076	579644.76365	627159.75207
1077	580648.46554	627159.83295
1078	581639.23293	627159.91245
1079	582644.82622	627159.99296
1080	583649.97674	627160.07371
1083	583649.95468	626155.58066
1084	582644.53043	626155.48538
1085	581638.60139	626155.38961
1086	580648.52568	626155.29566
1087	579644.93597	626155.20019

1088	578639.51870	626155.10474
1154	578639.70035	625149.56299
1155	579645.10832	625149.53522
1156	580648.58577	625149.50739
1157	581637.96922	625149.47979
1158	582644.23414	625149.45169
1159	583649.93262	625149.42384
1161	583649.91052	624140.53403
1162	582643.93722	624140.65346
1163	581637.33524	624140.77189
1164	580648.64651	624140.88891
1165	579645.28104	624141.00787
1166	578639.88165	624141.12678
1238	578640.04974	623208.57583
1239	579645.44091	623208.57555
1240	580648.70226	623208.57574
1241	581636.70344	623135.87110
1242	582643.64165	623136.80160
1243	583569.91937	623137.65849
1244	583214.60691	622132.53511
1245	582643.34567	622132.58611
1246	581636.07309	622132.67562
1247	580954.95316	622132.06628
1308	580933.86677	621119.92152
1309	581635.43710	621121.34840
1310	582643.04863	621123.19471
1391	581635.00540	620434.76148

3.6 Description of the Forest Compartment (2015-2016 Annual Coupe)

The 2015-2016 Annual Coupe blocks boundary line of Geblo Logging commences at a point marked on the surface of the Earth, waypoint # 688, Lat/Long (0575617 – 0636199), which is 3.1 kilometers West from Garbo Wragbah; thence a line runs Due East for 1,000 meters to a point; thence a line runs Due North for 2,000 meters to a point; thence a line runs Due East for 2,000 meters to a point; thence a line runs Due East for 2,000 meters to a point; thence a line runs Due East for 1,000 meters to the point; thence a line runs Due North for 2,000 meters to a point; thence a line runs Due East for 1,000 meters to a point; thence a line runs Due East for 1,000 meters to a point; thence a line runs Due East for 1,000 meters to a point; thence a line runs Due East for 2,000 meters to a point; thence a line runs Due East for 2,000 meters to a point; thence a line runs Due East for 3,000 meters to a point; t

runs Due North for 2,000 meters to a point; thence a line runs Due West for 1,000 meters to a point; thence a line runs Due South for 1,000 meters to a point; thence a line runs Due West for 1,000 meters to a point; thence a line runs Due North for 2,000 meters to a point; thence a line runs Due East for 1,000 meters to a point; thence a line runs Due North for 1,000 meters to the point of COMMENCEMENT, containing <u>5,943.917 hectares</u> of primary forest land and NO MORE.

The above fifty nine (59) blocks within the annual coupe of Geblo concession area has a total gross area of 5,943.917 hectares 14,687.679 acres. Each block contains 100 hectares measuring 1000 meters x1000 meters, which is equivalent to1 square kilometer. This means that Geblo Logging Inc., 2015-2016 annual coupe contains 59 square blocks.



Map of the Forest Compartment (2015-2016 Annual Coupe)

Geographic Coordinates of the Forest Compartment (2015-2016 Annual Coupe)

Waypoint	Coordinate X_UTM	Coordinate Y_UTM
450	580647.50339	643221.53257
451	581649.32931	643221.25253
452	582649.55532	643220.97254
471	582649.26017	642218.02336

472	581648.69883	642218.27854
473	580647.56316	642218.53470
474	579642.18297	642218.79104
515	579642.35505	641214.56232
516	580647.62339	641214.27644
517	581648.06781	641213.99181
518	582648.96447	641213.70737
537	582648.66934	640211.33998
538	581647.43751	640211.63719
539	580647.68381	640211.93384
540	579642.52707	640212.23238
541	578636.98523	640212.53044
583	578637.16571	639210.79644
584	579642.69853	639210.61573
585	580647.74355	639210.43486
586	581646.80833	639210.25547
587	582648.37430	639210.07530
606	582648.07914	638206.32537
607	581646.17684	638206.38997
608	580647.80376	638206.45409
609	579642.87044	638206.51896
610	578637.34657	638206.58403
611	577630.08959	638206.64843
612	576622.59615	638206.71339
659	576622.79270	637199.82864
660	577630.25369	637199.84327
661	578637.52784	637199.85825
662	579643.04345	637199.87258
663	580647.86399	637199.88726
664	581645.54415	637199.90175
665	582647.78243	637199.91642
681	582647.48814	636198.68934
682	581644.91487	636198.74027
683	580647.92387	636198.79082
684	579643.21440	636198.84084
685	578637.70850	636198.89207
686	577630.41692	636198.94288
687	576622.98834	636198.99357
688	575617.73012	636199.04447
740	574612.43082	635196.07479
741	575617.96816	635196.09742

742	576623.18438	635196.12061
743	577630.58044	635196.14384
744	578637.88933	635196.16673
745	579643.38645	635196.18961
746	580647.98408	635196.21299
747	581644.28468	635196.23532
748	582647.19250	635196.25857
749	583650.15287	635196.28144
761	583650.13093	634194.21848
762	582646.89731	634194.27677
763	581643.65483	634194.33488
764	580648.04354	634194.39247
765	579643.55818	634194.44991
766	578638.06973	634194.50801
767	577630.74378	634194.56604
768	576623.37966	634194.62424
769	575618.20582	634194.68216
770	574612.56771	634194.74037
825	574612.70527	633186.50924
826	575618.44477	633186.36490
827	576623.57666	633186.22022
828	577630.90833	633186.07557
829	578638.25148	633185.93054
830	579643.73093	633185.78625
831	580648.10453	633185.64187
832	581643.02081	633185.49885
833	582646.60040	633185.35461
834	583650.10882	633185.21058
844	583650.08679	632181.50484
845	582646.30472	632181.57190
846	581642.38981	632181.63906
847	580648.16466	632181.70555
848	579643.90286	632181.77266
849	578638.43237	632181.83997
850	577631.07205	632181.90740
851	576623.77349	632181.97475

3.7 Description of the Forest Compartment (2016-2017 Annual Coupe)

The 2016-2017 Annual Coupe blocks boundary line of Geblo Logging commences at a point marked on the surface of the Earth, waypoint # 587, Lat/Long (0582648 – 0639210); thence a line runs Due East for 9,000 meters to a point; (the boundary which serves as

border between Geblo Logging Company and the Putu Proposed Community Forest); thence a line runs along said boundary which is already surveyed and demarcated by the Forestry Development Authority GIS Department, in the Southwestern direction for 17,732.33 meters to a point; thence a line runs Due North for 11,562 meters to a point; thence a line runs Due West for 1,000 meters to a point; thence a line runs Due North for 4,000 meters to a point of COMMENCEMENT, containing <u>6,169 hectares</u> of primary forest land and NO MORE.

The below (66) blocks within the annual coupe of Geblo concession area has a total gross area of 6,169 hectares, 15,243 acres. Each block contains 100 hectares measuring 1000 meters x1000 meters, which is equivalent to one (1) square kilometer. This means that Geblo Logging Inc., 2016-2017 annual coupe contains 66 square blocks.

2016-2017 Annual Coupe Block Map of: Geblo Logging Incorporated (FMC "I" 131,450ha.) Interpretation Key Geblo Concession FMC "I" 2016-2017 block gps coord Town/Village Square block boundary River/Creek/Streamlet AA-31 AA-32 AA-33 AA-34 AA-35 AA-36 AA-37 AA-38 Major motor road Tracks/trail 666 667 668 669 670 671 672 672 Geblo 2016-2017 AOP block compt BB-33 BB-34 BB-35 BB-36 BB-37 BB-38 BB-39 BB Geblo concession boundary Karlorwieb Map Scale = 1:81,662 0.5 0 0.5 1 Kilometers CC-34 CC-35 CC-36 CC-37 CC-38 CC-39 CC-40 DD-36 DD-37 DD-38 DD-39 DD-40 DD 760 759 768 757 766 EE-37 EE-38 EE-39 EE-40 EE-4 835 836 837 838 FE-38 FE-39 F.37 843 842 841 FF-4 Nregbaleh Geblo Concession GG-3 919 37920 4 HH-38 HH-39 HH-**Putu Community** John Davis To II-38 II-39 II-4 Forest (proposed) .1001 JJ-38 JJ-33 1004 KK-38 KK 1081 11-38 Geblo Concession MM.34 1h.1161 Petroke Slogbale Gbevelogbo

Map of the Forest Compartment (2016-2017 Annual Coupe)

Geographic Coordinates of the Forest Compartment (2016-2017 Annual Coupe)

Waypoints	Latitudes_UTM	Longitudes_UTM
587	582648.37430	639210.07530
588	583650.24083	639209.89511

589	584651.39536 639209.71511			
590	585649.60187	639209.53566		
591	586651.85472	639209.35564		
592	587655.70441	639209.17464		
593	588659.41048	639208.99445		
594	589662.16979	639208.81410		
595	590665.21626	639208.63354		
596	591617.72076	639208.46224		
597	591077.26355	638205.78298		
598	590664.93260	638205.80928		
599	589662.00192	638205.87391		
600	588659.68270	638205.93864		
601	587655.94810	638206.00298		
602	586651.97190	638206.06775		
603	585649.78515	638206.13258		
604	584651.59072	638206.19629		
605	583650.21875	638206.26121		
606	582648.07914	638206.32537		
665	582647.78243	637199.91642		
666	583650.19674	637199.93095		
667	584651.78641	637199.94561		
668	585649.96891	637199.95998		
669	586652.08953	637199.97477		
670	587656.19249	637199.98929		
671	588659.95502	637200.00363		
672	589661.83329	637200.01831		
673	590535.14938	637200.03064		
674	589661.66530	636198.33537		
675	588660.22643	636198.38600		
676	587656.43588	636198.43678		
677	586652.20628	636198.48743		
678	585650.15214	636198.53840		
679	584651.98115	636198.58831		
680	583650.17487	636198.63895		
681	582647.48814	636198.68934		
748	582647.19250	635196.25857		
749	583650.15287	635196.28144		
750	584652.17654	635196.30410		
751	585650.33502	635196.32761		
752	586652.32371	635196.35039		
753	587656.67900	635196.37330		

754	588660.49789	3660.49789 635196.39648			
755	589455.17411	635196.41454			
756	588660.76953	634193.92951			
757	587656.92252	634193.98743			
758	586652.44057	634194.04511			
759	585650.51815	634194.10323			
760	584652.37144	634194.16080			
761	583650.13093	634194.21848			
834	583650.10882	633185.21058			
835	584652.56765	633185.06653			
836	585650.70244	633184.92239			
837	586652.55848	633184.77878			
838	587657.16783	633184.63424			
839	588370.74297	633184.53143			
840	587657.41106	632181.23635			
841	586652.67566	632181.30411			
842	585650.88583	632181.37111			
843	584652.76292	632181.43780			
844	583650.08679	632181.50484			
918	583650.06482	631177.19586			
919	584652.95820	631177.21234			
920	585651.06927	631177.22823			
921	586652.77969	631289.36638			
922	586225.21450	630174.30592			
923	585651.25259	630174.19932			
924	584653.15285	630174.01455			
925	583650.04288	630173.82863			
1000	583650.02091	629168.31839			
1001	584653.34928	629168.46461			
1002	585651.43616	629168.61050			
1003	585454.38315	628164.03127			
1004	584653.54458	628163.90399			
1005	583649.99845	628163.74377			
1080	583649.97674	627160.07371			
1081	584653.73985	627160.15431			
1082	584653.93532	626155.67611			
1083	583649.95468	626155.58066			
1159	583649.93262	625149.42384			
1160	584298.43798	625149.40591			
1161	583649.91052	624140.53403			

3.8 Description of the Forest Compartment (2017-2018 Annual Coupe)

The 2017-2018 Annual Coupe blocks boundary line of Geblo Logging commences at a point marked on the surface of the Earth, waypoint # 321, Lat/Long (058265 – 0646232); thence a line runs Due East for 6,000 meters to the point on the boundary of Former President Tubman property; thence a line runs along said property Southeast ward for 9,299 meters to a point; thence a line runs Due West for 9,000 meters to a point ; thence a line runs Due West for 9,000 meters to a point ; thence a line runs Due North for 7,000 meters to the point of COMMENCEMENT, containing 6,151 hectares of primary forest land and NO MORE.

The below (63) blocks within the annual coupe of Geblo concession area has a total gross area of 6,151 hectares, 15,198 acres. Each block contains 100 hectares measuring 1000 meters x1000 meters, which is equivalent to one (1) square kilometer. This means that Geblo Logging Inc., 2017-2018 annual coupe contains 63 square blocks.

	2016-2017 Annual Coupe Block Map of:										
	G	eblo	Loggi	ing In	corp	orate	d (FN	ИС "Ι	" 131	,450	ha.)
	Geblo Con	cession	319	318	586000 317	316	315		Tubn	nan	932000
646000		S-30	S-31	S-32	S-33	S-34	S-35	S-36	S-37	m S-38	
	380	7-30	→ ³⁸² 4 T-31		→ ³⁸⁴ 4 T-33	→ ³⁸⁵ 4 T-34	→ ³⁸⁶ 4 T-35	→ ³⁸⁷ 4 T-36	→ ³⁸⁸ 4 T-37) 389 ↔ T-38	CovniVillage Geblo 2017-2018 block coord, Major road Tacks Square block Geblo 2017-2018 A OP block
644000 1	399	³⁹⁸ U-26	→ ³⁹⁷ 4 U-27	→ ³⁹⁶ U-28) ³⁹⁵ (U-29	³⁹⁴ U-30	³⁹³ U-31) ³⁹² € U-32	³⁹¹ (U-33) ³⁹⁰ € U-34	Geblo Concession by Hary O.3 0 0.3 Killo meters Map Scale = 1:34088
	452	453 q V-25	454 (V-26	⁴⁵⁵ V-27	456 V-28	457 V-29	458 V-30	V-31	460 V-32	→ ⁴⁶¹ V-33	÷
642000 1	471	470 (W-24	→ ⁴⁶⁹ (W-25	468 W-26	467 W-27	⁴⁶⁶ W-28	→ ⁴⁶⁵ W-29	→ ⁴⁶⁴ ↔ ↔	463 d W-31	462 W-32	0 + + 200
-	518	519 X-25	520 X-26	521 X-27	522 X-28	523 X-29	→ ⁵²⁴ X-30	525 4 X-31	526 X-32	527 X-33	Þ
640000 :	537	538 Y-26	535 q Y-27	534 Y-28	→ 533 (Y-29	532 Y-30) 531 Y-31	→ ⁵³⁰ (Y-32	529 Y-33	528 Y-34	
	Geblo Conc	ession	589	590	591	592	593 C	eblo Co	595 Dincessi	596 on	

Map of the Forest Compartment (2017-2018 Annual Coupe)

Geographic Coordinates of the Forest Compartment (2017-2018 Annual Coupe)

Waypoints	Latitudes_UTM	Longitudes_UTM
315	588641.59921	646231.24605
316	587653.99906	646231.53427
317	586651.03424	646231.82692
318	585648.31904	646232.11938
319	584650.02918	646232.41089
320	583650.39472	646232.70246
321	582650.44246	646232.99424
380	582650.14675	645228.99355
381	583650.37293	645228.72373
382	584650.22438	645228.45418
383	585648.50240	645228.18487
384	586651.15185	645227.91422
385	587654.24301	645227.64409
386	588657.77999	645227.37342
387	589663.17790	645227.10222
388	590666.91832	645226.83159
389	591465.44791	645226.61606
390	591491.39827	644220.65509
391	590666.63414	644220.87837
392	589663.00925	644221.15079
393	588658.05244	644221.42333
394	587654.48736	644221.69554
395	586651.26894	644221.96731
396	585648.68617	644222.23952
397	584650.42011	644222.51053
398	583650.35067	644222.78151
399	582649.85046	644223.05264
452	582649.55532	643220.97254
453	583650.32877	643220.69302
454	584650.61516	643220.41313
455	585648.86919	643220.13433
456	586651.38641	643219.85429
457	587654.73048	643219.57346
458	588658.32396	643219.29285
459	589662.84165	643219.01190
460	590666.35056	643218.73142
461	591517.25036	643218.49351

462	591543.11696	642215.75305
463	590666.06697	642215.97714
464	589662.67353	642216.23315
465	588658.59575	642216.48949
466	587654.97419	642216.74570
467	586651.50335	642217.00161
468	585649.05252	642217.25768
469	584650.81013	642217.51244
470	583650.30706	642217.76759
471	582649.26017	642218.02336
518	582648.96447	641213.70737
519	583650.28475	641213.42266
520	584651.00577	641213.13836
521	585649.23623	641212.85413
522	586651.62068	641212.56929
523	587655.21818	641212.28392
524	588658.86799	641211.99832
525	589662.50541	641211.71300
526	590665.78278	641211.42785
527	591569.03175	641211.17102
528	591594.89213	640208.68489
529	590665.49929	640208.96068
530	589662.33756	640209.25851
531	588659.13926	640209.55645
532	587655.46162	640209.85414
533	586651.73793	640210.15181
534	585649.41897	640210.44949
535	584651.20084	640210.74563
536	583650.26265	640211.04255
537	582648.66934	640211.33998
587	582648.37430	639210.07530
588	583650.24083	639209.89511
589	584651.39536	639209.71511
590	585649.60187	639209.53566
591	586651.85472	639209.35564
592	587655.70441	639209.17464
593	588659.41048	639208.99445
594	589662.16979	639208.81410
595	590665.21626	639208.63354
596	591617.72076	639208.46224

4.0 Conceptual Framework of Partitioning Unites Into Forest Compartments

4.1 The land: (Geblo Concession/FMC "I")

Land is a delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface, including those of the near-surface climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes, and swamps), the near-surface sedimentary layers and associated groundwater reserve, the plant and animal populations, the human settlement pattern and physical results of past and present human activity (terracing, water storage or drainage structures, roads, buildings, etc.)". (FAO 1995, 6).



4.2 Land use affects land cover and changes in land cover affect land use. A change in

not

necessarily the product of the other. Changes in land cover by land use do not necessarily imply a degradation of the land. However, many shifting land use patterns, driven by a

variety of social causes, result in land cover changes that affect forest cover, biodiversity, water and radiation budgets, trace gas emissions and other processes that, cumulatively, affect global climate and biosphere (Riebsame, Meyer, and Turner, 1994).

4.3 Land cover can be altered by forces other than anthropogenic. Natural events such as weather, flooding, fire, climate fluctuations, and ecosystem dynamics may also initiate modifications upon land cover. Globally, land cover today is altered principally by direct human use: by agriculture and livestock raising, forest harvesting and management, and urban and suburban construction and development. There are also incidental impacts on land cover from other human activities such as forests and lakes damaged by acid rain from fossil fuel combustion and crops near cities damaged by tropospheric ozone resulting from automobile exhaust (Meyer, 1995)

4.4 Land Use and Land Cover

Every parcel of land on the Earth's surface is unique in the cover it possesses. Land use and land cover are distinct yet closely linked characteristics of the Earth's surface. Land use is the manner in which human beings employ the land and its resources. Examples of land use include agriculture, urban development, grazing, logging, and mining. In contrast, land cover describes the physical state of the land surface. Land cover categories include cropland, forests, wetlands, pasture, roads, and urban areas. The term land cover originally referred to the kind and state of vegetation, such as forest or grass cover, but it has broadened in subsequent usage to include human structures such as buildings or pavement and other aspects of the natural environment, such as soil type, biodiversity, and surface and groundwater (Meyer, 1995).

A primary component of mapping land use and land cover is adopting or developing a land cover classification system. Many current land use and land cover classification systems are designed specifically for use with remotely sensed data. Many of these classification systems often resemble or incorporate other classification systems in order to maintain cohesiveness and allow for data integration. A hierarchical framework is often implemented within a classification system. This type of framework allows the level of detail to vary for different project scopes and for the creation land use and land cover categories that are compatible with other classification systems.

The terms land use and land cover are not synonymous and the literature draws attention to their differences so that they are used properly in studies of land use and land cover change.

"Land cover is the biophysical state of the earth's surface and immediate subsurface" (Turner et al.1995,20). In other words, land cover "describes the physical state of the land surface: as in cropland, mountains, or forests" (Meyer 1995, 25 cited in Moser 1996, 247). Meyer and Turner (1994) add: "it embraces, for example, the quantity and type of surface vegetation, water, and earth materials (Meyer and Turner 1994, 5). Moser (1996) notes that: "The term originally referred to the type of vegetation that covered the land surface, but has broadened subsequently to include human structures, such as buildings or pavement, and other aspects of the physical environment, such as soils, biodiversity, and surfaces and groundwater" (Moser 1996, 247).

"Land use involves both the manner in which the biophysical attributes of the land are manipulated and the intent underlying that manipulation – the purpose for which the land is used" (Turner et al. 1995, 20). In a similar vein, Meyer (1995) states that "land use is the way in which, and the purpose for which, human beings employ the land and its resources (Meyer 1995, 25 cited in Moser 1996, 247). Briefly, land use "denotes the human employment of land" (Turner and Meyer 1994, 5). Skole (1994) expands further and states that "Land use itself is the human employment of a land-cover type, the means by which human activity appropriates the results of net primary production (NPP) as determined by a complex of socio-economic factors" (Skole 1994, 438). Finally, FAO (1995) states that "land use concerns the function or purpose for which the land is used by the local human population and can be defined as the human activities which are directly related to land, making use of its resources or having an impact on them" (FAO 1995, 21).

4.5 Land Use Change and Land Cover Change Within GLI

In the analysis of land use and land cover changes within Geblo Logging Incorporated area, it is first necessary to conceptualize the meaning of change to detect it in real world situations. At a very elementary level, land use and land cover change means (quantitative) changes in the area extent (increases or decreases) of a given type of land use or land cover, respectively. It is important to note that, even at this level, the detection and measurement of change depends on the spatial scale; the higher the spatial level of detail, the larger the changes in the area extent of land use and land cover which can be detected and recorded.

4.6 Land Use Change: Bio-Physical and Socio-Economic Drivers

The analysis of land use change revolves around two central and interrelated questions: "what drives/causes land use change" and "what are the (environmental and socioeconomic) impacts of land use change". This section addresses the first of these questions. The precise meaning of the "drivers" or "determinants" or "driving forces" of land use change is not always clear, commonly accepted and understood by all those who engage in studies of land use change. Frequently, certain driving forces are emphasized over some others and there is confusion as to the semantic categories to which these causes of land use change belong. Two principal distinctions are made in the following. The first regards the origins of the drivers of land use-cover change. It is almost unanimously accepted that there are two main categories: bio-physical and socio-economic drivers. The bio-physical drivers include characteristics and processes of the natural environment such as: weather and climate variations, landform, topography, and geomorphic processes, volcanic eruptions, plant succession, soil types and processes, drainage patterns, availability of natural resources. The socio-economic drivers comprise demographic, social, economic, political and institutional factors and processes such as population and population change, industrial structure and change, technology and technological change, the family, the market, various public sector bodies and the related policies and rules, values, community organization and norms, property regime. It should be noted that the bio-physical drivers usually do not cause *land use change* directly.

Mostly, they do cause *land-cover change* (or changes) which, in turn, may influence the land use decisions of land owners/managers (e.g. no farming on marginal lands). In addition, land use changes may result in land cover changes which, then, feedback on land use decisions causing perhaps new rounds of land use change (or changes).

4.7 Land Use Change: Environmental and Socio-Economic Impacts

The second central question with which the analysis of land use change is concerned is: "the (environmental and socio-economic) impacts of land use change". In fact, it was the negative impacts that stimulated the scientific and policy interest on land use change. As Kates *et al.* (1990) put it, "The lands of the earth bear the most visible if not necessarily the most profound imprints of humankind's actions" (Kates *et al.* 1990).

The impacts of land use change are broadly categorized into environmental and socioeconomic, the former having received more attention and publicity than the latter. One of the reasons for this imbalance in attention may be that the latter are more subtle, longerterm and subject to the influence of many more complex, and less visible and verifiable, factors than the former. But, it should be noted that the environmental and the socioeconomic impacts are closely interrelated; the former causing the latter.

Which then feedback to the former again, potentially causing successive rounds of land use change. A widely publicized case of a chain of environmental and socio-economic impacts of land use change is that of shifting cultivators in Latin America and other parts of the world. The sequence of land use change starts with forest clearance; cultivation follows, then heavy grazing, and, ultimately, land abandonment and movement to another location (along newly built highways which serve plantation sites) where the sequence is repeated (Blaikie and Brookfield 1987).

4.8 Land Use and Land Cover Classification Systems

The analysis of land use change depends critically on the chosen system of land use and land cover classification. The magnitude and quality of land use change is expressed in terms of specific land use or land use/cover types. The assessment of the environmental and socio-economic impacts of land use change is possible only when the particular environmental and socio-economic features of the chosen land use/cover types are specified. If this requirement is not met, then, the analysis will be of limited value in guiding policy and decision making especially at lower scales. Hence, the need to discuss available land use and land cover classification systems and consider their suitability for the analysis of land use change at various spatial and temporal levels.

In developing any land classification system, a central dilemma concerns the choice between representing "what is" and "what should be". The "what is" encompasses the land available on earth and its characteristics as described by a given technology at a given point in time while the "what should be" relates to values placed on the land and its characteristics and the resulting choices made by people about uses for land (Wolman 1987, 655).

4.9 Image Classification Techniques:

In contemporary land use and land cover mapping studies, land cover classes are often derived from satellite imagery by utilizing computer-assisted image classification techniques. Within the scope of the study, image classification is defined as the extraction of distinct classes or themes, land use and land cover classification categories, from satellite imagery. There are two primary methods of image classification utilized by image analysts, unsupervised and supervised classification.

Unsupervised image classification is a method in which the image interpreting software separates the pixels in an image based upon their reflectance values into classes or clusters with no direction from the analyst. Once this process is completed, the image analyst determines the land cover type for each class based on image interpretation, ground truth information, maps, field reports, etc... and assigns each class to a specified category by aggregation (ERDAS, 1999).

Supervised image classification is a method in which the analyst defines small areas, called training sites, on the image which are representative of each desired land cover category. The delineation of training areas representative of a cover type is most effective when an image analyst has knowledge of the geography of a region and experience with the spectral properties of the cover classes (Skidmore, 1989). The image analyst then trains the software to recognize spectral values or signatures associated with the training sites. After the signatures for each land cover category have been defined, the software then uses those signatures to classify the remaining pixels (ERDAS, 1999).

When classifying satellite imagery, single supervised or unsupervised classification techniques are often not enough to effectively classify an image. Automated classification accuracies can often be unacceptably low, < 80%, at the required level of categorical detail for many applications (Bolstad & Lillesand, 1992). Modifications of image classification techniques are most often required in order to assess for classification accuracy. Experimentation with proven or standardized classification techniques can produce accurate land cover classes as well as lead to the development of new classification procedures. Modifications of image classification techniques are often required in order to obtain adequate classification accuracy. The classification methodology employed in this Strategic Forest Management Plan (SFMP) is discussed in detailed.

5.0 Geblo	Logging Fores	t Compartment	Surface Area

Classification	Area (m2)	Perimeter (m)	Acres	Hectare
High forest	392210459.496	167250.686	96916.928	39221.046
High forest	152287630.720	90541.737	37630.943	15228.763
High forest	272520469.064	95076.586	67341.005	27252.047
Degraded Secondary forest	21062003.691	18585.545	5204.514	2106.200
Degraded Secondary forest	21333331.354	19128.139	5271.560	2133.333
Degraded Secondary forest	51672238.647	35132.962	12768.437	5167.224
Degraded Secondary forest	10317931.950	22774.822	2549.606	1031.793
Degraded Secondary forest	20976380.333	25386.720	5183.356	2097.638
Farmland and Regrowth	314730187.253	183956.453	77628.212	31416.019
Farmland and Regrowth	6119623.130	9996.529	1512.186	611.962

Farmland and Regrowth	35854773.258	50236.831	8859.872	3585.477
Farmland and Regrowth	15982041.163	22494.855	3949.233	1598.204
Total	1315067070.059	740561.865	324815.852	131449.706

5.1 Histogram Analysis of GLI Concession/FMC Area "I"





5.2 FOREST STRATIFICATION Map of G.L.I./FMC "I"



5.3 Block Map of Geblo Logging Incorporated/FMC "I"



6.0 First Five (5) Years Annual Coupe Map of Geblo Logging Incorporated/FMC "I"



7.0 THE ENVIRONMENT IN GEBLO FOREST CONCESSION

7.1 Biological Environment

7.1.1 Wildlife

Herpetofauna

These animals are found both on land as well as in water, and representatives were noticed during the socio-economic and biological surveys. Anecdotes by residents attest to a poor population of herpetofauna species in the area. A few small sized lizards were encountered on the site grounds. Tadpoles were not seen but it is expected they do occur in season. The specimens seen were crawling across trails or on trees, basking in the sun, feeding or hopping away. The list below summarizes the herpetofauna encountered in the area or those for which information was provided:

Common Names of Herpetofauna

Amphibian Spring frog Toad frog

Reptiles Lizard (brown/green) Cassava snake Black snake Brown lizard Boa constrictor

7.1.2 Invertebrates

These were largely represented by butterflies and moths and other insects such as beetles, ants, flies and mosquitoes. Other Arthropods were seen including the millipede and the centipede. Anecdotal evidence from residents indicates that many invertebrates exist in the area.

7.1.3 Birds

Representatives of various species of birds were observed during the surveys. Birds were observed at tree canopies along the riparian zones and on low lying native grasses as well as the floor of the project area. These were dominated by red eye dove, Senegal coucal, village weavers, common bulbul, orange cheek waxbill, cattle egret. Under storey species, the ant bird was also evident especially after rainfall. Few sightings of high canopy soaring birds like Harrier hawks were made with the aid of binoculars. These were generally isolated and at some distance away, probably outside the Concession Area. There was no owl sound close by.

7.1.4 Mammals

Information was gathered on few mammalian Families identified during the survey. They were either heard of by the researchers or their tracks were observed especially early in the mornings. The unmistakable calls of some of these latter mammals were seldom heard in the area. Additionally, second hand information gathered from the local population form the basis of the survey, as well as observation of their foot tracks and fecal droppings. No traps were observed in the field. Data collected on mammals were noted and recorded in data sheets, which included the following: opossum, porcupine, African Climbing Mouse, Water Cherevotain (Protected under Liberian laws), cane rat, Red Legged Sun Squirrel.

7.1.5 Aquatic Habitat

The fish survey was conducted by collecting information from residents from serveral towns situated along River, Creeks and streams within and around the Concession. Reports indicate that the locals carry on artisanal fishing activities using hook lines, baskets and nets made from piassava and palm tree products. Live samples of Fish were observed during the survey. Data collected on fish and other aquatic animals were recorded on the data sheets. Anecdotal evidences from several residents in the area indicate that in the dry weather more fishes are seen since the water flow is reduced considerably and fishes either move to lower ground or are stranded in shallow narrow pools. The types of fishery observed in the area include fishes locally known as catfish, crabfish, tilapia, bonny, crabfish, sunfish, mudfish, crabs etc

7.1.6 Vegetation

The survey of terrestrial resources was conducted midway between the dry seasons. The survey focused on the project site and nearby areas. The area is relatively flat, with undulating elevation and few wetlands. Weather conditions during the survey period were mixed, dry and wet. Significant breaks in rainfall allowed animals to move through their ranges. This enabled the team to get glimpse observations of animal life in the area. The Concession Area is comprised of the following types of forests after analysis:

- High Forest
- Degraded secondary forest
- Farmland & Regrowth

The activities of hunters and farmers have some effect on the biota present in the area. The floral survey, which was conducted via field observation, identified several wild leaves, flowers, twigs and fruits.

7.1.7 Endangered Species

Evidence of threatened or endangered animal species gathered during the survey was limited to the Water Chevrotain, locally known as "Water Deer" and Monkey.

Physical Environment

7.2.1 Climate and Air Quality

The climate of the project area, as is the case with the rest of Liberia, is influenced mainly by the prevailing hamattant wind. The climate of the area can be characterized as either wet or dry, depending on the prevailing precipitation. The rainy season extends from April through October, with ±90% of the rainfall occurring between mid-April and mid-October. The dry season extends from mid October to mid April. The humidity is low during the day and increasing slightly as the temperature cools at night. A relative humidity of 95% to 100% is common during the rainy season. During the dry season it decreases between75% and 80%. In February and March the driest period of the year, relative air humidity decreases to as low as 65%. Total wind speed is greatest in the rainy season and lowest in the dry season. The climate of the area can be described as tropical, experiencing warm dry seasons and cold wet season.

7.2.2 Rainfall

June, July, August and September are the months of heaviest rainfall with a range of 2000 to 4000 mm/year. The average rainfall recorded per year in Liberia is 2372mm/year

7.2.3 Temperature

Due to the high and low pressure belts and the influence of the Atlantic Ocean, the project area has a fairly warm temperature with a range of 27° to 32° Celsius during the day and 21° to 24° Celsius during the night.

7.2.4 Relative humidity

The relative air humidity is very high, ranging from 90% to 100%. During the dry season it stands between 75% to 80%, between February and March it stands at 70%.

7.2.5 Air Quality

Ambient air quality is good. There are no specific sources of gaseous or particulate emissions except from local and project traffic along the access roads of the project area. As a consequence of its geography, the area is under the influence of the dust-laden hammattan winds. This seasonal particulate pollution occurs principally during the four months of the dry season, from November to February. Wind speed is greatest during the rainy season and lowest in the dry season.

7.2.6 Water Resources

Groundwater

Ground water samples were collected from serverals bore holes and wells in the project area. An additional ground water sample was collected from town and Villages which is within 3 mile radius away from project site. Ground water samples collected from the bore holes and wells were taken to the laboratory and analyzed.

Ground Water Quality

Groundwater quality was determined by conducting analytical tests on groundwater samples recovered from serverals bore holes and wells. These samples were tested to determine the presence and concentration of pH, conductivity, turbidity, dissolved oxygen, salinity, total dissolved solids, oxidation reduction Potential and temperature, the results of which are indicated in the appendix.

Surface Water

The concession area is drained by the Cestos and Sehnkwehn Rivers, along with Creeks and Streams. There is no hydrological department in the area to monitor stream flow values for any stream, creek, or river in the vicinity of the project area. At present the vegetation cover intercepts most precipitation in the project area. The soils present at ground surface are primarily cohesive. As a result, a major part of precipitation incident on the ground surface serves to fuel surface runoff. Stream flow volume is highly likely to be only slightly influenced by surface runoff and stream flow is more likely due to discharge to surface water from groundwater.

Flow Conditions

The Project area is drained by the Cestos and Sanquin Rivers, which obtain its base flow from groundwater discharge from aquifers present in the surficial soils deposits and from northern highlands. Local groundwater flow direction appears to be towards these rivers and other creeks and streams located in the area. There are settlements within and around the proposed project area. Groundwater is therefore recovered for drinking and domestic purposes.

Surface Water Quality

Dozens of surface water samples were recovered from the serveral rivers, creeks and streams (up gradient and down gradient at different locations and intervals within and around the Concession area. Analytical tests were performed on these surface water samples to determine the presence and concentration of pH, conductivity, turbidity, dissolved oxygen, salinity, total dissolved solids, oxidation reduction Potential and temperature. The results indicate that surface water quality is within acceptable limits.

7.2.7 Soil

The soil type is a mixture of laterite-reddish brown in color containing aluminum iron, oxides, acid and low in nitrogen concentration; swamp soil occurring in swampy areas,

high concentration of humus with layers consisting of biodegradable materials; and alluvial soil with a high nutrient concentration which is suitable for agriculture.

7.3 Human Environment

A rough estimate would classify pre-project land capability of the area as approximately 90% tropical forest, 7% as wetland and 3% as grazing.

7.3.1 Land Use

A large proportion of the land-use in and around the study area is can classified predominantly forest, shifting agriculture , followed by rain-fed cultivation of cash crops (banana, plantain, eddoes, and cassava) and vegetables (okra, pepper, bitter balls). Most of the land that is not under cultivation is native national forest which serves as grounds for hunting and farming.

7.3.2 Local Communities

There are several local towns and villages located in the concession area. Major towns are at Kuma Town, Gorbowrogba Town, Payne's Town and Putu Jawodi Town. The ethnic groups living in the area are mainly Krahn and Sapo, and they are mixed with a minority of other tribes. Major economic activities are farming, hunting, and gold mining.

Administration

The Ministry of Internal Affairs through its Superintendent administers the Counties from the political capital assisted by other local officials. Administrative control of villages surrounding the project area is maintained by Town chiefs; See below administrative structure:

FLOW CHART OF LOCAL ADMINISTRATION



Those listed above are responsible for the governance of villages around the project area. The Superintendent is appointed by the President of Liberia along with the Development Superintendent and Commissioners. The Paramount chiefs, Clan Chiefs and Town chiefs are elected by the people in keeping with the laws of Liberia

Communication

The United Nations Mission in Liberia (UNMIL) radio, and ELBC (state broadcaster) etc are the radio stations that provide access to information about news and development activities around the country in the project area. There were notably four (4) community radio stations, One (1) each in Tippata, Toe Town and Zwedru. These provide community people with information and entertainment at intermittent periods. There is no access to telecommunication services within the project area.

Utilities

There is no public utility service in the entire area likely to be impacted by the Project, except for the River, Creeks and Streams which many use for household activities including bathing, washing clothes and ditches and drinking in few areas. There is also a supply of potable water in some of the areas provided by public wells/hand pumps. There are limited facilities for public latrines. However, many residents in the communities go into the surrounding bushes to latrine.

Education

There are access to few public primary, Elementary and nursery schools within few towns in the project area. However, secondary education is only accessible in the political capital of Zwedru. Therefore, primary school age children who pass to Secondary School have to leave their communities if they intend to further their education. The inadequate facilities for education have led to several factors. These included:

- High drop-out rates from school
- High levels of teenage pregnancies

There is no facility for skill training accessible for communities dwellers within the prooject area. The attendant contribution to national development is therefore minimized. The limitation for skill training and the attendant ability to contribute to development couple with the dysfunctional state of recreational activities and facilities has reportedly resulted in low social output and productivity of the communities.

Cost Of Living Issues

Cost of living is reported to be very high in the area, as indicated by many of the residents covered during the socio-economic survey, in spite of the fact that access by road has served to lower the cost of living somehow. The cost of food varies with weather. Costs are higher in the rainy season due to difficult access conditions. In addition, there is very little competition since the numbers of shops in the communities are few. A list of some of the prices of various essentials is provided below

Item	UNIT	Unit Price in L\$
Rice	cup	30.00
Sugar	Tie plastic	10.00
Salt	Tie plastic	5.00
AA Battery	pair	20.00
Bath Soap	рс	25.00
Washing soap	рс	20.00
Plantains	bunch	200.00
Soft Drink(coca cola)	bottle	50.00
Mangoes	рс	10.00
Okra	pile	10.00
Pepper	pile	10.00
Chicken	Medium size	150.00

Some essential commodities and their prices

7.4 Protected Areas and National Parks

Liberia's protected areas are all terrestrial ecosystems with no protected marine areas. The country has two categories of protected areas, partially protected and full protected. Currently there are eleven (11) National Forest, fourteen (14) Proposed Protected Areas and two (2) Protected Forest reserves. On partially protected lands, timber concessions can be leased out, but activities such as hunting, fishing, farming, and human settlements are prohibited. These partially protected areas are located primarily in southeast and northwest Liberia and comprise approximately 5.8 percent of the total area of Liberia. The two fully protected areas are the Sapo National Park and the East Nimba Nature Reserve. The 180,363 hectare (445,677-acre) Sapo National Park is comprised of lowland forest and is located in southeastern Liberia between the Sinoe River to the south and the Putu Range to the north. Mount Nimba Nature Reserve is located in northern Liberia within the Sanniquellie quadrangle, sharing a massif with Guinea and Cote d'Ivoire. This 13,569 ha (33,529 acres) mountainous area is the wintering site for numerous species of migratory birds. Together these two fully protected areas comprise approximately 1.86 percent of Liberia.

The Sapo National forest lies southeast of the Geblo Forest Concession; however there are no national parks or other protected areas located in the project area.

7.4.1 National Forests

NO.	NAME	LOCATION (S)	ACRES	PERIMETERS	HECTARES	SQUARE MILES
1	Gola	Gbarpolu, &	489,130	203,715	179,944	764
		Grand Cape				
		Mount				
2	Kpelle	Gbarpolu	403,828	279,388	163,423	631
3	Yoma	Gbarpolu	6,662	28,765	2,696	10
4	Gbi	Grand Gedeh	153,531	122,951	62,132	240
5	Krahn Bassa	Grand Gedeh,	1,281,084	491,430	518,436	2,002
		Nimba, Sinoe, &				
		River Cess				
6	Grebo	Grand Gedeh	640,855	426,470	259,345	1,001
7	North	Lofa	182,761	155,511	73,961	286
	Lorma					
8	South	Lofa	93,549	139,031	37,858	146
	Lorma					
9	West Nimba	Nimba	20,965	58,910	8,484	33
10	East Nimba	Nimba	21,103	57,792	8,540	33
11	Gio	Nimba	90,079	132,845	36,454	141
TOTAL			3,383,547	2,096,808	1,351,273	5,287

7.4.2 Protected Areas SHADED YELLOW and Proposed Protected Areas

NAME	OPTIMALUSE	AREA_M2	HECTARES	ACRES	PERIMETERS
Foya	PRESERVATION	1646280467	164628	406796	298045
Kpo Mountains	PRESERVATION	837090045	83709	206845	218021
Gola	PRESERVATION	979749902	97975	242096	190628
	MULTIPLE				
Lake Piso	RESERVE	959158547	95916	237008	233928
Bong Mountain	PRESERVATION	248215557	24822	61335	90979
Margibi Mangrove	PRESERVATION	238129766	23813	58842	104993
Senkwehn	PRESERVATION	803478811	80348	198540	153072
Grebo	PRESERVATION	971357380	97136	240023	255496
Gbi	PRESERVATION	884094580	88409	218459	177544
Grand Kru-River Gee	PRESERVATION	1351002683	135100	333832	269711
Nimba West	PRESERVATION	104820124	10482	25901	55045
Sapo	PRESERVATION	<u>1504817942</u>	180363	445677	185812
East Nimba	PRESERVATION	13 <mark>5689591</mark>	13569	33529	54717
Zwedru	PRESERVATION	637153944	63715	157440	174051

		12676211949	1297502	3206127	2739524
Wologizi	PRESERVATION	995383839	99538	245958	166889
Wonegisi	PRESERVATION	379788771	37979	93846	110593

8.0 Historical or Cultural Sites

In accordance with the Environment Protection and Management Law of Liberia, efforts were made to identify elements, objects and sites in the natural environment which are of national and traditional importance to the people of Liberia economically, culturally, and environmentally. Feasibility studies conducted within the Project Area revealed no such sites in the FMC licensed area.

8.1 ENVIRONMENTAL IMPACTS

Most development activities effect some changes in the natural environment. The extent and nature of the impact can vary widely depending on the method/technology, the characteristics of the project site and its surroundings and the control and management of the project operation.

This section of the EIS presents an assessment of the potential environmental impacts associated with the location, construction, operations and decommissioning of Geblo logging project.

The procedures used to identify impacts in this report are identified below and includes a standard set of identification tools as well as discussions with specialist and project team members. Potential impacts were assessed against a set of assessment criteria and a significance value was assigned.

The preliminary EMP includes all the plans that has been and will be developed to monitor environmental impacts that are predicted to occur as well as proposed mitigation measures, which comprises all relational aspects between the Company and the local population.

Finally, it must be pointed out that Geblo Logging Company and its associates will operate the project in accordance with Liberia legislations, regulations, guidelines and standards and other appropriate international environmental standards. Furthermore, it is envisaged that the project will meet the requirement of international EMS standard and procedures to contain all solutions, and to prevent any adverse effects on the health and safety of the workers, local population as well as the project area and regional environment.

9.0 CONCLUSIONS

The strengths, weakness, opportunities and threats associated with the management of the Geblo Forest Concession are indicated below:

9.1 Strengths and Weakness

Strengths

Good compliance with harvesting schedule

- Avenues for collaboration through the various local government institutions and forest fringe communities
- Conservation of sizeable forest resources to meet the current and future needs of society.
- Generation of funds for all stakeholders
- > Provision of livelihood for numerous people who rely on the forest.

<u>Weakness</u>

- ✓ Non-Involvement of communities in decision making
- ✓ Lack of resources for management purposes
- ✓ Inadequate staffing levels
- ✓ Inadequate forest-based educational programmes for communities
- ✓ Excessive exploitation of economic species
- ✓ No defined roles for the other stakeholders in the protection and management of the reserve
- ✓ Untimely disbursement of revenue to beneficiaries

9.2 Opportunities and Threats

Opportunities

- Development of small-scale forest-based industries e.g. snail production, carving, basketry
- @ Acceptance of land owners
- Potential for ecotourism
- Potential for species provenances and research

Threats

- ◆ Depletion of off-reserve resources may put undue pressure on the reserve
- Inadequate regeneration of scarlet species
- ✤ Illegal timber logging
- Over exploitation of NTFPs including wildlife
- Potential bushfires
- ✤ Illegal farming (possibly in future).

10.0 ACTIVITY FORECAST/IMPLEMENTATION CHART FOR FMC AREA "I"

Planning schedule of logging activities



10.1.1 Planning schedule of other activities during the forest compartment period

	Qu	uarters of Year 1 Quarters of Year 2				Quarters of Year 3				Quarters of Year 4				Quarters of Year 5						
Activity	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Staff management																				
program																				
Nature of the action																				
Training and awareness program																				
Nature of the action																				
RIL practical techniques and methods																				
Environmental program																				
Nature of action																				
Impact Assessments																				
Wildlife management																				
program																				
Nature of action																				
Awareness raising																				
Research and development program																				
Nature of action																				
Permanent Sampling plots establishment																				
Social program (refer to social Agreement																				
Number of social action																				
Infrastructural development																				