Treasury Timber Company Limited

ENVIRONMENT IMPACT STATEMENT FOR PROPOSED LOGGING OPERATIONS ON LR 171 NSINGUNU AND LR165 SARALUTI PEPERTUAL REGISTERED LAND, SOUTH CHOISEUL

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EXECUTIVE SUMMARY

Legal requirements and Purpose of EIS

Section 17(1) (2) of the Environment Act 1998 stipulated that "*any developer who proposes to carry out any prescribed development in Solomon Islands shall make application to the Director in such form as may be approved by the Minister accompanied by a development application with either a Public Environment Report (PER) or Environment Impact Statement (EIS).*

Pertaining to the requirements of the Environment Act 1998, and Environment Regulations 2008, an Environmental Impact Statement has been prepared for Treasury Timber Company Limited to be attached with their application to the Director of Environment and Conservation Division (ECD), Ministry of Environment, Climate Change, Disaster Management and Meteorology for a development consent.

The production of this report (EIS) is not only for the purpose of meeting the requirements of regulatory instruments (Act and Regulations) but is part and parcel of the commitment of developers, resource or land owners and users to institute best environmental practice to ensure development activities adhere to and promote sustainable development.

Scope, Purpose and Objectives of the Proposed Development

The proposed logging operation focuses on two registered perpetual estates/land in south Choiseul, namely LR165 Saraluti (267 ha) and LR171 Nsingunu (18ha).

The prime purpose of the proposed logging operations focus on the harvesting of natural timber products (logs) within two perpetual estate registered land

Grant of profit has been issued to the *Grantee*- Treasury Timber Limited for a term of 5 years commencing 30th November 2013 for both the above mentioned registered parcels. Treasury Timber Company Limited as the proposed developer/ development proponent is proposed to fell, extract and market logs and timber products within the said two parcels (Saraluti and Nsingunu).

Physical and Social Environments within Concession area

The physical environment within the proposed concession (Saraluti Nsingunu) areas includes:-

1. Coastal forest and associated vegetations mainly *Pandanus spp, Barringtonia spp,* ferns, including cultivated crops like *Cocos nucifera, Musa spp,* Sago palms, Ngali nut, *Terminalia catappa* (beach almond)
2. Riverine/ riparian forest

The assessment and consultation as well as interviews from the communities had identified two main issues/concerns. First, the effect on water quality and water catchment area which may will affect the livelihood of local populace within the concession area as well as the ecological systems within the water courses. This is because of the fact that the concession area has: -

- Surface water drainage from the inland mountainous areas
- Villages such as Rarakisi and Koa situated beside or along the water systems
- Some villages and communities solely depend on their rivers and streams for (domestic uses):-drinking, washing, swimming/bathing and cooking

Thus, it hereby highly recommended that the developer in close consultation with resource owners:-

- Provide assistance on water supply to the villages that may be affected by the water quality impairments.
- Provide additional water tanks/water collection materials to vulnerable communities
- The developer to adhere strictly to the Mitigation measures, code of logging practice and continuous monitoring.
- Ensure strict adherence to the exclusive areas and exclude all its operations or earthworks from the water catchment areas for water sources.
- Ensure adequate maintenance of all buffer strips at all water courses and tributaries.

The second concern is mainly a social and health or safety issue, concerning the effect of social interaction between employees and local communities as well as noise and disturbance of machineries/equipments on villages, especially on schools like Rarakisi and Zengunu. Such was brought about because; Zengunu School is located adjacent to the proposed log pond area making it vulnerable to noise effect and a health and safety concern for the school children.

Hence, it hereby highly recommended that the developer;

- Regular maintenance of Machineries and vehicles and use proper noise attenuation measures, like noise reduction mufflers for engines/exhausts.
- Execute operations only on normal working daylight hours
- Ensure strict adherence to the exclusive areas and adequate maintenance of all buffer strips at a minimum of 200m from schools.

Following to the assessment, consultations and formulation of this report, the general view is that, this report contains sufficient information required under the Environment Act 1998 and Environment Regulations 2008, and should be considered for development consent. The content outline pursues the requirements stipulated in Forms 1 and 3 of the Environment Regulations 2008.

2. GENERAL INFORMATION

2.1GENERAL INFORMATION

2.1.1 Proposed Prescribed Development and Scope of Operation

The proposed prescribed development is "*logging operations* "specified under number 5 of the second schedule of the Environment Act 1998. Such development is mandatory for Environmental Impact Assessment and thus requiring development consent from the Director of Environment and Conservation as a condition prior to commencement of operation.

The proposed logging operations by Treasury Timber Limited is projected to cover two perpetual estate registered lands; namely LR165 Saraluti (267 ha) and LR171 Nsingunu (18ha) situated in South Choiseul. Treasury Timber Limited is in the final stages of obtaining the felling license from the Commissioner of Forest resources.

2.1.2 Full Name the Designated Development Proponent

Proposed Licensee: Treasury Timber Limited
License No: N/A at the time of this report- Final stage of obtaining felling license

2.1.3 Outline of the Object of the Prescribed Development

The main objective of the proposed logging operation on the concession area is:

- To extract natural commercial logs using selective and directional felling methods as a sustainable management tool to attain maximum benefits that can be derived from the resource owner's timber resources.
- The proposed development would further provide benefits in favor of the resource owners, communities, schools and the Government. Government would benefit from the revenue of exported logs, fees, licenses, while landowners/resource owners will not only benefit from royalties but from downstream timber milling incentives. Communities would benefit from employment opportunities, small commercial activities (selling of goods to company's employees), market, transportation and accessibility. Schools may benefit from monetary, infrastructural, transportation, accessibility and in-kind assistance from the developer.

Though, the proposed development could cause a significant change on the natural environment, it is the priority of the developer that all care be taken in preventing, avoiding, minimizing, restoring and rehabilitating adverse environmental impacts on the natural and social environment. The harvesting of the commercial logs will be restricted to merchantable diameter sizes preferable with logs having diameter of greater than 30cm and length of more than 3 meters and only commercial and adequate merchantable logs

2.3 OTHER DEVELOPMENT PROJECTS WITHIN OR ADJACENT TO THE CONCESSION AREAS

Apart from subsistent cultivated areas, coconut plantation and small scale timber cutting, most of the lowland forest areas have not been disturbed. However, there are areas surrounding or adjacent to the proposed concession area that had been disturbed by previous and current logging operations. For example there are past logging operations by KTC at Kibi land close to Katurasele and there are proposed logging operations for Kibi Rumaboe land by Treasury Timber Limited.

Thus, the main form of development currently occurring adjacent to and surrounding the proposed development area and on most parts of Choiseul Island is logging. On the Southern eastern portion of Choiseul Island situated at about 50km from the Concession area is the mining prospecting site by Sumitomo Metal Mining. SMM conducted exploration and prospecting of mainly nickel and cobalt which involve auger surveys, core drilling, geochemical sampling and field reconnaissance.

Apart from major developments like Logging and Mining, located mostly on the coastal areas are coconut plantation owned by local communities which are mainly for copra. Several coconut plantations were evident along the coast of Luti and Nggalovai.

2.4 HUMAN/VILLAGE SETTLEMENTS AND DEMOGRAPHY

One of most important factors to be considered is villages, communities or settlements that are located within or adjacent to the proposed development area. The table below outlines some of the main villages or communities located within or adjacent to the concession area.

Table 1: List of Villages and communities within and adjacent to the proposed concession area.

Village, communities & hamlets	Approximate Population
Luti	8
Koa	53
Zengunu & Nggalovai	9
Alugapa	9
Rarakisi	250

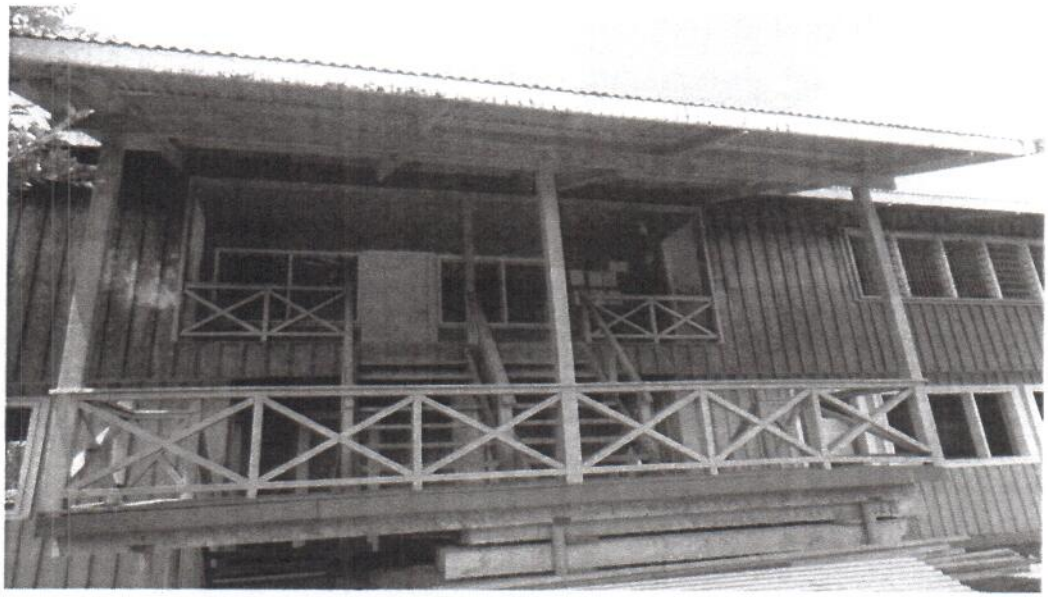

Figure 4: Rarakisi School

2.5HEALTH AND EDUCATION

A Nurse Aid post or clinic is located at Luti (figure 5) that serves most of the communities listed in table 1 above. Another nearest health care clinic or nurse aid facility is at Loloko while the closest hospital is located at Sasamunga. Access and distance to health facilities is one of the main problems facing communities within the concession area given there are no available inland roads and rising price of petrol for outboard motor transport.

According to interviews, common illness experience among the communities is, common cold, pneumonia, cough and malaria.

However, the developer will ensure that its camp sites will provide basic medicines for ordinary ailments such as flu, cough, fever, diarrhea and malaria that are free to its employees and all nearby local communities. The developer will also prioritize medical attention and shall maintain a number of speedboats for providing transportation for critically ill persons to clinic or hospital should the need arise.

In terms of educational institution, there is Primary school (Class 1-6) and Community high school (Forms 1-3) at Rarakisi (figure 4) in the inland area while at the coast a primary school at Zengunu (figure 3).

3. ADMINISTRATIVE, LEGAL AND POLICY FRAMEWORK

3.1 ADMINISTRATIVE FRAMEWORK

Established under Part II of the Environment Act 1998, Environment and Conservation Division (ECD) is the administrative authority that oversees the implementation of the Environment Impact Assessment. It consists of the Director, Deputy Director and Environment Inspectors. ECD is the responsible consent authority that screens, scope, reviews development application submitted by the development proponents. The Director of ECD stipulated by the Environment Act 1998 as having the power to issue development consent for any prescribed development. Currently, the ECD has:-

1. Director (1)
2. Deputy director (1)
3. Chief Environment Officer (1)-
4. Chief Conservation Officer (1)
5. Principal Conservation officer (1)
6. Senior Conservation Officer (2)
7. Senior Environment Officer (4)

3.11 ENVIRONMENT IMPACT ASSESSMENT PROCESS

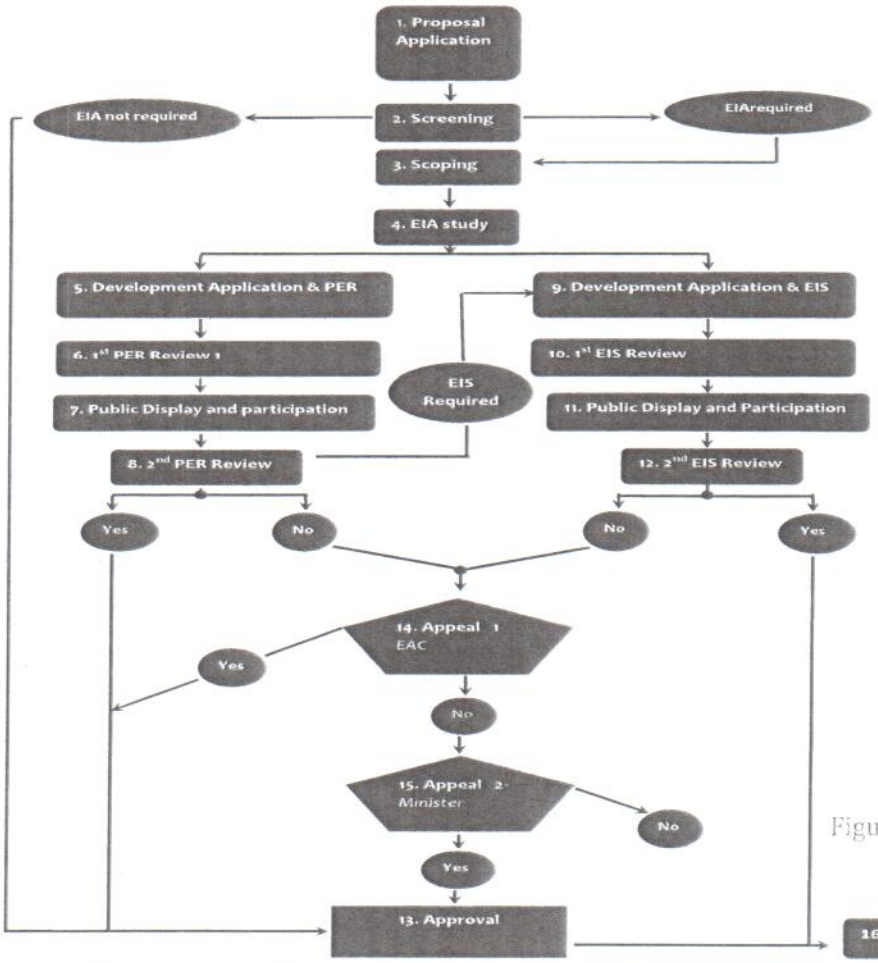

Figure 6: EIA process

WILDLIFE MANAGEMENT AND PROTECTION ACT 1998

This Act provides for the protection, conservation and management of wildlife by regulating the export and import of certain animals and plants; and to comply with obligations under the Convention on International Trade in Endangered Species (CITES).

FOREST AND TIMBER UTILIZATION ACT 1991

This Act oversees licensing of felling trees and mills, and timber agreements on customary land; deals with forest declare as State forest and Forest reserves and establishes restrictions. A forestry bill 2004 seeks to replace the Act and various amendments. The bill provides for the conservation of forests and improves forest management including establishment of national forests.

SOLOMON ISLANDS CODE OF LOGGING PRACTICE 2002

The code of logging practice complements and simplifies the complicated requirements in Schedule C and Form 4 of the *Forest and Timber Utilization Act*. It provides guidelines for planning and monitoring of logging operations to improve logging practices in Solomon Islands thereby minimizing potential adverse environmental consequences associated with logging.

MINES AND MINERALS ACT 1996

Establishes system for mining applications and licensing; establishes Minerals board; regulates and controls mining activities; includes alluvial mining.

LANDS AND TITLES ACT 1988

Covers the management of land, defines customary land, and sets out procedures for Land acquisition. Act is currently being reviewed and a new draft bill is circulated for consultation.

TOWN AND COUNTRY PLANNING BOARD ACT 1979

An Act that applies to urban areas (capital city and provincial towns); covers the management of land, including crown land; specifies urban and rural management and planning functions and controlling development.

RIVER WATERS ACT 1973

Control of river waters for equitable and beneficial use; establishes activities for which permits are required.

4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposed logging operations will concentrate on the concession area as per map in figure 1, LR165 Saraluti (267 ha) and LR171 Nsingunu (18ha). The following logging activities are proposed to occur on the concession area.

4.1 WHARF AND LOG POND

The proposed wharf, log pond is proposed to be established adjacent to Zengunu. Apparently, the proposed log pond area is flat and has previously been disturbed by cultivation of Cocos nucifera. Coastal plants and vegetation (Aru trees, ***Pandanus spp***), including cultivated plants like Sago palm also inhabited the proposed log pond area.

Rocks with gravel will be used to resurface the area and compacted to create adequate space for storage prior to shipment. The wharf will be constructed with logs and gravel and will be extended into the deeper parts of the marine environment to ensure adequate dept for Tug boat and barge during loading/shipment. The size of log pond, log storage area will be constructed according to the standard logging practice code.

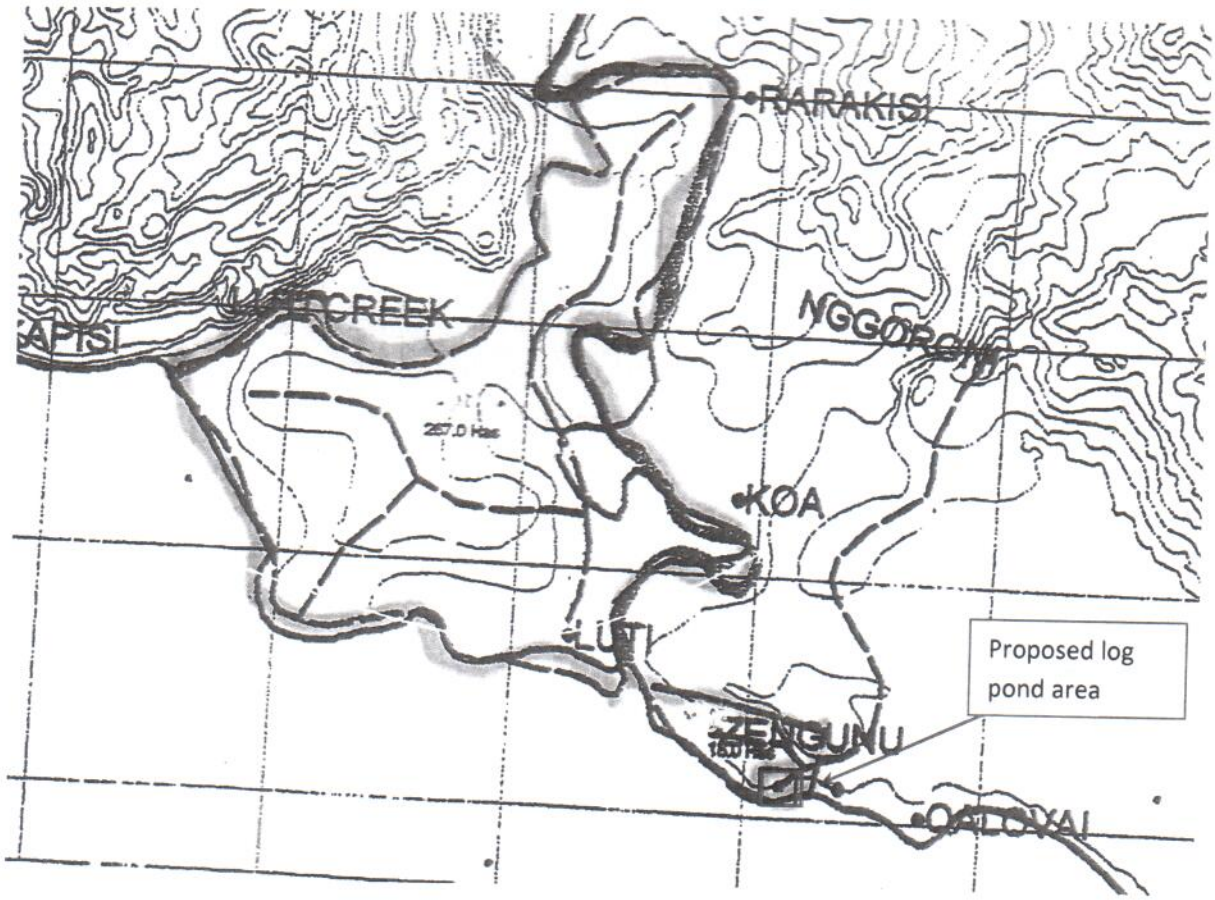

Figure7: Proposed log pond area.

minimum of ten (10) meters on both sides of the road. A road gradient of less than 12° will be maintained to prevent adverse effects during surface runoff. Gravel sources will be identified on adequate sites and all roads will be graveled and compacted before usage. The total number and length of roads will be provided in the Harvesting plan subsequent to its completion.

4.5 SKID TRACKS

The main skid tracks will be constructed mostly on the ridge tops. This is to ensure minimal disturbance and damaged to the soil and vegetation cover. The skid tracks will adhere to the planned tracks as per harvesting plan to avoid water course crossings. This will ensure minimal damage and disturbance to water course bed, channel, discharge and Riverine vegetation. The skid tracks will be marked prior to establishment. Skidders will be used to construct the skid tracks. However, the developer will also use existing skid tracks to avoid and minimize soil and vegetation disturbance. On hilly or sloppy areas the company will employ tracker skidding while on flat areas the use of excavators will be prioritized. Skidding will be avoided in buffer zones, exclusive and protected areas. The skidders shall use the same tracks each time it travels back and forth to minimize vegetation and land disturbance.

3.6 LANDINGS

The landings will be established with dimensions of (40 meters x 40) to ensure a limited area of 1600 as per SICLP (figure 8) to minimize soil and vegetation damage. Landings will be located on roadsides where there are connecting finger ridges, to ensure adequate space for log storage and for easier maneuver of loaders. The number of landings will be one landing per one hectare as to avoid much vegetation and land clearance. Landings will be allowed to dry completely prior to usage.

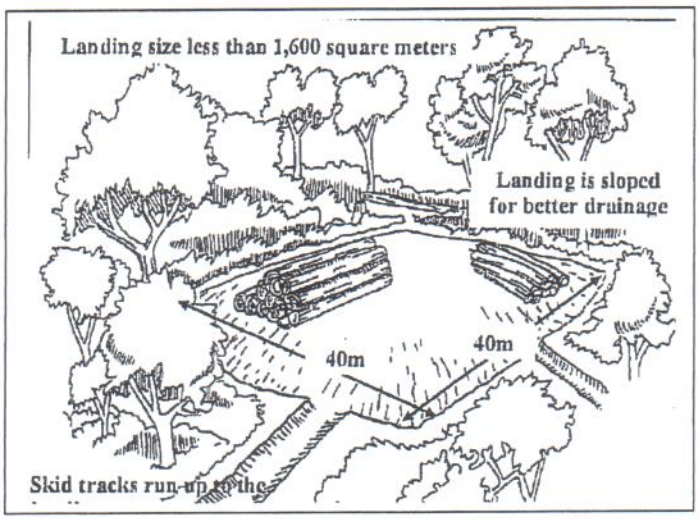

Figure 8: Landing clearance requirement (SICLP, 2002)

5. DESCRIPTION OF THE EXISTING (BASELINE) ENVIRONMENT

5.1 PHYSICAL ENVIRONMENT/ RESOURCES

5.1.1 GENERAL GEOGRAPHY

Choiseul Province is located between 6.35 ^{0} and 7.32^{0}S, and 157.53^0 and 156.23^{0}E (figure 8). The province is comprised of two main islands, Choiseul (also known as Lauru), and Wagina (Vaghena) Islands. The total land area of Choiseul Island is 3,208 km^2, with Wagina and the adjacent smaller islands making up an additional 86 km^2 (Hansell and Wall 1976). Choiseul Province occupies 13.5 percent of the total land area of the Solomon Islands. Choiseul Island is one of the main islands in the Solomon Islands chain and, like Santa Isabel Island is long and narrow with tropical rainforests on rugged terrain (CSP, 2006).

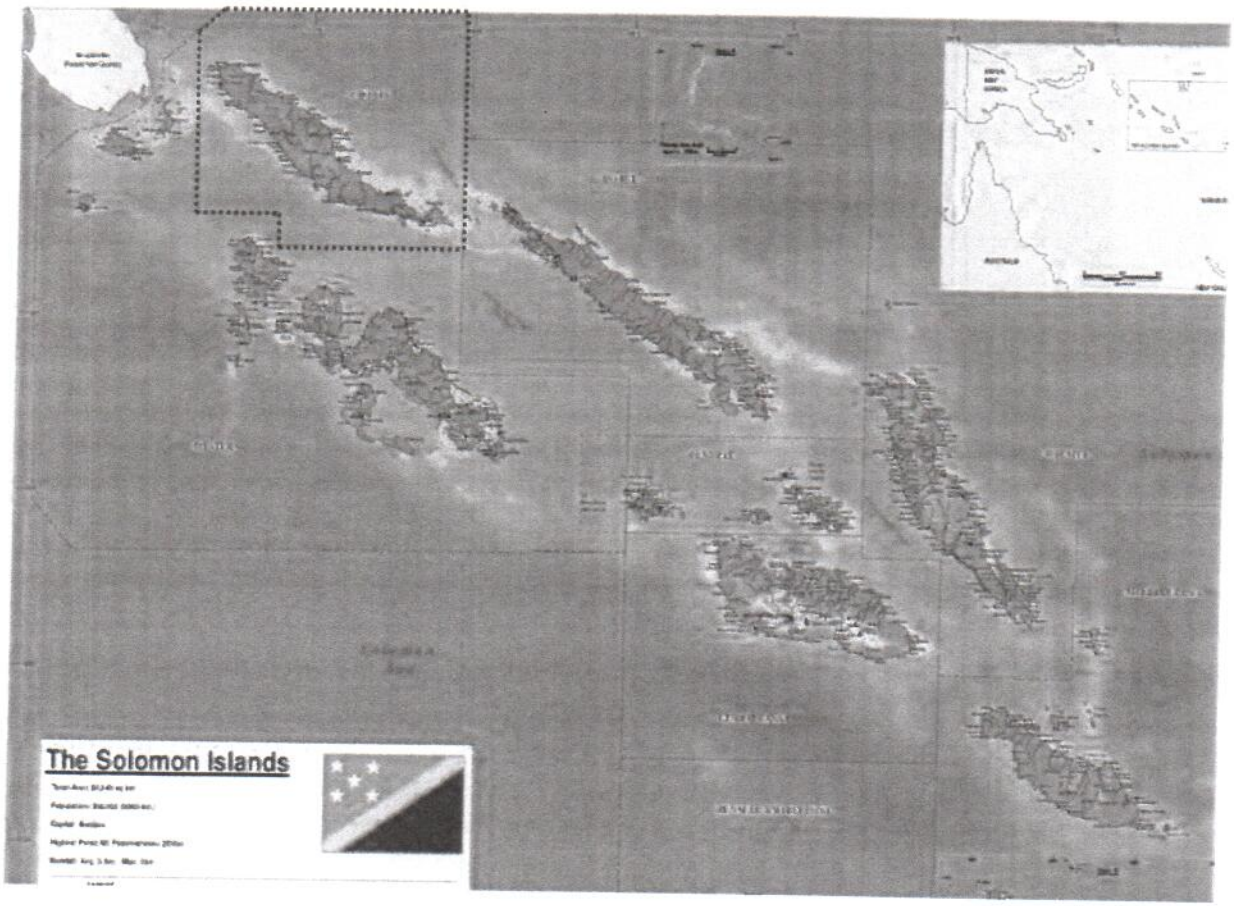

Figure 9: Overview map of Choiseul Island Location (Source: Adapted from SOE 2008)

There are deep gorges, numerous short, fast flowing rivers and some of the country's most spectacular waterfalls. A pristine water fall was observed at Rarakisi close to its water source (figure 10). Its coastal region and shorelines are covered with long narrow beaches protected by shallow coral reefs. On parts of the main island, in particular around Choiseul

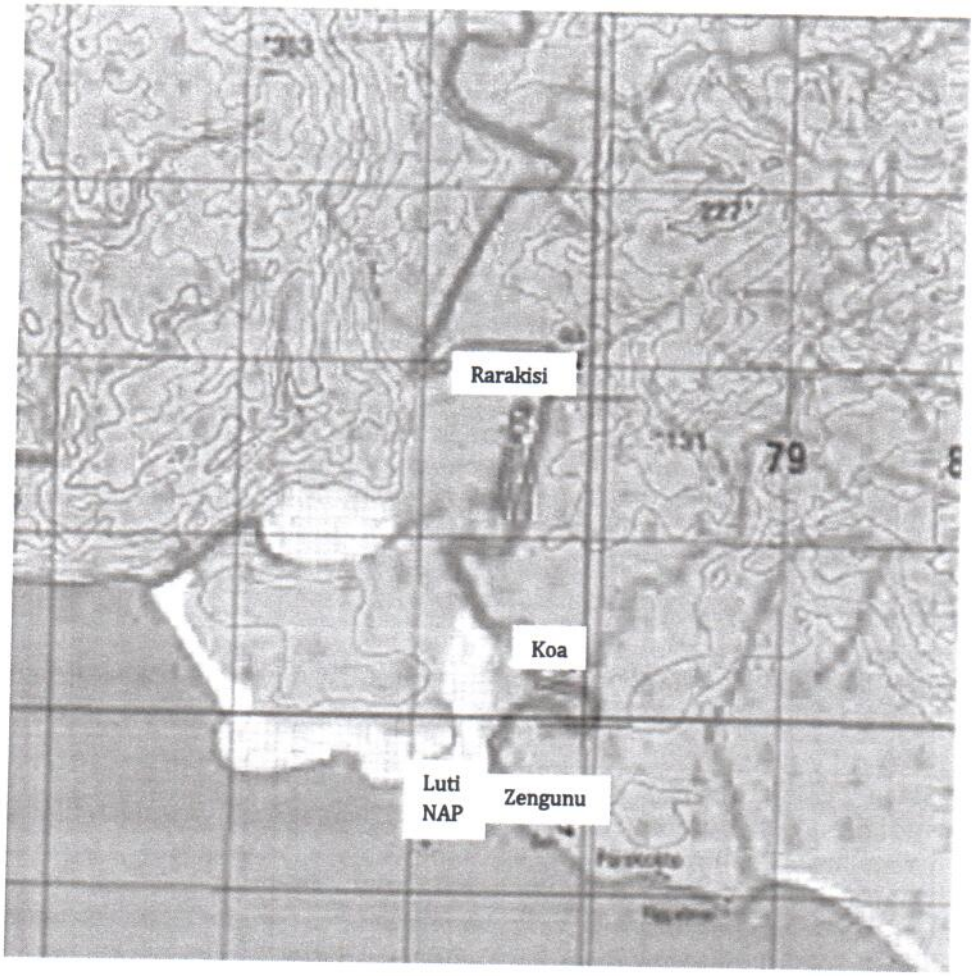

Figure11: Topographical map of Southern Choiseul, indicating general topographical features within Saraluti and Nsingunu concession (Source: Lands Division)

In line with the Geological study conducted by Hansell and Wall (1976), the geology and topography of Saraluti and Nsingunu is categorized into about 3 land systems (Tenaru, Pusuraghi, Sakatokana, Posarae). Note that the concession area has a mixture of these land systems. The table below summarizes the land systems and their approximate location in reference to the reconnaissance /assessment conducted.

Table 4: Land systems, Landforms, soil and Geology within Saraluti and Nsingunu.

Land system	Landform	Soil	Vegetation cover	Location	Geology
Tenaru	Beach ridges level (flat)	Land system compromise of narrow beaches	Mostly coconuts, cleared forest	Coastline areas between	Coarse-grained sediments derived from

around Choiseul Bay. The wettest months are from August to November but all months are wet, averaging between 190 and 330 mm, with July as the wettest month (300 – 400 mm) and November the driest month (200 – 250 mm) (SIEAP 2008).

The province is subject to cyclones but compared with the rest of the country, Choiseul has experienced fewer natural disasters. During the last fifty years the major cyclones have been Annie in 1967, Gisele in 1968, Isa in 1970 and Ida in 1972 (SIEAP 2008). Although no deaths occurred as direct result of these cyclones, Cyclone Annie caused extensive damage to infrastructure. The area experiences constant seismic activity, due to the location of Solomon Islands at the junction of two tectonic plates. According to community consultation reports, the areas of Nggalovai and Kakaza within and adjacent to concession area were affected by the massive 2007 earthquake and Tsunami that hit Western and Choiseul Province. Households in Kakaza were severely affected which resulted in their relocation. There was also an alleged death of one person at Nggalovai as a result of the Tsunami (Pers, Comm., Abednego 2013).

5.1.4 WATER SYSTEM

Choiseul Island is rich in surface water because of its high terrain topography, intense rainfall and rich forest stands. Within Saraluti and Nsingunu, there are two large surface water courses identified during the reconnaissance. They are the Rarakisi and Koa Rivers. According to watercourse classification as per Solomon Islands Code of Logging Practice, all of these three rivers are class three stream with bed width more than 10 meters.

Figure 12: Koa River

5.2 BIOLOGICAL AND ECOLOGICAL RESOURCES

5.2.1 FOREST

The forest types within concession area: - coastal vegetation, cultivated crops (including coconut plantation, sago palms, nut trees, lowland forest, Riverine forest. Coastal vegetation that naturally inhabit the coastal areas range from vines, creepers to shrubs and trees. Coastal plants identified are ***Pandanus spp, Terminalia spp, Barringtonia spp, Cocos nucifera*** etc with other species of palms and ferns. Lowland forest have a diversity of vegetation ranging from vines, creepers, ferns, lianas, shrubs, palms, and trees. Common tree species identified are: - ***Calophyllum spp, Pometia spp, Vitex and Terminalia spp.***

Figure 15: In Land lowland forest composed mainly of palms, ferns and *Pometia spp.* located about 1 km

5.2.2 FRESH WATER FAUNA

The freshwater species reported for Solomon Island is a result of two collections made by Gray in 1974 on Guadalcanal and preliminary studies by Gerry Allan in 2004 (SOE 2008). The results show that Solomon Islands has 60 freshwater species. There is possibility of more as no detailed study has been conducted focusing on fresh water species throughout the country.

The numerous water system and their tributaries within the concession area has various fresh water species of fish. Despite no detail quantitative assessment conducted the watercourse were reported by the communities to have prawns, eels, shellfish and crabs. Local communities commonly use the water systems for catching aquatic fauna as sources of protein. Freshwater fauna observed during the assessment include fresh water prawns

has remained virtually unaffected by coral bleaching events and crown of thorn starfish outbreaks that have detrimentally affected nearby regions such as the Autonomous Region of Bougainville and New Ireland Province in Papua New Guinea, in the past decade (Hamilton et al. 2009).

Though there were no detail quantitative assessment conducted, according to Green et al (2006) coral reef fish communities were in good condition throughout Choiseul as well as there are healthy populations of food fishes. Large bony reef fishes (>30cm) were also most abundant Choiseul. Large and vulnerable emperor species were most abundant in, Choiseul.

Table 5: List of Provinces and major islands or island groups where healthy coral reef communities or populations of key fisheries species were encountered

Province	Island or Island Group	Coral Reef Fish Comm.	Food Fish Pops.	Large Reef Fishes (>30cm)	Large, vulnerable reef fishes	Aquarium Fishes
Central	Russell Islands	Yes	Yes	Yes	No	Yes
	Florida Islands	No	No			No
	Savo Island	Yes	No			Yes
Choiseul	Choiseul	Yes	Yes	Yes	Yes	Yes
Guadalcanal	Guadalcanal	No	No	No	No	No
Isabel	Isabel	Yes	Yes	Yes	Yes	Yes
	Arnavon Islands	Yes	Yes			No
Makira	Makira	Yes	Yes	Yes	No	No
	Three Sisters Islands	Yes	No			Yes
	Ugi Island	Yes	No			Yes
Malaita	Malaita	No	No	No	No	No
Western*	New Georgia	Yes	Yes	Yes	Yes	Yes
	Shortland Islands	Yes	Yes			Yes

(Source: Green et al 2006)

Table 5 above clearly indicates that Choiseul has rich marine resources of coral reef fishes and high species diversity. Among other islands like Western, Isabel, Central and Makira, Choiseul has the highest densities of key fisheries species of snappers, surgeon fishes, emperors, and parrot fishes recorded. The most abundant genera of food fishes were (Appendices 5 and 6): ***Lutjanus*** and ***Macolor*** (snappers), ***Acanthurus***, ***Ctenochaetus*** and ***Naso*** (surgeonfishes), ***Lethrinus*** and ***Monotaxis*** (emperors), ***Hipposcarus*** (parrotfishes) and ***Caesio*** (fusiliers) (Green et al 2006).

4.2.5 PROTECTED AREAS AND AREAS OF CONSERVATION

The Nature Conservancy (TNC) is the first international environmental NGO to work in Choiseul Province commencing in 1992, with its initial work being to facilitate the

Area			
Kubongava Forest Protection Area	Protected Area - Proposed	Unknown	897
Baukoalo Forest Protection Area	Protected Area - Proposed	Unknown	1,262
Boeboe Forest Protection Area	Protected Area - Proposed	Unknown	1,108
Sub-Total		**4,887**	
Grand Total		**7,913**	

NB: 3 Conservation sites close to proposed logging area are in italics and bold

In terms of conservation areas close to the proposed logging area of Saraluti and Nsingunu, there are three managed areas namely:-

1. Katurasele Managed area

2. Tuzu Managed area

3. Tandanai Managed area

Figures 17 and 18 below adapted from Moore et al (2010) identifies and highlighted the three managed areas that are close to the concession area.

Nevertheless, it must be noted that these three are not within the concession boundaries of Saraluti and Nsingunu and may not be directly affected by the proposed logging activities.

5.3 ECONOMIC DEVELOPMENTS AND SOCIAL PARAMETERS

5.3.1 INDUSTRIES

Within Saraluti and Nsingunu Concession there are no major industries. However adjacent to the concession are other logging activities for instance at Tasure and on the other side of Kakaza river.

5.3.2ECONOMIC ACTIVITIES

- Main Economic Activities

From consultations with the local communities, the two main income generating activities are:-
(a) Sawn Timber (locally referred to as cubic)
(b) Copra

An estimated average value of $300-$500 is normally generated by each household from selling Copra. In terms of timber, it all depends on the volume of sawn wood or timber produced. However, some villagers stated they normally obtain an average range from $5000-$20,000 at Honiara where the prices are better than local buyers.

Other small activities include selling of petrol and basic food items. One of the main hamlets which engage in Petrol selling and basic food items, laundry, toiletries, clothes etc is at Alugapa (figure 19).

Figure 19: A shop at Alugapa selling basic food items laundry, toiletries, clothes etc.

5.4. SOCIAL AND CULTURAL RESOURCES

POPULATION

The total population of Choiseul is 26,372 as per 2009 census (SINSO 2011). Saraluti and Nsingunu concession area is within ward 3 referred to as Vasiduki with a total population of about 1,574. However, the total population of villages within the Saraluti and Nsingunu Concession estimated to be less than 80.

CULTURAL RESOURCES:-ARCHAEOLOGICAL AND HISTORICAL SITES

Within most of the islands of the Solomon Islands are cultural sites commonly referred to as Tambu sites that are of great importance to the diverse cultures of the Solomon Islanders. This no exception for areas outside of the Saraluti and Nsingunu Concession area as there are also Tambu sites of great cultural and heritage values.

However during the consultation with landowners, there were no Tambu sites identified within Saraluti and Nsingunu Concession area using their local knowledge and sketch map (see figure 21). Other sites marked were old villages and places of Ngali nut trees cultivation which were outside of the concession.

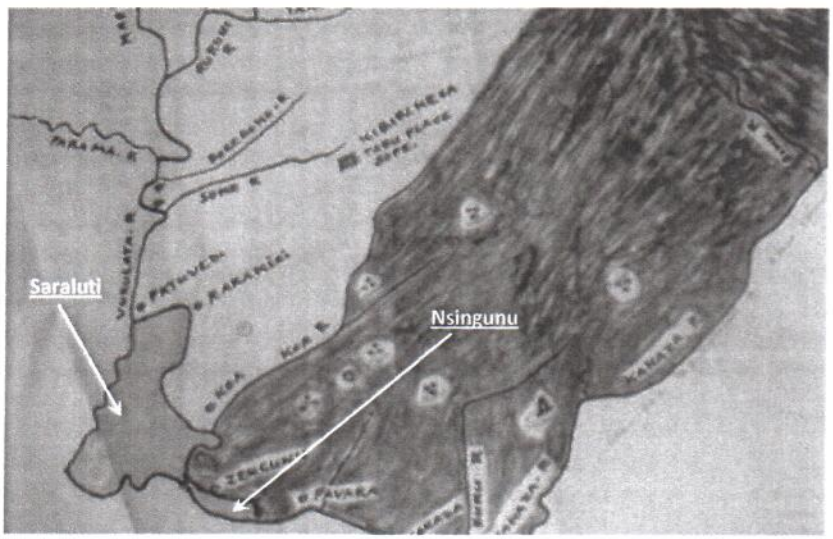

Figure 21: Local mapping of Tambu sites and important cultural sites. None were located within Saraluti and Nsingunu Concession area (highlighted orange)

6.2 MATRIX TABLE

Logging Activities	Environment Likely to be Affected	Potential adverse impacts Identified	Certainty (Yes or No)	Nature of Impact	Magnitude	Duration	Significance (Yes or No)
<u>Camp site establishment</u> -land/vegetation clearance -soil compaction	-vegetation -Soil/land -Wetland/swamp -Physical properties (coconut, sago palm, Ngali nut, fruit trees etc.) - social structures-Zengunu School	-Loss of vegetation -Soil/land-degradation -Disruption of soil structure and texture -Increased Surface runoff -Loss of arable lands and garden produces -Change/influence on traditional way of life and custom -Risk of spread of diseases (HIV, STD etc) -Disturbance /health & safety risks for school children.	Yes	Adverse	Moderate-High	Medium-Long- term	Yes
<u>Log pond</u> - land/vegetation clearance -soil compaction -coastal reclamation	-Coast line -Coastal vegetation -Soil/land -Marine flora/fauna -Physical properties (coconut, sago palm, etc.) -Fishing grounds -sea water quality impairment - social structures-Zengunu School	-Coastline erosion -Ecological- disruption -Loss of coastal vegetation -Soil/land-degradation -disruption of soil structure and texture -Increased Surface runoff -Loss of arable lands and garden produces -Noise impact -Disturbance on Fishing grounds Reduction of sea water quality - Disturbance /health & safety risks for school children.	Yes	Adverse	Moderate	Medium-term	Yes

		-Habitat destruction -Riparian vegetation disturbance -Accelerated soil erosion -Increased Surface runoff -Water quality impairments	Yes	Adverse	High	Medium-Long term	Yes
Aggregate extraction -gravel extraction	-Water quality -Water system -Land/soil systems	-Water quality impairment (increase turbidity) -land degradation -Disruption of water system stability and bed structure -River bank erosion	Yes	Adverse	High	Long term	Yes
Water crossings -bridges/culvert construction	-Water system -Riparian vegetation -Aquatic fauna -Human health-downstream communities -Domestic use	-Reduction in water quality (increased turbidity) and quantity -Changes in the hydrology of water systems -Destabilization of water course beds -River bank erosion -Disturbance to aquatic habitats -Pollution on water quality (leakage of oil/fuel) -Sedimentation and Siltation -Loss of aquatic resources for human consumption -Impact on health and welfare of communities	Yes	Adverse	High	Long term	Yes
Landings -construction of landing	-Land and soil -Vegetation	-Physical damage to soil texture/structure	Yes	Adverse	Moderate	Medium	Yes

6.3 COMMON ENVIRONMENTAL AND SOCIAL ADVERSE IMPACTS PREDICTED

Appended below are the common environmental impacts predicted.

1. Reduction Air Quality
2. Forest Fragmentation
3. Loss of Non-Timber Products
4. Land Degradation
5. Water system Impairments
6. Impact on Marine ecosystem
7. Impact of Solid waste
8. Impacts on Health and Safety
9. Loss of Arable land
10. Visual impact

6.3.1 REDUCTION OF AIR QUALITY

In all rural areas of Solomon Islands the quality of air is excellent due to the natural surrounding and the lack of major air polluting activities.
The only activity that usually affects air quality in the rural areas is the practice within village areas, of burning biodegradable materials either in the village when cleaning the surroundings, gardening or cooking in the traditional kitchens using firewood or drying of copra.(Source: SIEAP 2008). It is predicted that the following activities are expected to produce impacts on air quality. Earth works associated with campsite, log pond and wharf establishment which includes all vegetation and surface clearance, operating vehicle emitting exhaust fumes; operating vehicle moving on road surface at high speed; operating vehicle loading earth materials and travelling on road; digging on gravel sites; loading aggregates onto vehicle; hauling of logs and earth/aggregate materials stock piles.

Solomon Islands do not have emission or air quality standards; however international standards may be used in place. Since the impact on air quality is judged to be very minimal, compilation of baseline data on air quality for subsequent monitoring are not proposed. Periodic air quality observations will need to be carried out via a proposed monitoring mechanism.

6.3.2 FOREST FRAGMENTATION

Construction of roads, skid tracks, landing and felling apparently will result in the removal of vegetation cover. The consequence of such activities would result in the following effects:-

1. Forest Fragmentation
2. Loss of faunal and floral habitats
3. Destruction of riparian vegetation
4. Increased surface runoff

More so, under story vegetation, which includes mat of decaying leaves, twigs and stems break the force of falling water drops and helps to keep these openings clear.

Removal of vegetation and disturbance of soil cover weakens the ability of nature to break the force of raindrops therefore affects infiltration. When rain falls too rapidly to be passed through soil openings, runoff occurs and surface water layer runs over the ground surface and down the direction of the ground slope as overland flow. Overland flow is somewhat responsible for movement of surface particles from higher slopes to flat lands or rivers.

The earthworks (excavation), associated with vegetation and land clearing for the skid tracks, landings roads, will cause:

1. Soil exposure
2. Soil compaction
3. Removal of natural barrier (vegetation) to rainfall

These will allow water from rain to be easily transported from ridge/hill tops downwards on exposed soil surface and directly into the gullies, valleys and watercourse ways.

The vegetation clearance, exposure and compaction of soil will influence increased surface run off which will then be transported to the watercourses. On dissected hills and ridges that are moderately to highly steep, the tendency of water seeping into the soil is low however water travelling (on soil surface) downwards with the influence of gravity will be high. Hence, with vegetation removed and soil being exposed, the topography also plays an important role in increased surface run off.

6.3.3 LOSS OF NON-TIMBER PRODUCTS

Felling of commercial timber species generally involve removal of identified trees by chainsaw. However, as it is not always easy to direct felled trees into non forested areas, it is likely that unwanted trees such as undergrowths can be affected and this particularly noteworthy for rainforest of complex canopy structures.

Land clearing for roads and associated earth works are activities inherent in logging that can result in the loss of local building materials and properties such as Loya canes, bush ropes, and wild betel nut species. In most rural areas, the forest is termed as their store house where most of their needs may be attained. Not only are building materials but medicinal and herbal plants are important resources that may be affected by the proposed operations.

Siltation and sedimentation are caused by the delivery and deposition of sediment or silt runoffs from disturbed soils and ground cover. The loose soil particles are transported into surface waters (streams) underground sources and sea via surface water runoffs. The degree of sedimentation of ground water, swamp/wetland and sea is proportional to particle size, volume and velocity of runoffs. Increased surface runoff and accelerated soil erosion, due to, vegetation clearance and associated earthworks for log landing and skid tracks and crossing will contribute intensely to the siltation and sedimentation of the Surface water courses and their tributaries. The siltation and sedimentation may be moderate during dry weather however, may be significantly high during intensive rainfall.

Siltation and sedimentation as a result of the proposed logging activities may enhance a long-term turbidity of the streams mainly during rainfall. Sediments do reach the stream mainly by surface runoff associated with moderate to high rainfall events, with bulk of the sediments transported during storm events. In the stream the coarse sediments form part of the bed load and transported downstream in suspension.

The close proximity of excavated soil, for road, crossings and skid tracks plus the steep slopes of the ridges may also influence the continuance siltation and sedimentation of the water course especially during high rainfall thus induce reduction in water quality. Another factor that may contribute to water quality impairment is due to the debris blockage of water channel. The debris may be composed of vegetation that will be washed down slope from hills and ridges that will be cleared for roads, skid tracks and landings. There are also probable chances of accidental fuel or oil spills in the event that machines operate close to water courses or crossing watercourses. The developer should avoid refueling and storing of fuel close to water courses and repair malfunction equipments prior to usage.

Gravel and aggregate extraction from the rivers will be a significant environmental and social issue. Extraction may induce physical damage to the river system influencing impact on the discharge, flow (including its direction), and river bank/bed stability. Such would also have negative impact on the habitat of aquatic creatures. Thus, proper identification of adequate sites for gravel extraction should be a priority by the developer.

Likely pollution from accidental fuel or oil spills from machineries may also affect the quality of water.

6.3.6 IMPACT ON MARINE ECOSYSTEM

The impact on marine ecosystem will be mainly from the establishment of the campsite, log pond, wharf and gravel extraction. This may involve physical damage to the coral reef, sea floor substrata, spawning/feeding areas, and faunal (fish, shells) habitats. Siltation and sedimentation of the marine environment is certain during intense rainfall given the exposure of soil/land and compacted nature of soil which may hinder infiltration of

trampling of machinery. Not only does soil fertility and productivity may decline as a consequence of top soil and organic matter removal but changes in soil structure and texture are also crucial.

This may pose concern for any future development may be in terms of agriculture or local gardening sites which are significant for social and economic needs.

6.3.10 VISUAL IMPACT

The perception of the people of the environment is primarily visual. Most of the information people pick is through what they see. Negative visual responses provoke questions about other values that may have been adversely impacted on. It is predicted that the logging operations on the concession area will create significant impact on the landscape, particularly with the earthworks, felling and roading. For instance, ground disturbance will be highly visible as tracks are seen as lines across the site. Another common problem with logging activities is redundant machineries. Redundant machineries were usually left on coastal shores or inland areas after the completion of logging activities. This a significant visual impact on the environment.

6.4 POSITIVE IMPACTS

6.4.1 EMPLOYMENT OPPORTUNITIES

Unemployment in the rural areas is identified as a one of the push factors that influences rural unemployed dwellers to migrate to urban areas in seeking for employment. Lack of employment opportunities is a major concern and challenge not only for government but for rural people.

The proposed logging operations within the Saraluti and Nsingunu concession area will provide limited and short term employment opportunities for rural people to be engaged in wage employment to cater for their basic needs and wants such as food, clothes and school fees. Though the security of tenure of such employment may be temporary (~3-5 years), access to steady income should be an important economic factor that villagers may consider.

6.4.2 INCOME GENERATION THROUGH SPIN OFFS

Other income opportunities apart from wage employment would be, the accessibility locals have in selling their local produce (vegetables and root crops) or catch of the day (fishing products) to the developer's employees. This access is important as locals do not require traveling long distances to market places such as Sasamunga, Taro or Gizo where fuel cost

7. MITIGATION AND ENVIRONMENTAL MANAGEMENT PLAN

7.1 MITIGATION MEASURES

The following measures shall be taken by the Developer in ensuring the protection of the Environment and to mitigate the predicted adverse impacts.

7.1.1 BUFFER STRIPS

Establishment of buffer strips on both sides of the water courses (streams, gulleys, creeks etc.), garden areas, villages, sea (ocean), and areas that exceed 400m above sea level (altitude). The size of the buffer strips shall conform to the recommended buffer widths stipulated in the Solomon Islands Code of Logging practice (SICLP 2002) page 3.

Garden areas should also have a 30 meter radius starting from the edge of the garden, forming at least a circle. Villages will have buffers of 200 meters.

7.1.2 ADEQUATE DRAINAGE

Adequate drainage engineering is required to reduce the amount of sediments transported into the significant environment ecosystems like water courses, sea, and wetlands. Drain turnouts will be necessary to divert surface runoff away from sensitive environment areas. All drainage construction will adhere to the requirements of the SILCP 2002, page6.

7.1.3 PROPER EARTH WORKS

Roads must follow survey lines situated on ridges and roadside clearance should be kept to a minimum of 10m on both sides. The gradient of the road should be maintained at gradient of less than 12°.

7.1.4 DECOMMISSIONING ACTIVITIES

Water bars to be constructed on all skid tracks after operation Log land/ponds to be ripped off once coupe is thoroughly logged and the top soils to be restored after usage. Old bridges and culverts must be decommissioned after logging a coupe and Waterways shall be cleared with debris to keep water flowing freely.

7.1.5 WASTE MANAGEMENT

A designated site shall be excavated for solid waste dumping. This site should be located far from sensitive sites like wetlands, watercourses, and marine

headache; diarrhea, malaria etc. will be available at the camp. The developer will ensure that boat transport is readily available for any urgent medical needs for the employees and nearby communities should the need arise.

7.1.11 EXCLUSION AREAS

Specific areas or exclusion areas within the concession should be reserved for either their cultural, ecological, economical, social or environmental significance values.

7.1.12 LIMITED AND CONTROLLED EARTH CLEARANCE

Road and log landing clearance with associated earthworks will be undertaken as per guidelines stipulated in the Solomon Islands Code of logging practice. Machine operators will be reminded of code of practice and shall be closely monitored by their supervisor. This is necessary to reduce impacts on the habitats, ensure ecosystem services are maintained, soil erosion control, and minimize forest fragmentation.

7.2 ADDITIONAL MITIGATION MEASURES

IMPACT	MITIGATION MEASURES
Air pollution	Regular Machinery, and vehicle checkup and maintenance (e.g. oil change, fuel/oil filter change, etc.) Prohibition of vehicles that induce excessive smoke. Provide cover to dump trucks transporting potential dust producing material. Apply water on road surface (esp. those close to hamlets) when very dry to reduce dust.
Increase surface Runoff	Maintain adequate buffer zones on river catchments and all watercourses. Prohibit operation on steep slopes (>400m above sea level) Construct adequate drainage for excess water to flow into vegetated areas. Execute selective felling to maintain canopy protection.
Accelerated Soil erosion	Maintain buffer zones on river catchments and all watercourses. Prohibit operation on steep slopes (>400m above sea level) Construct adequate drainage for excess water to flow into vegetated areas. Execute selective felling to maintain canopy protection. Revegetate exposed landforms with fast growing plants and creepers.
Siltation and Sedimentation	Maintain buffer zones on river catchments and all water courses. Prohibit operation on steep slopes (>400m above sea level)

	The developer will be responsible for any damages on the local water supply. Immediate response will be done by the developer to mitigate any such damage by either repair/fix or replacement of the water supply parameters. In case where it would take time to immediately replace such parameters, tanks would be provided while maintenance/replacement works are underway. Health awareness on STDs, social interactions, sanitation to be conducted by developer in consultation and collaboration with Choiseul provincial health authorities.
Noise	Regular maintenance of Machineries and vehicles. Execute operations only on normal working daylight hours Use of Standard Personal Protective Equipment (e.g. ear muffs) Use proper noise attenuation measures, like noise reduction mufflers for engines/exhausts.
Visual Impact	Decommissioning of road, skid tracks, crossings after use. Revegetate exposed landforms with fast growing plants and creepers. Recover/burry excavated gravel pit or aggregate source after use.

	with fast growing plants and creepers.			
Siltation and Sedimentation	Maintain buffer zones on river catchments and all watercourses. Prohibit operation on steep slopes (>400m above sea level) Construct adequate drainage for excess water to flow into vegetated areas. Execute selective felling to maintain canopy protection. Construct adequate crossing as stipulated in the Solomon Islands Code of logging practice 2002. Cease operational activities during rainfall events. Prohibit felling and skidding within buffers and into water courses Install silt traps	1. Buffer widths 2. Water crossings 3. Drainage 4. Water quality	Forestry Officer Environment Officer	Quarterly
Fresh water and Sea water Quality impairment	Maintain buffer zones on river catchments and all watercourses. Prohibit operation on steep slopes (>400m above sea level) Construct adequate drainage for excess water to flow into vegetated areas. Execute selective felling to maintain canopy protection. Construct adequate crossing as stipulated in the Solomon Islands Code of logging practice 2002. Cease operational activities during rainfall events. Monitor all water courses weekly. Prohibit Direct crossing of vehicles in watercourses. Disposal of wastes in designated areas not in watercourses. Maintenance of vehicle regularly. (Preventing fuel/ oil leakage/spills). Avoid placing fuel tanks close to watercourses and coastline. The developer will be responsible for any damages on the local water supply or source. Immediate response	1. Buffer Widths 2. Water crossings 3. Drainage 4. Waste disposal sites 5. Fuel/oil storage sites 6. Water quality	Forestry Officer Environment Officer	Quarterly Monthly

Noise	Regular maintenance of Machineries and vehicles Execute operations only on normal working daylight hours Use of Standard Personal Protective Equipment (e.g. ear muffs) Use proper noise attenuation measures, like noise reduction mufflers for engines/exhausts	1. Machineries 2. Check PPE on employees	Environmental Health Officer Developer Environment officer	Monthly
Visual Impact	Decommissioning of road, skid tracks, crossings after use. Revegetate exposed landforms with fast growing plants and creepers. Recover/burry excavated gravel pit or aggregate source after use.	1. Roading 2. Skid tracks 3. Crossings 4. Landings 5. Gravel Pits	Forestry Officer Environment Officer	Prior to signing of completion certificate.

The assessment and consultation as well as interviews from the communities had identified two main issues/concerns. First, the effect on water quality and water catchment area which may will affect the livelihood of local populace within the concession area as well as the ecological systems within the water courses. This is because of the fact that the concession area has: -

- Surface water drainage from the inland mountainous areas
- Villages such as Rarakisi and Koa situated beside or along the water systems
- Some villages and communities solely depend on their rivers and streams for (domestic uses):-drinking, washing, swimming/bathing and cooking

Thus, it hereby highly recommended that the developer in close consultation with resource owners:-

- Provide assistance on water supply to the villages that may be affected by the water quality impairments.
- Provide additional water tanks/water collection materials to vulnerable communities
- The developer to adhere strictly to the Mitigation measures, code of logging practice and continuous monitoring.
- Ensure strict adherence to the exclusive areas and exclude all its operations or earthworks from the water catchment areas for water sources.
- Ensure adequate maintenance of all buffer strips at all water courses and tributaries.

The second concern is mainly a social and health or safety issue, concerning the effect of social interaction between employees and local communities as well as noise and disturbance of machineries/equipments on villages, especially on schools like Rarakisi and Zengunu. Such was brought about because; Zengunu School is located adjacent to the proposed log pond area making it vulnerable to noise effect and a health and safety concern for the school children.

Hence, it hereby highly recommended that the developer;

- Regular maintenance of Machineries and vehicles and use proper noise attenuation measures, like noise reduction mufflers for engines/exhausts.
- Execute operations only on normal working daylight hours
- Ensure strict adherence to the exclusive areas and adequate maintenance of all buffer strips at a minimum of 200m from schools.

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