HIGH CONSERVATION VALUES (HCV) ASSESSMENT REPORT (REVISED) FOR GERAK SAGA SDN BHD (SFMLA 01/2015) IN BENGKOKA FOREST RESERVE & TAMBALUGU FOREST RESERVE (6,467 HA) PITAS DISTRICT

2020

Prepared by:	**Signatures**
Wilvia O. William Certification Officer	Date: 15 August 2020
Chrystalyziana Venchin Conservation Officer	Date: 14 August 2020
Approved by: Guy Thornton Forestry Director	Date: 14 August 2020

CONSERVATION SECTION
PROJECTS DIVISION
FOREST SOLUTIONS MALAYSIA
AUGUST 2020

CONTENTS

LIST OF FIGURES

LIST OF TABLES

Update from the Last Version (14 February 2020)

The purpose of this section is to highlight the changes made in the document from the previous report. The whole concept of the HCV approach is based on the adaptive management concept by revising management strategies based on the finding from the progressive monitoring efforts. In this latest report, dated 15th August 2020, update of the contents is made by including the threats to the HCVs identified in Gerak Saga. The additional content is attached in the Addendum 1 (Page 24-25).

1.0 Introduction and Background

Gerak Saga Sdn Bhd is implementing industrial tree plantation (ITP) under the Sustainable Forest Management License Agreement (SFMLA/2015) with the government of Sabah State for 100 years on 6,467 ha (hereinafter referred to as the 'Project Area') of land in Bengkoka and Tambalugu Forest Reserves (Class II) located in Bengkoka Peninsula (Figure 1.1). Pursuant to the terms and conditions of the SFMLA, Gerak Saga Sdn Bhd (hereinafter referred to as the 'Company') is undertaking inter-alia, the extraction of residual timber, establishment of managed forest plantation and restoration of natural forest areas.

To meet growing local and global demands for timber, pulpwood, and other wood products, Malaysia has undertaken extensive industrial tree plantation with fast-growing exotic species such as *Acacia spp.* and *Eucalyptus spp.* (Gaveau *et al*., 2016) which contribute enormously to the country's economy including pulpwood. These plantations may satisfy increasing demands for wood materials but also contribute to tropical forest conservation by reducing extraction from primary and secondary forests, providing important ecosystem services and offering suitable habitat for threatened species.

The Project Area is mainly dominated by *Acacia mangium* and other *Acacia species* which comprising approximately over 90% of the forest (*CAIMS*, 2005). The forest reserve is deteriorating due to previous exploitation as early as the 1970s, lack of management, forest fire, droughts and disease thus resulting in the invasion of the Acacia spp. leaving approximately less than 2% of natural forest remnant mostly in riparian areas.

The HCV approach was initially developed by the Forest Stewardship Council (FSC) and it is a requirement under Principle 9 of the FSC Stewardship Standards, and it has proven useful for identifying and managing environmental and social values in production landscapes. Under this, to obtain the forest certification such as the FSC, Malaysian Timber Certification Council (MTCC) and Programme for the Endorsement of Forest Certification (PEFC), forest managers are required to identify HCV attributes that occurs within their individual forest management units or concessions, to manage them with the intention of maintaining or enhancing the values identified and to monitor the success of this management.

FSC Principle 9 High Conservation Values (FSC-STD-01-001 v5.2);
The Organization* shall maintain and/or enhance the High Conservation Values* in the Management Unit* through applying the precautionary approach*.

9.1 The Organization*, through engagement* with affected stakeholders*, interested stakeholders* and other means and sources, shall assess and record the presence and status of the following High Conservation Values* in the Management Unit*, proportionate to the scale, intensity and risk* of impacts of management activities, and likelihood of the occurrence of the High Conservation Values;

HCV 1 - Species diversity. Concentrations of biological diversity* including endemic species, and rare, threatened or endangered* species, that are significant at global, regional or national levels.

HCV 2 - Landscape-level ecosystems and mosaics. Intact forest landscapes and large landscape-level ecosystems* and ecosystem mosaics that are significant at global, regional or national levels, and that contain viable populations of the great majority of the naturally occurring species in natural patterns of distribution and abundance.

HCV 3 - Ecosystems and habitats. Rare, threatened, or endangered ecosystems, habitats* or refugia*.

HCV 4 - Critical ecosystem services. Basic ecosystem services* in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes.

HCV 5 - Community needs. Sites and resources fundamental for satisfying the basic necessities of local communities* or Indigenous Peoples* (for livelihoods, health, nutrition, water, etc.), identified through engagement with these communities or Indigenous Peoples.

HCV 6 - Cultural values. Sites, resources, habitats and landscapes* of global or national cultural, archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities or Indigenous Peoples, identified through engagement with these local communities or Indigenous Peoples.

There is no public record of comprehensive surveys of wildlife carried out in the project areas and there is a little information on the project area available on the Sabah Forestry Department's

website *(CAIMS)* which mentioned the last survey in the project area was conducted in the year 2003.

This assessment is fundamental to collect the data on the wildlife as well as their habitat including identifying HCV attributes and embarks the following objectives:

i. To provide baseline data of wildlife in the Project Area for the management and monitoring plan.
ii. To identify any potential High Conservation Values (HCV) in the 6,467 ha of Gerak Saga concession area.

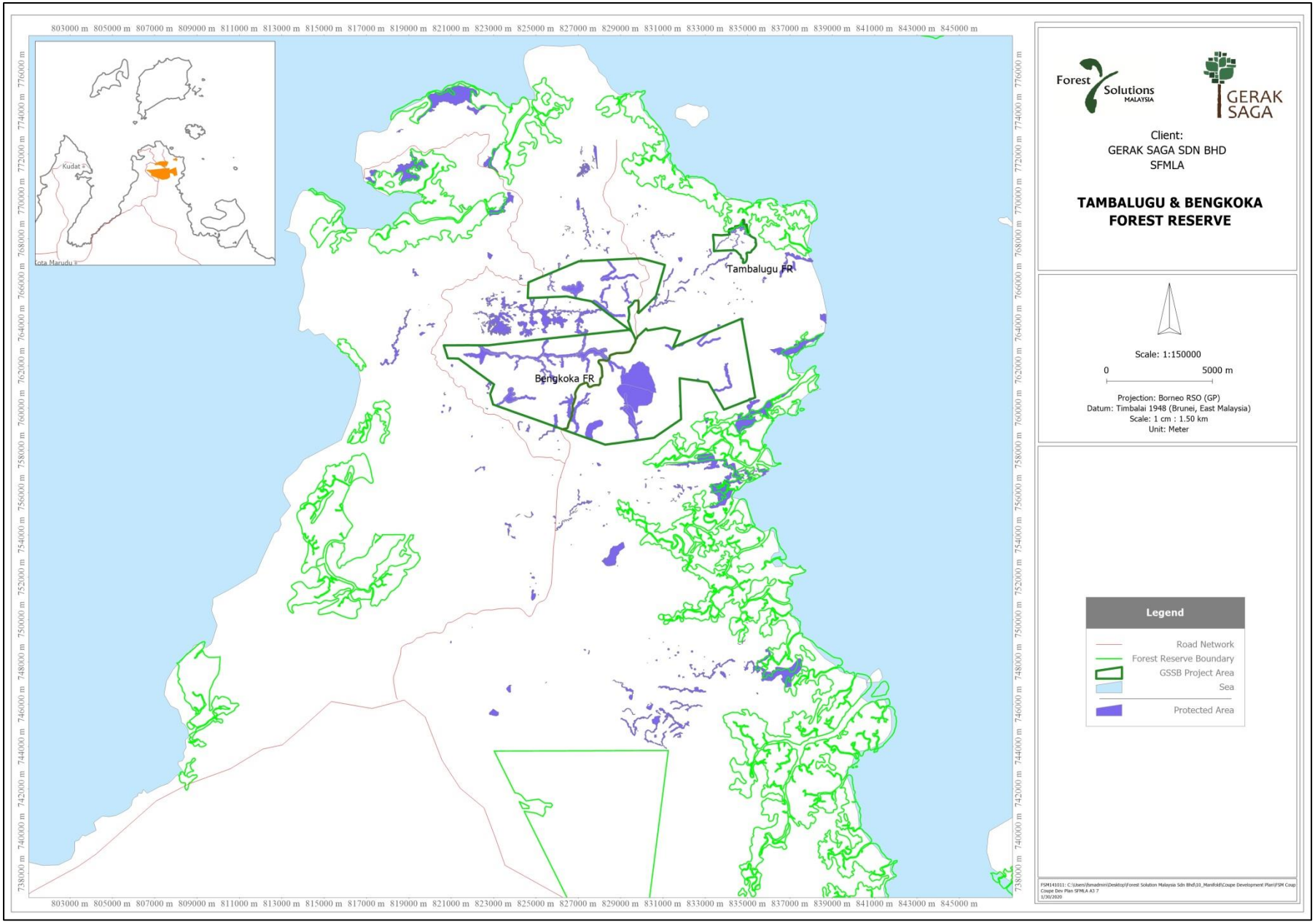


Figure 1.1 Map showing the location of Bengkoka Forest Reserve and Tambalugu Forest Reserve (6,467 ha) in Bengkoka Peninsular, Pitas

2.0 Description of the Assessment Area

a. Project Location and Size

The Bengkoka Peninsula occupies the northernmost part of the Borneo Island in the Malay Archipelago between 6'40'' and 7'01' degrees North, 117'01" and 117'15" East, covering roughly an area of 640 kilometres square (km^2). It is verged on the West and North by the South China Sea, on the East by the Sulu Sea and the South by lower regions of Crocker Range.

The project area is known as Gerak Saga Sdn. Bhd Tree Plantation License Area, which covers an area approximately 6,467 ha, comprising the 6,270 ha Bengkoka Forest Reserve and the 197 ha Tambalugu Forest Reserve (Figure 1.1).

The two forest reserves are managed as a single Forest Management Unit (FMU) and are divided into four (4) Coupes, Coupes 1-3 (Bengkoka Forest Reserve) and Coupe 4 (Tambalagu Forest Reserve).

b. Access

The primary access to the Bengkoka Peninsula is through the main highway connecting Kota Marudu and Pitas Districts. Bengkoka Forest Reserve (BFR) is accessible off tarred and gravelled road of Jalan Mongkubou Laut, approximately 25 kilometres (km) north of Pitas town, less than a kilometre (km) north of Kampung Bongkol, Pitas. The Tambalugu Forest Reserve (TFR) is located approximately 4 kilometres (km) north-east of the BFR and is accessible from Kampung Sorupil following the existing roads north, connecting to Jalan Suang Duyung to access the project area.

c. Geology and Topography

The geology of the Bengkoka Peninsula area is represented by Tertiary sedimentary formation that extends to mainland Asia and it is on the Eurasian Plate. The majority of the peninsular interior is clastic sedimentary rocks while coastline alluvial deposits make its exterior.

The major E-W trending structure of the project area consists of moderate hills, cuestas, and ridges. Several major faults dominate the project area including the South-eastern Petani Baru fault, central Nuri Harapan fault, Telaga fault dominates the Western part of the area and Kampung Bongkol fault dominates North-central part.

The topography in the project area consists of gently undulating terrain with some low broken ridges. Some short steep slopes occur next to rivers but the slopes are predominantly less than 25 degrees. Elevations range from 26 meters (m) to 130 metres (m) above sea level.

Types of soils including Orthic Acrisols/Ustols being predominantly type formed on sandstone parent material. Minor soils area represented by Orthic Cambisols/Typic Dystrochrepts formed on sandstone parent material, Gleyic Cambisols/Fluventhic Dystrustepts formed on alluvium parent material and Orthic Podzols/Orthods formed on sandstone parent.

d. Climate

Malaysia belongs to the Tropical Rainforest Climate Zone (Af) according to the Köppen Climate Classification which suggests all 12 months have an average precipitation of at least 60 mm. The South-west monsoon occurs in May to August usually brings more rains to the West coast of Sabah and less in the East coast, while in November to February more rains in the East coast than the west coast of Sabah by the North-east monsoon.

The highest and lowest of average rainfall amount recorded annually since 2009 – 2015 in Pitas is 317.48 mm in March 2011 and 11.27 mm in February 2010 respectively (Figure 2.1). Meanwhile, the highest and lowest of average temperature annually since 2009 – 2015 in Pitas is 29°C and 26°C respectively (Figure 2.2). Humidity in Pitas has recorded an average of 86% as the highest in January 2009 and recorded 72% as the lowest in June 2012, July 2014 and June 2015 (Figure 2.3).

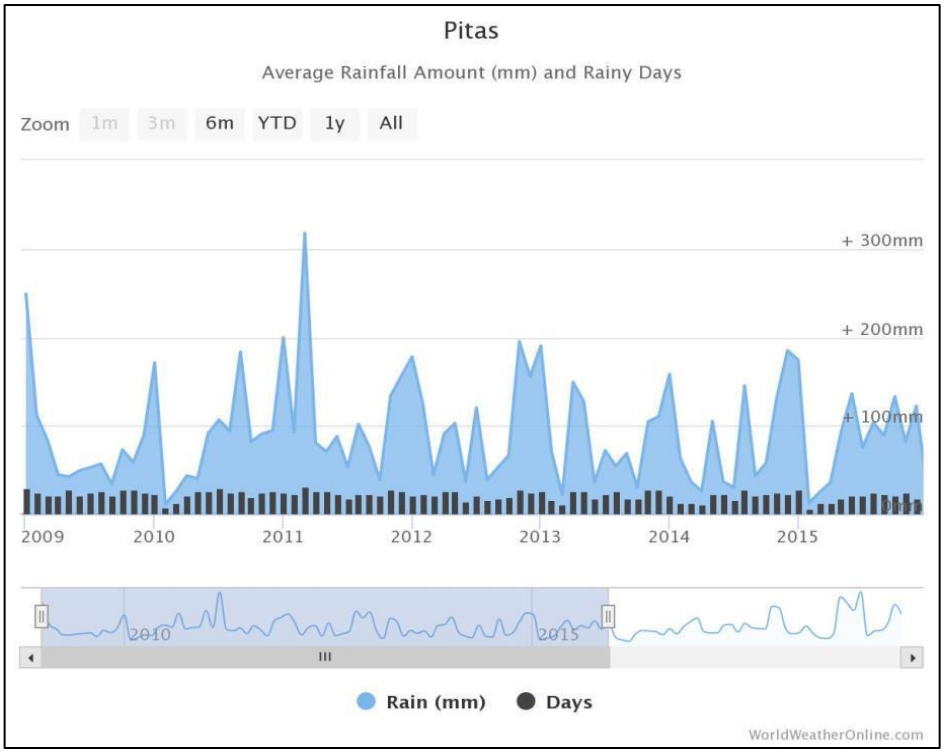


Figure 2.1 Record of average rainfall amount (mm) and rainy days in Pitas from 2009 - 2015
(Source: https://www.worldweatheronline.com/pitas-weather-averages/sabah/my.aspx)

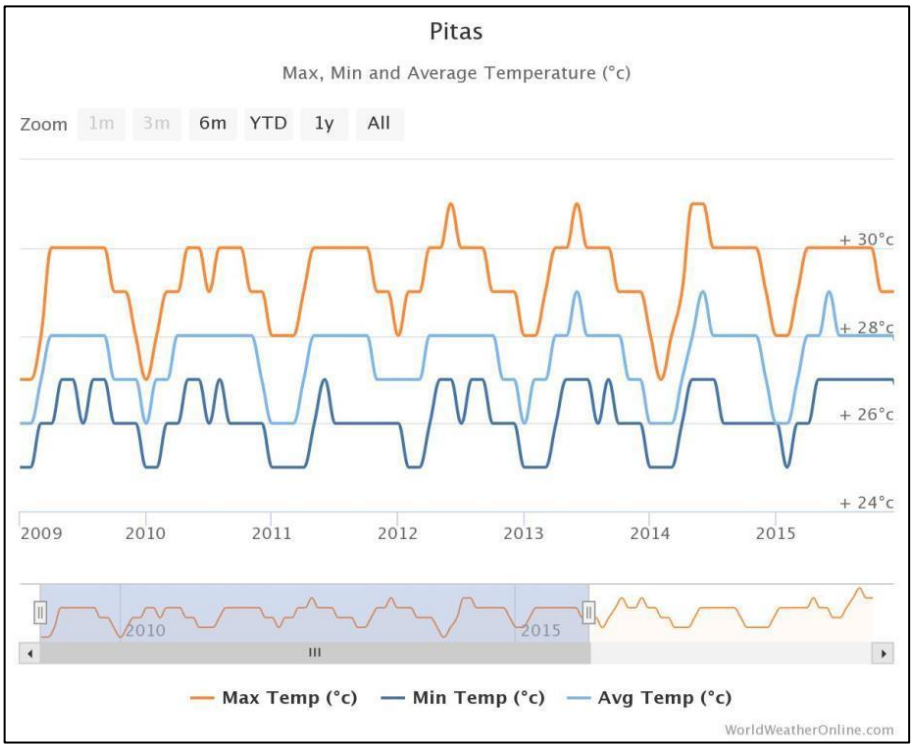


Figure 2.2 Record of max, min and the average temperature of Pitas from 2009 – 2015
(Source: https://www.worldweatheronline.com/pitas-weather-averages/sabah/my.aspx)

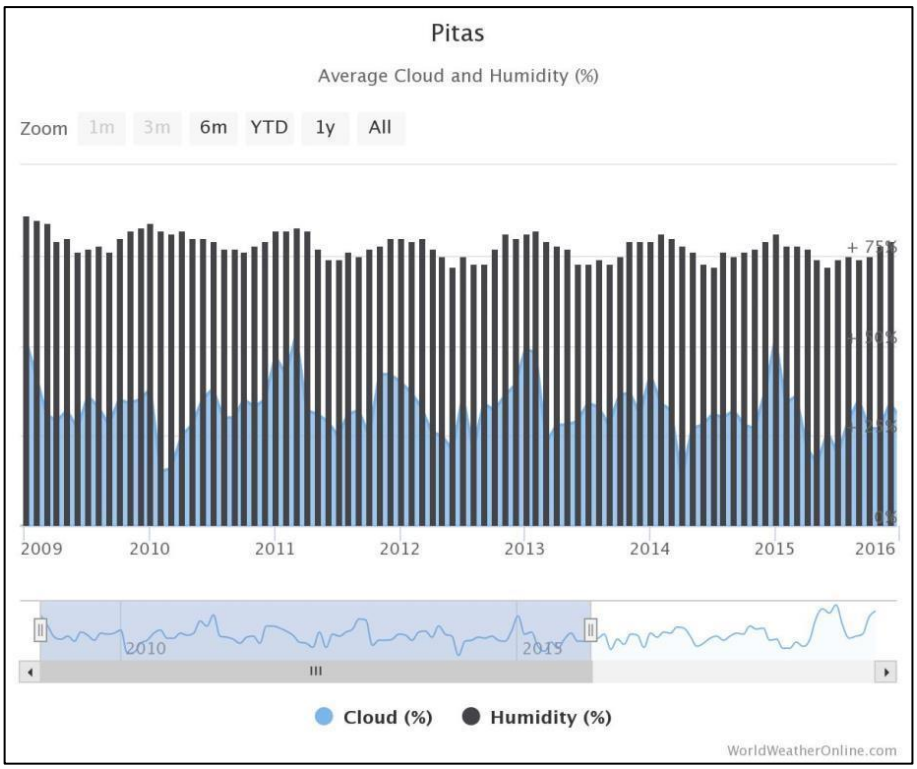


Figure 2.3 Record of average cloud and humidity in Pitas from 2009 -2015 *(Source: https://www.worldweatheronline.com/pitas-weather-averages/sabah/my.aspx)*

e. Vegetation Types

The Bengkoka Peninsular was originally covered in tropical rainforest until 80 years ago when forest clearing happened for agriculture crops cultivation and forest clearing for the purpose of plantation establishment started approximately 30 years ago. Scattered remnants of the original forest can be seen although the coastal zone remains fringed with mangrove forest. Presently, most of Bengkoka Peninsular area is under commercial plantations of tropical timber, oil palm, and rubber and subsidence agriculture of dry and wet paddy.

The project area was severely degraded and dominated by wild *Acacia mangium* and *Acacia spp.* of mixed ages and densities, comprising approximately 90% of the area (*CAIMS*, 2005). The wild *Acacia mangium* in most areas were attacked by fungus disease known as *Ceratocystis manginecan*, and has also been subjected to several fires.

Wildfires occurred through the project area as early as 1983 impacting approximately 70% of the project area and the area were repeatedly burnt since then leaving fields barren of trees, vegetated only with grasses, fern, and wild regeneration of the *Acacia* tree species.

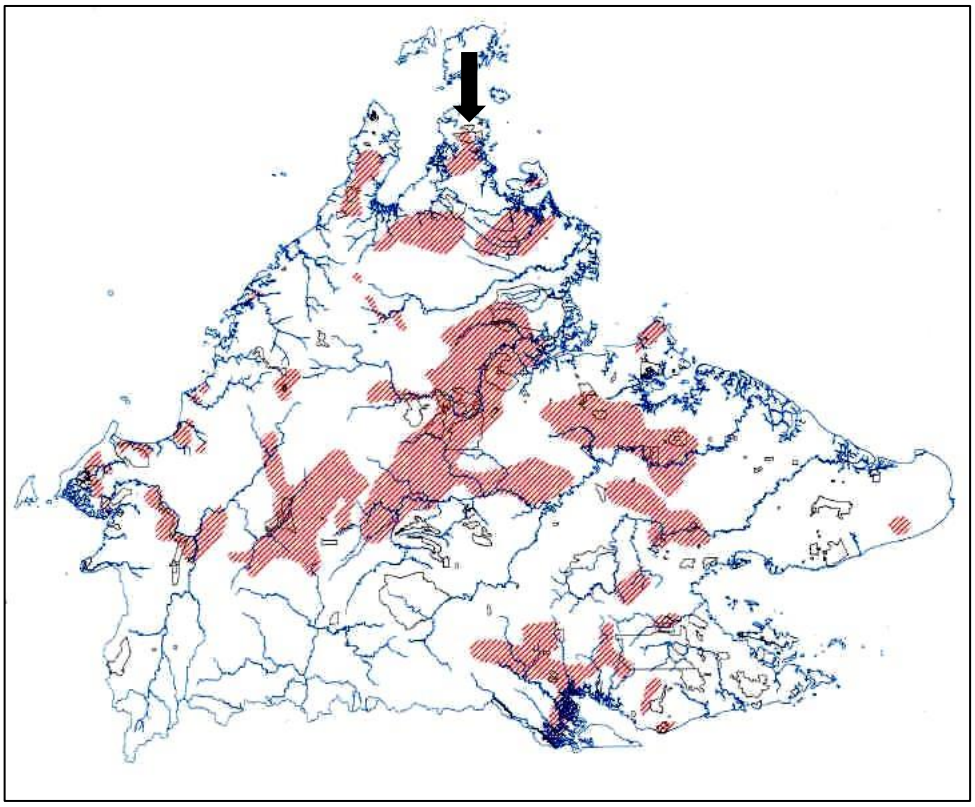


Figure 2.4 Fire scar 1983 across Sabah

Acacia is known to be an aggressive invasive species on degraded land but does not readily establish itself in the shade of well-established forest stands. On the other hand, the natural vegetation (< 2%) exists in small patches on the riverine areas within the project area.

Table 2.1 Vegetation Type

Vegetation Type	Sizes (ha)	Percentage (%)
Unmanaged Acacia (wild regeneration) and barren areas	5820.3	90
Secondary (natural) forest	112.8	1.74
Mangrove forest	12.1	0.18

3.0 HCV Assessment Team

The HCV assessment was conducted internally by a team of the management company of the project area; Forest Solutions Malaysia Sdn. Bhd. HCV assessment in both forest reserves was conducted from October 2015 to March 2016. Biodiversity surveys were conducted by the project management team to identify HCV 1 for species diversity, HCV 3 for endangered ecosystem or habitat and HCV 4 for ecosystem services. HCV 2 and HCV 4 were first identified by the Planning and GIS Department through Geographic Information System and field verification by the Survey team through the boundary and blocking demarcation. There are no settlements within the project area and the surrounding villages were identified by the Community team during the community survey. HCV 5 and 6 were identified during the social impact assessment activities.

4.0 Timeline and Methods

a. Timeline

Table 4.1 Summary of the timeline of the HCV Assessment

Timeline	Event
3rd October 2015 – 11th November 2015	Recce and conduct fieldwork of identification of HCV identification in Bengkoka Forest Reserve
16th – 17th December 2015	Recce and sampling for Environmental Impact Assessment with Environmental Consultant in the Project Area.
2nd March 2016 – 24th March 2016	Conduct fieldwork for HCV identification in Tambalugu Forest Reserve.
30th March 2016	HCV Assessment Report completed
12th Jan 2017 - 24th Feb 2017	Megapode Field Survey in Tambalugu Forest Reserve *(see Annex 6 for full report)*
28th February 2018	HCV Assessment Report submitted to Sabah Forestry Dept.
19th June 2019 – 20th June 2019	Engagement with stakeholders regarding HCV at Kg Suang Duyung's community hall involving local communities from 4 villages - Kg. Suang Duyung, Kg Sorupil, Kg. Bawing, Kg. Maringgan; neighbouring forest manager - Acacia Forest Industries; and a government agency - the Sabah Wildlife Department.
20th September 2019	HCV Assessment Report 2019 (Revised) completed
28th September 2019	Submission of the report to stakeholders for review
October 2019 - December 2019	Conducted another Social Impact Assessment
7th February 2020	HCV Assessment Report (Revision 2020) completed - with regards to the stakeholder's review.

b. Methods

- **Environmental Impact Assessment (EIA)**

Environmental Impact Assessment was conducted in the project area to evaluate the impacts of forest management in the area on the environment. The EIA was conducted by the company appointed consultant - Chemsain Konsultant Sdn Bhd. The EIA report defined the management objectives to support sustainable forest management based on the principles of the multiple uses, sustained yield of resources for economic, social and environmental purposes.

- **Field Survey and Sampling Designs**

Field surveys were conducted within a different timeframe in the project area. The field survey was conducted in Bengkoka Forest Reserve from 3rd October until 11th November 2015 meanwhile in Tambalugu Forest Reserve it was conducted from 2nd March 2016 until 24th March 2016. This was due to poor condition of road access to the Tambalugu Forest Reserve, lack of clean water supply nearby to set up camp for the team and other technical resources to conduct the field surveys.

In both of the forest reserves, flora and fauna assessment were conducted through;

1. Line Transect and Recce Walks
2. Opportunistic sighting - foot and road survey
3. Mist-netting
4. Stream transect (for amphibian)
5. Camera trapping

Recce Walks

The concept in recce walks is to collect the information of wildlife through walking along a chosen transect which least resistance through the forest understorey (Ancrenaz, 2013).

In Bengkoka Forest Reserve, recce walks were carried out on 23rd - 25th October 2015 (Figure 4.2) and in Tambalugu Forest Reserve, recce walks were carried out between 3rd March 2016 and 23rd March 2016 (Annex 1.3). Transect lines were established from the walks.

The details of the vegetation, topography, canopies, animal signs and sights, as well as signs of disturbances, were recorded by the collector in the field survey forms during the walks. Opportunistic sightings of animals were also recorded during the walk.

Table 4.2 Transect lines coordinate in Bengkoka Forest Reserve

No.	Transect Name	Location	Date	Starting Point	Ending Point	Distance (m)
1	Transect 1	Coupe 1	23/10/2015	N06°51'46.9" E117°08'28.7"	N06°51'38.2" E117°08'04.7"	1000
2	Transect 2	Coupe 1	24/10/2015	N06°51'49.8" E117°07'08.8"	N06°51'45.2" E117°07'15.3"	320
3	Transect 3	Coupe 2	24/10/2015	N06°52'39.1" E117°09'35.5"	N06°52'52.8" E117°09'21.3"	620
4	Transect 4	Coupe 2	25/10/2015	N06°51'10.1" E117°08'52.5"	N06°50'56.3" E117°08'47.8"	850

5	Transect 5	Coupe 3	26/10/2015	N06°54'16.6" E117°08'29.8"	N06°54'16.7" E117°08'50.0"	700
					Total	3490

Opportunistic Sightings

Road survey by foot was carried out in Bengkoka Forest Reserve four times which was from 23rd - 26th October 2015. The recommended ideal length of a road segment for a road survey by foot was 5 km (Ancrenaz, 2013). In this assessment, the total of road segment surveyed by foot was approximately 8 km (Table 4.3). Road access in the Bengkoka Forest Reserve could increase the chance to observe certain species such as the primates as they may be attracted to come to the road for food. On the contrary, some other big species may avoid themselves from the road. Any animal's signs such as footprints, faeces, and call or direct observation, during the survey were recorded.

A survey by vehicle was carried out on the 3rd and 4th November 2015. This survey was carried out at night time as the chances of observing animals may increase. The ideal road survey segment suggested for road survey by vehicle is from 10 - 20 km (Ancrenaz, 2013). Opportunistic sightings during the road surveys by the vehicle were recorded in a field datasheet.

These are the materials and equipment that were used for the road surveys by foot and vehicle;

i. GPS and binocular
ii. Field datasheet
iii. Spotlight
iv. Four-wheel drive vehicle

Table 4.3 Road survey segment in Bengkoka Forest Reserve

No.	Segment	Coupe	Date	Starting Point	Ending Point	Distance (m)
1	1 (by foot)	Coupe 1	23/10/2015	N06°51'46.4" E117°08'28.7"	N06°51'38.2" E117°08'04.7"	789
2	2 (by foot)	Coupe 1	25/10/2015	N06°52'01.1" E117°09'06.5"	N06°52'15.1" E117°08'09.8"	1780
3	3 (by foot)	Coupe 2	24/10/2015	N06°52'39.0" E117°09'35.5"	N06°52'52.8" E117°09'21.3"	619
4	4 (by foot)	Coupe 2	25/10/2015	N06°50'56.3" E117°08'47.8"	N06°52'01.1" E117°09'06.5"	2080
5	5 (by foot)	Coupe 3	26/10/2015	N06°54'15.6" E117°08'49.0"	N06°54'16.5" E117°08'29.8"	589
6	6 (by vehicle)	Coupe 1-2	04/11/2015	N06°52'15.7" E117°08'09.7"	N06°55'12.6" E117°08'09.7"	1292
7	7 (by vehicle)	Coupe 1-2	04/11/2015	N06°52'15.7" E117°08'09.7"	N06°52'17.8" E117°07'45.1"	1030
					Total	8179

Mist Netting

Mist nets were used to conduct the bird survey as the baseline survey for the bird in the area (Figure 4.1). The bird survey in Bengkoka Forest Reserve was conducted for 13 days from 27th - 31st October 2015, 4th November 2015 and from 5th - 8th November 2015 and the bird survey in Tambalugu Forest Reserve was carried out only one day at different location in the area due to factors such as poor road accessibility and the team were not able to camp in the area due to drought season where water (cooking, bathing etc.) was scarce.

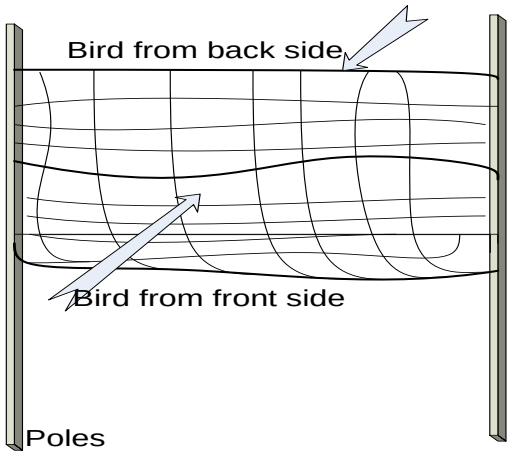


Figure 4.1 Illustration of mist netting for a bird survey

Five to six mist nets were used and they were randomly placed at the suitable sites (Table 4.4, Table 4.5 and Annex 1). Wooden pole was used to tie the mist nets. The mist nets were opened every day before 7:00 am, checked every two hours and closed at 5:00 pm. The mist nets were closed at 5:00 pm to avoid other animals trapped in the net in the evening or night. Birds that were caught, were identified, photographed and recorded before being released.

These are the materials and equipment used for the bird survey:

i. Mist nets
ii. Wooden pole
iii. Field manual book
iv. GPS
v. Camera

Table 4.4 Mist nets coordinate in Bengkoka Forest Reserve

No.	Mist-net No.	Coordinates	Date set	Date removed
1	1	N06°52'01.1" E117°09'06.5"	27/10/2015	31/10/2015
2	2	N06°52'19." E117°07'57.5"		
3	3	N06°52'13.9" E117°08'11.8"		
4	4	N06°51'33.5" E117°10'15.0"	04/11/2015	04/11/2015
5	5	N06°52'13.9" E117°08'11.8"		
6	6	N06°52'17.4" E117°08'28.5"	05/11/2015	09/11/2015
7	7	N06°52'13.9" E117°08'11.8"		

Table 4.5 Mist nets coordinate in Tambalugu Forest Reserve

Mists-net	Coordinates	Vegetation	Date set	Date removed
1	N06°55'43.9" E117°13'21.2"	Wild Acacia	5/03/2016	5/03/16
2	N06°56'01.8" E117°12'54.0"	Mangrove	6/03/16	6/03/16
3	N06°55'53.6" E117°12'45.4"	Wild Acacia	22/03/16	22/03/16
4	N06°55'49.7" E117°12'50.4"	Wild Acacia	22/03/16	22/03/16
5	N06°55'52.1" E117°13'58.2"	Wild Acacia	22/03/16	22/03/16
6	N06°55'43.3" E 117°13’26.0”	Wild Acacia	22/03/16	22/03/16

Stream transect

The stream-transect method was used to carry out the amphibian survey in Bengkoka Forest Reserve. The basic concept of stream-transect is to establish a transect line in a stream to do the survey for amphibians especially frogs during the night time (Figure 4.2). Torchlight was used to torch the eyes of frogs as it reflects the light directed to the eyes. Once the frog was captured, it was captured inside a plastic bag for a while and being released back after being identified and photographed. The surveys were carried out on 30th October 2015 and 6th November starting from 7.30 pm to 9.00 pm.

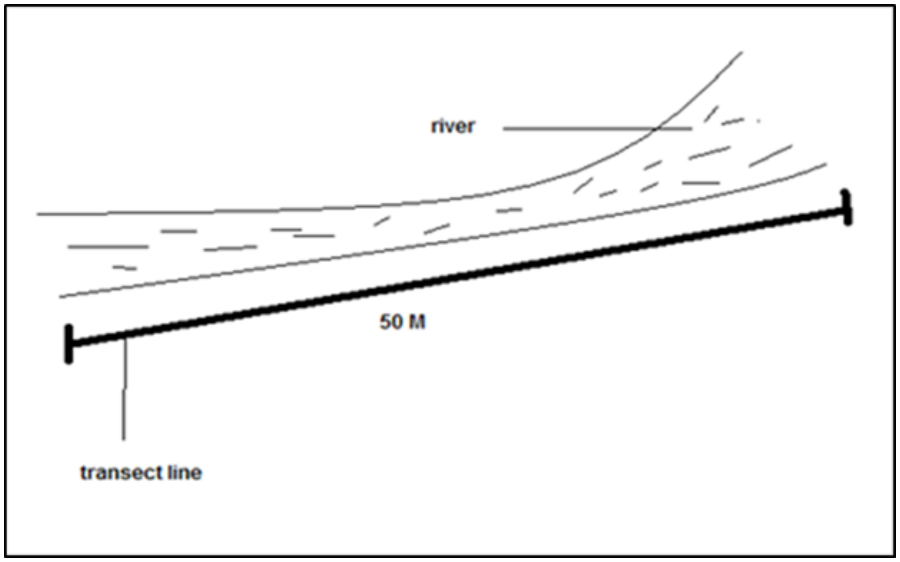


Figure 4.2 Illustration of stream-transect method

Materials used in the stream transect method;

i. Torchlight
ii. Field guide manual
iii. Rubber band
iv. Field notebook
v. Plastic bag
vi. Marker pen

Camera trapping

Remote cameras were often used to conduct mammal surveys to assess the diversity of ground-dwelling mammal's species in an area. In both forest reserves, remote cameras (Bushnell and Reconyx) were deployed to collect the baseline information of mammals in the forest reserves. GPS coordinates and other details of the deployed remote cameras were taken (Table 4.6 and Table 4.7). Remote cameras were placed (perpendicular) in the path of known animal trails, mounted on a tree 30 - 40 cm from the ground with no bait used (Table 4.6 and Table 4.7) and left for at least 14 days.

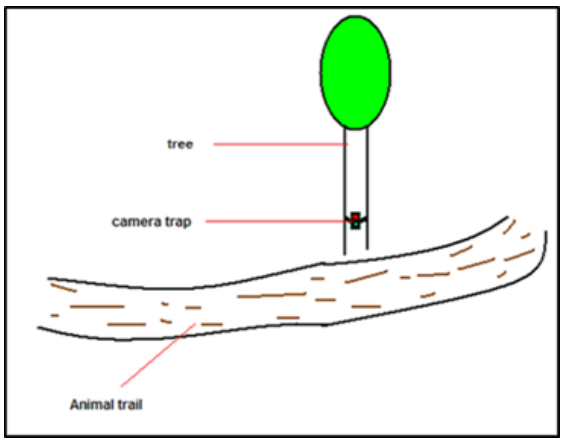


Figure 4.3 Illustration of remote cameras placement

Table 4.6 Remote cameras coordinate in Bengkoka Forest Reserve

No	Camera	Coordinates	Date Set	Date Removed
1	BKK 1	N06°51'44.8" E117°07'15.4"	3/10/2015	24/10/2015
2	BKK 2	N06°52'46.3" E117°09'28.2"	3/10/2015	24/10/2015
3	BKK 3	N06°51'27.3" E117°10'13.2"	4/10/2015	4/11/2015
4	BKK 4	N06°52'17.8" E117°08'20.6"	17/10/2015	11/11/2015
5	BKK 5	N06°54'43.1" E117°10'28.2"	19/10/2015	11/11/2015
6	BKK 6	N06°51'00.5" E117°08'54.2"	25/10/2015	11/11/2015

Table 4.7 Remote cameras coordinate in Tambalugu Forest Reserve

Camera	Coordinates	Vegetation	Date set	Date removed
1	N06°55'38.3" E117°13'07.3"	Wild Acacia	5/03/2016	21/03/2016
2	N06°55'43.8" E117°12'50.3"		5/03/2016	21/03/2016
3	N06°56'00.4" E117°13'14.7"	Mangrove	6/03/2016	21/03/2016
4	N06°56'01.6" E117°12'54.8"		6/03/2016	6/03/2016

- Stakeholder Consultation

Stakeholder consultation was conducted with the nearby local communities namely from Kampung Sorupil, Kampung Suang Duyung, Kampung Maringgan, and Kampung Bawing; also attended by representatives from neighbouring plantation, Acacia Forest Industries (AFI) and a government agency, the Sabah Wildlife Department, through an open dialogue at the community hall of the Kampung Suang Duyung.

After that, the Community Development Department team has conducted more stakeholder consultation in Kampung Kipahung, Kampung Bongkol, Kampung Kapok, Kampung Kodong, Kampung Jambu, Kg Kakarangan and Kampung Kandang. The purpose of this consultation is mainly to assess and to cross-check the HCV 5 and HCV 6.

This assessment is conducted similar to the conducting of the community census. Several factors had been taken into account during the actual assessment day itself. The interviewer has chosen the time between 8.00 am to 10.00 am and from 2.00 pm and 4.00 pm as these are deemed by the community to be the right time to meet individuals from the outside. From the company's point of view, this selection of time is crucial to keep the level of professionalism and respect at all-time high.

Secondly, the interviewers have been briefed on the local customs during a conversation; this includes the manner in which they were dressed, tone of voice and body gesture during interviews and even greeting before entering the owner's compound. This has helped them to set a favourable environment for the villagers to truly express their views and concern. It is very important to note that, there is variance in respondent answers though they live in the same village. Therefore, the interviewer should practice the utmost professionalism during an assessment. There shall be no leading questions or a rebuttal argument given by the interviewer against answers from the community.

Questions asked during local consultation are divided into five main sections namely hunting activity, agriculture and aquaculture, water source, non-timber forest product and sites of cultural importance. The interviewer has asked the questions in a cohesive and coherent manner, at the villagers' pace.

5.0 Assessment Findings/ HCV Identification

i. HCV Outcomes and Justification

HCV identification and wildlife field survey was carried out from October 2015 - March 2016, and another field survey was carried out in January - February 2017 specifically to identify the Megapode existence in Tambalugu Forest Reserve (Coupe 4 of Gerak Saga area). Based on the ground assessment, although the forest is dominated by wild Acacia species, there are environmental and social values potentially associated with HCV were identified.

ii. HCV 1 - Species Diversity

Based on the findings from the field surveys on species diversity under the IUCN Red List of Threatened Species status, four (4) mammals species; Malayan sun bear, sambar deer, pig-tailed macaque and bearded pig are categorized as 'Vulnerable (VU)' and the other mammals are categorized as 'Least Concern' and 'Data Deficient' (Table 5.1). The Malayan sun bear is Totally Protected under the Schedule 1 of the Sabah Wildlife

Enactment (WCE) 1997, meanwhile, the pig-tailed macaque, bearded pig and sambar deer are protected under Schedule 2 of the enactment. Therefore, under the conservation effort, the company will focus on the species which potentially associated with HCV 1 such as the sun bear.

Table 5.1 List of medium and large-sized mammals observed during the survey in the year 2015 and 2016.

Common Name	**Scientific Name**	**Method**	**IUCN Red List Status**
Long-tailed macaque	*Macaca fascicularis*	Remote camera	Least Concern
Pig-tailed macaque	*Macaca nemestrina*	Remote camera	Vulnerable
Malay civet	*Viverra tangalunga*	Remote camera, Direct sighting	Least Concern
Malayan sun bear	*Helarctos malayanus*	Remote camera	Vulnerable
Small toothed palm civet	*Arctogalidia trivirgata*	Remote camera	Least Concern
Mouse-deer	*Tragulus spp.*	Remote camera	Data Deficient (Lesser mouse-deer) Least Concern (Greater mouse-deer)
Muntjac	*Muntiacus spp.*	Remote camera	Least Concern
Sambar deer	*Rusa unicolor*	Remote camera	Vulnerable
Bearded pig	*Sus Barbatus*	Remote camera, Direct sighting	Vulnerable
Red giant flying squirrel	*Petaurista petaurista*	Direct sighting	Least Concern

Table 5.2 List of bird species observed during the survey in the year 2015 and 2016.

Common Name	Scientific Name	Method	Sampling/ Observation Year	IUCN Red List Status
Blue-eared Kingfisher	*Alcedo meninting*	Mist-net, Direct sighting	2016	Least Concern
Collared Kingfisher	*Todiramphus chloris*	Mist-net, Direct sighting	2016	Least Concern
Rufous-backed Kingfisher	*Ceyx rufidorsus*	Mist-net	2015	Least Concern

Emerald Dove	*Chalcophaps indica*	Mist-net, Direct sighting	2015	Least Concern
Buff-rumped Woodpecker	*Meiglyptes grammithorax*	Direct sighting	2015	Least Concern
Buff-necked Woodpecker	*Meiglyptes tukki*	Mist-netting	2015	Near Threatened
Common Flameback	*Dinopium javanese*	Direct sighting	2016	Least Concern
Yellow-vented Bulbul	*Pycnonotus goiavier*	Mist-net	2015	Least Concern
Red Eye Bulbul	*pycnonotus brunneus*	Mist-net	2015	Least Concern
White-chested babbler	*Trichastoma rostratum*	Mist-net	2015	Near threatened
Little Spiderhunter	*Arachnothera longirostra*	Mist-net	2015, 2016	Least Concern
Long-billed Spiderhunter	*Arachnothera crassirostris*	Mist-net	2015	Least Concern
Pied Fantail	*Rhipidura javanica*	Mist-net	2015	Least Concern
Collared nightjar	*Gactornis enarratus*	Direct sighting	2015	Least Concern
Megapode	*Megapodius cumingii*	Remote camera	2016	Least Concern
White-crown shama	*Copsychus striklandii*	Mist-nest	2015	nil

Due to limited resources, the population of the wildlife species in the project area is still unknown and therefore precautionary approach such as continuous monitoring and research for wildlife species were taken; the list of large and medium-sized mammals and birds observed in the project area are updated (Annex 2) since the first surveys conducted in 2015 and 2016 as the result of yearly biological monitoring conducted by the Conservation Team.

iii. HCV 2 - Landscape-level ecosystems and mosaics

As stated earlier, the project area is only 6,467 ha and mainly covered with wild Acacia species. The natural forest of the Bengkoka and Tambalugu Forest Reserves are fragmented and cover less than 2% of the area. Thus, the project area is too small to be considered as landscape-level ecosystems and mosaics.

iv. HCV 3 - Ecosystem and habitats

A small, contiguous fringe of mangrove forests forms the Northern Boundary of Tambalugu Forest Reserve was identified during the assessment and the company will mitigate environmental aspects and potential HCV elements through the protection of riparian, steeper areas and the 26.9 ha mangrove area including its buffer (Annex 3.1).

v. HCV 4 - Ecosystem services

The topography of the project area is generally below 25 degrees slope thus is not generally vulnerable. The company has identified water catchments, riparian and steeper areas in the project area to be protected as important environmental values. (Annex 3.2).

vi. HCV 5 - Community needs

There are no communities living within the forest reserves and based on the Social Assessment conducted, there are no communities relying on the project area for livelihood, health, nutrition and water. As a general principle, water catchment areas within the project area have been identified for protection.

vii. HCV 6 - Cultural values

As stated earlier, there were no communities living in both forest reserves. Historically, there is part of the areas in the forest used by the community in their paganism practice such as rituals. However, this belief is no longer practised as communities started to commit themselves into religion and religious belief and only two (2) graveyard areas identified for protection in Coupe 4 (Annex 3.3) and details are reported in the Social Impact Assessment (SIA) report.

As a general principle, the Company will set aside and protect any area known to contain sites important to a local community's cultural, ecological, or religious activity.

6.0 Precautionary Approach - HCV Management and Monitoring

Table 6.1 HCV Management and Monitoring Plan

HCV	General Objective	Specific Objective	Target	Indicator	Strategy (Area)	Strategy (Prescription)	Monitoring	Verifier
1	Potentially associated HCV are maintained or enhanced	The operation maintained the wildlife-occupied area as suitable habitat	1. Number of present protected species are maintained 2. Retain natural forest cover at protected/ conservation areas for the sun bear species	1. All protected species are still present as the operation proceed/ intensify sighted should at least be maintained 2. Regardless of the quantity, the number of species detected 3. Size (hectare) of retained natural forest OR restored	Protected areas/ Conservation areas within the project area	1. No hunting policy within the project area 2. Control access by gate installation at all entry point to the coupes within the project area 3. Awareness and outreach program to reduce the threat associated with HCV 1	1. Remote camera to monitor large and medium-sized mammal 2. Record opportunistic sightings of flora and fauna 3. Operation - Schedule patrolling in the project area 4. Monitor threat: encroachment/ hunting	1. Annual Conservation Report 2. Patrolling records
3	Potentially associated HCV are maintained or enhanced	No deterioration of mangrove forest cover	Mangrove forest	Size (hectare) of the mangrove forest	Mangrove forest in Coupe 4	No harvesting of mangrove forest	1. Operation: Monitor encroachment	1. Annual Conservation Report

							2. Annual boundary re-brushing of the mangrove area	2. Annual Compliance Report
4 & 5	Potentially associated HCV are maintained or enhanced	1. No deterioration of water catchment 2. Crucial water catchment restoration is carried out by stages	1. Maintain the water quality 2. Riparian function restored	1. Water quality (for maintenance) 2. Size (hectare) of riparian restored	1. Water catchment areas within the project area 2. Riparian Reserves	1. No open burning and no forest clearance 2. Fire prevention strategy	1. Quarterly water monitoring 2. Remote sensing - coverage of re-established riparian or restoration progress monitoring	1. Environmental Compliance Report 2. Annual Conservation Report
6	Potentially associated HCV are maintained or enhanced	No deterioration to potential HCV 6, and ensuring access for stakeholders	No disturbance to the graveyard or burial sites	State of the graveyard (no disturbance) and accessibility for stakeholders	Graveyards in Coupe 4	Demarcation and strictly no activities on the graveyard and buffer area	Continuous engagement with the local community	1. Community Development Program (CDP) Report

7.0 References

Ancrenaz, M. 2013. Field Manual: Monitoring Large Terrestrial Mammals in Sabah. Sabah Forestry Department. Sandakan, Sabah, Malaysia.

De Kok, R. P. J & Utteridge, T. M. A. 2010. Field Guide To The Plants of East Sabah. Royal Botanic Gardens, Kew.

Forest Management Plan for Gerak Saga Sdn Bhd (2017).

Francis, C. M. 2007. A Pocket Guide to the Birds of Borneo (3rd Edition). The Sabah Society.

Gaveau, D. L. A., Sheil, D., Husnayaen, Salim, M. A., Arjasakusuma, S., Ancrenaz, M., Meijaard, E. (2016). Rapid conversions and avoided deforestation: examining four decades of industrial plantation expansion in Borneo. Scientific Reports, 6(October 2015), 32017. https://doi.org/10.1038/srep32017.

Gerak Saga Sdn Bhd. Environmental Impact Assessment for Forest Management of Bengkoka and Tambalugu Forest Reserves (6,467 Hectares, Pitas, Sabah.

Inger, R. F. & Tan, F. L. 1996. The Natural History of Amphibians and Reptiles in Sabah (2nd Edition). Natural History Publications (Borneo) Sdn. Bhd.

Inger, R. F. & Stuebing, R.B. 2005. A Field Guide to The Frogs of Borneo (2nd Edition). Natural History Publications (Borneo) Sdn. Bhd.

IUCN 2019. The IUCN Red List of Threatened Species. Version 2019-2. http://www.iucnredlist.org. http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T9760A45033547.en. Downloaded on 05 September 2019.

Lee, Y.F. 2003. Preferred Check-List of Sabah Trees (3rd Edition). Natural History Publications (Borneo) Sdn. Bhd.

Myers, S. 2009. A Field Guide to the Birds of Borneo. Simon Papps, Talisman Publishing, Pte Ltd. Hong Kong.

Payne, J. & Francis.C. M. 2007. A Field Guide to The Mammals of Borneo. The Sabah Society.

Phillipps, Q. & Phillipps, K. 2014. Phillipps' Field Guide to The Birds of Borneo Sabah, Sarawak, Brunei and Kalimantan (3rd Edition). John Beaufoy Publishing.

Sabah Forestry Department 2005. CAIMS. http://ww2.sabah.gov.my/htan_caims/Level%202%20frame%20pgs/Class%201%20Frames/tambalugu_fr.htm.http://ww2.sabah.gov.my/htan_caims/Level%202%20frame%20pgs/Class%201%20Frames/bengkoka_fr.htm. Downloaded on 04 February 2020.

ADDENDUM
NO 1

8.0 HCV Threats and the Precautionary Approach for Threat Management

8.1 Key threats to the project area

The Project Area is easily accessible for forest encroachment to seek out land for farming, illegal exploitation, and illegal hunting. Encroachment for crop cultivation is often a threat to biodiversity loss which soon leads to a highly fragmented landscape.

Besides that, forest fires are also considered as major threat to the Project Area. This is because the Project Area is not highly forested (secondary vegetation) and dry land with high potential of forest fires during the long drought season/ events, which associated with atmospheric and oceanic anomaly known as El-Nino – Southern Oscillation (ENSO) phenomenon that may increase the susceptibility of vegetation to wildfire. The threats become serious during this drought.

The domination from the invasive species such as the wild *Acacia spp*., is one of the key threats to the HCV identified. The germination and growth rate of the species is faster than the native forest, thus it may dominate the remaining natural forests, the water catchment, and ecosystem services areas. Table 7.1 summarised the threats to the HCV identified.

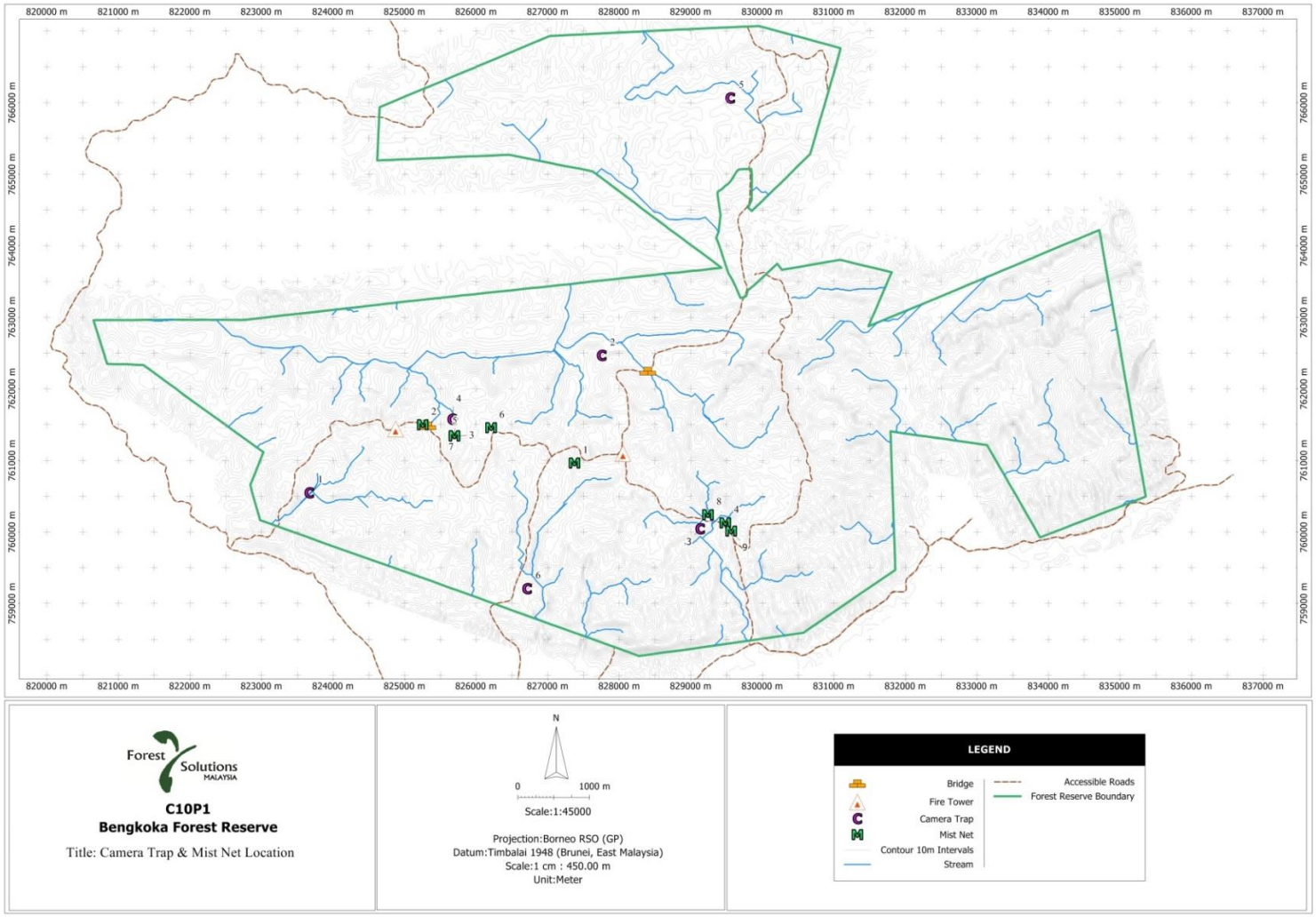
Table 7.1 Summary of threats to the HCV in the project area

HCV	Specific Threats	Precautionary Approach	Common Threats	Precautionary Approach
1 – Species associated with HCV 1	1. Poaching and hunting 2. Human-wildlife conflict	1. No hunting policy, no hunting signboard installation, roadblocks, and regular patrol 2. Awareness programs with employees and local communities	1. Forest Fire 2. Invasive Species Domination especially from the wild *Acacia spp* – For HCV 1 applied for flora but not applicable for HCV 6.	1. Using the Forest Fire Management Plan to control threats from forest fires 2. Regular patrolling following the patrol schedule in the areas where fires hotspots were identified 3. Implementing restoration activities in stages to eliminate invasive and undesired non-native species in the project area.
3 - Mangrove Forest in Tambalagu Forest Reserve (Coupe 4)	1. Illegal harvesting of mangrove trees 2. Encroachment	1. No harvesting of mangrove species, annual boundary re-brushing, 2. Monitor encroachment 3. Awareness programs with local communities on Mangrove conservation		
4 - Water catchment areas and riparian reserve **&** **5 -** Water catchment area Coupe 2	1. Encroachment 2. Obstruction to watercourse	1. Monitor encroachment 2. Quarterly water quality monitoring 3. Remote sensing - coverage of re-established riparian or restoration progress monitoring		
6 - Graveyard of Suang Duyung Village in Tambalugu Forest Reserve / Coupe 4	1. Encroachment 2. Falling trees/branches from operational activities and natural causes.	1. Two times a year checking on the graveyard areas, also during the harvesting operations 2. Demarcation and strictly no activities on the graveyard and buffer area.		

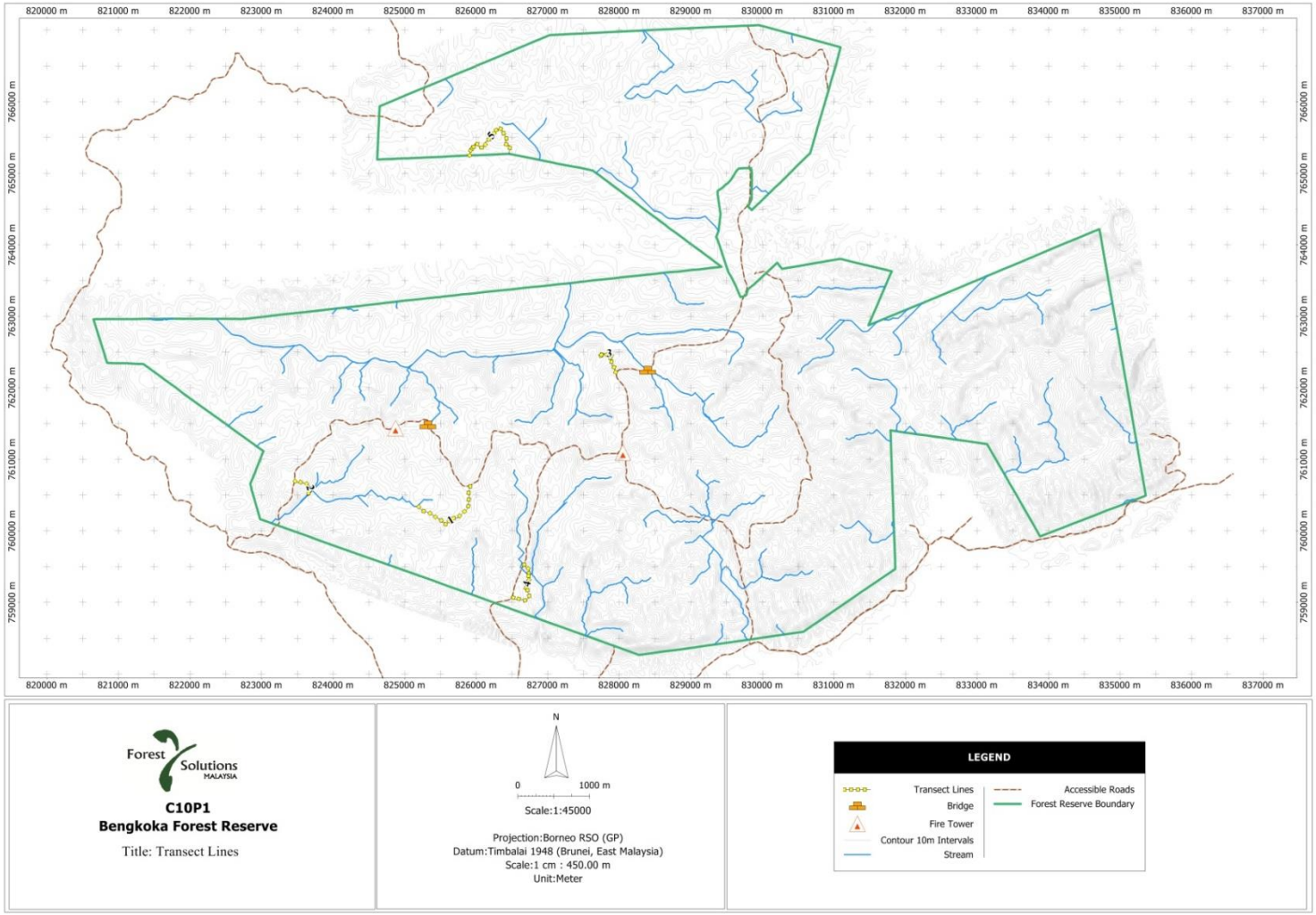
ANNEXE 1

MAPS OF SAMPLING LOCATION OF THE BASELINE WILDLIFE SURVEY 2015-2016

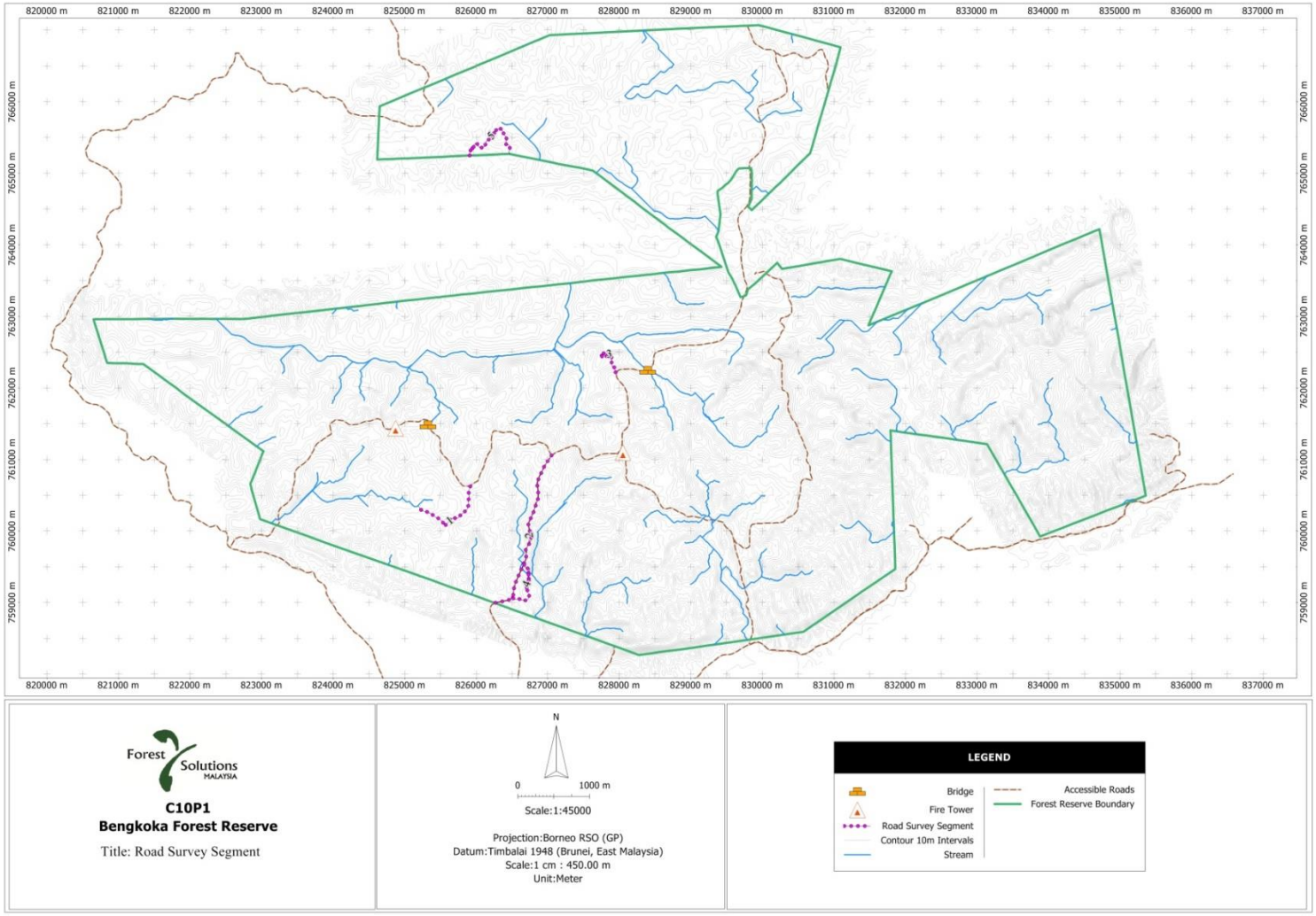
Annexe 1.1 Sampling locations of remote cameras and mist nets in Bengkoka Forest Reserve, 2015



Annexe 1.2 Track for a recce walk in Bengkoka Forest Reserve, 2015

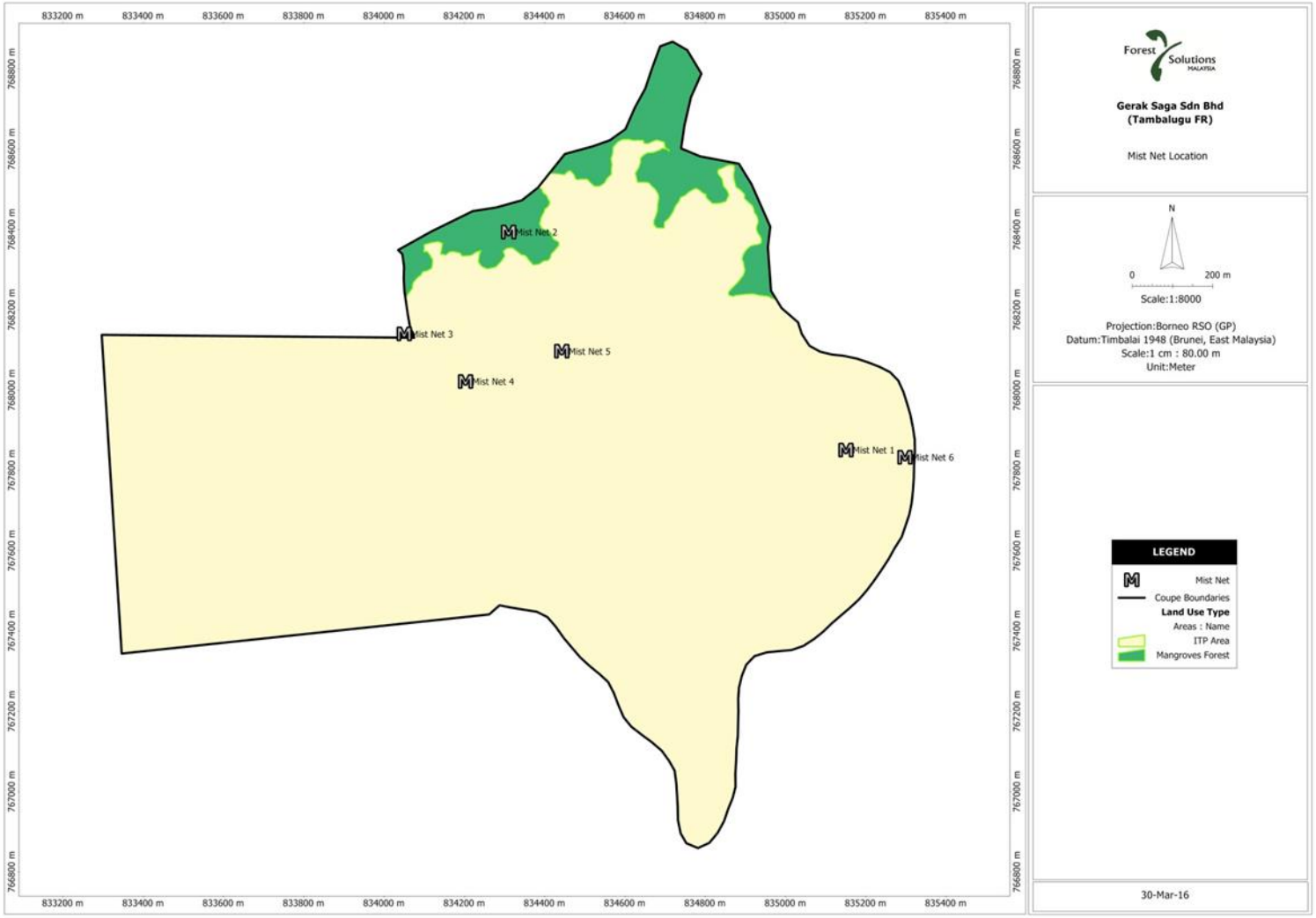


Annexe 1.3 Road segment tracks surveyed by foot and vehicle in Bengkoka Forest Reserve, 2015

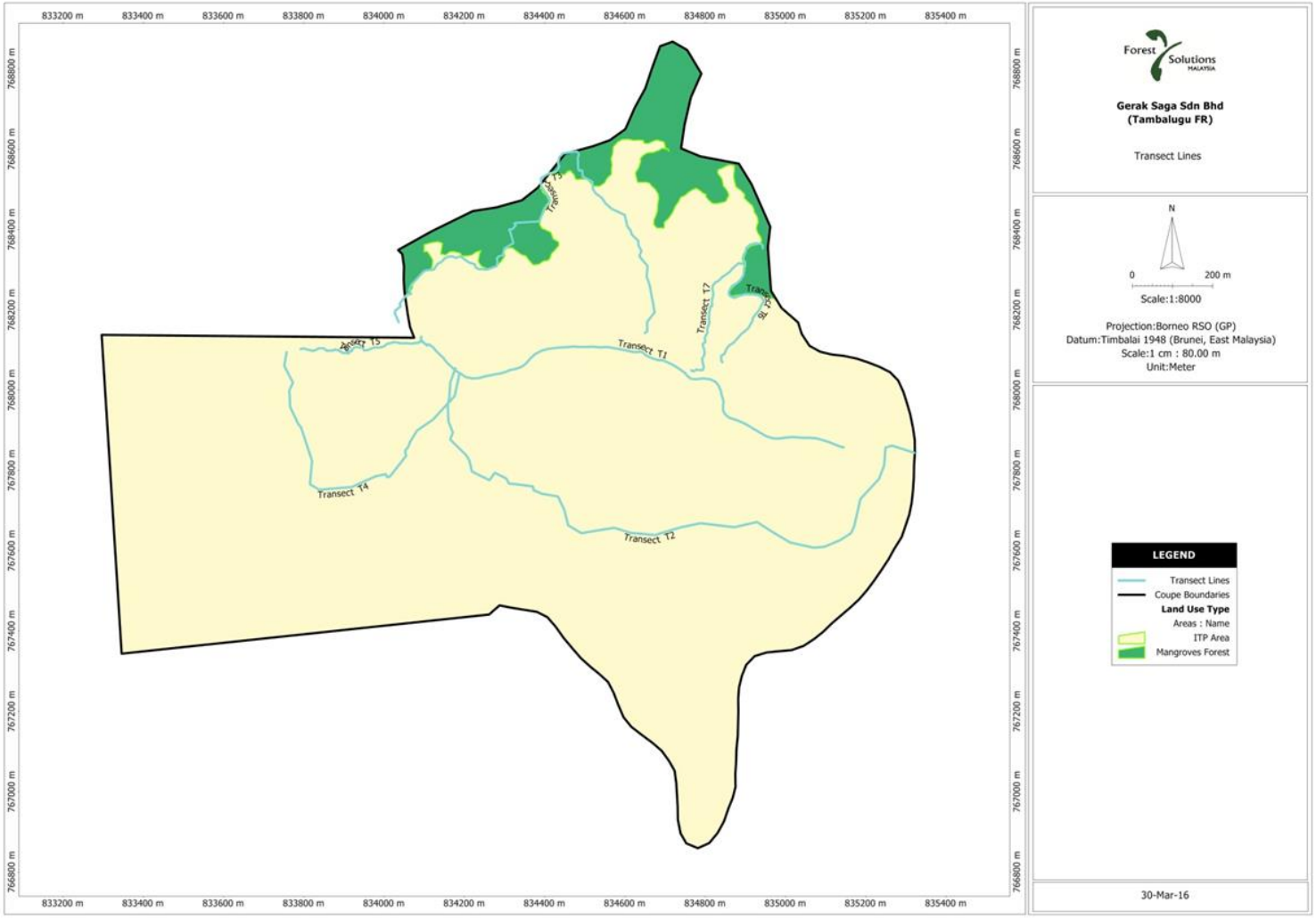


Annexe 1.4 Sampling locations of camera trapping in Tambalugu Forest Reserve (Coupe 4), 2016

Annexe 1.5 Sampling locations of mist-netting in Tambalugu Forest Reserve (Coupe 4), 2016



Annexe 1.6 Maps of transect lines surveyed by foot in Tambalugu Forest Reserve (Coupe 4), 2016


833200 m
833400 m
833600 m
833800 m
834000 m
834200 m
834400 m
834600 m
834800 m
835000 m
835200 m
835400 m
768800 m
768600 m
768400 m
768200 m
768000 m
767800 m
767600 m
767400 m
767200 m
767000 m
766800 m
Transect T1
Transect T2
Transect T3
Transect T4
Transect T5
Transect T6
Transect T7
Gerak Saga Sdn Bhd
(Tambalugu FR)
Transect Lines
N
0
200 m
Scale:1:8000
Projection:Borneo RSO (GP)
Datum:Timbalai 1948 (Brunei, East Malaysia)
Scale:1 cm : 80.00 m
Unit:Meter
LEGEND
Transect Lines
Coupe Boundaries
Land Use Type
Areas : Name
ITP Area
Mangroves Forest
30-Mar-16

ANNEXE 2
LIST OF FLORA AND FAUNA IN GERAK SAGA

Annexe 2.1 Updated lists of medium and large-sized mammals observed in the year 2015 until 2019 through survey and monitoring using remote camera and direct sighting recorded.

Order	Common Name	Scientific Name	Observation/Detection Year	Survey/Monitoring Method	Identified by	IUCN Red List of Threatened Species Status	Population Trend (IUCN)	WCE (1997)
Primates	Long-tailed macaque	*Macaca fascicularis ssp. fascicularis*	2016, 2017, 2018	Remote camera	Conservation Team	Least Concern	Decreasing	Schedule 2
	Pig-tailed macaque	*Macaca nemestrina*	2015, 2017, 2018, 2019	Remote camera	Conservation Team	Vulnerable	Decreasing	Schedule 2
Carnivora	Banded civet	Hemigalus derbyanus	2018	Remote camera	Conservation Team	Near Threatened	Decreasing	Schedule 2
	Common palm civet	*Paradoxurus hermaphroditus*	2017	Remote camera	Conservation Team	Least Concern	Decreasing	Schedule 2
	Leopard cat	*Prionailurus bengalensis*	2017, 2019	Remote camera	Conservation Team	Least Concern	Stable	Schedule 2
	Malay badger	*Mydaus javanensis*	2019	Remote camera	Conservation Team	Least Concern	Stable	Schedule 2
	Malay civet	Viverra tangalunga	2015, 2016, 2018, 2019	Remote camera, Direct sighting	Conservation Team	Least Concern	Stable	Schedule 2
	Sun Bear	Helarctos malayanus	2015, 2016,2017, 2018, 2019	Remote camera	Conservation Team	Vulnerable	Decreasing	Schedule 1
Cetartiodactyla	Mouse-deer	*Tragulus spp.*	2015, 2017, 2018, 2019	Remote camera	Conservation Team	Data Deficient (Lesser mouse-deer)/ Least Concern (Greater mouse-deer)	Unknown/ Decreasing	Schedule 2

	Barking deer	*Muntiacus spp.*	2015, 2016, 2017, 2018	Remote camera	Conservation Team	Least Concern	Decreasing	Schedule 2
	Sambar Deer	*Rusa unicolor*	2016, 2018	Remote camera	Conservation Team	Vulnerable	Decreasing	Schedule 2
	Bearded Pig	*Sus barbatus*	2015, 2016, 2017, 2018, 2019	Remote camera	Conservation Team	Vulnerable	Decreasing	Schedule 2
Rodentia	Long-tailed porcupine	*Trichys fasciculata*	2019	Remote camera	Conservation Team	Least Concern	Stable	Schedule 2
	Red giant flying squirrel	Petaurista petaurista	2015	Direct sighting	Conservation Team	Least Concern	Decreasing	
	Thick-spined porcupine	*Hystrix crassispinis*	2019	Remote camera	Conservation Team	Least Concern	Stable	Schedule 2

Annex 2.2 List of amphibians observed in year 2015 and 2016.

Family	**Common Name**	**Scientific Name**	**IUCN Red List of Threatened Species Status**	**Population Trend (IUCN)**	**Wildlife Conservation Enactment (1997) Schedule**
Dicroglossidae	Grass frog	*Fejervarya limnocharis*	Least concern	Stable	nil
	Lesser swamp frog	*Limnonectes paramacrodon*	Near threatened	Decreasing	nil
Ranidae	Large-white lipped tree frog	Chalcorana megalonesa	Least Concern	Unknown	nil
	Northern Torrent Frog	*Meristogenys orphnocnemis*	Least Concern	Decreasing	nil
Rhacophoridae	Four-lined tree frog	*Polypedates leucomystax*	least Concern	Stable	nil

Annexe 2.3 List of reptiles observed in the year 2015 and 2016Annex 2.4 Updated list of birds mist-netted and observed in the year 2015 to 2019.

Order	Common Name	Scientific Name	IUCN Red List of Threatened Species Status	Population Trend (IUCN)	Wildlife Conservation Enactment (1997) Schedule
Alcedinidae	Blue Banded Kingfisher	*Alcedo peninsulae*	Near threatened	Decreasing	nil
	Blue-eared Kingfisher	*Alcedo meninting*	Least Concern	Decreasing	nil
	Collared Kingfisher	*Todiramphus chloris*	Least Concern	Decreasing	nil
	Rufous Collared Kingfisher	*Halcyon concreta*	Near Threatened	Decreasing	nil
	Ruddy Kingfisher	*Halcyon coromanda*	Least Concern	Decreasing	nil
	Rufous-backed Kingfisher	*Ceyx rufidorsus*	Least Concern	no data	nil
Columbidae	Emerald Dove	*Chalcophaps indica*	Least Concern	Decreasing	Schedule 2
	Pink-necked Green-Pigeon	*Treron vernans*	Least Concern	Stable	nil
	Little-green Pigeon	*Treron olax*	Least Concern	Decreasing	nil
Picidae	Buff-rumped Woodpecker	*Meiglyptes grammithorax*	Least concern	Decreasing	nil
	Buff-necked Woodpecker	*Meiglyptes tukki*	Near Threatened	Decreasing	nil
	Common Flameback	*Dinopium javanese*	Least Concern	Decreasing	nil
	Greater Flameback	*Chrysocolaptes guttacristatus*	Least Concern	Decreasing	nil
	Rufous Woodpecker	*Micropternus brachyurus*	Least concern	Decreasing	nil

	Rufous Piculet	*Sasia abnormis*	Least Concern	Stable	Schedule 2
Eurylaimidae	Black and Red Broadbill	*Cymbirhynchus macrorhynchos*	Least Concern	Decreasing	nil
Pycnonotidae	Yellow-vented Bulbul	*Pycnonotus goiavier*	Least Concern	Increasing	nil
	Olive-winged Bulbul	*Pycnonotus plumosus*	Least Concern	Stable	nil
	Red Eye Bulbul	*pycnonotus brunneus*	Least Concern	Decreasing	nil
	Spectacled Bulbul	*pycnonotus erythropthalmos*	Least Concern	Decreasing	nil
	Black-headed Bulbul	*Pycnonotus atriceps*	Least Concern	Decreasing	nil
	Cinereous Bulbul	*Hemixos cinereus*	Least Concern	Stable	nil
	Cream-vented bulbul	*Pycnonotus simplex*	Least Concern	Decreasing	nil
Muscicapidae	White-rumped shama	*Copysychus malabaricus*	Least Concern	Decreasing	Schedule 2
	Grey chested jungle flycatcher	*Cyornis brunneatus*	Near Threatened	Decreasing	nil
	Magpie-robin	*Copyschus saularis*	Least Concern	Stable	Schedule 2
Eupetidae	Chestnut-backed Schimitar Babbler	*Pomatorhinus montanus*	Least Concern	Stable	nil
	White-chested babbler	*Trichastoma rostratum*	Near threatened	Decreasing	Schedule 2
	Grey-headed Babbler	*stachyris poliocephala*	Least Concern	Decreasing	Schedule 2
	Fluffy-backed Tit-babbler	*Macronous ptilosus*	Near Threatened	Decreasing	nil

	Bold-striped Tit Babbler	*Mixornis bornensis*	Least Concern	Stable	nil
	Abbott's Babbler	*Trichastoma abbotti*	Least Concern	Stable	nil
	Ferruginous Babbler	*Trichastoma bicolor*	Least Concern	Stable	Schedule 2
	Temminck‘s Babbler	*Trichastoma pyrrogenys*	Least Concern	Decreasing	nil
	Chestnut-rumped babbler	*Stachyris maculata*	Near Threatened	decreasing	nil
Leiotrichidae	Brown Fulvetta	*Alcippe brunneicauda*	Near Threatened	Decreasing	nil
Nectariniidae	Brown-throated sunbird	*Anthreptes malacensis*	Least Concern	Stable	nil
	Red-throated Sunbird	*Anthreptes rhodolaemus*	Near Threatened	Decreasing	nil
	Plain Sunbird	*Anthreptes simplex*	Least Concern	Decreasing	nil
	Little Spiderhunter	*Arachnothera longirostra*	Least Concern	Stable	nil
	Long-billed Spiderhunter	*Arachnothera robusta*	Least Concern	Decreasing	nil
	Ruby-cheeked Sunbird	*Chalcoparia singalensis*	Least Concern	Stable	nil
Dicruridae	Crow-billed Drongo	*Dicrurus annectans*	Least Concern	Unknown	nil
Dicaeidae	Orange-bellied flowerpecker	*Dicaeum trigonostigma*	Least Concern	Stable	Schedule 2
Rhipiduridae	White-throated Fantail	*Rhipidura albicollis*	Least Concern	Stable	nil
	Pied Fantail	*Rhipidura javanica*	Least Concern	Stable	nil
	Spotted Fantail	*Rhipidura perlata*	Least Concern	Stable	nil
Chloropseidae	Lesser Green Leafbird	*Chloropsis cyanopogon*	Near Threatened	Decreasing	Schedule 2

	Greater Green Leafbird	*Chloropsis sonnerati*	Least Concern	Decreasing	nil
Turididae	Chestnut-capped Thrush	*Geokichla interpres*	Near Threatened	Decreasing	nil
Cisticolidae	Ashy Tailorbird	*Orthotomus ruficeps*	Least Concern	Stable	nil
Meropidae	Blue-throated Bee-eater	*Merops viridis*	Least Concern	Stable	nil
Estrildidae	Black Headed Munia	*Lonchura malacca*	Least Concern	Stable	nil
	White-throated Munia	*Lonchura leucogastra*	Least Concern	Stable	nil
	Dusky Munia	*Lonchura fuscans*	Least Concern	Stable	nil
Sturnidae	Common Hill Myna (Direct sighting)	*Gracula religiosa*	Least Concern	Decreasing	Schedule 2
Sittidae	Velvet-fronted nuthatch	*Sitta frontalis*	Least Concern	Decreasing	nil
Aegithinidae	Common Iora	*Aegithina tiphia*	Least Concern	Unknown	nil

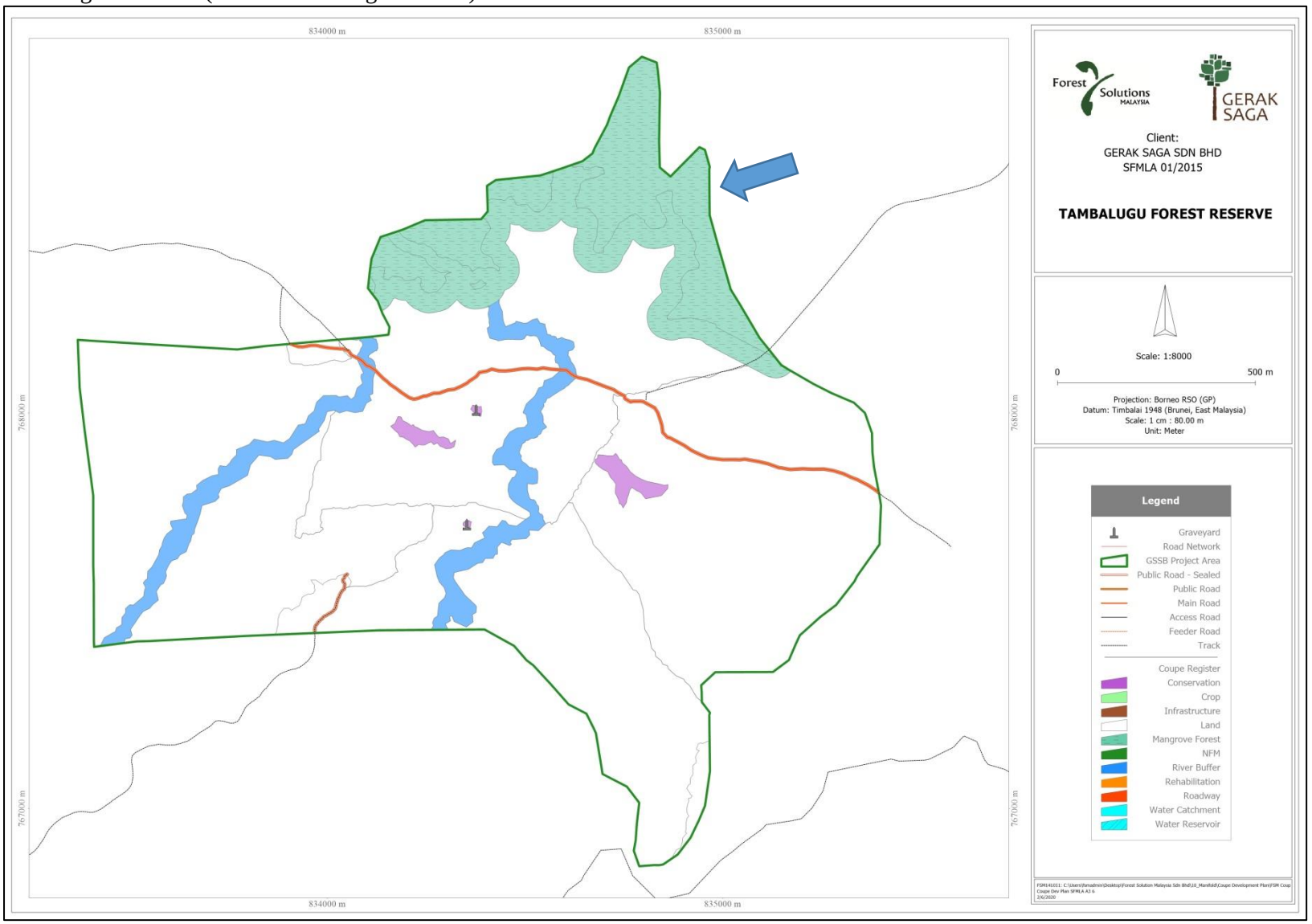
Annexe 2.5 List of flora identified in the project area (2015 - 2016)

Family	Common Name	Scientific Name	IUCN Red List of Threatened Species Status	Population trend (IUCN)
Dipterocarpaceae	Keruing Belimbing	*Dipterocarpus grandiflorus*	Endangered	Decreasing
Verbenaveae	Bunga Biren	*Stachytarpheta dichotoma*	No data	No Data
Areceaceae	Chinese Fan Palm	*Livistona chinensis*	No data	No data
Dilleniaceae	Buan/Rungin	*Dillenia suffruticosa*	No data	No data
Fagaceae	Akasia	*Acacia mangium*	No data	No data
	-	*Licula sp*	No data	No data
Malvaceae	Dungun	*Heritiera littoralis*	No data	No data
Pteridaceae	Piyai Raya laut	*Acrostichum sp.*	No data	No data
Rhizophoraceae	Bakau minyak/Akit	*Rhizophoea apiculata*	Least Concern	Decreasing
Myrtaceae	Jambu batu	*Psidium guajava*	No data	No data
Simaroubiaceae	Tongkat Ali	*Eurycoma longifolia*	No data	No data
Melastomataceae	Senduduk/ Gosing	*Melastoma malabathricum*	No data	No data
Apocynaceae	Pulai	*Alstonia Sp*	No data	No data
	Pokok restong	*Evatamia divaricata*	No data	No data
Zingiberaceae	Lengkuas	*Aplinia galanga*	-	-
Compositae	Subong	*Blumea balsamifera*	No data	No data

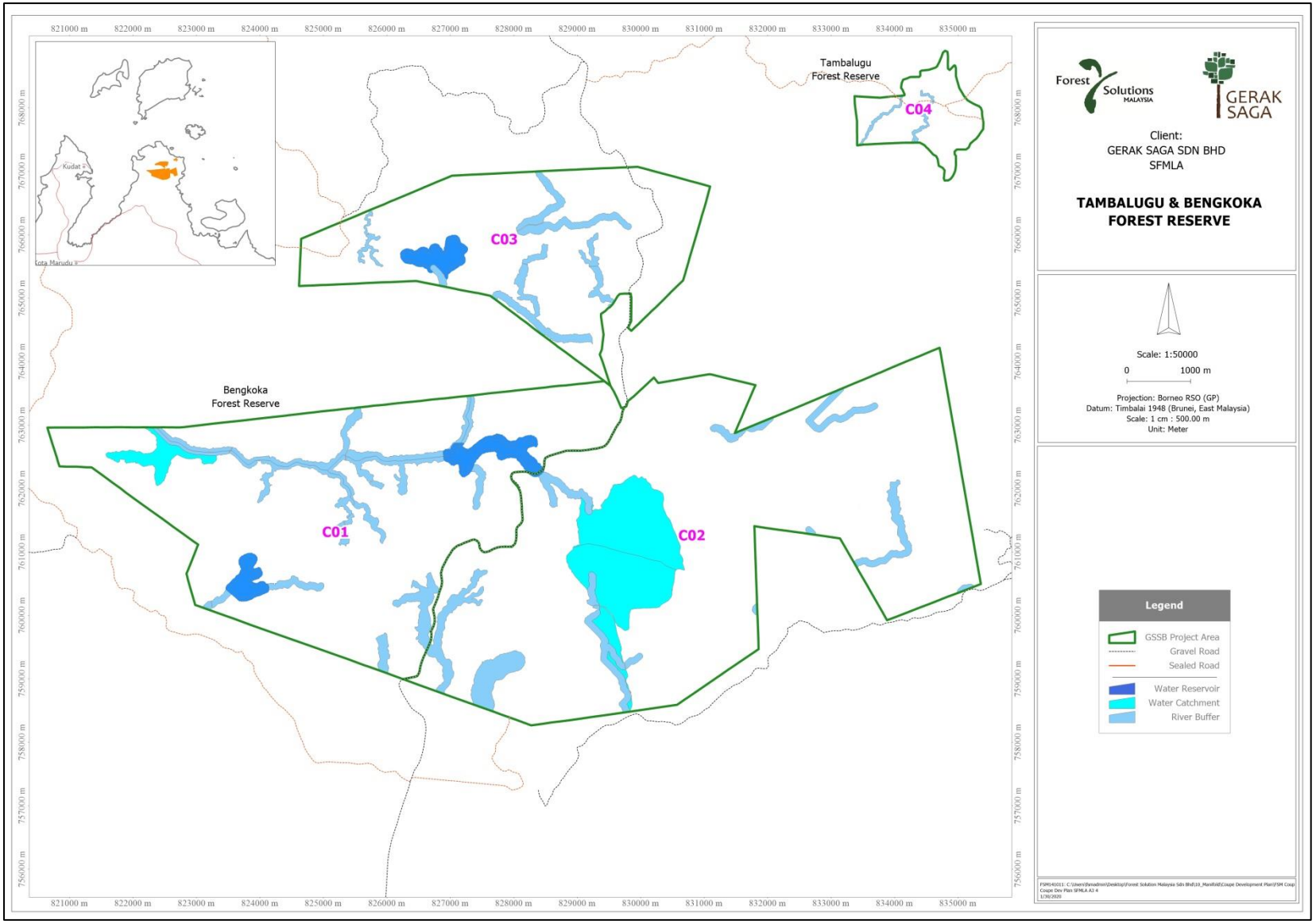
	Lohunoi/ Lahunai	*Chromolaena odorata*	No data	No data
Saururaceae	Kenemek Jantan	*Houttuynia cordata*	No data	No data

ANNEXE 3
MAPS

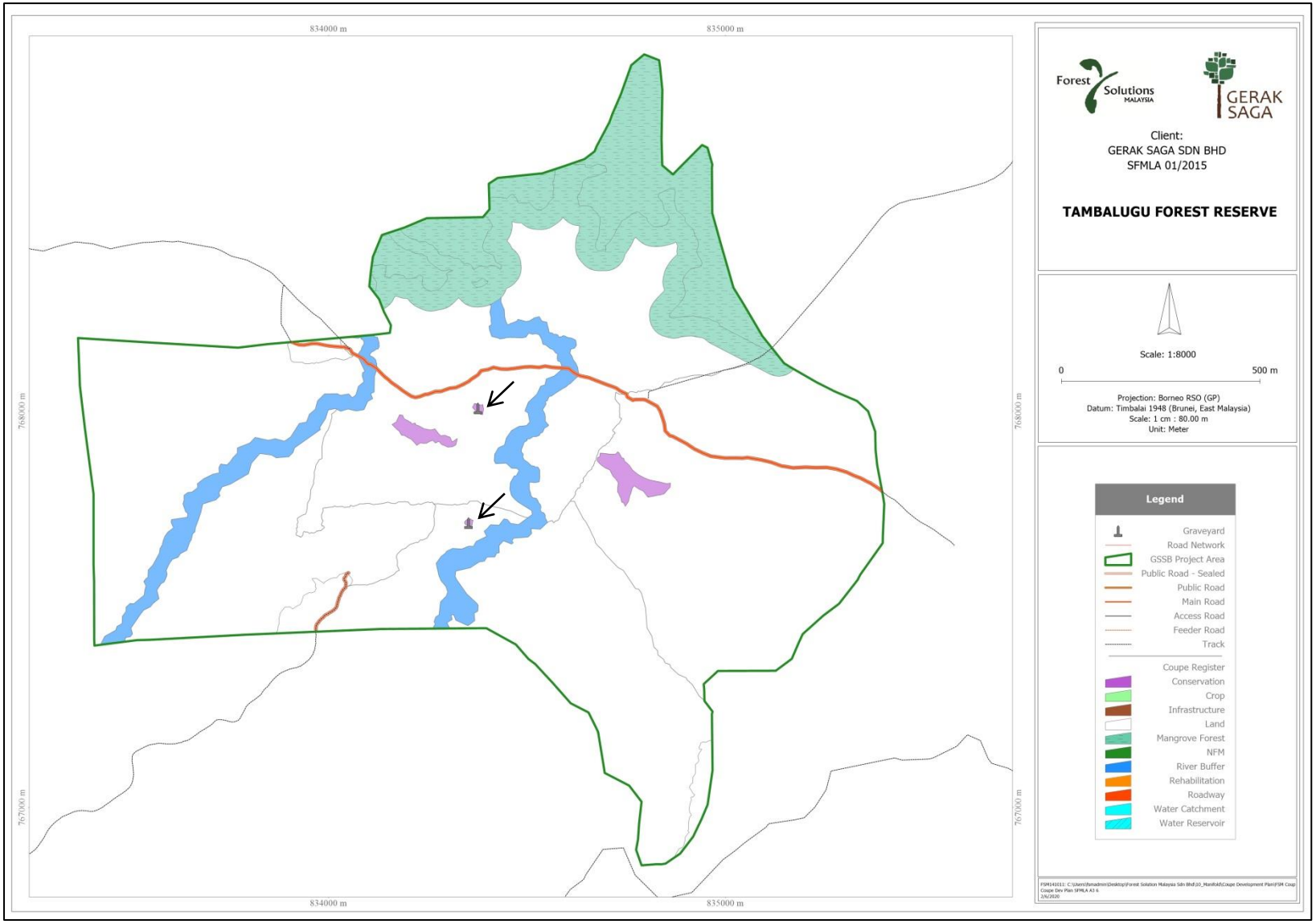
3.1 Mangrove Forest (26.9 ha including its buffer)



3.2 Map of protected areas of water catchments, reservoirs and riparian reserves.

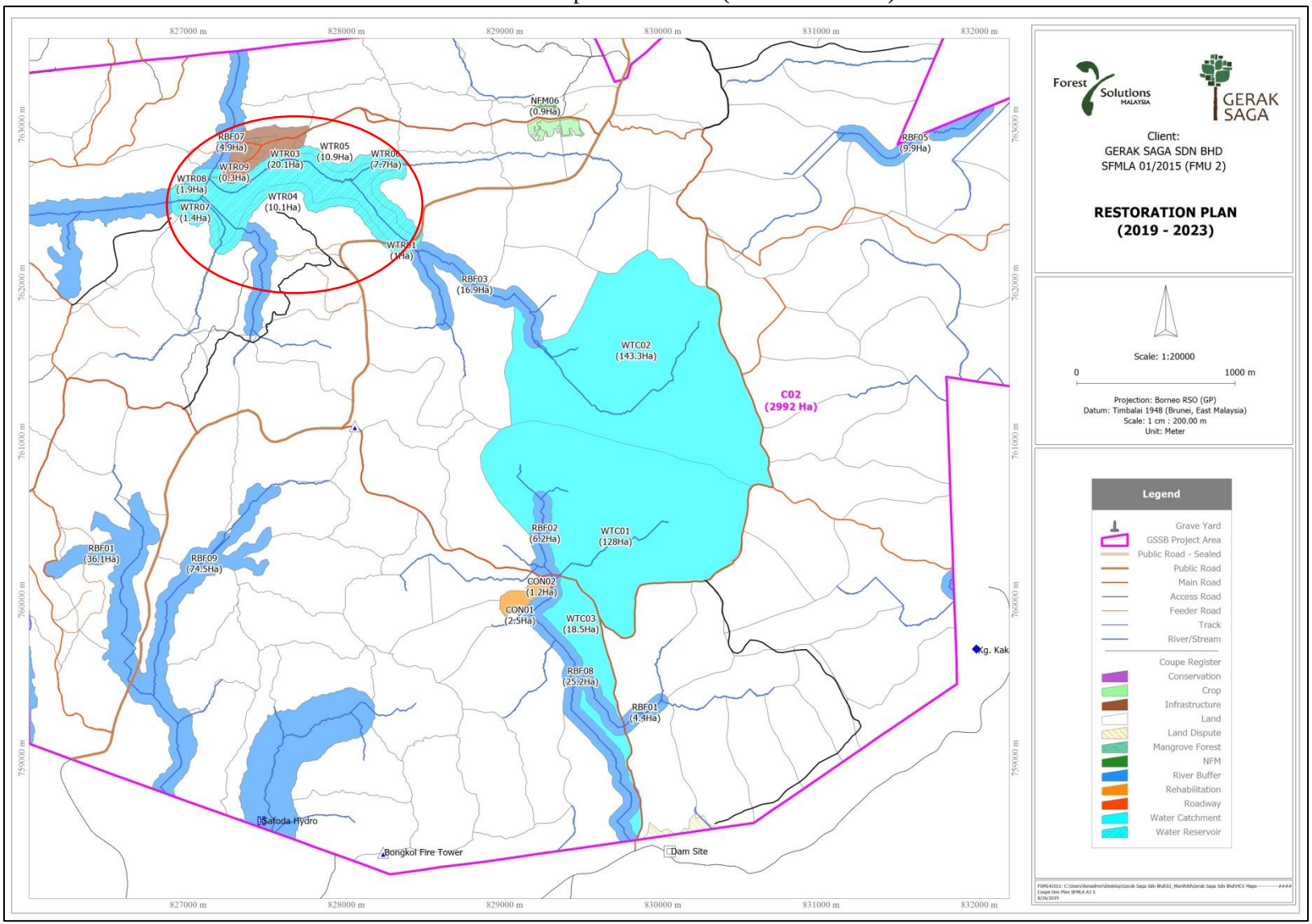


3.3 Burial sites demarcated and protected at Tambalugu Forest Reserve, Coupe 4

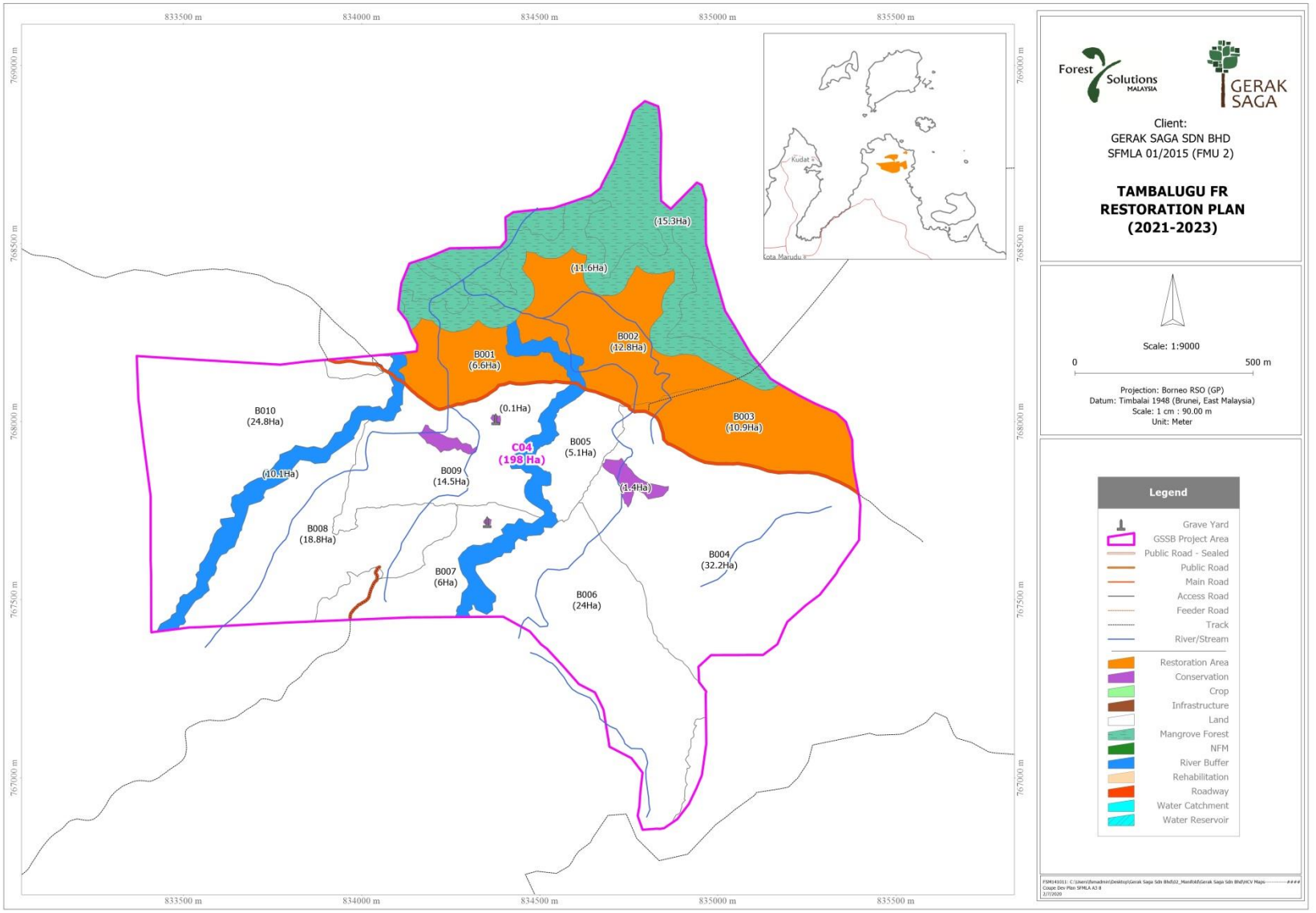

834000 m
835000 m
768000 m
767000 m
Client:
GERAK SAGA SDN BHD
SFMLA 01/2015
TAMBALUGU FOREST RESERVE
Scale: 1:8000
0
500 m
Projection: Borneo RSO (GP)
Datum: Timbalai 1948 (Brunei, East Malaysia)
Scale: 1 cm : 80.00 m
Unit: Meter
Legend
Graveyard
Road Network
GSSB Project Area
Public Road - Sealed
Public Road
Main Road
Access Road
Feeder Road
Track
Coupe Register
Conservation
Crop
Infrastructure
Land
Mangrove Forest
NFM
River Buffer
Rehabilitation
Roadway
Water Catchment
Water Reservoir

ANNEXE 4
THE MAP OF RESTORATION PLAN 2019 - 2023

Annexe 4.1 Restoration Plan at water catchment areas and riparian reserves (area in red circle).

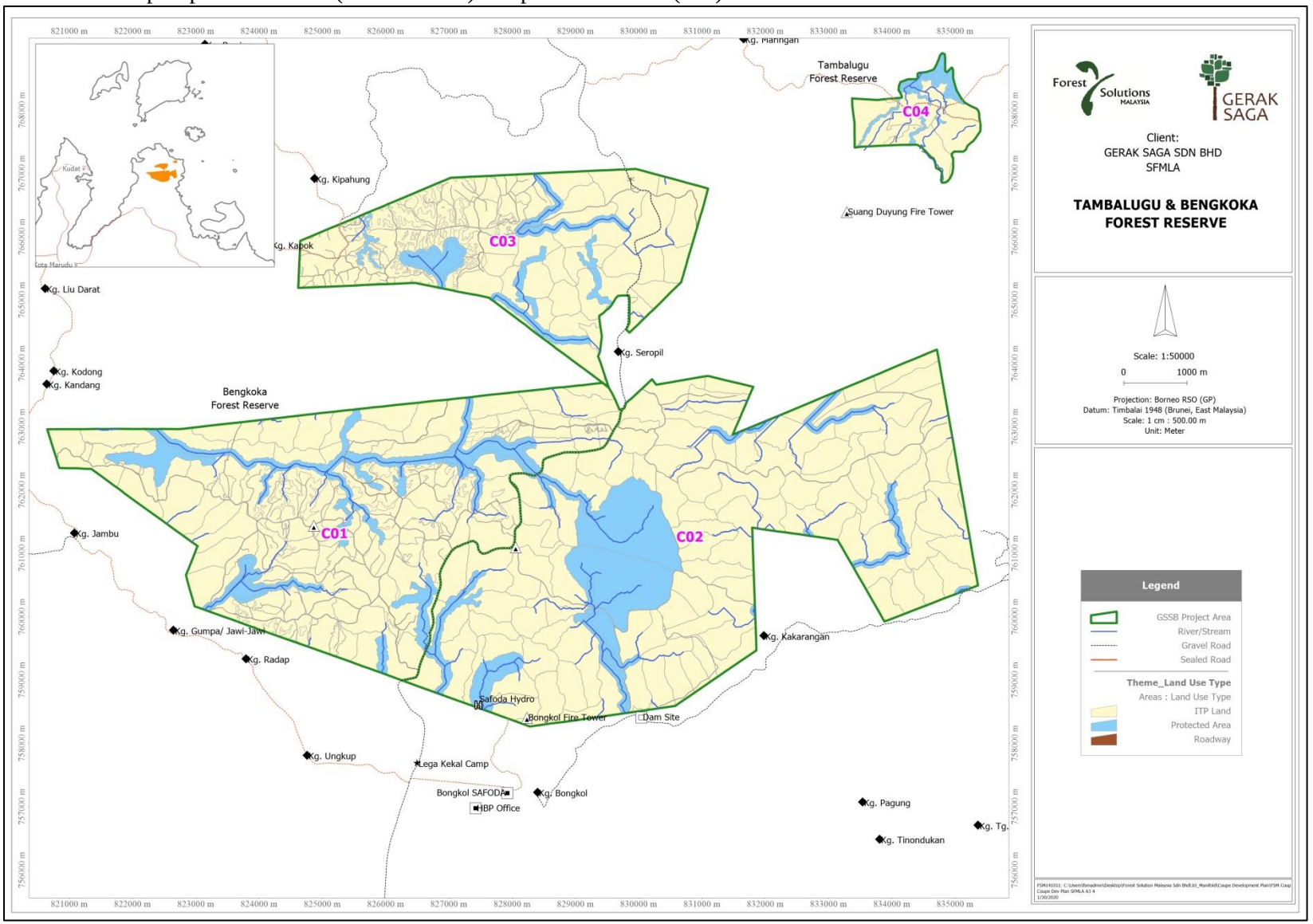


Annexe 4.2 Restoration Plan at Tambalugu Forest Reserve, 2021-2023.


833500 m
834000 m
834500 m
835000 m
835500 m
7690000 m
7685000 m
7680000 m
7675000 m
7670000 m
(15.3Ha)
(11.6Ha)
B001
(6.6Ha)
B002
(12.8Ha)
B003
(10.9Ha)
B010
(24.8Ha)
(0.1Ha)
C04
(198 Ha)
B005
(5.1Ha)
(10.1Ha)
B009
(14.5Ha)
(1.4Ha)
B008
(18.8Ha)
B004
(32.2Ha)
B007
(6Ha)
B006
(24Ha)
Kudat
Kota Marudu
Forest Solutions MALAYSIA
GERAK SAGA
Client:
GERAK SAGA SDN BHD
SFMLA 01/2015 (FMU 2)
TAMBALUGU FR
RESTORATION PLAN
(2021-2023)
Scale: 1:9000
0
500 m
Projection: Borneo RSO (GP)
Datum: Timbalai 1948 (Brunei, East Malaysia)
Scale: 1 cm : 90.00 m
Unit: Meter
Legend
Grave Yard
GSSB Project Area
Public Road - Sealed
Public Road
Main Road
Access Road
Feeder Road
Track
River/Stream
Restoration Area
Conservation
Crop
Infrastructure
Land
Mangrove Forest
NFM
River Buffer
Rehabilitation
Roadway
Water Catchment
Water Reservoir

ANNEXE 5
A MAP OF PROTECTION/ CONSERVATION AREA VS PRODUCTION AREA

Annexe 5.1 Map of protection area (Conservation) and production area (ITP).



ANNEXE 6
PICTURES OF THE SURVEY ACTIVITIES

Annexe 6.1 Pictures of vegetation in the forest reserves.

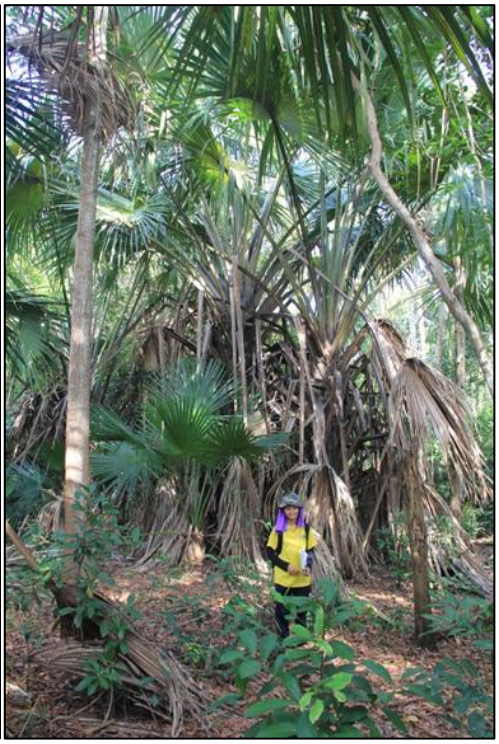
Mangrove Forest at Tambalugu Forest Reserve (Coupe 4)

Acacia spp. in the project area

Waterfall at the water catchment area in Coupe 2, Bengkoka Forest Reserves

Annexe 6.2 Pictures of survey activities

Installing remote camera



Big fan palm trees

Installing mist-net

Mammal footprint

Sun bear picture caught in camera trap

A Buff-rumped woodpecker

A Bearded pig

A Sambar deer

Annexe 6.3 Pictures of the stakeholder consultation at the community hall of Kampung Suang Duyung

Conservation Officer giving talks on the HCV to the local communities

Sabah Wildlife Officer giving talks on the Wildlife Conservation Enactment 1997