



Biodiversity and Critical Habitat Assessment: *Sabah Forest Industries (SFI), Malaysia*

Sabah Forest Industries

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Sabah Forest Industries

**Biodiversity and Critical Habitat
Assessment: *Sabah Forest Industries
(SFI), Malaysia***

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Environmental Resources Management (ERM) India has been contracted by Sabah Forest Industries Sdn Bhd (SFI) in response to a Terms of Reference to provide strategic advice on the biodiversity values of the Sipitang Forest Concession in Sabah State, Malaysia.

SFI operates forestry operations within the Sipitang Concession. The total area that SFI operates within is 287,703 ha, with 275,626 ha of forest reserves contained within the Concession. A further 1,279 ha of titled land is wholly owned by SFI (known as LOT in this report). Within the concessions forest reserve the land falls under two management regimes, Natural Forest Management (NFM) comprising an area of 103,879 ha, and the Industrial Timber Plantation (ITP) area of 170,468 ha. The ITP area currently contains logged natural forest and plantation timber as well as some conservation areas. The plantation timber is a mix of acacia and eucalypt species that are rotationally harvested every seven years.

SFI is seeking funding from international lenders and the International Finance Corporation (IFC) to expand the plantation area in the ITP to provide a sustainable supply of pulpwood for the pulp and paper mill. The existing area of plantation in the ITP is 47,455 ha with an additional 7,296 planted in Titled or SFI land.

Two scenarios have been analysed. The first scenario would increase the total plantation area of 85,000 ha is required to satisfy the mill's raw material requirements for the next 5 years. Therefore, an additional 30,217 ha of plantation must be developed to guarantee supply of suitable pulp grade timber for the mill. The 30,217 ha will be developed from the previously logged Mixed Tropical Hardwood (MTH) area in the ITP including areas already clear felled but not planted.

The second scenario analysed would utilise the existing governmental lease agreements to allow the development of the full potential of the concession covering an additional 45,000 ha development of MTH into plantation. This will increase the total plantation area to 130,000 ha. This would occur later in the medium to long term and would be subject to an additional environmental assessment at that time to ensure currency of the analysis, especially in relation to the biodiversity values present.

This report provides an assessment of the Concession considering the IFC's Performance Standard (PS) 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012a). This assessment includes an initial desktop review of the Natural Habitat, Modified Habitat and potential Critical Habitat (as defined within the Standard) for species identified to occur, or are likely to occur within the Concession. In particular,

the assessment focuses on the area of natural forest to be converted within the ITP to plantation. It is this area that is likely to contain biodiversity values that would be subject to the assessment procedures within the Standard. ERM has undertaken a desktop assessment of the biodiversity values of the Concession to define the habitat and species of interest. This has included community engagement and literature reviews relevant to the Concession area. This work has been completed by detailed remote sensing analysis of habitats based on up-to-date satellite imagery by ERM's sub-contractor, PT Hatfield (Indonesia). The assessment has used a screening process to categorise species based on their conservation status and to define the areas of Natural Habitat, Modified Habitat within the Concession and in particular, to screen species against the Critical Habitat criteria. The results of the assessment have identified an area of Modified Habitat within the ITP Area is 1452.8ha. The area of Natural habitat proposed to be converted has been assessed to include 59,681 ha. *Table 1.1* summarises the areas of natural and modified habitat across the Concession, including NFM, ITP, Title Land and LOT.

Table 1.1 *Distribution of Natural and Modified Habitat within the Concession*

Land Use per Management	Habitat Type				
	Natural Habitat	Modified Habitat	Converted Habitat	Exclusions	Grand Total
NFM	77,816.57		1,595.89	24,466.87	103,879.33
ITP	59,677.11	24,817.12	43,128.12	42,845.19	170,467.53
Conservation				35,753.21	35,753.21
Excised		1,048.84	136.14	400.29	1,585.26
Infrastructure		83.19	212.63	16.10	311.92
MTH	59,677.11	19,261.50	5,065.36	1,358.52	85,362.48
Plantation		4,423.60	37,713.99	5,317.06	47,454.65
TITLED LAND	1,591.75	1,327.18	5,811.76	3,347.13	12,077.82
Conservation				2,517.49	2,517.49
Excised		288.62	58.68	46.89	394.18
Infrastructure		1.77	79.08	4.32	85.17
MTH	1,591.75	418.23	57.85	63.48	2,131.30
Plantation		618.57	5,616.15	714.95	6,949.67
LOT			1,239.52	39.32	1,278.84
Conservation				39.32	39.32
Infrastructure			648.84		648.84
MTH			244.62		244.62
Plantation			346.06		346.06
Grand Total	139,085.43	26,144.30	51,775.29	70,698.50	287,703.52

It should be noted that the remote sensing analysis has been based on data derived from satellite imagery on condition and logging history information provided by SFI. Ground truthing of this analysis is recommended to test the assumptions made. The accuracy of the assessment requires to be benchmarked against field data before it can be considered as conclusive.

In relation to the Critical Habitat assessment, *Table 1.2* shows those species that may trigger Critical Habitat within the Concession. Critical Habitat may also be triggered for the floral assemblage at Ulu Padas, although this area is within the NFM part of the Concession and outside the area likely to be converted to ITP.

Table 1.2 *Species that may trigger Critical Habitat within the Concession*

Species
Mammals
Banteng (<i>Bos javanicus</i>)
Bornean Clouded Leopard (<i>Neofelis diardi</i> ssp. <i>Borneensis</i>)
Amphibians
Golden-legged Bush Frog (<i>Philautus aurantium</i>)
Flora
Borneo Kauri (<i>Agathis borneensis</i>)
Orchid sp. (<i>Bulbophyllum jolandae</i>)
Keruing (<i>Dipterocarpus validus</i>)
Giam (<i>Hopea ferruginea</i>)
Yellow Meranti (<i>Shorea gibbosa</i>)
<i>Shorea hypoleuca</i>
<i>Shorea inappendiculata</i>
Light Red Meranti (<i>Shorea johorensis</i>)
Light Red Meranti (different species) (<i>Shorea smithiana</i>)
Balau (<i>Shorea superba</i>)
White Meranti (<i>Shorea symingtonii</i>)

To fully complete the Critical Habitat assessment further work covering, desktop and literature review, stakeholder engagement and field survey will be needed. The findings of this report should be updated and used to guide where additional surveys should be carried out and on what species.

Of particular importance will be identifying the presence of species with the potential to trigger Critical Habitat such as the Banteng and Bornean Clouded Leopard, and it will be key to identify where these species occur within the concession and how important areas scheduled for development are. It will also be extremely important to undertake further research with regards to the Ulu Padas floral assemblage and to identify whether species and assemblage are indeed unique. Development of a protocol to define Discrete Management Units (DMUs) will also be prepared to define the expected range of species within the concession when compared to their existing distribution and across the species entire range.

Field verification and validation of the habitat model is required to confirm assumptions and improve the accuracy of the model. Field assessments of forest condition are important to verify the distribution of natural and modified habitats.

In relation to the two scenarios considered, the application of the mitigation hierarchy is necessary to firstly avoid areas of high biodiversity value prior to designing mitigations and finally offsetting residual impacts. Detailed field assessments should be undertaken as a matter of priority to have greater

certainty of the distribution of the species present and the natural and modified habitats across the concession before decisions are made on the areas of MTH within the ITP that can be converted.

This further information can be used in the application of IFC PS 6, including appropriate application of the mitigation hierarchy for the proposed ITP area. This assessment would include applying the biodiversity goals contained within the Standard to mitigate residual impacts and achieve a “no-net-loss” of biodiversity values or in the case of critical habitat, a net-gain in biodiversity values.

2.1 INTRODUCTION

This report has been developed as per the Terms of Reference (ToR) to provide the first phase of assessment for the Sabah Forest Industries Sdn Bhd (SFI) Sipitang Concession in respect to the International Finance Corporations (IFCs) Performance Standard (PS) 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012a).

In order for the SFI operation to be economically viable, SFI plan to expand the extent of the existing industrial timber plantation areas by continued clearance of logged forest and development to Industrial Timber Plantation (ITP) within the concession. SFI will also continue to manage Natural Forest Management (NFM) areas sustainably as they are currently doing.

Based on the above information on the planned forest management in the concession, this Project is being completed to provide a preliminary assessment against PS6 of the status of the biodiversity interests within the concession, with particular reference to the areas which are likely to be converted from forest to industrial timber plantation.

The location of the Study area is given in *Figure 2.1*.

2.2 OBJECTIVES OF STUDY

To understand the overall impacts of this Project from development of the MTH area to ITP and the continued management of the NFM area it is first key to understand what biodiversity interests are present. Therefore based on the requirements of the ToR, provided by SFI, and in line with the requirements of PS6 the analysis here will seek to identify the extent of Natural and Modified Habitat. It will also provide a preliminary assessment as to the potential for Critical Habitat to be present, and the species / habitats that might trigger it.

Due to the limited nature of the analysis possible in such a short period, it has not been possible to delineate the Discrete Management Unit (DMU) for any species for which Critical Habitat might be triggered. However, this task will be undertaken as part of Phase 2.

Figure 2.1 Location of the Study Area



SFI is the holder of the Sipitang concession rights with the Sabah Forestry Department (SFD) (see *Figure 2.1*). This area, as designated by SFD includes 275,626 ha of forest reserves. A further 1,279 ha of titled land is wholly owned by SFI although authorisation for land management activities on this land must still go through SFD. Within the concessions forest reserve the land falls under two management regimes, NFM comprising an area of 103,790 ha, and the ITP area of 170,468 ha.

SFI is seeking funding to expand development activities within the ITP and to increase capacity for the pulp and paper mill. It is proposed that 63,886ha of logged natural forest within the ITP area be converted to plantation to provide sufficient pulp grade timber for the mill in addition to the formerly forested area within the ITP that has already been logged which is thought to be 23,854 ha.

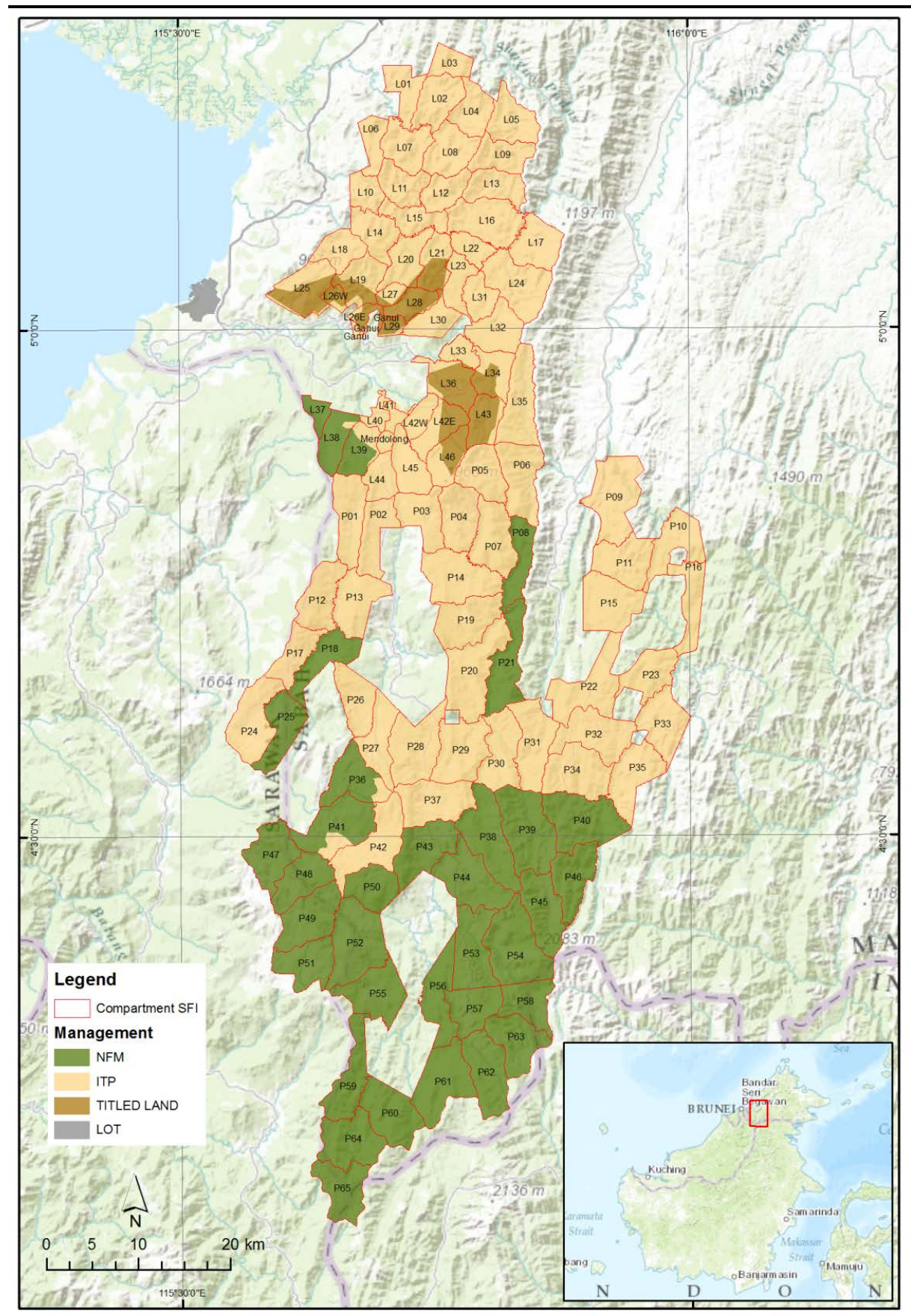
Table 2.1 outlines the current landuse by management within the Concession with mapping shown in *Figure 2.2*.

Table 2.1 *Land Use and Management within Concession Area*

Land Use	Area (ha)
Native Forest Management (NFM) Area	103,790
Industrial Timber Plantation (ITP) Area	170,468
<i>Logged Mixed Tropical Hardwood (MTH) Forest within ITP Area</i>	63,886
<i>Cleared but unplanted ITP Area</i>	23,854
Titled Land	12,078
LOT	1,279
Conservation Areas*	38,311
Infrastructure	1,046
TOTAL	287,703.52

**Conservation Areas within the NFM area are not included in this table but are illustrated in further detail in Figure 2.4.*

Figure 2.2 Land Use and Management within the Concession Area



As outlined in the objectives for this study a number of key activities will be undertaken, the methodology for completing each task is provided below. At this point it is also of importance to define some key terms associated with this assessment. The term Concession is used throughout this report and refers to the entire area under management by SFI. This area is considered the 'Project area' and has been referred to extensively. The study area includes the Concession as well as the surrounding area that could be affected by the Project or are within its zone of influence. Of particular relevance in this case are the protected areas which continue for some distance away from the Concession.

2.4.1 *Habitat Classification and Identification of Natural and Modified Habitat*

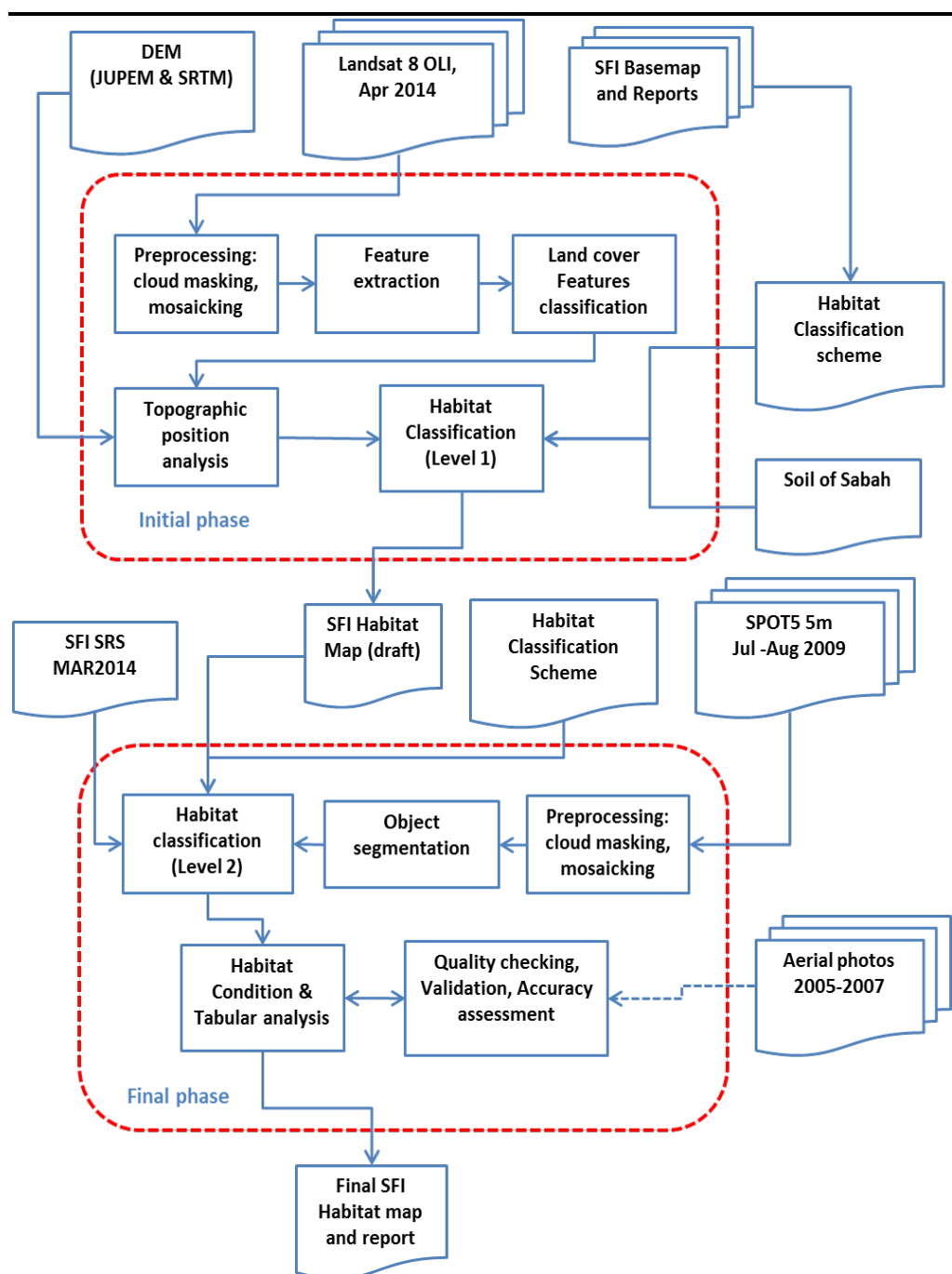
2.4.1.1 *Habitat Classification*

As part of the Phase 1 assessment work a classification exercise has been carried out to identify all the habitat types within the Concession and to generate a habitat type map. The purpose of this habitat mapping will be to provide detail of the habitat extents throughout the Concession which will help with future mitigation works and any biodiversity offset calculations as well as providing valuable contextual data for any faunal records. As species habitat preferences become better known and the extent of the habitat in the concession is known, the potential impacts from future development or forest management can also be better predicted and the relevant mitigation applied. The classification exercise was divided into two phases (see *Figure 2.3*).

The initial phase involved generating a Level 1 Major habitat type based on Landsat8 images acquired from Earth Resources Observation & Science Centre in April 2014 combined with existing base maps and data from SFI (see *Table 2.2* below and *Section 2.6 Figure 2.4*). The main objective of this was to identify major habitat type based on physical factors such as elevation, slope, topographic position/ landform profile and general soil type.

Once this was done, the second phase involved delineating more detailed habitat type ie Level 2 classification using SPOT 5 data as this has a 5m pixel resolution good for vegetation combined with aerial photos for validation and crosschecking this with historical information (see *Section 2.6*).

Figure 2.3 *Habitat Classification Workflow*



Source: Hatfield, 2014

All data used for habitat mapping is listed below. For this study, Hatfield used SPOT 5 data taken on Jul and Aug 2014 as a baseline data and used Aerial photos 2005-2007 as a reference for validation process.

No	Description	Format	Source
1	Base map dataset	Shape files	Sabah Forest Industries, 2014
2	Elevation data	Tiff	Processed SRTM Data Version 4.1: Jarvis A., H.I. Reuter, A. Nelson, E. Guevara, 2008, Hole-filled seamless SRTM data V4, International Centre for Tropical Agriculture (CIAT), available from http://srtm.csi.cgiar.org .
3	Landsat 8 OLI imagery	GeoTiff	path 118 row 56 date acquired 2014-02-21 path 118 row 56 date acquired 2014-04-26 path 118 row 57 date acquired 2013-08-29 path 118 row 57 date acquired 2014-04-10 path 118 row 57 date acquired 2014-04-26
4	Soils	JPG	The Soil of Sabah sheet: NB 50-14 at scale 1:250,000. Published by the British Government's Overseas Development Administration (Land Resources Division) United Kingdom, 1974, for Sabah Government.
6	SPOT 5, 5m and 10m	GeoTiff	Sabah Forest Industries: SPOT-5, 5 meters resolution, date acquired: 2009/08/03, 2009/07/20¹, SPOT-5, 10 meters resolution, date acquired: 2006/08/07, 2007/03/03, 2006/08/07
7	Aerial photos	GeoTiff	ENSO Mosaics Aerial photo 2005-2007, received on Jun 11, 2014

¹ Baseline data source for habitat type level 2

Table 2.2 *Habitat Classification Scheme*

Level 1 Major Habitat Type	Level 2 Sub Habitat Type	Key Parameters			
		Land cover/ Land use	Elevation	Topographic Position Index	Soil
Upper Montane Forests	Ericaceous forest	NFM, Small Crown Forest	>1800 – 2400 m asl	Ridges	
	Dacrydium gibbsiae forest	NFM, ITM Small Crown Forest	> 2400 m asl		
	Gymnostoma/ Tristania mossy forest	NFM, Small Crown Forest	> 1800 – 2400 m asl		Ultra basic soils
Lower Montane Forests	Upper Dipterocarp forest	NFM, Primary Forest	900 – 1500 m asl	Eastern slope	Maliau Association/ Sipitang Association
	Agathis dammara forest	NFM, Primary Forest	1200 – 1700 m asl	Near Tomani	
	Oak/Conifer forest	NFM, Primary Forest	900 – 1500 m asl	Steep slopes, Ridges	Crocker association
Mixed Dipterocarp Forest	Rubroshorea/Dipterocarpus	NFM, Primary Forest	< 900 m asl		Ultra basic, north area
	Parashorea malaanonan/ Dryobalanops lanceolata	NFM, Primary Forest	< 900 m asl	Lower slope	Non-sandstone hills
	Selangan Batu	NFM, Primary Forest	< 900 m asl	Hill, steep slope	
Heath forest	Heath forest (Karangas)	Primary, Secondary	< 900 m asl	Gentle slope	Sandy soil
Bamboo Vegetation	Bamboo Vegetation	ITP, Secondary			
Modified Habitat	Converted to plantation	Converted to plantation			
	Burnt	Burnt			
Riparian Forest	Riparian forest	Vegetation near river		Gentle slope	
Plantation	Acacia plantation	Plantation			
	Eucalyptus plantation	Plantation			
Rocky, Bare soil, Road		Rocky			
Water body, river		Open water, river			

To identify Natural and Modified Habitats, it is key to first define what they are in the context of the land use of the Concession and the surrounding habitat values. ERM has used the IFC PS6 Guidance Note to define the habitat types within the concession.

For the purposes of this study the definitions provided by the IFC (2012a) are used as outlined below.

“Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area’s primary ecological functions and species components.”

“Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area’s primary functions and species composition.”

For both of these habitat types, it clearly states in IFC PS6 Guidance Note 6 (IFCb, 2012), that there are no metrics available to identify what constitutes Modified or Natural Habitat. ERM has undertaken an assessment based on a desktop GIS analysis conducted by PT Hatfield in Indonesia.

The analysis uses a number of metrics to define what natural habitat may be present within the Concession based on metrics defined to characterise the level of disturbance and condition.

The analysis has included a review of:

- canopy integrity;
- fire damage;
- roads and logging skid trail density;
- drainage density;
- SFI logging history (number of harvesting cycles and time since previous cycle);
- Vegetation condition using Normalised Differential Vegetation Index (NDVI) analysis; and
- desktop validation based on the SFI Forest Management Plan and the HCV Report (2011).

Modified habitats are defined as those with a greater disturbance and lower condition based on the characterisation of these factors. Natural habitats are those characterised as having less human disturbance and having a generally good condition.

The classification parameters used to characterise each habitat type for this Project is listed in *Table 2.3* below.

Table 2.3 *Classification Parameters Used in GIS Analysis for Modified and Natural Habitat Classification*

Classification	Definition, Assumption
Vegetation Density	
High Density Vegetation:	NDVI: 0.2 to 0.71 Brightness: 44.15 to 131.47 GLCM Texture: 0.09 to 0.66
Medium Density Vegetation	NDVI: 0.01 to 0.58 Brightness: 52.8 to 1141.23 GLCM Texture: 0.1 to 0.63
Low Density Vegetation	NDVI: 0.02 to 5.73 Brightness: 55.12 to 135.99 GLCM Texture: 0.10 to 0.614
Non Vegetation	NDVI: -0.227 to 0.59 Brightness: 46.84 to 222.91 GLCM Texture: 0.05 to 0.67
Cloud and Shadow	NDVI: -0.227 to 0.53 Brightness: 40.68 to 254.92 GLCM Texture: 0.06 to 0.97
Logging Cycle:	
High impacted	Harvested areas: 2 or more logged cycles with ground base harvested method; One or more logging cycles has occurred in the last 3 years.
Moderate impacted	Harvested areas: 1 cycle harvested method using ground base; 2 or more logged cycle using cable yarder; One or more logging cycle has occurred greater than 3 years but less than 5 years.
Low impacted	Harvested areas: 1 logged cycles with cable yarder harvested method; no ground base method; One or no (zero) logging cycle has occurred greater than 5 years but less than 10 years .
Habitat Type:	
Upper Montane Forest	High, medium and low density vegetation with elevation above 1800m
Montane Forest	High, medium and low density vegetation with elevation 1500 to 1800m
Lower Montane Forest	High, medium and low density vegetation elevation class between 900 to 1500m
Mixed Dipterocarp Forest	High, medium and low density vegetation elevation class between up to 900m
Kerangas - Heath Forest	Kerangas - Heath Forest (from SRS MAR2014)
Bamboo Vegetation	Bamboo vegetation (from SRS MAR2014)
Swampy areas	Swampy areas (from SRS MAR2014)
Rocky	Rocky (from SRS_MAR2014)
Converted Habitat	Infrastructure, LOT, Plantation, Burnt areas.
Habitat Class (IFC)	
Natural Habitat	High Density; Low Impacted
Modified Habitat	Medium Density; Moderate Impacted
Converted Habitat	Non Vegetated; Converted Habitat; High Impact

2.4.2 *Preliminary Critical Habitat Screening Assessment*

As part of the assessment from Phase 1 to Phase 2 the identification of Critical Habitat will be one of the main goals. Critical Habitat is a sub-set of Modified and Natural Habitats and is defined in PS6 (IFC, 2012a) as:

“Critical Habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.”

At the Phase 1 stage it is not possible to properly identify critical habitat as sufficient data to accurately identify species distributions and populations in the Concession is not currently available. However, a preliminary analysis has been carried out using what data is available to identify which species and habitats may trigger Critical Habitat. This analysis has been provided in Section 2.7.

In general terms the preliminary analysis has been carried out similarly to the work that will be carried out for the full analysis for Phase 2 and has included:

- Step 1 – Stakeholder Consultation/Initial Literature Review; and
- Step 2 – Preliminary Critical Habitat Determination.

During Phase 1 no in-field survey data has been collected although a field reconnaissance survey was carried out between the 24th and 26th May and a full suite of detailed surveys will be carried out as part of Phase 2 to verify and update this desktop assessment through actual sighting and records.

2.4.3

Step 1 Stakeholder Consultation/Literature Review

The biodiversity assessment for the Project encompassed an analysis of the biodiversity values within the Concession and surrounding area including protected or designated areas, habitats of high biodiversity value, species of conservation concern as well as general flora and fauna assemblages were examined. This included GIS analysis, desk based data collection and stakeholder engagement with relevant parties as presented below:

- Engagement of local experts: – A number of local experts from University Malaysia Sabah (UMS) have been contacted for data to supplement the desk based studies.
- Consultation with local stakeholders – Consultation was undertaken with a number of villagers, local communities and land holders and land users (including hunters) within the vicinity of the Concession between the 24th – 26th May.
- Literature Review: – Literature was examined from a number of sources to gain as accurate an understanding as possible to the species present in the Project Area. These included: SFI Environmental Impact Assessment (EIA) (2002) and EIA Re-assessment (2008); SFI Initial High Conservation Value (HCV) assessment (2011); SFI Draft Conservation Plan (2013); SFI Natural Forest Management (NFM) plan (2012); SFI Industrial Tree Plantation (ITP)

plan (2012); SFI In-house compartment-level HCV Monitoring reports; published data sources (from journals or other literature sources); online databases (including Protected Planet.net, the IUCN Global Red List, WWF, etc); and personal records and expert contact.

Details of the various consultation exercises can be seen in more detail in the *Annex B*.

The data was used to evaluate the presence of High Biodiversity Value (HBV) species from which it was possible to identify whether Critical Habitat was triggered for any species in accordance with IFC PS 6 (IFC, 2012) (see *Annex A* for the list of species present/ potentially present in the project area, *Annex B* for the consultation list and *Annex C* for those listed as present within the Ecoregions that cover the Concession).

In addition to the literature review and consultation a further GIS based exercise was also undertaken to create a detailed habitat map to provide an initial analysis of likely distribution of species and habitats within the Concession area. This analysis carefully examined various datasets including Aerial Photos, SPOT Satellite Imagery as well as existing layers developed by SFI regarding the concession and the current land management practices. It should be noted that the current GIS analysis has specifically used the March 2014 SFI data on plantations as a key dataset for identification of modified habitats.

2.4.4 Step 3 Critical Habitat Determination

The determination of Critical Habitat as outlined here has only been carried out in a preliminary capacity based on desktop study only. No field survey across the concession has been carried out yet to ground truth distribution data, literature records or stakeholder sightings and so it is difficult to confirm whether Critical Habitat should be triggered. As such, the assessment results provided in *Section 2.7* include a list of possible species for which will need further assessment as part of Phase 2.

It should also be noted that at this Phase 1 stage of the assessment it has not been possible to accurately identify a DMU as ideally this should be done for each species for which Critical Habitat might be triggered. This exercise will be carried out as part of Phase 2.

If an overall Project DMU were to be identified it would be logical to use the Concession boundary as this is a management unit in its own right and PS6 states a DMU may or may not have an actual management boundary (eg legally protected areas, Key Biodiversity Areas (KBAs), Important Bird Areas (IBAs), community reserves) but could also be defined by some other sensible ecologically defined boundary (IFC 2012a).

Determination of Critical Habitat is a process that usually follows determination as to whether the habitat area in question is Natural or Modified as outlined in *Section 2.4.1.2*. Natural Habitats are generally of higher biodiversity value than Modified Habitats, although both can still support species that trigger Critical Habitat (as regularly happens in man-made wetland habitats which support large assemblages of migratory birds).

Critical Habitat is defined as habitat which supports species or assemblages of species that fulfil the five criteria as set out in *Section 2.4.4.2* provided in detail within PS6 (IFC, 2012a, IFC 2012b).

For Criterion 1-3 (1 - Critically Endangered and Endangered Species; 2 - Endemic or Restricted Range Species; and 3 - Migratory or Congregatory species) a tiered system is used whereby Critical Habitat of the highest importance is Tier 1 and Critical Habitat of slightly lower importance is classed as Tier 2 (see *Table 2.4* for further details).

The determination of Critical Habitat is also not completely limited to Criteria 1-5 and other recognised high biodiversity values may also qualify for Critical Habitat designation which is carried out on a case by case basis.

Examples may include but not be limited to:

- Areas of high scientific value;
- Concentrations of Vulnerable species (under the IUCN Global Red List) where there is uncertainty regarding their listing; and
- Landscape and ecological processes (eg water catchment areas, areas which prevent flooding or fire).

IFC PS6 also contains requirements for Critical Habitat in 'Legally Protected and Internationally Recognised Areas'. It is stated in PS6 (IFC, 2012b) that the following sites are included in the definition of such areas:

"In general, internationally and/or nationally recognised areas of high biodiversity value will likely qualify as critical habitats; examples include the following:

- *"The majority of Key Biodiversity Areas (KBAs), which encompass inter alia, Ramsar Sites, Important Bird Areas (IBA), Important Plant Areas (IPA) and Alliance for Zero Extinction Sites (AZE)."*

The term '*recognised area*' is explicitly used instead of '*designated*' so that it can be clear that the area does not have to be protected but must be internationally or nationally recognised for its biodiversity value.

In the case of this project in addition to the five legally protected areas which are located directly adjacent to the Concession (and within it for Sungai Basio). The Heart of Borneo (HoB) and Borneo Mountain Endemic Bird Area (EBA)

could be classed as internationally recognised areas, and both are present in the Concession area. All have been considered within this assessment under *Criterion 4*.

2.4.4.2

Criterion for Critical Habitat

Critical Habitat criteria as defined in PS6 Guidance Note 6 (GN6) Paragraphs GN69 – GN97 (*IFC 2012b*), and shown in *Table 2.4*. This table provides detail of the qualifying requirements for Criteria 1-3 while details of the likely qualifying interests are given for Criterion 4 and 5 which will be defined based on research and expert opinion (as will those for Criteria 1-3 where data is lacking).

The criteria listed in *Table 2.4* have been used to complete this assessment and it should be noted that this has been only done on a preliminary basis as previously stated.

Table 2.4 *Critical Habitat Criteria*

Criteria	Tier 1 ⁽¹⁾	Tier 2 ⁽¹⁾
Criterion 1: Critically Endangered (CR) / Endangered (EN) species:	a) Habitat required to sustain ≥ 10 % of the global population of a CR or EN species / sub / species and where there known regular occurrences of the species and where habitat could be considered a discrete management unit for the species. b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	c) Habitat that supports the regular occurrence of a single individual or a CR species and/or habitat containing regionally- important concentrations of Red-listed EN species where that habitat could be considered as a discrete management unit for the species/subspecies. d) Habitat of significant importance to CR/EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.
Criterion 2: Habitat of significant importance to endemic and/or restricted-range species;	a) Habitat known to sustain ≥ 95 % of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species.	b) Habitat known to sustain ≥ 1 % but < 95 % of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment.
Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 % of the global population of a migratory or congregatory species at	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 % but < 95 % of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management

Criteria	Tier 1 ⁽¹⁾	Tier 2 ⁽¹⁾
species;	any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species.	unit for that species, where data are available and/or based on expert judgment. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at $\geq 5\%$ of the global population for both terrestrial and marine species. (e) Source sites that contribute $\geq 1\%$ of the global population of recruits.
Criterion 4: Highly threatened and/or unique ecosystems; and/or	Criterion 4 has no tiered system although recent publication (<i>Keith et al, 2013</i>) may introduce this. This criterion must include one of the following a) the ecosystem is at risk of significantly decreasing in area or quality; b) has a small spatial extent; and /or c) contains unique assemblages of species including assemblages or concentrations of biome-restricted species. Highly threatened or unique ecosystems are defined by a combination of factors which may include long-term trend, rarity, ecological condition, and threat.	
Criterion 5: Areas associated with key evolutionary processes	The criterion is defined by: a) the physical features of a landscape that might be associated with particular evolutionary processes; and/or b) subpopulations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history. The latter includes evolutionarily significant units and evolutionarily distinct and globally endangered species.	

Note: ⁽¹⁾ No Tier system is in place for Criterion 4 and Criterion 5.

It should be noted that the IFC defines an endemic species as one that has $\geq 95\%$ of its global range inside the country or region of analysis. Restricted range (also referred to as 'geographically restricted') is a concept first developed for bird species with a global breeding range of less than 50,000 km². This definition has since been applied to terrestrial vertebrates (mammals, reptiles, and amphibians), plants, and freshwater fish (*Langhammer et al, 2007*). Consistent with these definitions, this Critical Habitat assessment more simply defines endemic species as those species that are endemic to Borneo and the wider Sundaland region (which includes Sumatra, Peninsula Malaysia and Borneo) while restricted range species as those species that have

a small range distribution or are restricted to specific habitat types (ie, Montane Forest).

2.4.4.3 *Critical Habitat Triggers*

The five criteria are 'triggers' in that if an area of habitat meets any one of the criteria then it is considered to be Critical Habitat, irrespective of any other criterion (TBC, 2012). Hence Critical Habitat can be determined through a single criterion or where a habitat area holds biodiversity meeting all five criteria. This approach is generally more cautious but is used more widely in conservation (McDonald-Madden *et al*, 2009). Critical Habitat criteria therefore have two distinctive characteristics. First, components of biodiversity are essentially assigned to only two levels of conservation significance, those that trigger Critical Habitat and those that do not (Tier considerations being secondary to this primary Critical Habitat determination). Second, each criterion is applied separately, not in combination, meaning that the scores are not cumulative (TBC, 2012).

2.4.4.4 *Species Specific Approach for Criterion 1-3*

For Criterion 1, 2 and 3 this preliminary exercise has used species identified to be of High Biodiversity Value (HBV) as outlined in *Annex A* as well as *Annex C*. HBV species were evaluated as being of high biodiversity value based on IUCN status, endemism, restricted range, protection status, threats and habitat requirements. HBV species also included species where uncertainty existed around their status or their importance in a Sabah/Malaysia context was thought to be potentially higher based, often on the knowledge of local experts involved in the baseline studies (as gleaned from the literature review and from the provisional stakeholder engagement). The additional species list in *Annex C* provides a further number of species which may be present in the Concession based on Ecoregions data provided by the WWF (WWF, 2006).

For the first three Criteria it should also be noted that each species has been considered individually. This is of key importance as the habitats for one species will vary dramatically compared to another, for example Dragonflies /Damselflies versus Mammals.

2.4.5 *Limitations of this Study*

The limitations of this study largely relate to the preliminary nature of this analysis (both for the Habitat classification and Critical Habitat assessment) and the lack of information at a global, national and regional level and site specific level on species particularly for invertebrates and fish. Limited data is available for most of the species attributes including population size, ranges, habitat requirements and due to the lack of detailed survey data across the Concession there is the potential for species new to science and others, where their distribution was not formally known from the area. As such the preliminary Critical Habitat Assessment has been made using the best data available at the time of reporting and should be revisited once further field

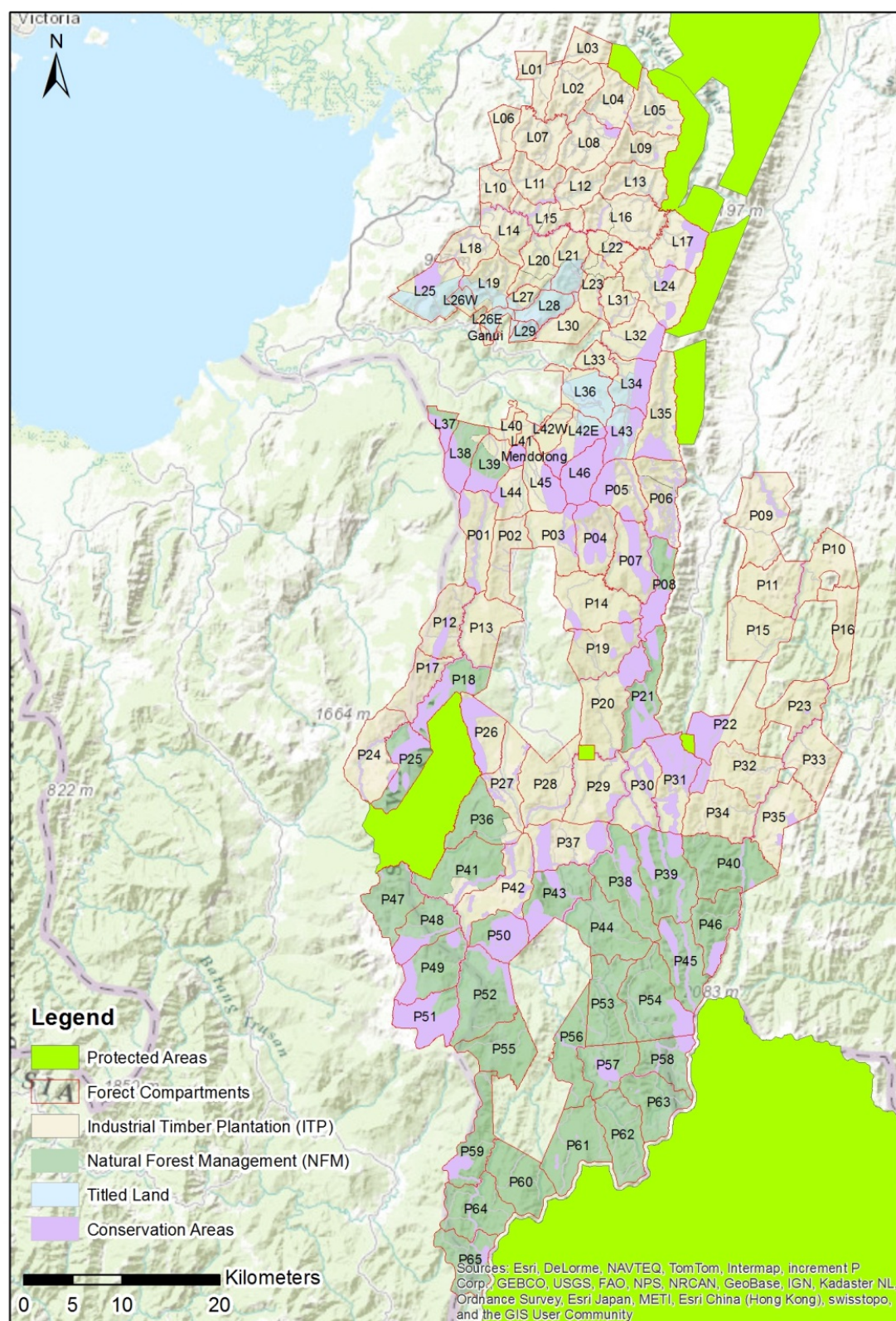
survey is conducted and following further literature review and consultation. Where there is a lack of data or uncertainty regarding the Critical Habitat prediction, this limitation has been provided in the screening assessment. As further data comes to light from HCV surveys and dedicated Phase 2 surveys for this Project the assessment will be refined and updated.

2.5 *BASELINE RESULTS*

2.5.1 *Forestry Operations and the Concession*

Based on the GIS analysis completed as part of this report , within the ITP, plantation currently covers 47,455 ha with Mixed Tropical Hardwood (MTH) still covering 85,362 ha (including some felled areas). The NFM is largely the same as designated by SFD at 103,879 ha with some small historic planting of plantation having occurred (see *Figure 2.4* below). The NFM area has not been completely logged over and still contains compartments in primary condition in the south west, it also has been subject to Reduced Impact Logging (RIL) techniques for the lower half of the management area as opposed to Selective logging as carried out in the northern half of the NFM and across the MTH area. It should be noted that some MTH areas have been logged on more than one occasion and many now support few of the emergent dipterocarp trees which were originally present, particularly in the MTH area which is scheduled for development to ITP.

Figure 2.4 Conservation Areas within the Concession



The NFM area is divided into 35 compartments for administrative convenience. Twenty Five (25) of these are in the Sipitang FR and 10 in the Ulu Sungai Padas FR (SFI, 2012). The NFM Area is also divided into three principal zones on the basis of land use. These zones are for production, conservation and Community Based Natural Resource Management (CBNRM) (Table 2.5) as also illustrated in Figure 2.4. It should be noted that the Conservation Areas have increased in extent since the NFM Forest Management Plan Plan and subsequently stand at 24,466.87 ha including all exclusions.

Table 2.5 *Functions of Conservation Areas in NFM*

Conservation Areas	Area (ha)
Protection of Upper Padas Hydro-electricity Project dam	2,803
Riparian reserves	2,125
High risk of erosion	6,779
Wildlife corridor	2,979
Scientific interest	9,070
Total	23,756

Source: NFM Forest Management Plan, SFI, 2012.

The ITP Licence Area is divided into 70 compartments for administrative convenience. All are in the Sipitang FR. Some of these compartments have areas in SFI's Titled Land although those areas are not included in this Plantation Development Plan (PDP).

The ITP Licence Area is also divided into two principal zones; conservation and production, on the basis of land use. The primary uses of the ITP Licence Area are for the production of raw materials from the industrial plantation for SFI's pulp and paper facility at Sipitang and for conservation. There is some recreational use, and the potential for utilising this resource is being explored, but there are no specific areas where recreation is the primary activity.

The natural forests of the ITP Licence Area, as its name suggests, have undergone, and will continue to undergo, considerable modification. In the Plantation Development Plan (PDP) 2011-2020, the decision was made in the early 1980's to convert this area into plantations and it has been heavily logged to provide wood for SFI's mills and to prepare the sites for plantation establishment. At least 100,000 ha have been logged at least once, and most several times. All the areas that had merchantable forest and were accessible have been logged.

The areas of conservation value within the ITP have been identified in 2002 and 2009, as shown in Table 2.6 and as illustrated in Figure 2.5. As for the NFM area it should be noted that the Conservation Areas have increased since the publication of this plan and currently stands at a total of 35,753.21 ha within the ITP including all exclusions.

Table 2.6 *Functions of Conservation Areas in ITP Licence Area*

Conservation Areas	Area (ha)
Riparian reserves	5,143
High risk of erosion	11,625
Wildlife corridor	3,805
Watershed protection, scientific interest and community use	4,796
Total	25,369

Source: Plantation Development Plan 2011-2020, SFI, 2012.

As part of SFIs environmental commitments and to previously seek Forestry Stewardship Council (FSC) certification an assessment of the concession for areas of High Conservation Value (HCVs) using the Malaysia Toolkit (WWF, 2009) was undertaken and reported in 2011. This exercise which was completed by the WWF as a pilot project helped identify areas of high conservation value throughout the concession (see Table 2.6 for those areas in the ITP). Since the identification of these areas, they have been managed for conservation by SFI. HCV assessments are still regularly carried out for monitoring purposes, and for any new compartment scheduled for development an HCV assessment will be carried out beforehand. This process ensures areas that should be preserved like riparian corridors will be identified and preserved (in addition to the areas already identified in the 2011 assessment).

2.5.2 *Protected and Designated Areas*

Adjacent to the SFI concession area there are five legally gazetted protected areas including Gunung Lumaku Forest Reserve (Class I), Agathis, Sg. Basio and Meligan Virgin Jungle Reserve (VJR). In addition, the Kayan Mentarang National Park in Indonesia borders the southern edge of the concession.

A summary of these areas key information is provided in Table 2.7 below and their location can be seen in Figure 2.5.

Table 2.7 *Protected Areas within the vicinity of the SFI Concession*

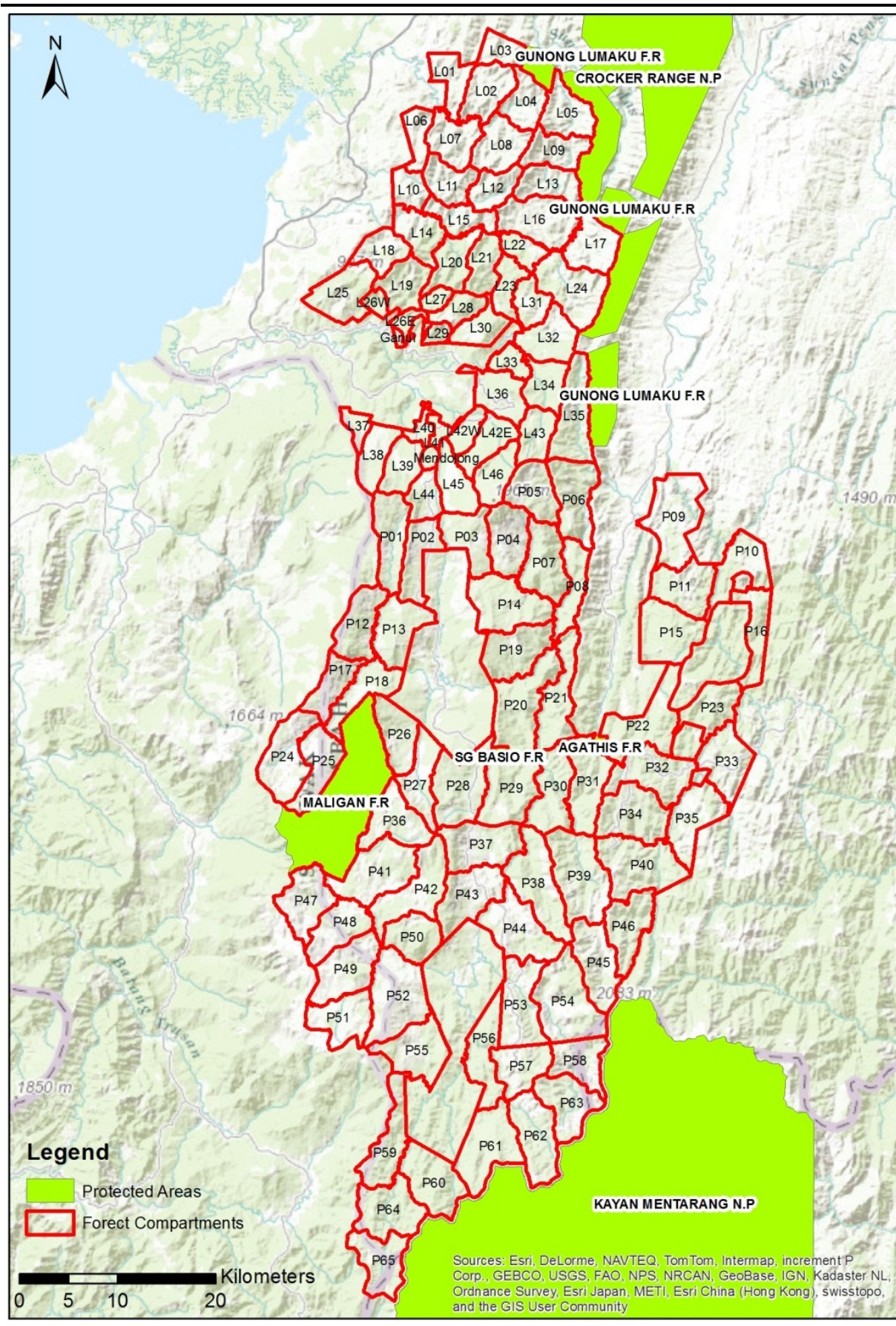
Name	Location	Status		Area (ha)
		Class ^(a)	IUCN ^(b)	
Gunung Lumaku FR	Immediately northeast of the SFI concession area	I	IV	5,180
Agathis VJR	Within the SFI concession area, at compartment P22	VI	Ia	200
Sg. Basio VJR	Within the SFI concession area, at compartment P29	VI	Ia	213
Meligan VJR	Immediately west of SFI concession area	VI	II	9,240
Kayan Mentarang National Park	North Kalimantan, Borneo Island, Indonesia	N/A	II	14,000,000

Notes:

(a) Classification of Forest Reserve under the Sabah Forest Enactment 1968: I – Protection Forest; and VI – VJR.

(b) IUCN Status – Ia – Strict Nature Reserve; II – National Park; IV – Habitat/Species Management Area; VI – Protected Area with sustainable use of natural resources.

Figure 2.5 Protected Areas within and adjacent to the Concession



While none of these sites will be directly affected by forestry activities and a buffer around each of 100 m will be enforced (as per the HCV report), these sites are still effectively within the Concession. Sg. Basio VJR is surrounded on all sides by the Concession while the Agathis and Meligan VJRs are bordered on three sides. These sites will all provide a refuge for wildlife and the Meligan site is of particular interest given its zonation of habitat in relation to edaphic conditions and the recorded presence of plant species such as *Dendrobium spectatissimum* which is only known from the Kinabalu area outside of Meligan.

Under the Sabah Forest Enactment 1968 (Part II, Section 5), Class I forest reserves (ie Gunung Lumaku) are fully protected and no activity can be carried out there while Class VI VJRs (ie Agathis, Sg. Basio and Meligan) are also protected for forest research purpose. The harvesting of forest produce and logging in state land and removal of forest produce from private land area all subjected to the Sabah Forest Enactment 1968. There is no control over logging on private land, as long as the timber is not removed.

As can be seen from Table 2.6 the Kayan Mentarang National Park (KMNP) in North Kalimantan province, Borneo Indonesia is located along the concessions southern border, it represents the largest protected rainforest block in Borneo and consists of both lowland and montane habitat and is home to a wide variety of species including many that are of conservation concern such as the Bornean Clouded Leopard (*Neofelis nebulosa borniensis*) (EN), Sumatran Rhino (*Dicerorhinus sumatrensis*) (CR) and Pangolin (*Manis javanica*) (EN). (HCV Report, 2011). In 1996, KMNP was designated to serve as national park through the decision of the Minister of Forestry, namely SK. No. 631/Kpts-II/1996 (Anon, 1998).

In addition to the legally protected areas already outlined above, the concession is also completely within the Sabah element of the Heart of Borneo (HoB) designated area. While the HoB is not legally protected the Heart of Borneo Declaration (2007) signed by the governments of Malaysia, Indonesia and Brunei states:

“With one conservation vision and with a view to promote people’s welfare, we will cooperate in ensuring the effective management of forest resources and conservation of a network of protected areas, productive forests and other sustainable land-uses within an area which the three respective countries will designate as the “Heart of Borneo (HoB)”, thereby maintaining Bornean natural heritage for the benefit of present and future generations, with full respect to each country’s sovereignty and territorial boundaries, and also without prejudice to the ongoing negotiations on land boundary demarcation.”

Based on current information the HoB covers an area of 22 million ha of ecologically inter-connected rainforest in the provinces of Kalimantan (Indonesia), the states of Sabah and Sarawak (Malaysia) and Brunei Darussalam (WWF, 2012). Borneo’s forests are estimated to be home to 221

species of mammals, 620 species of birds, 35% out of its 15,000 plant species and the island is well known to be one of the world's biodiversity hotspots (Myers *et al*, 2000). Over the past ten years, 360 new species have been found in the Heart of Borneo including 123 new species discovered between 2007 and 2010 during – an average of more than 3 new species per month. These fascinating finds include the world's longest known stick insect, a flame-coloured snake and a colour-changing frog. In total, 67 plants, 29 invertebrates, 17 fish, five frogs, three snakes and two lizards and a brand new species of bird have been discovered between 2007 and 2010.

The Concession also overlaps with the Borneo Mountains Endemic Bird Area (EBA) which lists 29 endemic species that are present. Many of these species have been recorded in the Concession although their range extends widely within the mountainous regions of Borneo (Birdlife, 2014a). There are no Important Bird Areas (IBAs) crossing the Concession although the Crocker Range IBA is located directly to the north east (Yeap *et al*, 2007).

2.5.3

Habitats

The vegetation within the concession will be classified and mapped in detail as provided in Section 2.6. The purpose of this mapping will be to provide detail of the habitat extents throughout the Concession which will help with future mitigation works and any biodiversity offset calculations as well as providing valuable contextual data for any faunal records as previously outlined.

The original vegetation of the NMF area can be classified into three broad vegetation types that would have been present as outlined by Fox (1970) including:

- Mixed Dipterocarp Forest (MDF): 0 – 900 m asl;
- Lower Montane Forest (two storey forest): 900 – 1800 m asl; and
- Upper Montane Forest (small crown): > 1800 m asl.

The above habitats also fall within two broader ecoregions as outlined by the WWF (WWF, 2006) which include the Borneo Lowland Rainforest (427,592 km²) and Borneo Montane Rainforest (115,509 km²). Of these ecoregions, the conservation status of the Borneo Lowland Rainforest is listed as Vulnerable due to the rapid conversion of this ecoregion type to palm oil, industrial timber plantation and agriculture over the last twenty years. In contrast Borneo Montane Forest is considered to be in a relatively stable condition, probably as a result of its inaccessibility, limited value for growing plantations and the reduced value of the timber present.

Both ecoregions show high levels of endemism with the Borneo Lowland Rainforest being the centre of the world's diversity for Dipterocarps with 267 species being present of which 155 are endemic (WWF, 2006). Borneo Montane Rainforest has particular importance for flora with numerous

endemics and it is viewed as the most speciose rainforest found in the Indo-Pacific Region.

2.5.4 *Flora*

High conservation value (HCV) plants identified in the ITP area including 18 IUCN Red List species (Dipterocarps and fruit trees).

Sixty Two (62) species from 27 families were found in compartment of P35. The species in this area are predominantly lower montane or sub-montane species with *Agathis* spp, *Lithocarpus* spp. and *Elaeocarpus* spp. commonly encountered. Several economically important species are found, namely *Agathis dammara*, *Aquilaria malaccensis*, *Vatica* sp, *Palaquium gutta* and *Shorea* spp. Secondary plant species are less abundant in P35 except in several open areas where *Melastoma malabathricum* has successfully invaded the areas.

There are important plant species listed under CITES Appendix II and as endangered in the IUCN Red List present in this area. The species are the *Aquilaria malaccensis* (Thymelaeaceae - agar wood, known in Malay as *gaharu*) and *Gonystylus keithii*.

A total of 257 species from 73 families are recorded in the forest surveyed in P42. The forest is of montane kerangas/heath vegetation with *Agathis*, *Dacrydium*, *Dacrycarpus*, *Litsea* and *Eugenia* being the dominant species. One of the *Agathis* species, *Agathis dammara*, is an important economic tree species, harvested for its high quality timber. It is observed that *Agathis dammara* trees are not as abundant as *A. borneensis*, and only small diameter trees were found. Orchids were recorded only in P42 and this may explain why there is higher diversity of plant species in the area. A *Tetrastigma* sp, a host plant for *Rafflesia* is found in P42. All species of *Tetrastigma* are legally protected as stated in Schedule I of the Wildlife Conservation Enactment 1997.

A majority of the plant species are timber species of the Dipterocarpaceae family. Six dipterocarp species are listed as CR in the IUCN Red List. These species are *Hopea ferruginea*, *Dipterocarpus validus*, *Shorea smithiana*, *S. johorensis*, *S. gibbosa* and *S. superb*. Most of the species which were listed as VU, EN, or CR are found to be quite common in the study sites. However their distribution is local and restricted to scattered forest patches. They will face extinction if threats to their survival are not removed. Human intervention may be deemed necessary to increase the chances of survival of these species.

2.5.5 *Fauna*

In terms of Fauna, the Concession is home to a large assemblage of species and various surveys from the 1980s onwards have identified numerous species including a number endemic to Borneo, those of conservation concern as well as many that are legally protected in Sabah.

All of the studies, including that by WWF in the early 1980's and the EIA for the SFI Forest Logging and Plantation Activity at Sipitang Sabah (SFI, 2002), have recorded the presence of a wide range of animal and plant species in the NFM Area, and all have concluded that the area does not have any threatened or endangered species which are likely to be adversely affected by SFI's Activities which in the NFM area only included selective and Reduced Impact Logging (RIL) over this period and up until the present.

Paine (1988) who reviewed the status of the conservation of Orang Utan (*Pongo pygmeus*) (EN) reported the absence of this great ape in southwest Sabah. Elephants (*Elephas maximus*) (EN) have also not been reported in the area. Villagers living around the NFM Area have also confirmed the absence of these two mammals. Distant records from 1982 of the Sumtran Rhino (*Dicerorhinus sumatrensis*) (CR) recorded in the Maligan Virgin Jungle Reserve and Kayan Mentarang National Park exist (SFI EIA, 2002), however, it is now likely that this species is extinct in the Concession area and it is extremely rare in these Protected areas given the lack of records since 1982 (as reported in the EIA (SFI, 2002).

Large mammals commonly sighted in the area include *Rusa unicolor* (Sambar deer) (VU), *Muntiacus muntjak* (Barking deer), *Tragulus* spp (Mouse deer) and *Sus* spp (Wild boar/Bearded Pig). Other large mammals such as the Sun Bear (*Helacartos malayanus*) (VU), Bornean gibbon (*Hylobates muelleri*) (EN), and Bornean Clouded Leopard (*Neofelis nebulosa borniense*) (EN) are also known to be present based on sightings from local residents and from tracks and other signs that have been seen by SFI staff including the conservation team in 2014. This area is also home to the Pig-tailed Macaque or berok/ambuk (*Macaca nemestrina*) (VU), Long-tail Macaque (*Macaca fascicularis*), Malayan / Sunda pangolin (*Manis javanica*) (EN), Western Tarsier (*Tarsius bancanus*) (VU) and the Banteng or Tembadau (*Bos javanicus*) (EN) (SFI, 2012).

The area is rich in bird life, notably the hornbills including the rhinoceros hornbill (*Buceros rhinoceros*) which is easily recognised from its distinctive call and other hornbills such as the helmeted hornbill (*Buceros vigil*) and the white crested hornbill (*Bevenicornis comatus*) may also be present (SFI, 2012). In addition, a large number of Borneo endemics have also been recorded within the NFM area including Whitehead's Trogon (*Harpactes whiteheadi*), Bornean Frogmouth (*Batrachostomus mixtus*), Bornean Barbet (*Megalaima eximia*), Bornean Falconet (*Microheirex latifrons*) and Bornean Crested Serpent Eagle (*Spilornis kinabaluensis*). Most of these species are associated with montane habitat and are present throughout the mountain ranges of central and northern Borneo with the exception of the Bornean Falconet which is only present in Sabah.

Numerous amphibian and reptile species have been recorded within the concession and it is expected that many species will be present within the NFM area although currently no dedicated survey has been conducted there. Similarly detailed information for fish and invertebrates also needs further study. However, it should be noted that for fish, the large montane streams provide a valuable source of 'Pelian' for residents in the Ulu padas area (WWF, 1998). Furthermore, recent efforts to manage fish stocks using the traditional 'Tagal' technique have been a great success in the same location.

2.5.5.2

ITP Area

One species of mammal found in P42 of the ITP area is listed under Schedule I of the Wildlife Conservation Enactment (WCE) (1997) and it is a fully protected species. This species is the Clouded Leopard (*Neofelis diardii*) classified as vulnerable (IUCN Red List) and listed in the CITES Appendix I. The Bornean Gibbon was found in P35 and P42. It is categorised as Endangered in IUCN Red list and Schedule II of Wildlife Conservation Enactment, 1997. One species of frog namely Golden-legged Bush Frog (*Philautus aurantium*) (EN) found in P35 was listed to be of conservation concern within the IUCN Red List.

Most of the bird species found are common residents, local residents, migratory species or winter visitors. Some are endemics while others are threatened species. HCVF (2011) study had found 10 bird species in compartment of P42 are protected under WCE 1997 Schedule II – Crested Serpent Eagle (*Spilornis cheela*), Edible-nest Swiftlet (*Aerodramus fuscipagus*), Rhinoceros Hornbill (*Buceros rhinoceros*), Emerald Dove (*Chalcophaps indica*), Violet Cuckoo (*Chrysococcyx xanthorhynchus*), Bornean Falconet (*Microheirex latifrons*), Malaysian Blue Flycatcher (*Cyornis turcosus*), Blue-crowned Hanging Parrot (*Loriculus galgulus*), Hill Myna (*Gracula religiosa*) and White-chested Babbler (*Trichastoma rostratum*).

Of the amphibians and reptiles that have been recorded within the ITP area records from compartments P10, P35 and P42 provide useful data with 15, 13 and 16 species respectively recorded in surveys undertaken in 2010 (HCV, 2011). Species included Bornean Horned Frog (*Megophrys nasuta*), Giant River Frog (*Limnonectes leporinus*) and the Kinabalu Tree Frog (*Racophorus kinabaluensis*). For reptiles the numbers were generally lower with five species recorded in compartments L10 and P35, and only two recorded in compartment 42. Species of note included the Malaysian Flat-shelled Turtle (*Notochelys platynota*) (VU), Blood Python (*Python curtus*) and Large Forest Gekko (*Gekko smithii*).

For invertebrates and fish further survey work is required to build an adequate baseline across the Concession within the ITP area.

Data on invasive species is fairly limited for Malaysia. However, evidence from other parts of the world show that forestry operations do cause significant impacts to native flora and fauna from introduction of invasive species via silvicultural practices, movement of germplasm, solid wood packaging material, timber and from fruit or seeds. It is expected that invasive species may gain access to previously inaccessible forest interior habitat from forestry operations and this can be in many forms all the way from fungi to vertebrate species. SFI have stated that the species utilised in their plantations including *Acacia mangium* and the *Acacia auriculiformis* introduced from Aru Island and New Guinea are pioneer species and in forest they will not survive once the canopy has been restored, it is expected that this would also be the case for any Eucalyptus species used in the Concession, although this has not been confirmed.

For faunal species data is still lacking, although anecdotal evidence from Brunei (*pers. Comm Dr. Charles UBD, 2013*) suggest that some species more tolerant of disturbance such as the introduced Wild Boar (*Sus scrofa*) can outcompete local species like the Bearded Pig (*Sus barbatus*) when forest habitat is modified. This trend is repeated for other faunal groups as is the case for the Bornean Cricket Frog (*Hylarana nicobariensis*) which although a Borneo local, it is not historically a forest interior species (*Pers. obs.*). However, following modification it often out-competes those species that are more forest dependant. It is expected that the more the habitat is modified within the Concession, the more invasive species may be present and affect local populations.

2.6

HABITAT ANALYSIS

The habitat analysis comes in two parts. The first is the provision of a habitat map showing all the different habitat types and vegetation density within the Concession as provided in *Figure 2.6* and *Figure 2.7*, following the criteria as defined within *Section 2.4.1*. The second part is the provision of habitat maps that provide details of the habitat conditions as well as Natural and Modified habitats within the Concession as provided in *Figure 2.8* and *Figure 2.9*.

2.6.1

Habitat Classification

The habitat type map provided below in *Figure 2.6* is a Level 2 Habitat analysis of the Concession. The habitat extents illustrated in this map are also provided *Table 2.8*. As can be seen a large proportion of the Concession has had some form of modification by anthropogenic activities and the remaining areas tend to be montane or inaccessible.

Table 2.8 *Habitat Extents within the SFI Concession by Type and Management*

Habitat Type	Management				Grand Total
	ITP	LOT	NFM	Titled Land	
Upper Montane Forest	940.19		2,784.48	20.85	3,745.52
Montane Forest	7,602.87		28,645.19	321.39	36,569.45
Lower Montane Forest	38,971.15		64,063.53	1,287.92	104,322.60
Mixed Dipterocarp Forest	71,922.35		6,674.80	3,866.82	82,463.97
Bamboo Vegetation	5.01				5.01
Kerangas - Heath Forest	88.80		19.16		107.96
Rocky	153.40	23.70		20.71	197.81
Converted Habitat	50,783.74	1,255.14	1,692.18	6,560.14	60,291.20
Grand Total	170,467.51	1,278.84	103,879.33	12,077.83	287,703.52

As shown in *Figure 2.6*, vegetation within the concession area is dominated by three broad vegetation types ie mixed dipterocarp forest (MDF), lower montane and upper montane forests. Details for each are provided below in *Section 2.6.1.1* to *Section 2.6.1.3*. Other habitat types found in small proportions are the heath forest, swampy areas, bamboo vegetation and converted habitat. *Figure 2.7* shows the vegetation density for the concession area based on the criteria outline in *Section 2.4.1*.

Figure 2.6 Habitat Type

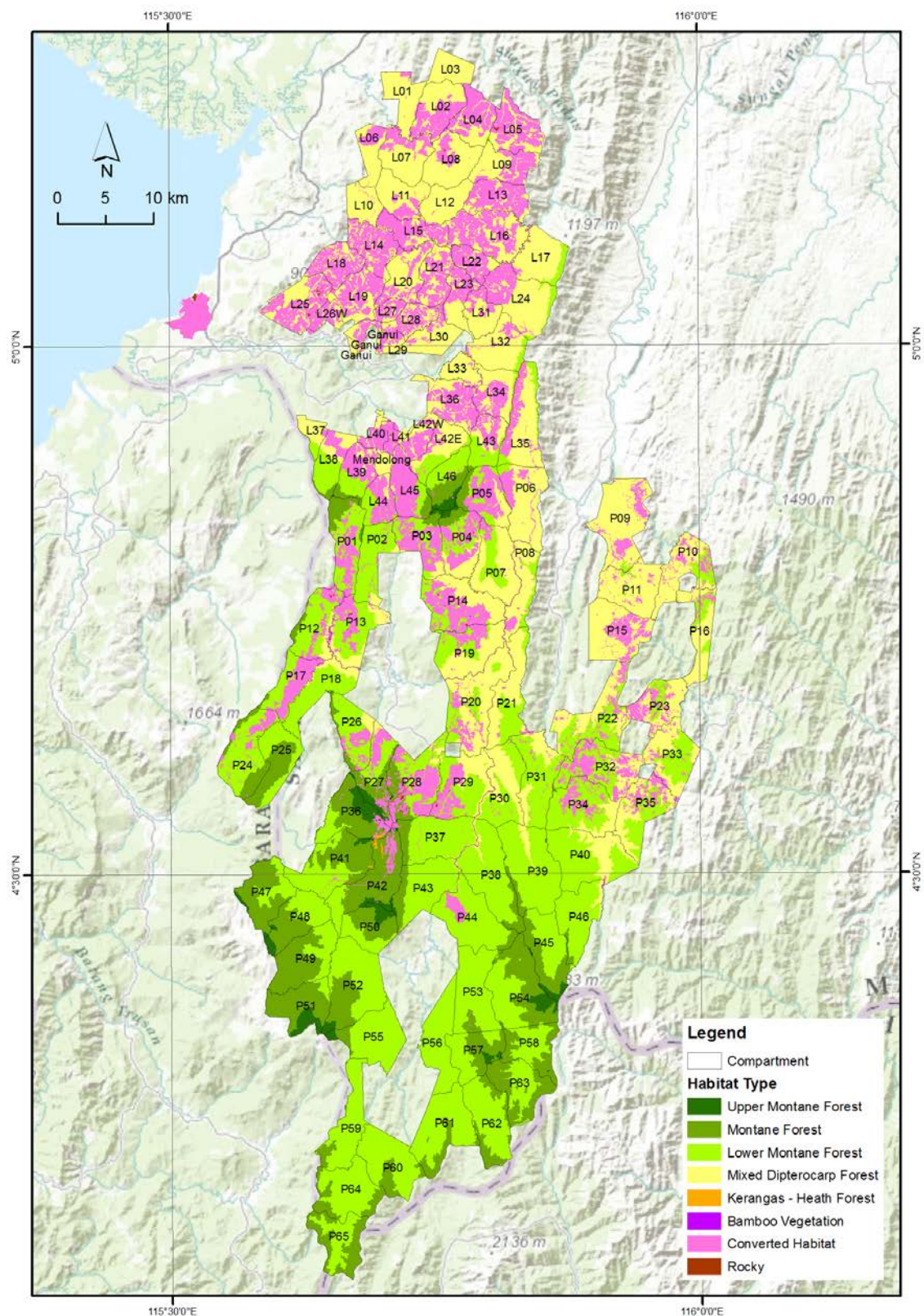
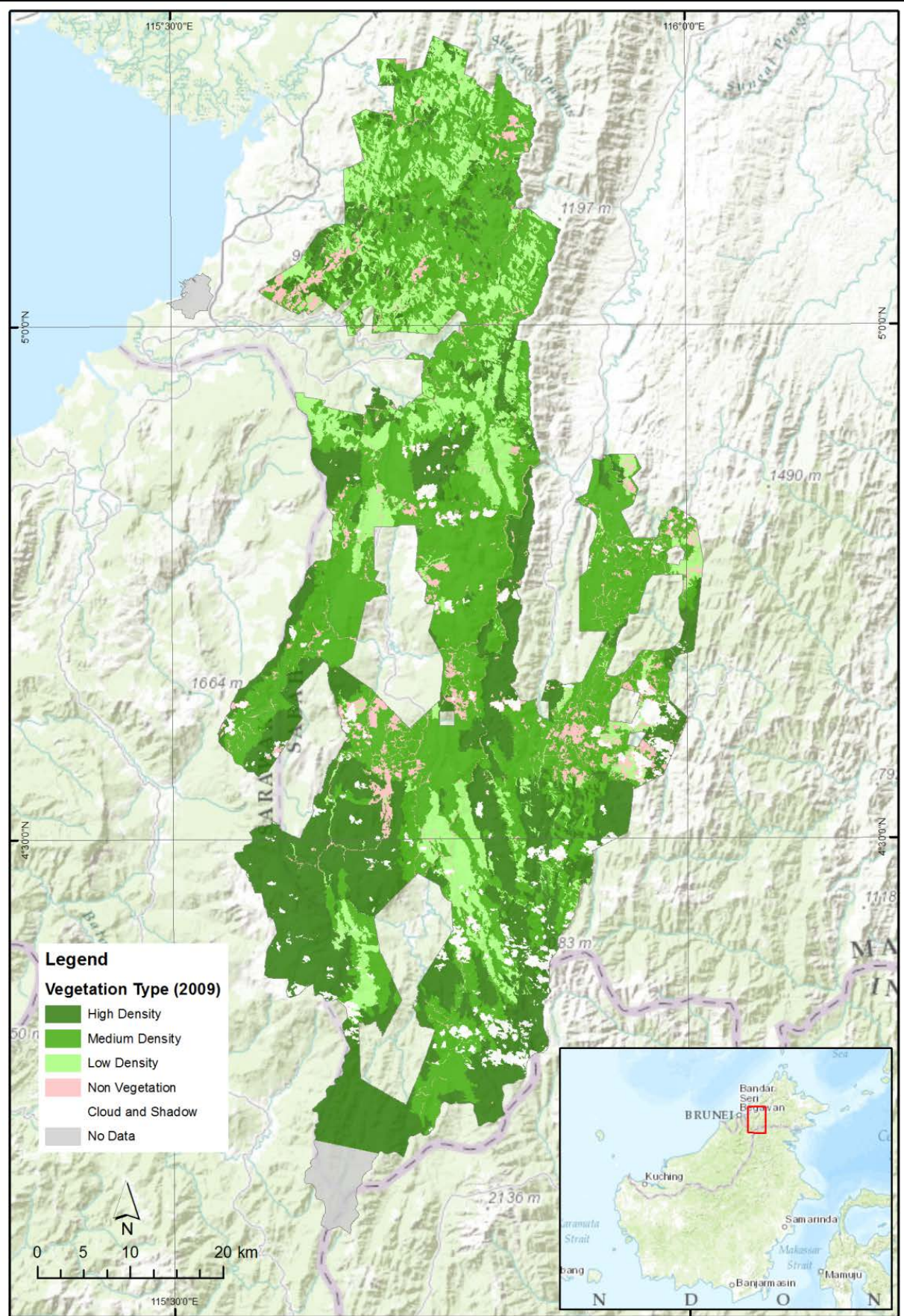


Figure 2.7 Vegetation Density



2.6.1.1 *Mixed Dipterocarp Forest (MDF)*

The MDF is the most valuable found in the SFI Concession but forms only a very small proportion of the area with 66,062 ha thought to be present based on the current analysis. The main characteristic of the MDF found here is the relative scarcity of Belian (*Eusideroxylon zwageri*). The main sub-types of MDF to be found in the SFI Estate are described in Table 2.9:

Table 2.9 *Sub-types of MDF Found in the SFI Concession*

Sub-type	Area in SFI/ Characteristic	Dominant Species
Rubroshorea/ Dipterocarpus	Extensively found in north of the SFI with poorer soils.	<i>Dipterocarpus ochraceus</i> , <i>D. confertus</i> , <i>Shorea almon</i> , <i>S. ovalis</i> and <i>S. rubra</i> common, Fagaceae (higher altitude)
<i>Parashorea malaanonan</i> / <i>Dryobalanops lanceolata</i>	It is found at the lower slope of hills. Prevalent in the Crocker Range but has been largely eliminated by shifting cultivation.	Richetia (eg <i>S. faguetiana</i> and <i>S. kudatensis</i> ; <i>S. leptoclados</i>); Rubroshorea (<i>S. ferruginea</i> and <i>S. smithiana</i>); and <i>Dipterocarpus warburgii</i>
Selangor Batu	Prevalent in higher hills or on steep slopes at lower elevations within a matrix of one or the other of the preceding lowland sub-types. It is largely found in the hills east of Sipitang and behind Mesapol.	Dipterocarpus

2.6.1.2 *Lower Montane Forest*

These two-storey forests comprise of several sub-types of forest as indicated in Table 2.10. From the Level 1 analysis it is not possible to accurately identify the sub-categories for this habitat type although it has been possible to provide a total extent for this habitat type of 126,389 ha.

Table 2.10 *Sub-types of Lower Montane Forest found in the SFI Concession*

Sub-type	Area in SFI/ Characteristic	Dominant Species
Upper Dipterocarp	It is largely confined to the eastern slopes and peters out at altitudes 1,500 m.	Dipterocarpus
Agathis Dammara	Parts of the NFM area located near Tomani.	<i>Agathis dammara</i>
Oak/ Conifer	Mostly found in highlands of the NFM area above the zone of shifting cultivation.	A two-layered forest with a thin under-storey consists of species from the families Lauraceae, Theaceae, Clusiaceae, and of <i>Eugenia</i> species

2.6.1.3 *Upper Montane Forest*

The forests are characterised by small crowns in aerial photographs. Commercially, they are not as valuable as the other forest types, not only because of the lower volumes but also due to the difficulties involved in extracting the timber. The total extent for this habitat type within the Concession is 8,583 ha based on the current analysis. The main sub-type is the Ericaceous Forests, which is the term applied to the forests above lower montane forests from 1,800 m, the other sub-type likely to be found in the higher elevations is *Dacrydium gibbsiae* Forest (found from around 2,400 m). Another sub-type that may be present is the *Gymnostoma/Tristania* mossy forest which is found at peaks at lower elevations but on poorer and on ultra-basic soils.

2.6.2 *Natural and Modified Habitat Classification*

From the analysis undertaken for the Phase 1 assessment it has been possible to classify the Concession into two main categories of Natural and Modified habitat. As stated above in *Section 2.6.1* the majority of the Concession has undergone some modification. However based on the species present, the function it provides and its overall provision of essentially the same natural system, the majority of the logged forest has been classed as Natural Habitat.

As shown in *Figure 2.8* and *Table 2.11*, much of the Concession area is considered Natural Habitat (including modified natural habitat). This is followed by Converted Habitat (areas converted to plantations) and Modified Habitat (non-natural/ man made infrastructure). *Figure 2.9* shows the habitats specifically within the ITP area.

Table 2.11 *Modified and Natural Habitat Classification within the SFI Concession*

Land Use per Management	Habitat Type				
	Natural Habitat	Modified Habitat	Converted Habitat	Exclusions	Grand Total
NFM	77,816.57		1,595.89	24,466.87	103,879.33
ITP	59,677.11	24,817.12	43,128.12	42,845.19	170,467.53
Conservation				35,753.21	35,753.21
Excised		1,048.84	136.14	400.29	1,585.26
Infrastructure		83.19	212.63	16.10	311.92
MTH	59,677.11	19,261.50	5,065.36	1,358.52	85,362.48
Plantation		4,423.60	37,713.99	5,317.06	47,454.65
TITLED LAND	1,591.75	1,327.18	5,811.76	3,347.13	12,077.82
Conservation				2,517.49	2,517.49
Excised		288.62	58.68	46.89	394.18
Infrastructure		1.77	79.08	4.32	85.17
MTH	1,591.75	418.23	57.85	63.48	2,131.30
Plantation		618.57	5,616.15	714.95	6,949.67
LOT			1,239.52	39.32	1,278.84
Conservation				39.32	39.32
Infrastructure			648.84		648.84
MTH			244.62		244.62
Plantation			346.06		346.06
Grand Total	139,085.43	26,144.30	51,775.29	70,698.50	287,703.52

Figure 2.8 Modified and Natural Habitat Classification within the SFI Concession

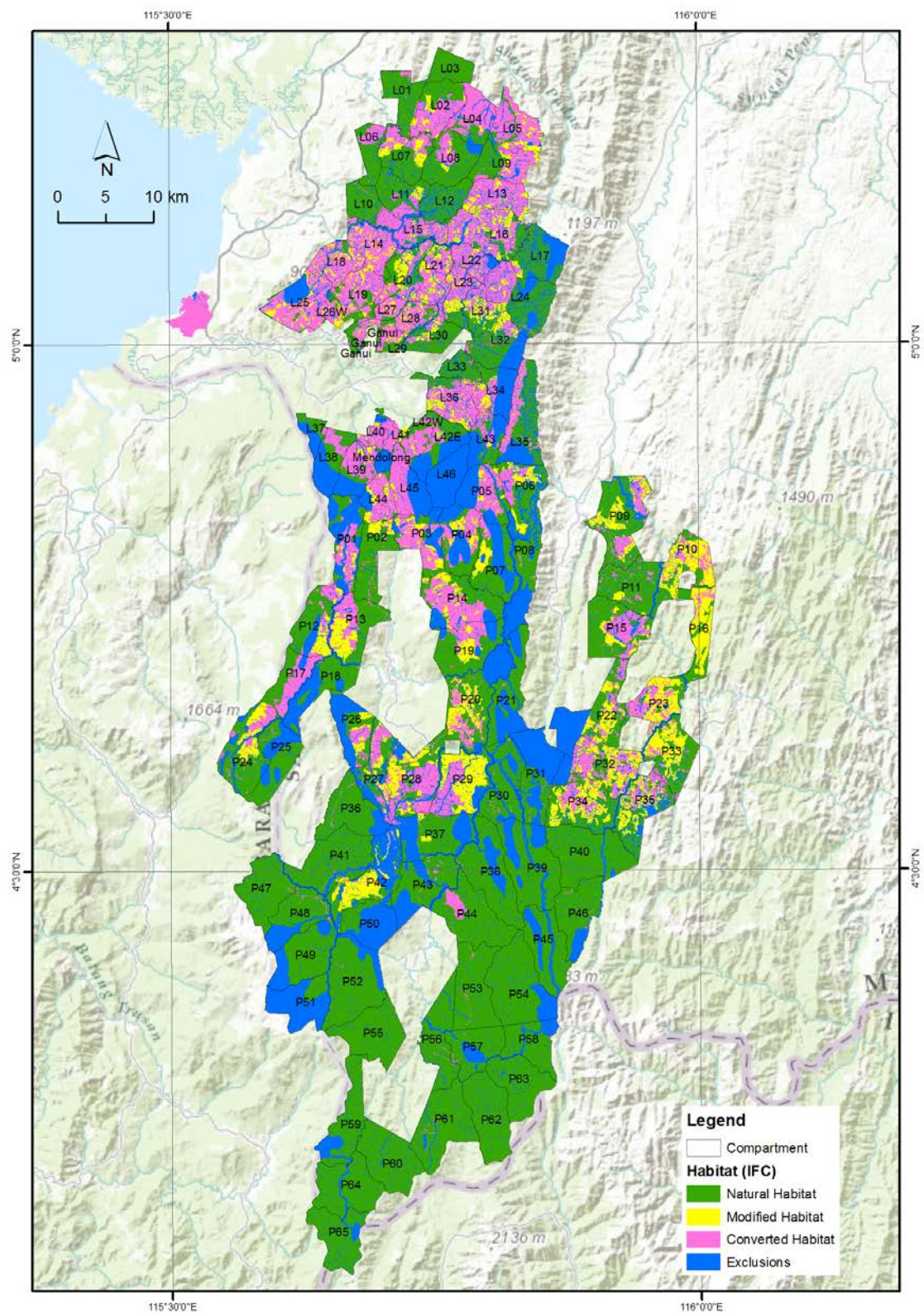
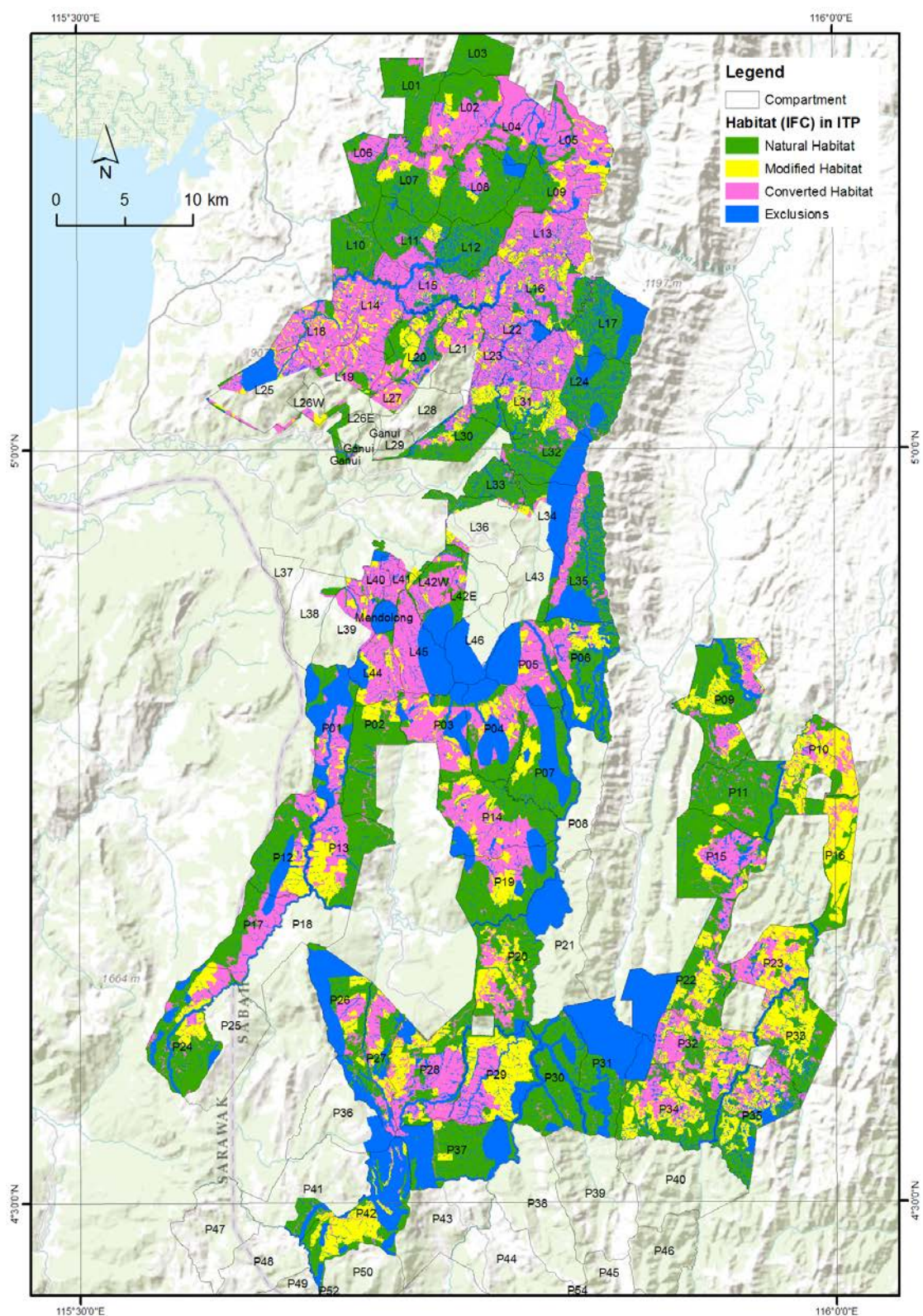


Figure 2.9 *Modified and Natural Habitat Classification within the ITP area only*



Within this document Critical Habitat has been split into sections relative to the five criteria listed above in *Table 2.12*. Within each, the relevant biodiversity features have been listed and screened to assess where they are thought to potentially trigger Critical Habitat. In these sections, the abbreviation of Critical Habitat (CH) has been used as appropriate.

2.7.1 *Criterion 1, 2 and 3: -1) Critically Endangered or Endangered Species, 2) Endemic and/or Restricted-range species and 3) Migratory or Congregatory Species*

Based on the literature review all HBV species (as provided in *Annex A* and *Annex C*) were thought to have potential for triggering Critical Habitat in their own right or as part of a species assemblage. However only those directly recorded, where habitat was thought to be preferable and for which the various criteria from *Table 2.4* were thought to be potentially filled were included in *Table 2.12*, and screened directly against Criterion 1, 2 and 3 of PS6. Due to the uncertainty surrounding the assessment at this preliminary stage the list of species for which Critical Habitat may be triggered is still provisional and will require further analysis as reiterated in the Discussion (*Section 2.8*).

The justification for the assessment has been provided in the rationale and information sections on the right columns of the *Table 2.12*. The relevant qualifying Criterion has also been listed along with the relevant sub-criteria from a-e (see *Table 2.4* for details).

It should be noted that this list is preliminary and other species not currently included or poorly represented such as birds, fish, and invertebrates may come to light and require inclusion following the field surveys, continued desk study and stakeholder engagement.

Table 2.12 Critical Habitat Screening Assessment – Criteria 1 and 2 Critically Endangered or Endangered Species and Endemic and/or Restricted-range species

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
Mammals								
<i>Bos javanicus</i>	Banteng	EN		-	-	✓	Criteria 1c Regionally important population of EN species Confirmed breeding of species within the Concession area.	-Observed at: P04, P14, P20, P29, P37 -Maximum of 6 individuals recorded in 2011 by SFI staff in P37. Overall the population size in concession unknown. -Once widespread in Borneo but now they are confined to isolated forest reserves in Sabah and (unconfirmed) on the Sabah/Kalimantan border (WWF, 2011) -A basic survey of Sabah's banteng population was conducted in the 1980s by WWF and the population size was estimated to be in the range of 300-550, however the population size of Kalimantan remains unknown (WWF, 2011), it is also likely the population would have significantly decreased since the 1980s. -world population of Banteng is unlikely to be more than 8,000 and is quite possibly fewer than 5,000 animals. No subpopulations of more than 500, and only 6-8 subpopulations of more than 50 animals, are known, with 4 -5 on Java and 1-2 in Thailand (S. Hedges pers. comm. 2000; Pudyatmoko 2004) (IUCN, 2014) -Shy animals, they dwell in remote tropical lowland mixed dipterocarp, swamp or beach forest.. Within the concession, based on species recordings from the 2014 Banteng study the habitat preference appears to be for lowland mixed dipterocarp forest. -Noted to be breeding in the project site (Goon & Gardner, 2014)

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Hylobates muelleri</i>	Bornean Gibbon	EN	Borneo Endemic	-	-	-	Records of the species present in the Concession area unlikely to represent regionally important population of the species.	-Observed at: P35, P42, -Meijaard and Nijman (unpubl. data) conservatively estimate the total population to be approximately 250,000-375,000 individuals (<i>IUCN</i> , 2014). -It occurs in a number of protected areas across its range, including Betung-Kerihun National Park, Bukit Baka Bukit Raya National Park, Kayan Mentarang National Park, Kutai National Park, Sungai Wain Protection Forest, Tanjung Puting National Park (Indonesia); Lanjak-Entimau Sanctuary, Semengok Forest Reserve (Malaysia) (Richardson pers. comm.) (<i>IUCN</i> , 2014).
<i>Neofelis diardi ssp. borneensis</i>	Bornean Clouded Leopard	EN	Borneo Endemic	-	-	✓	Criteria 1c Regionally important population of EN species.	-Field signs recorded at P42 almost every day of the HCV survey 2011 and initial consultation with local villages suggest the species may be present in a number of locations (see <i>Annex B</i>). No records were taken during the Banteng study of 2014 in P04, P14, P17, P20, P29, P37 and P44 although much of the Concession would still broadly provide suitable habitat for this species. While the overall population of the Sunda species is thought to be less than <10,000 individuals (Hearn et al, 2008a), the Bornean ssp. may only comprise <2,500 (hence its status as EN) with no sub-population having a greater population than 250 mature individuals (Hearn et al, 2008b). Wilting et al (2006) suggest that the species likes to travel along watercourses and utilise densely vegetated areas. Wilting also outlines that no population within the SFI Concession is currently known. -The species in Borneo is recorded in a number of habitat types but is generally forest-dependent. Records from logged and unlogged as well as Peat Swamp Forest all exist (Mathai et al, 2010; Cheyne and MacDonald, 2011; Yasuda et al, 2007).

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Chimarrogale phaeura</i>	Bornean Water Shrew	EN	Borneo Endemic	-	-	-	Not confirmed present in the Concession area.	-This species has recently been split into two sub-species for Borneo and Sumatra and can now be considered a Bornean Endemic. -Hearn et al, (2008b) extrapolated that 6.4 individuals may be present per 100km². So based on this, the Concession within the 200,000 ha of remaining MTH and NFM forest has the potential to support a population of roughly 128 animals. It is also expected that the population will be transboundary and will also occur in Kayan Mentarang National Park although the more Montane areas are likely to be less suitable for this species. -Despite no sightings, there is potential for the species to be present in the project area and may warrant further study -Its extent of occurrence is less than 5,000 km², its distribution is severely fragmented, and there is continuing decline in the extent and quality of its habitat. It is found in the state Sabah and is present in three mountain ranges: Mount Trus Madi; Mount Kinabalu; and the Crocker Range. It probably occurs further south in Kalimantan (Indonesia) in appropriate habitats although no records currently exist. -This species has a small range, and it is confined to a restricted habitat that is under pressure from human encroachment, especially for logging. It is not known whether or not it can adapt to anthropogenic habitats, but the extensive habitat loss within its range is likely to be having an impact, and the species is probably ecologically sensitive. -Further studies are needed into the distribution, abundance and conservation needs of this species.

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Pardofelis badia</i>	Borneo Bay Cat	EN	Borneo Endemic	-	-	-	Not confirmed present in the Concession area.	-Despite no confirmed sightings, there is potential for the species to be present in the project area and initial consultation with local villages suggest the species may be present (see <i>Annex B</i>) -A decline of >20% in the Borneo Bay Cat population is projected over the next 12 years (= two generations) (IUCN Cats Red List Workshop 2007) -Found only on the island Borneo, where its distribution is poorly known, with increasing but relatively few recent records -Forest dependent, with records from hill and lowland forest as well as swamp forest -Key threats are mostly related to habitat loss due to commercial logging and oil palm plantations are the major threat- if current deforestation rates continue, it's projected to decline from 50% to less than one-third by 2020 (Rautner <i>et al.</i> 2005). -Species population and abundance unknown -It has been confirmed to occur in the following protected areas: • Sabah: Danum Valley Conservation Area (Nowell and Jackson 1996) • Sarawak - Gunung Mulu National Park (Dinets 2003), Lanjak-Entimau Wildlife Sanctuary (Azlan <i>et al.</i> 2003) • Kalimantan: Gunung Palung National Park, Bentuang Karimum National Park (Meijaard 1997), Sungai Wain Protection Forest (Yasuda <i>et al.</i> 2007)
<i>Prionailurus planiceps</i>	Flat-headed Cat	EN	Sunda Endemic	-	-	-	Not confirmed present in the Concession area.	-No confirmed records, there is potential for the species to be present in the project area and initial consultation with local villages suggest the species may be present (see <i>Annex B</i>) Based on rates of habitat loss and the threatened status of many wetlands in its range, a continuing decline in the Flat-headed Cat

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
								population of at least 20% over the next 12 years (two generations) is likely. It is difficult to estimate population size given its patchy distribution and lack of any density estimates, but it is suspected that the effective population size could be fewer than 2,500 mature individuals, with no subpopulation having an effective population size larger than 250. -The species appears to be dependent on swamp and peat swamp forest habitat and as such the Concession does not represent an area likely to be of high importance for the species.
<i>Lutra sumatrana</i>	Hairy-nosed Otter	EN	South Asia Endemic	-	-	-	Not confirmed from Concession although otter species present. Further investigation needed for this species.	-No confirmed records from Concession area, although consultation with local residents did identify Otter species being present (see <i>Annex B</i>). -In its distribution range the species is considered as rare. It has been studied in Phru Toa Daeng Peat Swamp Forest in Thailand (Kanchanasaka <i>et al.</i> 1998), U Minh Thuong Nature Reserve in Viet Nam (Nguyen <i>et al.</i> 2001, Sage <i>et al.</i> 2004) and in Tonle Sap from Cambodia (Poole 2003, Heng 2007). -In U Minha National Park it was estimated that there were around 50-230 individuals. The species is believed to be extremely rare in Peninsular Malaysia (Sebastian 1995) - reported from scattered localities in the Borneo (Payne <i>et al.</i> 1985). - their abundance or group sizes are relatively unknown. -Based on habitat preference, the Padas River and other rivers within the Concession may provide ideal habitat for this species.
<i>Manis javanica</i>	Malayan Pangolin	EN	Sunda Endemic	-	-	-	Population present in the Concession area unlikely to represent a significant regional population for this species.	-Claw marks were recorded on a tree at P03 (N040 49' 54.4"; E1150 45' 07.0") -This species is found in primary and secondary forest, and is found in cultivated areas including gardens and plantations, including near human settlements

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
								-Records of species within within project site unlikely to represent a regionally important population of the species. -Recoded throughout the Sunda region although population under heavy threat from poaching.
<i>Pteromyscus pulverulentus</i>	Smoky Flying Squirrel	EN	-	-	-	-	Not confirmed present in the Concession area; if present, species unlikely to represent regionally important population.	-Found in the Agathis Virgin Jungle Reserve -This species is assessed as Endangered due to an expected population decline over more than 50% in the past and the future inferred from the extensive and rapid habitat loss.
<i>Dicerorhinus sumatrensis</i>	Sumatran Rhinoceros	CR	-	-	-	-	No records in region since 1982.	-Observed in Maligan Virgin Jungle Reserve and Kayan Mentarang National Park in 1982 (<i>SFI EIA, 2002</i>) -Population now likely to be locally extinct in the area. Records from Temburong in Brunei are still taken, although this population is likely to be different. -The subspecies <i>Dicerorhinus sumatrensis harrissoni</i> formerly occurred throughout the island of Borneo. Currently, the species occurs only in Sabah (Malaysia), although a few individuals may still survive in Sarawak (Malaysia) and Kalimantan (Indonesia) (Meyard, 1986) (<i>IUCN, 2013</i>). -Further investigation as to the species presence should be carried out although it is unlikely to be now present.
<i>Helarctos malayanus</i>	Sun Bear	VU	-	-	-	-	Non-endemic species with population not regionally significant in Concession.	-Species recorded in L10 The Malayan sun bears on Borneo are the smallest of this species and are considered by many to warrant subspecies status (<i>Helarctos malayanus eurispylus</i>) -Population in Concession unlikely to be regionally important for this Asiatic species.-

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
Amphibians								
<i>Philautus aurantium</i>	Golden-legged Bush Frog	EN	Borneo Endemic	-	-	✓	Regionally important population of EN species.	-Observed at: P35 This endemic is known only from western Sabah, Malaysia, at elevations of 750-1,800m asl. Area of Occupancy is probably less than 500km², its distribution is severely fragmented, and there is continuing decline in the extent and quality of its habitat/ it is locally abundant in suitable habitat. - It has been found in primary and selectively logged forests, where it calls from shrubs and small trees 2-4m above the ground. - It is present in Gunung Kinabalu National Park and the Crocker Range - Strengthened and expanded protection of submontane and montane forests is essential for the long-term survival of this species.
Birds								
<i>Microhierax latifrons</i>	Bornean Falconet	NT	Borneo Endemic	-	-	-	Unlikely to be present in a regionally significant population	-Observed at: P35 -Species restricted to Sabah -Estimated at 15,000-30,000 individuals -Species occurs widely in Sabah and habitat present in the Concession is unlikely to be of importance to this endemic species.
<i>Batrachostomus mixtus</i>	Bornean Frogmouth	NT	Borneo Endemic	-	-	-	Unlikely to be present in a regionally significant population	-Observed at: P35 -The global population size has not been quantified, but the species is described as probably not common. -It occurs in lower montane forest at 600-1,675 m and may use secondary habitats. -Species occurs widely in Sabah where habitat present and habitat present in the Concession is unlikely to be of importance to this endemic species.

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
Odonata								
<i>Camacinia harterti</i>		DD	-	-	-		Further assessment/ data needed to confirm whether this species may qualify for Critical Habitat.	-Although the species has an apparently wide distribution, there have only been recent records from two locations, one in southern China, the other in northern Thailand, and there are relatively few older records (<i>IUCN, 2013</i>) -Species was also recorded from Mount Marapok; and has a case for Critically Endangered (<i>R.A. Dow, pers. comm</i>) -The species is considered Data Deficient at present and its ecology, distribution and current population require further research -Native: China (Guangdong); Indonesia (Sumatera); Malaysia (Peninsular Malaysia, Sabah); Thailand
<i>Leptogomphus pasia</i>		DD	Borneo Endemic	-	-		Further assessment/ data needed to confirm whether this species may qualify for Critical Habitat.	-Apparently endemic to northern Borneo, described from a female from Long Pasia; because of confusion over the male there are some confusing records from other places, but a true male was found on Mt Kinabalu two years ago (<i>R.A. Dow, pers. comm</i>) -Known with certainty from the Long Pasia area of southern Sabah, close to the border with Sarawak (van Tol 1990), the Kelabit Highlands of northeast Sarawak (Dow 2007) and from the Kuala Belalong Field Studies Centre in Brunei (Kalkman 2007). Males that may be of this species have been collected at the Danum Valley in Sabah (van Tol 1990) and at Gunung Mulu National Park in Sarawak (Dow 2007). Thus the distribution of the species covers northeast Sarawak, Brunei and southern Sabah.

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Linaeschna polli</i>		DD	Borneo Endemic	-	-		Further assessment/ data needed to confirm whether this species may qualify for Critical Habitat.	-Known only from two locations in western Sabah (Laidlaw 1920, Lieftinck 1954, von Ellenrieder 2002). The type locality is Mount Marapok, near the border with Sarawak. The other location is in the Crocker Range (IUCN, 2013). -Two recent records from one stream in Sarawak's Bintulu division, where the habitat has been altered and it may be extinct there now (R.A. Dow, pers. comm).
Flora								
<i>Agathis borneensis</i>	Borneo Kauri	EN	Endemic	-	-	✓	Criteria 1c, (possible 2b) Regionally important population of EN species.	-Observed at: P35, P42 where habitat is lowland mixed dipterocarp forest. The species is known to occur up to 1,200 m asl and often found on sandy or peaty soils. -This species has been very heavily over-exploited in many areas and as a result its total area of occupancy (AOO) is estimated to have at least been reduced by half and this is still ongoing. Stands covering an estimated total of 30,000 ha discovered in Kalimantan in the 1930s had effectively been logged out by the mid-1960s. Most stands outside the few well protected nature reserves (mostly situated in the Malay Peninsula and in Sabah) have been seriously depleted and it is doubted that regeneration will be sufficient to restore the losses. Habitat degradation has caused further reductions in recruitment of young trees to replace felled ones. -This species is present in several protected areas, but these only cover a tiny proportion of the global population and are skewed geographically to parts of Malaysia; in Indonesia there are few reserves relevant to this species

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Agathis orbicula</i>	Kauri	EN	Endemic	-	-	-	Not confirmed present in the Concession area.	- A Bornean species recorded from Indonesia (Kalimantan Timur) and Malaysia (Sabah, Sarawak). This species is known from seven localities. In addition to those mapped in <i>Flora Malesiana</i>, ser. 1, 10 (3): 437, f. 78 (De Laubenfels 1988) there are two in Kalimantan Timur. Of the three dots on the map in that publication for central Sarawak, only one could be confirmed with a herbarium collection - <i>Agathis orbicula</i> occurs at lower altitudes than <i>A. lenticula</i> in evergreen tropical rainforest and high kerangas. Recorded from 450 up to 1,050 m asl. - Two localities on the map based on herbarium collections appear to be in protected areas: Maligan in Sabah and Usun Apau in Sarawak.
<i>Bulbophyllum jolandae</i>	(orchid)	NE	Borneo Endemic	-	-	✓	Criteria 2b Concession area could potentially represent habitat of importance to endemic and restricted range species. Eight (8) species in this genus recorded during Ulu padas survey (1998). Further investigation required as to presence in Concession.	-Observed at: P42 -The species is restricted to the Ulu Padas area in Sabah (HCVF, 2011). Eight species in the <i>Bulbophyllum</i> genus only recorded in Ulu padas were identified during the 1998 WWF expedition. Further survey for this species group is essential in the montane habitat to identify the potential for Critical Habitat for this genus.
<i>Cotylelobium melanoxydon</i>	Mersawa (Timber)	EN	Endemic	-	-	-	Records of the species present in the Concession area unlikely to represent regionally important population of the species.	-Observed at: P42 -This species wide spread in Sabah and Sarawak, with several populations occurring in the network of Totally Protected Areas. It inhabits lowland areas up to hill dipterocarp forests at altitudes below 400 m and in kerangas (heath) on podsols. Populations of <i>C. melanoxydon</i> are usually located not far from the coast (BDCHM,2013) -listed at LC for Sabah and Sarawak (Chua et al, 2010)

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Dipterocarpus validus</i>	Keruing (Timber)	CR	Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Observed at: L10 -Found to be quite common in the study sites; however their distribution is local and restricted to scattered forest patches (HCVF, 2011), likely to only occur in the lowland areas of the Concession (where remaining). -This species occurs in both primary and secondary forest, especially along rivers and in freshwater swamps. Species known from Sabah and Sarawak to occur up to 200 masl and to prefer lowland floodplains or lowland clay rich hills (Soepadmo et al 2002). -Native to Sabah, Kalimantan and the Philippines.
<i>Dryobalanops lanceolata</i>	Kapur (Timber)	EN	Borneo Endemic	-	-	-	Records of the species present in the Concession area unlikely to represent regionally important population of the species.	-Observed at: L10 -Common and widespread in Sabah and Sarawak (Soepadmo et al 2002)
<i>Hopea ferruginea</i>	Giam (Timber)	CR	Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Observed at: P35, P42 -Listed as LC for Malaysia (Chua et al, 2010) -Found to be quite common in the study sites; however their distribution is local and restricted to scattered forest patches (HCVF, 2011). Found in mixed dipterocarp forest on clay-rich soils and along ridges in uppder dipterocarp forest at altitudes of 750 m. (Soepadmo et al 2002).

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Melanochyla beccariana</i>		NE	Borneo Endemic	-	-		Range and distribution data needed to confirm whether this species may qualify for Critical Habitat.	-Observed at: P42 -Uncommon in Sabah and Sarawak; also in Brunei and Kalimantan (Soepadmo & Wong, 1995) - Lowland to lower montane forest, to 1500 m. Flowering and fruiting in April and July. - Project site could potentially represent habitat of importance to this endemic and restricted range species.
<i>Shorea andulensis</i>		EN	Borneo Endemic	-	-	-	Records of the species present in the Concession area unlikely to represent regionally important population of the species.	-Recorded at L10 -Locally known from Kinabatangan and Labuk Sugut Districts in Sabah; Bintulu, Kapit, Kuching, Lawas and Limbang Districts in Sarawak ((Soepadmo et al, 2002) -Local and rare in mixed dipterocarp forest (Soepadmo et al, 2002)
<i>Shorea gibbosa</i>	Yellow Meranti (Timber)	CR	Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Observed at: L10 -Found to be quite common in the study sites; however their distribution is local and restricted to scattered forest patches (HCVF, 2011) -Listed as LC for Sabah (Chua et al, 2010) found to be quite common in the study sites; however their distribution is local and restricted to scattered forest patches (HCVF, 2011) Occurs in mixed dipterocarp forest and is rare above 1000 masl. Prefers forest with well-structured clay-loam soils, particularly on low hills and undulating terrain (Soepadmo et al, 2002).

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Shorea hypoleuca</i>		CR	Borneo Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Recorded during the SFI EIA 2002 -Local but frequent where it occurs; occurring in Sepilok FR; elsewhere vulnerable, possibly endangered by forest conversion (Soepadmo <i>et al</i> 2002) -Present in mixed Dipterocarp Forest on well-structured clay soils over sedimentary and basic to intermediate igneous rocks up to an altitude of 400 masl (Soepadmo <i>et al</i> , 2002)
<i>Shorea inappendiculata</i>		CR	Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Recorded at L10 -Listed an EN for Peninsular Malaysia; VU for Sabah and Sarawak (Chua <i>et al</i> , 2010) -Also occurs in Brunei, Sumatra --Locally known from Kinabatangan and Tawau Districts in Sabah; Bintulu, Kapit, Lundu, Miri, Samarahan and Tatau Districts in Sarawak -Scattered in mixed dipterocarp forest; apparently generally rare as single individuals with little regeneration. Usually in coastal hills up to 400 masl (Soepadmo <i>et al</i> , 2002).
<i>Shorea johorensis</i>	Light Red Meranti (Timber)	CR	Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Observed at: L10 -Found to be quite common in the study sites; however their distribution is local and restricted to scattered forest patches (HCVF, 2011) -In Sabah and Sarawak the species is represented in the network of totally protected areas -Widespread in Sabah/ listed as NT for Sabah (Chua <i>et al</i> , 2010) -Generally found in mixed dipterocarp forest, rare at altitude of 800 masl. Formerly common.

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Shorea ovata</i>	Dark Red Meranti (Timber)	EN	Endemic	-	-	-	Records of the species present in the Concession area unlikely to represent regionally important population of the species.	-Observed at: P35, L10 -Listed as NT in Sabah (<i>Chua et al, 2010</i>)
<i>Shorea platyclados</i>	Dark Red Meranti (Timber)	EN	Endemic	-	-	-	Records of the species present in the project site unlikely to represent regionally important population of the species.	-Observed at: P35, P42 -Listed as NT in Sabah (<i>Chua et al, 2010</i>)
<i>Shorea smithiana</i>	Light Red Meranti (Timber)	CR	Borneo Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Observed at: L10 -Found to be quite common in the study sites; however their distribution is local and restricted to scattered forest patches (<i>HCVF, 2011</i>) -Locally common in Mixed Dipterocarp Forest on deep sand clay soils. Occurs on hills up to 400 masl (<i>Soepadmo et al 2002</i>). -Widespread in Sabah and Sarawak; occurring in Lambir and Mulu NPs; Danum Valley Conservation area and Sepilok FR; elsewhere vulnerable owing to land conversion (<i>Soepadmo et al 2002</i>)
<i>Shorea superba</i>	Balau (Timber)	CR	Borneo Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Observed at: L10 -Found to be quite common in the study sites; however their distribution is local and restricted to scattered forest patches (<i>HCVF, 2011</i>) -Occurring in Lambir and Mulu NPs; Danum Valley Conservation area and Sepilok FR; elsewhere vulnerable owing to land conversion. Records from Beaufort and Sipitang. Occurs in mixed dipterocarp forest on moist lower slopes, low hills and floodplains (<i>Soepadmo et al 2002</i>)

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Shorea symingtonii</i>	White Meranti (Timber)	CR	Borneo Endemic	-	-	✓	Criteria 1c (potential for 2b) Regular occurrence of CR listed species.	-Observe at: P35 -Confined to the eastern parts of Sabah (although found within Concession) occurring in Kinabatangan, Lahad Datu, Sandakan, Semporna and Tawau Districts (<i>Soepadmo et al 2002</i>). Present in lowland mixed dipterocarp forest.
<i>Nepenthes rajah</i>	Rajah Brooke's Pitcher Plant	EN	Endemic	-	-	-	Not confirmed present in the Concession area, unlikely to be present	-It is endemic to Mount Kinabalu and neighbouring Mount Tambuyukon in Sabah, Malaysian Borneo - The species has an altitudinal range of 1500 to 2650 m asl. and is thus considered a highland or sub-alpine plant. Due to its localised distribution, <i>N. rajah</i> is classified as an endangered species by the IUCN and listed on CITES Appendix I.
<i>Nepenthes pilosa</i>	Golden-Furred Pitcher Plant	EN	Endemic	-	-	-	Range and distribution data needed to confirm whether this species may qualify for Critical Habitat.	-Observed during the surveys undertaken for the SFI EIA 2002

Species Name	Common Name	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Rationale	Information
<i>Podocarpus globulus</i>		EN	Endemic	-	-	-	Not confirmed present in the Concession area.	- The small number of known subpopulations occurring in an area and at least partly in habitat which suffer ongoing deforestation (mainly due to conversion to plantations of oil palms and rubber trees) are inferred to be in continuing decline. No protected areas are known to contain this species. Its Area Of Occupancy (AOO) is difficult to estimate because trees occur scattered and there may be locations not yet known where it also occurs. Taking this into account using a wider grid cell per location still results in an AOO under the threshold for Endangered (500 km²) and so this species meets the criteria under B2 for that category of threat. - Endemic to Sabah (and on the border with Sarawak), Malaysia. The currently known distribution is based on eight herbarium collections giving four separate localities (=locations). Most collections are by the author of the species, David de Laubenfels. It is possible that other localities will be discovered, especially in Kalimantan (Indonesia).

Legend: Details of the various triggering criteria can be seen in Table 2.3.

Endemic – Refers to Borneo Endemic, where species are Sunda Endemic (endemic to the Sunda Region of Sumatra, Borneo and Peninsular Malaysia) this has been stated.

CR – Critically Endangered; EN – Endangered under the IUCN Red List.

Highly threatened and Unique ecosystems as defined by the IFC are outlined under three key areas listed within *Table 2.4* which can be summarised as being a) under significant threat; b) are small in size; and/or c) have unique assemblages. In the case of the SFI Concession this assessment may need to be revisited once further studies as part of Phase 2 have been undertaken, which will further improve our understanding of the Concession and the species and habitats that may be present there. In the meantime, a preliminary assessment is provided as described in the subsections below based on current understanding of the Concession and existing data.

2.7.2.1

Ecosystems at risk of significantly decreasing in area or quality

Historically South-East Asia has had the highest relative rate of deforestation of any major tropical region (*Sodhi et al, 2004*). While recently deforestation has slowed, across the region forest degradation, deforestation and conversion to plantation still represents the greatest threat to biodiversity (*Bryan et al, 2013*), and Borneo is no exception to this trend (*Rautner et al, 2005*). Of the forest being lost, Lowland Evergreen Forest is clearly being significantly affected with an estimated loss within South East Asia totalling 11.1% recorded between 2000 and 2010 (*Miettinen et al, 2011*). Lower Montane Forest has fared much better over the same period with a loss of only 2.1 % and upper montane habitat has not decreased in extent at all. For forest overall in Borneo over the same period the total lost is thought to be 12% and such losses are clearly still occurring although the rate of change has reduced (*Miettinen et al, 2011*).

Lowland Mixed Dipterocarp Forest in a modified or more natural state covers much of the Concession area (see *Figure 2.4*). The exact extent is currently thought to be 66,062 ha although further analysis of the modified natural forest may identify this habitat to be Lowland Mixed dipterocarp.

The Lowland Mixed Dipterocarp Forest is the only ecosystem likely to be under significant threat due to the high quality timber that it provides, its accessibility and potential for conversion (*WWF, 2014*), and as such this assessment section has focused on this ecosystem type. While the habitat type may be represented with the largest forest extent in Borneo it is still considered threatened as there are very few areas of this forest type left outside of protected areas such as parks and wildlife reserves that have not been degraded or already heavily logged. Most of the dipterocarp forest left in Malaysia is hill dipterocarp forests as the hilly and rugged terrain makes it unsuitable for agriculture or large-scale settlements, as well as being difficult to access and clear for logging or conversion (*WWF, 2014*).

Recent published papers outlining foundations for an Ecosystems Redlist under the IUCN (*Keith et al, 2013; Rodríguez et al, 2012; Rodríguez et al, 2011*) help to define the threat levels for ecosystems under the various usual Red List Criteria. Following these categories within *Keith et al, (2013)*, this would

place the Mixed Dipterocarp Forest Ecosystem present within the Concession as follows:

- Category A (1 - Reduced in geographical distribution over the last 50 years) Vulnerable (VU) $\geq 30\%$ within Borneo.
- Category A (2a - Reduced in geographical extent over the next 50 years) Vulnerable (VU) $\geq 50\%$ is likely to be lost in Borneo based on current rates of deforestation and development of palm oil estates in Malaysia and Indonesia particularly.

Other criteria including ecosystem degradation are also listed in *Keith et al, (2013)* and it is expected that lowland dipterocarp forests would also qualify under this criteria as at least Vulnerable (VU).

Critical habitat is unlikely to be triggered under this criterion for Lowland Mixed Dipterocarp Forest or any other Forest type as they are not considered to meet the Endangered or Critically Endangered threshold for Ecosystem type provided by *Keith et al, (2013)*.

Ecosystems with a small spatial extent

The Concession includes Lowland Mixed Dipterocarp Forest habitat type, Lower Montane Forest habitat type, and Upper Montane Forest habitat type. If these forest types are grouped within the classification system of the Borneo Ecoregions (*Olson et al, 2001*), two Ecoregion types, Borneo Lowland Forest (427,592 km² in total for Borneo) and Borneo Montane Forest (115,509 km² in total for Borneo) can be directly compared. For these ecoregions the area of these ecoregion types within the Concession does not represent a significant proportion of the total for either with both being represented by less than one percent (<1%) of the total extents for these ecoregions. Therefore it is unlikely that Critical Habitat would be triggered for this criterion.

Ecosystems containing unique assemblages of species including assemblages or concentrations of biome-restricted species

The Concession contains a variety of different forest types as previously stated – the main categories being mixed dipterocarp forest (<900 masl), lower montane forest (900 – 1800 masl) and upper montane forest (> 1800 masl). Within the Concession, desk based study and baseline surveys undertaken during the EIA and HCVF assessments have identified within these forest types an assemblage of species that are biome restricted. The Concession particularly has been identified to support an important assemblage of species which would include Banteng (*Bos javanicus*) (EN), Bornean Gibbon (*Hylobates muelleri*) (EN) etc. These species as with others may have limited ranges in Borneo, are endemic and some have potentially triggered Critical Habitat in their own right under Criteria 1 and 2. The assemblage also includes many species which are under heavy threat in other parts of their range from hunting and habitat loss including Sun bear (*Helarctos malayanus*) (VU), Sunda Pangolin (*Manis javanica*) (EN), Bearded Pig (*Sus barbatus*) (VU), Sambar Deer

(*Rusa unicolor*) (VU) and Borneo Clouded Leopard (*Neofelis diardi* ssp. *Borneensis*) (EN) as well as many endemic bird species including Whitehead's Trogon (*Harpactes whiteheadi*), Bornean Frogmouth (*Batrachostomus mixtus*), Bornean Barbet (*Megalaima eximia*), Bornean Falconet (*Microheirex latifrons*) and Bornean Crested Serpent Eagle (*Spilornis kinabaluensis*) and other montane endemics. Overall though the faunal assemblage is not unique in Sabah or Borneo with other areas providing habitat for similar groups including the Crocker Range, Danum Valley, Malinau Basin and more. As such it is unlikely that the faunal assemblage would trigger critical habitat.

However, in the southern region of the Concession ie Ulu Padas area, many rare species of rhododendrons, orchids, gingers and pitcher-plants have been recorded in the montane forest and many of these are believed to be found nowhere else in Sabah, with several endemics that have only been collected from Ulu Padas (WWF, 1998) as presently understood. For the Ulu Padas area endemism among the orchids was recorded as particularly high. In the *Bulbophyllum* genus alone, 115 of the 220 species recorded in Borneo occur in Ulu Padas, of which 8 species have been found nowhere else but Ulu Padas (WWF, 1998). It has been further described that the Ulu Padas region has a distinct floristic composition within Sabah's forest estate which is not found elsewhere in the State. While this is based on literature that is outdated, it does warrant further assessment as such findings distinguish Ulu Padas as an important centre for plant biodiversity in Sabah. This in itself would trigger Critical Habitat under Criterion 4.

It should be noted however that while the Ulu Padas flora assemblage is presently thought to be unique within the Concession or even Sabah, these species may still be represented elsewhere in Borneo but may be as yet undiscovered.

2.7.3 *Criterion 5 Key evolutionary processes*

While there are undoubtedly a large number of Borneo endemics in the Concession, the vast majority of these, whether lowland species or montane species, are found in many other areas on the island. The Montane habitat towards the south of the Concession in the Ulu Padas area presents the highest potential for triggering Critical Habitat under Criteria 5 and further investigation into the floral assemblage present needs to be conducted. If this area is truly represented by a totally unique flora endemic only to Ulu Padas as potentially outlined in the WWF survey from 1998 then this montane area would trigger CH under this criteria

2.8 *DISCUSSION*

The following section provides a summary of the preliminary findings of this Phase 1 assessment work. At this stage the predictions made here must only be viewed on a preliminary basis for the various reasons previously outlined in Limitations section (Section 2.4.5).

2.8.1

Habitat Analysis

This assessment has determined that the Concession provides valuable habitat for a wide variety of species as outlined within the *Section 1.4*.

Overall the habitat is made up of six habitat types as identified during this Level 1 analysis with the largest proportion made up of Lower Montane Forest with 126,389 ha. Lowland Mixed Dipterocarp Forest makes up 66,062 ha while Upper Montane Forest only comprises 8,853 ha. The majority of the concession has however been logged either selectively or using reduced impact techniques. Of the remaining forest habitat the majority (202,390 ha) can still be classed as Natural Habitat as it still retains its structure and ecosystem function and as stated by *Berry et al., (2010)* and *Meijaard and Sheil (2008; 2007)* amongst others, many such logged forest areas still provide high quality resource for faunal species.

The Modified Habitat is considered to be 83,878 ha which includes all the forest areas which have been clear felled, have any infrastructure, have been significantly affected by fire and the industrial timber plantation areas which have been planted.

2.8.2

Preliminary Critical Habitat Assessment

For Criteria 1-2 (Criterion 1: Critically Endangered and Endangered Species; Criterion 2: Endemic or Restricted Range Species); potential for Critical Habitat has been identified for 14 species, within the Concession, although one recently confirmed, of up to eight orchids in the *Bulbophyllum* genus could qualify if still present only in Ulu padas. No species for which Critical Habitat would be triggered under Criteria 3 (Migratory or Congregatory Species) have been identified, and no birds, reptiles, fish or invertebrates currently are thought to have the potential to trigger Critical Habitat based on current evidence, although further examination of the species lists in *Annex A* and *Annex C* should be carried out. All species for which the Critical Habitat could be triggered would fall within Tier 2 Critical Habitat and the majority identified within this initial assessment are Critically Endangered Endemic Dipterocarp trees. For these Dipterocarp species it is important to note that within the National Redlist (*Chua et al, 2010*) and in a Sabah context these species may be neither protected or considered as threatened such as Light Red Meranti (*Shorea johorensis*) which is listed as Critically Endangered (CR) on the Global Redlist and Near Threatened (NT) on the National Redlist and is not protected. As such careful discussion with SFD will be required moving forward into Phase 2 with regards to these species.

A summary of all species is provided in *Table 2.13* below (refer to *Section 2.7* for justifications/ further description).

Table 2.13 Species for which Critical Habitat could be Triggered for Criterion 1-3

Species	Criterion
Mammals	
Banteng (<i>Bos javanicus</i>)	1c
Bornean Clouded Leopard (<i>Neofelis diardi</i> ssp. <i>Borneensis</i>)	1c
Amphibians	
Golden-legged Bush Frog (<i>Philautus aurantium</i>)	1c
Flora	
Borneo Kauri (<i>Agathis borneensis</i>)	1c (poss 2b)
Orchid species. <i>Bulbophyllum jolandae</i>	2b
Keruing (<i>Dipterocarpus validus</i>)	1c (poss 2b)
Giam (<i>Hopea ferruginea</i>)	1c (poss 2b)
Yellow Meranti (<i>Shorea gibbosa</i>)	1c (poss 2b)
<i>Shorea hypoleuca</i>	1c (poss 2b)
<i>Shorea inappendiculata</i>	1c (poss 2b)
Light Red Meranti (<i>Shorea johorensis</i>)	1c (poss 2b)
Light Red Meranti (different species) (<i>Shorea smithiana</i>)	1c (poss 2b)
Balau (<i>Shorea superba</i>)	1c (poss 2b)
White Meranti (<i>Shorea symingtonii</i>)	1c (poss 2b)

As outlined in Table 2.14 most of these species have triggered Critical Habitat under Criterion 1 or 2 or both which indicates species that are either Endangered or Critically Endangered on the IUCN Red List, and species that are endemic or restricted in range. At present it is unclear as to whether the MTH forest scheduled for development would represent significant habitat resource for these species and whether the NFM area would provide a similar resource if retained for those displaced. However, for the MTH forest, based on the findings from the HCV assessment of 2011 which showed species including Clouded Leopard being regularly sighted in Compartment P42 as well as the Banteng recorded from camera trapping in 2014 being sighted in Compartments P04, P14, P20, P29 and P37 it is expected that these compartments (which are all scheduled for at least partial development) or other areas within the MTH forest will be important for these species and the others listed above.

Critical Habitat has also the potential to be triggered under Criterion 4 (Highly threatened and/or unique ecosystems) for the unique floral community present in the Ulu Padas area to the south of the Concession and further investigation of this site is needed with regards to this floral assemblage which may also have the potential to trigger Critical Habitat under Criteria 5 site for Key Evolutionary Processes.

Five protected areas are present within or adjacent to the Concession and the Concession is also within the Heart of Borneo and the Borneo Mountain Endemic Bird Area (EBA). The Concession does not have any planned activities within the Protected Areas.

2.8.3 Mitigation Framework

The mitigation of impacts on biodiversity will be a critical component when applying the mitigation hierarchy. The approach proposed will use

recognised conservation techniques to identify and manage habitats and species of significance within the Concession. These techniques will be applied during the application of the mitigation hierarchy to limit residual impacts on biodiversity values.

A proposed mitigation framework is outlined below in *Table 2.14*.

Table 2.14 *Proposed Mitigation Framework*

Management Action	Description
1. Management Plan	The management plan is to provide the roles, responsibilities, accountabilities, actions, resources and budgets available to actively manage biodiversity. Clear goals and objectives linked to the monitoring and evaluation framework should be set.
2. Monitoring and evaluation	The monitoring and evaluation framework is to define an approach to determine the effectiveness of the management actions in achieving biodiversity conservation goals. The approach should look at the institutional, financial and governance frameworks applied as well as relevant biodiversity indicators (eg. species richness, basal area). The monitoring and evaluation should directly relate to goals and objectives set for biodiversity management.
3. Management of hunting	The management of hunting should aim to monitor and enforce in conjunction with the community, activities such as the hunting and poaching of wildlife. The approach should include: patrols and surveillance for illegal hunting activities; education and awareness; and incentives.
4. Sustainable forestry management	Sustainable forestry management should focus on the ecologically sustainable harvesting of timber for the use within the local community. The approach should restrict impacts on known habitats to threatened species; sustainable yield assessment and harvesting approaches; patrols and surveillance for illegal forestry activities; education and awareness and incentives.
5. Sustainable forest product use (NTFP)	The sustainable use of NTFP should focus on documenting cultural and heritage usage of NTFP; analysis of sustainable yield for NTFP; identifying alternatives where sustainable collection is identified; and education and awareness on sustainable collection practices.
6. Management of weeds and pests	Managing weeds and pests should: identify and monitor the distribution and abundance of weeds and pests in the area; identify appropriate controls at a spatial and temporal scale; define control techniques and actions. Actions may include active control of weeds or specific hunting programs for pest animals.
7. Fire management	Managing fire should: identify historical fire regimes within the offset site at a spatial and temporal scale; determine ecological fire regimes based on intensity and frequency of fire; defining and map exclusion zones; consider threatened species responses to fire; and design ecological fire control methods.
8. Sediment and erosion control	Sediment and erosion control should focus on key sources of sediment pollution within the watershed. Mapping of soils and erosion sources should be undertaken; and targeted management actions should be designed to manage sediment sources (natural surface roads, areas of existing erosion). A detailed maintenance and monitoring regime should also be designed to ensure the effectiveness of management control measures.
9. Assisted natural regeneration	Assisted natural regeneration should focus on the establishment of relevant plant stock to assist natural regeneration of disturbed areas. Assessment and mapping of areas identified as being suppressed or degraded; determination of suitable plant stock and planting regime; collection and propagation of plant stock; preparation and management of regeneration areas. Local community engagement in horticultural activities is recommended.

Management Action	Description
10. Habitat installation (eg. nest boxes or salt licks)	Habitat enhancement should focus on restoring critical habitat features such as nesting hollows that have been impacted or removed from the forest. An assessment should be undertaken of the presence of habitat features (such as nesting tree hollows, shelter and refuge sites). A program of habitat installation should occur to mimic the natural presence of these features within the landscape. An example is the installation of nest boxes for hollow dependent birds or salt licks for mammals.
11. Community engagement and development	Community engagement and development is designed to involve the local community in the management actions developed for each of the offset sites. Consultation during the preparation of the management plans is required to ensure that the management actions and approaches are acceptable to the community. This can include direct engagement in undertaking actions (hunting patrols, employment at the nursery; manufacture of nest boxes). Community engagement is an essential component in determining the appropriateness and ensuring success of the sustainable forest practices and NTFP development.
12. Education and training	Education and awareness approaches are integral to the success of offset management. This should include community engagement surveys; education seminars; posters and flyers; identification of community champions and incentives. Each management action should include an education and awareness component.
13. Species Specific Management	These activities would manage threats to species. Activities may be linked to those listed above but may include specific planning and coordinated management to reduce threats, possibly at a local, regional or possibly national level. Species specific recovery and management plans may be required.

2.9

RECOMMENDATIONS

To fully complete the Critical Habitat Assessment further work covering, desktop and literature review, stakeholder engagement and field survey will be needed as part of Phase 2 along with completing the Level 2 Habitat Analysis. The findings of this report should be updated and used to guide where additional surveys should be carried out and on what species.

Of particular importance will be identifying the presence of species with the potential to trigger Critical Habitat such as the Banteng and Bornean Clouded Leopard, and it will be key to identify where these species occur within the concession, how important areas scheduled for development are and the different habitat types.

Defining the Discrete Management Units for the species will be an important step when applying the mitigation hierarchy. ERM will prepare a framework to identify the distribution of the species populations within the concession based on available data. Comparison will be made against the extent and range for the species to provide an analysis of the importance of the habitat values on the Concession for the species.

It will also be extremely important to undertake further research with regards to the Ulu Padas floral assemblage and to identify whether species and assemblage are indeed unique.

Regarding the two development scenarios available, the first scenario that would increase the total plantation area of 85,000 ha it is recommended that the application of the mitigation hierarchy be exercised to limit impacts on biodiversity values. The 30,217 ha will be developed from the previously logged Mixed Tropical Hardwood (MTH) area in the ITP and particularly those areas already cleared. Biodiversity offsets may be required to be applied to offset any impacts on residual biodiversity values following application of the mitigation step.

The second scenario would utilise the existing governmental lease agreements that require the development of the full potential of the concession covering an additional 45,000 ha development of MTH into plantation to increase the total plantation area to 130,000 ha. This would occur later in the medium to long term and would be subject to an additional environmental assessment focused on the biodiversity values will occur at that time.

Field verification and validation of the habitat model is required to confirm assumptions and improve the accuracy of the model. Field assessments of forest condition are important to verify the distribution of natural and modified habitats.

Full application of the mitigation hierarchy as outlined in IFC PS 6 should be applied. This will determine the areas of high biodiversity value to be avoided; the necessary mitigation to limit impacts; and the consideration of offsets for any residual impacts to achieve a no-net-loss of biodiversity values.

Detailed field assessments should be undertaken as a matter of priority to have greater certainty of the distribution of the species present and the distribution of natural and modified habitats across the concession before decisions are made on the areas of MTH within the ITP that can be converted.

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Annex A

High Biodiversity Value Species

The following tables present the lists of species for both flora and fauna (ie mammals, birds, amphibians, reptiles, fish and insects) identified in the Concession. The legend presented below is common to all tables.

A.1

LEGEND**Nomenclature**

- **Latin Name** – Nomenclature from most up to date sources of data including IUCN (2012/3) as well as recent publications on species.
- **English Name** – Also known as a common name for a taxon or organism which is generally used within a community, it is often contrasted with the scientific name for the same organism.

1 Presence

- **Observed** – Species directly seen or indirectly recorded from field signs (tracks, droppings, territory markings, skins, feeding remains or other);
- **Potentially Present** – Species not directly or indirectly identified but thought to be potentially present due to suitability of habitat recorded, current range of the species (from literature or records) or both range and habitat suitability together; and
- **Unlikely** – Habitat unsuitable for species and / or species thought to be extinct as no records (from literature) taken recently (within 10 years).

2 Habitat Preference

This describes where possible species habitat preference (based on existing literature) or habitat present where the species was recorded.

3 IUCN Red List

Status of species listed based on level of conservation threat faced nationally and according to IUCN Red List classification system. The IUCN Red list classification system utilises the following categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Lower Risk (LR), Least Concern (LC), Data Deficient (DD), and Not Evaluated (NE).

4 Endemicity

Endemicity is the ecological state of an organism for being unique to a defined geographic location or habitat type. The geographic location is defined as shown in *Table 1*.

Table A.1 **Definition of Geographic Location and Endemism**

Abbrev.	Definition
AS	Australasia region, which includes Australia, New Zealand, New Guinea Island and neighbouring islands in Pacific Ocean
BO	Borneo Island, which includes only Brunei, Sabah, Sarawak and Kalimantan
EA	East Asia region, which includes from Sakhalin to the north, Japan, Korean Peninsula, mainland China, and Taiwan
IC	Indochinese Region, which includes only Cambodia, Laos, Vietnam, Myanmar, Thailand and Southern China
IM	Indomalaya Ecozone, which includes South Asian countries, Southeast Asian countries, Southern China and parts of East Asia
PH	Philippines only
SD	Sundaland, which includes only Borneo, Peninsular Malaysia, Singapore and Indonesia
TM	Thai-Malay Peninsula, which includes only Myanmar, Thailand, Singapore and Peninsular Malaysia

5 *Protected Status*

Legal protection given to the species by the law of Malaysia/ Sabah, with reference to the Wildlife Conservation Enactment (WCE) 1997.

6 *CITES Appendix*

A list of species or population that protected by CITES against over-exploitation through international trade, which reflects the extent of the threat to it and the controls that apply to the trade. The Appendices are divided into 3 lists, namely:

- *Appendix I* – Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances;
- *Appendix II* – Species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival; and
- *Appendix III* – Species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade.

Table A.1 List of Mammal Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Bovidae	<i>Bos javanicus</i>	Banteng		√		Generally avoids evergreen rainforest and is usually within more open dry deciduous forests	Endangered A2cd+3cd+4cd ver 3.1	IC + SD	II			
Cercopithecidae	<i>Macaca fascicularis</i>	Long-tailed Macaque	√			Extremely tolerant of a range of habitats, including mangrove and swamp forests, and can be found in agricultural areas near forest (secondary growth, secondary forest, and primary forest)	Least Concern ver 3.1	TM + SD	II		√	
Cercopithecidae	<i>Macaca nemestrina</i>	Pig-tailed Macaque	√			Commonly found in lowland primary and secondary forest, as well as coastal, swamp and montane forest	Vulnerable A2cd ver 3.1	TM + BO	II		√	
Cercopithecidae	<i>Presbytis hosei</i>	Hose's Langur	√			Occurs in lowland to hill dipterocarp rainforest	Vulnerable A2cd ver 3.1	BO	II		√	
Cercopithecidae	<i>Presbytis rubicunda</i>	Maroon Langur	√			Almost wholly arboreal, prefers primary forest	Least Concern ver 3.1	BO	II		√	
Cervidae	<i>Muntiacus atherodes</i>	Bornean Yellow Muntjac	√			Predominates over the low hill ranges and coastal regions	Least Concern ver 3.1	BO	III		√	

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Cervidae	<i>Muntiacus muntjak</i>	Barking Deer	√			Occurs widely in heavily degraded forest and, in areas adjacent to forest, in plantations of coffee, rubber, sugarcane, cassava, coconut, and teak	Least Concern ver 3.1	TM + SD	III		√	
Cervidae	<i>Rusa unicolor</i>	Sambar Dear	√			Occurs in dense evergreen closed-canopy forest, highly tolerant of forest degradation	Vulnerable A2cd + 3cd + 4cd ver 3.1	IM	III			
Cynocephalidae	<i>Cynocephalus variegatus</i>	Sunda Flying Lemur	√			Forest-dependent species, but can be found in secondary habitats close to human populations	Least Concern ver 3.1	TM + SD	II			
Felidae	<i>Neofelis diardi</i>	Sunda Clouded Leopard	√			Occurs in lowland rainforest, a forest-dependent animal and does not go deep into plantations	Vulnerable C1 ver 3.1	BO	I	√		
Felidae	<i>Pardofelis badia</i>	Borneo Bay Cat	√			Forest dependent, with records from hill and lowland forest as well as swamp forest	Endangered C1 ver 3.1	BO	NA		√	
Felidae	<i>Pardofelis marmorata</i>	Marbled Cat	√			Moist and mixed deciduous-evergreen tropical forest, and may prefer hill forest	Vulnerable C1+2a(i) ver 3.1	IM	II	√		

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Felidae	<i>Prionailurus bengalensis</i>	Leopard Cat	√			Occurs in a broad spectrum of habitats, from tropical rainforest to temperate broadleaf and, marginally, coniferous forest, as well as shrub forest and successional grasslands	Least Concern ver 3.1	IM	II		√	
Felidae	<i>Prionailurus planiceps</i>	Flat-headed Cat	√			Peat swamp forest, secondary forest, swampy areas, lakes and streams, and riverine forest	Endangered C1 + 2a(i) ver 3.1	BO	NA	√		
Hylobatidae	<i>Hylobates muelleri</i>	Bornean Gibbon	√			Tropical evergreen forests of primary, selectively logged and secondary forest types.	Endangered A2cd ver 3.1	BO	III	√		
Hystriidae	<i>Hystrix brachyura</i>	Malayan Porcupine	√			Can be found in various forest habitats, i.e. in scrubby, open areas close to forest, and agricultural areas, but needs to have rocky outcrops or other areas in which it can create a den or dig burrows	Least Concern ver 3.1	IM	III			
Lorisidae	<i>Nycticebus menagensis</i>	Bornean Slow Loris		√		Occurs in primary and secondary lowland forest, gardens, and plantations	Vulnerable A2cd + 3cd ver 3.1	BO + PH	NA	√		

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Manidae	<i>Manis javanica</i>	Malayan Pangolin	√			Found in primary and secondary forest, and is found in cultivated areas including gardens and plantations, including near human settlements.	Endangered A2d + 3d + 4d ver 3.1	IC + SD	II		√	
Muridae	<i>Maxomys baeodon</i>	Small Spiny Rat	√			Terrestrial species living in primary rain forest with preference for microhabitat with a high number of large trees	Data Deficient ver 3.1	BO	NA			
Muridae	<i>Maxomys ochraceiventer</i>	Chestnut-bellied Spiny Rat	√			Restricted to hills occurring in dipterocarp and lower montane forests	Data Deficient ver 3.1	BO	NA			
Mustelidae	<i>Aonyx cinerea</i>	Oriental Small-clawed Otter		√		Wetland systems having pools and stagnant water	Vulnerable A2acd ver 3.1	IM	I		√	
Mustelidae	<i>Lutra sumatrana</i>	Hairy-nosed Otters	√			Inhabits freshwater and coastal areas, especially mangroves and low lying peat swamp forests	Endangered A2cd ver 3.1	TM + SD	II		√	
Mustelidae	<i>Martes flavigula</i>	Yellow-throated Marten	√			Can be found in forests and various other adjacent habitats across a wide altitudinal range, even areas well isolated from old-growth stands	Least Concern ver 3.1	IM	I		√	
Mustelidae	<i>Mydaus javanensis</i>	Malay Badger	√			Can be found in secondary forests and open grounds such as gardens adjacent to forests	Least Concern ver 3.1	BO	I			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Pteropidae	<i>Pteropus vampyrus</i>	Large Flying fox	√			Occurs in primary, and secondary forest and uses adjacent agricultural areas for feeding	Near Threatened ver 3.1	TM + SD + PH	III		√	
Pteropodidae	<i>Aethalops alecto</i>	Grey Fruit Bat	√			Occurs in hill and montane forests (probably restricted to forest) from 1,000 m up to 2,700 m above sea level	Least Concern ver 3.1	SD	NA			
Pteropodidae	<i>Cynopterus brachyotis</i>	Common Short-nosed Fruit Bat	√			Can be found from habitats ranging from orchards, gardens to forested tracts	Least Concern ver 3.1	IM	NA			
Pteropodidae	<i>Penthetor lucasi</i>	Dusky Fruit Bat	√			Roosts in caves and lives in large colonies with more than 100 individuals within secondary and primary lowland to hill forest	Least Concern ver 3.1	SD	NA			
Sciuridae	<i>Callosciurus baluensis</i>	Kinabalu Squirrel	√			Generally inhabits primary forest, but also occurs in secondary forest and agricultural lands.	Least Concern ver 3.1	BO	NA			
Sciuridae	<i>Callosciurus orestes</i>	Borneo Black-banded Squirrel	√			Restricted to lower montane forest and to upper dipterocarp forest	Least Concern ver 3.1	BO	NA			
Sciuridae	<i>Exilisciurus whiteheadi</i>	Tufted Pygmy Squirrel	√			Generally found in lower sub-montane (up to 3,000 m) forest	Least Concern ver 3.1	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Sciuridae	<i>Pteromyscus pulverulentus</i>	Smoky Flying Squirrel		√		Tree hollows in tall, undisturbed primary forest.	Endangered A2c+A3c+A4c ver 3.1	SD	II			
Sciuridae	<i>Ratufa affinis</i>	Pale Giant Squirrel	√			Dependent on tall, wet evergreen forests and this species can tolerate plantations and secondary forest	Near Threatened ver 3.1	SD	II		√	
Sciuridae	<i>Rheithrosciurus macrotis</i>	Tufted Ground Squirrel	√			Restricted to primary forest in hilly areas	Vulnerable A4cd ver 3.1	BO	I			
Sciuridae	<i>Sundasciurus jentinki</i>	Jentink's Squirrel	√			Generally found in montane forest	Least Concern ver 3.1	BO	NA			
Soricidae	<i>Chimarrogale phaeura</i>	Bornean Water Shrew		√		Semi-aquatic, can be found in moist habitats in montane forest, and by streams in tropical forests in addition to marshland habitats	Endangered B1ab(iii) ver 3.1	BO	NA			
Suidae	<i>Sus barbatus</i>	Bearded Pig	√			Wide variety of habitat types, ranging from beaches to upper montane cloud forests	Vulnerable A2cd ver 3.1	TM + SD	III			
Tarsiidae	<i>Tarsius bancanus</i>	Horsfield's Tarsier	√			Primary and secondary forest, as well as along the coasts or on the edge of plantations.	Vulnerable A2cd ver 3.1	BO	II		√	
Tragulidae	<i>Tragulus javanicus</i>	Javan Mouse Deer	√			Generally found in lowland/foothill primary and secondary forests	Data Deficient ver 3.1	TM + SD	III			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Tragulidae	<i>Tragulus kanchil</i>	Lesser Mouse Deer	√			Generally found in lowland/foothill primary and secondary forests	Least Concern ver 3.1	TM + SD	III			
Tragulidae	<i>Tragulus napu</i>	Greater Mouse Deer	√			Generally found in lowland/foothill primary and secondary forests	Least Concern ver 3.1	TM + SD	III			
Tupaiaidae	<i>Dendrogale melanura</i>	Bornean Smooth-tailed Treshrew	√			Generally found in submontane and montane pristine forest	Data Deficient ver 3.1	BO	NA		√	
Tupaiaidae	<i>Tupaia gracilis</i>	Slender Treshrew	√			Generally found in lowland old growth forests, secondary forest and in older (>5years) tree plantations	Least Concern ver 3.1	BO	NA		√	
Tupaiaidae	<i>Tupaia minor</i>	Lesser Treeshrew	√			Occurs in both primary and secondary forest	Least Concern ver 3.1	TM + BO	NA		√	
Tupaiaidae	<i>Tupaia montana</i>	Mountain Treeshrew	√			Can be found only in submontane and montane forest, but can tolerate disturbed forest	Least Concern ver 3.1	BO	NA		√	
Ursidae	<i>Helarctos malayanus</i>	Sun Bear	√			Restricted to tropical evergreen rainforest	Vulnerable A2cd + 3cd + 4cd ver 3.1	TM + SD	I	√		
Viverridae	<i>Arctictis binturong</i>	Binturong	√			Generally found in primary and secondary lowland forest	Vulnerable A2cd ver 3.1	IM	II		√	
Viverridae	<i>Arctogalidia trivirgata</i>	Small-toothed Palm Civet	√			Generally found in evergreen and semi-evergreen forest	Least Concern ver 3.1	TM + SD	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Viverridae	<i>Cynogale bennettii</i>	Otter Civet	√			Thought to be largely confined to peat swamp forests, though there are recent records from lowland dry forest	Endangered A2ce ver 3.1	SD	II		√	
Viverridae	<i>Hemigalus derbyanus</i>	Banded Palm Civet	√			This species has been recorded from primary lowland rainforest, but also in disturbed habitat, peat swamp forest and acacia plantations as well as elevations up to 1,200 m	Vulnerable A2cd + 3c ver 3.1	TM + SD	II		√	

Table A.2 List of Bird Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Accipitridae	<i>Accipiter gularis</i>	Japanese Sparrowhawk	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Accipitridae	<i>Butastur indicus</i>	Grey-faced Buzzard	√			Commonly found in open land	Least Concern ver 3.1	Native: EA Migrant: SD + PH	NA			
Accipitridae	<i>Haliastur indus</i>	Brahminy Kite	√			Commonly found on the coast and in inland wetlands	Least Concern ver 3.1	IM	II			
Accipitridae	<i>Ichthyophaga humilis</i>	Lessed Fish Eagle	√			Generally found in large forested rivers and wetlands in the lowlands and foothills up to 2,400 m, but usually below 1,000 m	Near Threatened ver 3.1	IM	II		√	
Accipitridae	<i>Ictinaetus malayensis</i>	Black Eagle	√			Commonly found in subtropical or tropical rainforest	Least Concern ver 3.1	IM	II			
Accipitridae	<i>Lophotriorchis kienerii</i>	Rufous-bellied Eagle	√			Commonly found in subtropical or tropical montane rainforest	Least Concern ver 3.1	IM	NA			
Accipitridae	<i>Nisaetus alboniger</i>	Blyth's Hawk-Eagle	√			Generally found in open woodland	Least Concern ver 3.1	SD	NA			
Accipitridae	<i>Pernis ptilorhyncus</i>	Oriental Honey Buzzard	√			Inhabits woodland of various climatic types, preferring broad-leaved forests; it is recorded up to 1,800 m	Least Concern ver 3.1	Native: EA Migrant: SD + PH	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Accipitridae	<i>Spilornis cheela</i>	Crested Serpent Eagle	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Aegithinidae	<i>Aegithina viridissima</i>	Green Iora	√			Generally found in mangroves and primary, tall secondary and logged forests, up to 825 m	Near Threatened ver 3.1	TM + SD	NA			
Alcedinidae	<i>Alcedo euryzona</i>	Blue-banded Kingfisher	√			Generally found in subtropical or tropical moist lowland forests, subtropical or tropical mangrove forests, and rivers	Vulnerable A2c+3c+4c ver 3.1	TM + SD	NA			
Alcedinidae	<i>Alcedo meninting</i>	Blue-eared Kingfisher	√			Commonly found in dense evergreen forest	Least Concern ver 3.1	IM	NA			
Alcedinidae	<i>Ceyx rufidorsa</i>	Rufous-backed Kingfisher	√			Commonly found in subtropical or tropical lowland rainforest and streamsides	Least Concern ver 3.1	TM + SD	NA			
Alcedinidae	<i>Lacedo pulchella</i>	Banded Kingfisher	√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Anhingidae	<i>Anhinga melanogaster</i>	Oriental Darter	√			Generally found in shallow inland wetlands including lakes, rivers, swamps and reservoirs	Near Threatened ver 3.1	IM	II			
Apodidae	<i>Aerodramus fuciphagus</i>	Edible-nest Swiftlet	√			Covers a range of habitats from coastal areas to the montane forest, occurring up to 2,800 metres above sea-level	Least Concern ver 3.1	TM + SD + PH	NA			
Apodidae	<i>Collocalia esculenta</i>	Glossy Swiftlet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Apodidae	<i>Rhaphidura leucopygialis</i>	Silver-rumped Spinetail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Ardeidae	<i>Ardea sumatrana</i>	Great-billed Heron	√			Generally found by the coastal such as islands, coral reefs, mangroves, large rivers, found inland in shallow ponds	Least Concern ver 3.1	IM	II			
Bucerotidae	<i>Anorrhinus galeritus</i>	Bushy-crested Hornbill	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	II			
Bucerotidae	<i>Berenicornis comatus</i>	White-crested Hornbill	√			Commonly found in subtropical or tropical lowland rainforest	Near Threatened ver 3.1	TM + SD	II			
Bucerotidae	<i>Buceros rhinoceros</i>	Rhinoceros Hornbill	√			Generally occurs in extensive areas of primary lowland and hill forest, extending into tall secondary forest and swamp forests, up to 1,400 m	Near Threatened ver 3.1	TM + SD	II		√	
Bucerotidae	<i>Rhinoplax vigil</i>	Helmeted Hornbill	√			Generally found in primary semi-evergreen and evergreen lowland forest	Near Threatened ver 3.1	TM + SD	II	√		
Bucerotidae	<i>Rhyticeros undulatus</i>	Wreathed Hornbill	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Campephagidae	<i>Coracina larvata</i>	Sunda Cuckooshrike	√			Commonly found in subtropical or tropical montane rainforests	Least Concern ver 3.1	SD	NA			
Campephagidae	<i>Hemipus hirundinaceus</i>	Black-winged Flycatcher-shrike	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Campephagidae	<i>Pericrocotus igneus</i>	Fiery Minivet	√			Generally found in broadleaved forest and forest edges, mature secondary growth, dry coastal forest, mangroves and occasionally overgrown plantations and gardens	Near Threatened ver 3.1	TM + SD	NA			
Campephagidae	<i>Pericrocotus solaris</i>	Grey-chinned Minivet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Caprimulgidae	<i>Eurostopodus temminckii</i>	Malaysian Eared Nightjar	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Chloropseidae	<i>Chloropsis cyanopogon</i>	Lesser Green Leafbird	√			Commonly found in canopy and high edge of lowland evergreen forest, including peat-swamp forest, mature and regenerating secondary forest	Near Threatened ver 3.1	TM + SD	NA			
Chloropseidae	<i>Chloropsis kinabaluensis</i>	Bornean Leafbird	√			Commonly found in the canopy and edge of mature or well-regenerated montane moist forest, from 2200 m occasionally to as low as 550 m	Least Concern ver 3.1	BO	NA			
Chloropseidae	<i>Chloropsis sonnerati</i>	Greater Green Leafbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Columbidae	<i>Chalcophaps indica</i>	Emerald Dove	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Columbidae	<i>Ducula badia</i>	Mountain Imperial Pigeon	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Columbidae	<i>Macropygia emiliana</i>	Ruddy Cuckoo-Dove	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Columbidae	<i>Macropygia ruficeps</i>	Little Cuckoo-Dove	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IC + SD	NA			
Columbidae	<i>Treron olax</i>	Little Green Pigeon	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Corvidae	<i>Corvus enca</i>	Slender-billed Crow	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD + PH	NA			
Corvidae	<i>Dendrocitta cinerascens</i>	Bornean Treepie	√			Commonly found in submontane and montane rainforest	Not Evaluated	BO	NA			
Corvidae	<i>Platylophus galericulatus</i>	Crested Jay	√			Generally found in lowland evergreen forest, both primary and tall secondary, up to 1,500 m	Near Threatened ver 3.1	TM + SD	NA			
Corvidae	<i>Platysmurus leucopterus</i>	Black Magpie	√			Generally occurs in dense lowland evergreen forest, swampy woodland, tall secondary forest, forest edges and mangroves, up to 800 m.	Near Threatened ver 3.1	TM + SD	II			
Cuculidae	<i>Cacomantis merulinus</i>	Plantive Cuckoo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Centropus bengalensis</i>	Lesser Coucal	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Cuculidae	<i>Centropus sinensis</i>	Greater Coucal	√			Commonly found in wide range of habitats from forest to cultivation and urban gardens	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Cuculus micropterus</i>	Indian Cuckoo	√			Commonly found in forests and open woodland at up to 3,600 m	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Cuculus saturatus</i>	Himalayan Cuckoo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Phaenicophaeus chlorophaeus</i>	Raffles Malkoha	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Cuculidae	<i>Phaenicophaeus curvirostris</i>	Chestnut-breasted Malkoha	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD + PH	NA			
Cuculidae	<i>Phaenicophaeus diardi</i>	Black-bellied Malkoha	√			Generally occurs in primary or secondary evergreen forest, swamp forest, bamboo or mangroves to 1,220 m	Near Threatened ver 3.1	TM + SD	NA			
Dicaeidae	<i>Dicaeum everetti</i>	Thick-billed Flowerpecker	√			Generally found in swamp forest, heath forest and secondary forests	Near Threatened ver 3.1	BO	II			
Dicaeidae	<i>Dicaeum monticolum</i>	Bornean Flowerpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Dicaeidae	<i>Dicaeum triognostigma</i>	Orange-bellied Flowerpecker	√			Commonly found in subtropical or tropical lowland rainforests, subtropical or tropical mangrove forests, and subtropical or tropical montane rainforests	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Dicaeidae	<i>Prionochilus xanthopygius</i>	Yellow-rumped Flowerpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Dicruridae	<i>Dicrurus hottentottus</i>	Hair-crested Drongo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Dicruridae	<i>Dicrurus leucophaeus</i>	Ashy Drongo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Dicruridae	<i>Dicrurus paradiseus</i>	Greater Racket-tailed Drongo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Estrildidae	<i>Lonchura atricapilla</i>	Chestnut Munia	√			Commonly found in open grassland and cultivation	Least Concern ver 3.1	IM	NA			
Estrildidae	<i>Lonchura fuscans</i>	Dusky Munia	√			Commonly found in subtropical or tropical lowland shrubland, forest and grassland habitat	Least Concern ver 3.1	BO	NA			
Eurylaimidae	<i>Calyptomena viridis</i>	Green Broadbill	√			Generally found in the understorey of primary evergreen and mixed dipterocarp forest in the lowlands, principally below 800 m, but occasionally to 1,700 m	Near Threatened ver 3.1	TM + SD	NA			
Eurylaimidae	<i>Calyptomena whiteheadi</i>	Whitehead's Broadbill	√			Commonly found in montane forest	Least Concern ver 3.1	BO	NA			
Eurylaimidae	<i>Eurylaimus javanicus</i>	Banded Broadbill	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Eurylaimidae	<i>Eurylaimus ochromalus</i>	Black-and-Yellow Broadbill	√			Generally found in primary lowland evergreen forest, mixed dipterocarp forest, swamp forest and forest edge, as well as secondary growth and adjacent plantations	Near Threatened ver 3.1	TM + SD	NA			
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon	√			Commonly found along mountain ranges, river valleys and coastlines	Least Concern ver 3.1	SD	II			
Falconidae	<i>Microhierax latifrons</i>	Bornean Falconet	√			Generally occurs in forest-edge habitats and cultivation with scattered trees up to 1,200 m	Near Threatened ver 3.1	BO	II		√	
Hemiprocidae	<i>Hemiprocne comata</i>	Whiskered Treeswiftlet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD + PH	NA			
Irenidae	<i>Irena puella</i>	Asian Fairy-Bluebird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Leiothrichidae	<i>Garrulax treacheri</i>	Chestnut-hooded Laughing Thrush	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Meropidae	<i>Merops viridis</i>	Blue-throated Bee-eater	√			Commonly found in subtropical or tropical mangrove forest	Least Concern ver 3.1	TM + SD + PH	NA			
Meropidae	<i>Nyctyornis amictus</i>	Red-bearded Bee-eater	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Monarchidae	<i>Hypothymis azurea</i>	Black-naped Monarch	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Monarchidae	<i>Terpsiphone paradisi</i>	Asian Paradise Flycatcher	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Muscicapidae	<i>Copsychus malabaricus</i>	White-rumped Shama	√			Commonly found in lowland tropical moist forest, swamp forest, overgrown tree plantations, secondary jungle, mangroves and forest clearings, from sea-level to 1500 m	Least Concern ver 3.1	IM	II			
Muscicapidae	<i>Copsychus saularis</i>	Oriental Magpie Robin	√			Commonly found in open woodland and cultivated areas close to human habitations	Least Concern ver 3.1	IM	II			
Muscicapidae	<i>Copsychus stricklandii</i>	White-crowned Shama	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	II			
Muscicapidae	<i>Culicicapa ceylonensis</i>	Grey-headed Canary Flycatcher	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Muscicapidae	<i>Cyornis caeruleus</i>	Sunda Blue Flycatcher	√			Generally found in the middle and understoreys of primary, selectively logged and mature secondary dryland rainforest	Vulnerable A2c+3c+4c ver 3.1	BO	II			
Muscicapidae	<i>Cyornis turcosus</i>	Malaysian Blue Flycatcher	√			Generally found in bamboo, swamp and evergreen forest, usually in association with waterways	Near Threatened ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Muscicapidae	<i>Enicurus borneensis</i>	Bornean Forktail	√			Generally found by the streamside habitats in montane primary forest	Not Evaluated	BO	NA			
Muscicapidae	<i>Enicurus leschenaulti</i>	White-crowned Forktail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Muscicapidae	<i>Eumyias indigo</i>	Indigo Flycatcher	√			Commonly found in submontane or montane tropical rain forests between 900m to 3000m	Least Concern ver 3.1	BO	NA			
Muscicapidae	<i>Ficedula narcissina</i>	Narcissus Flycatcher	√			Commonly found in deciduous woodlands	Least Concern ver 3.1	Native: EA Migrant: SD + PH	NA			
Muscicapidae	<i>Ficedula westermanni</i>	Little Pied Flycatcher	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Muscicapidae	<i>Rhinomyias gularis</i>	Eyebrowed Jungle Flycatcher	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Muscicapidae	<i>Rhipidura perlata</i>	Spotted Fantail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Nectariniidae	<i>Aethopyga mystacalis</i>	Scarlet Sunbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Nectariniidae	<i>Aethopyga siparaja</i>	Crimson Sunbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Nectariniidae	<i>Anthreptes malacensis</i>	Brown-throated Sunbird	√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	TM + SD + PH	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Nectariniidae	<i>Anthreptes rhodolaemus</i>	Red-throated Sunbird	√			Generally occurs in various forest types, including lowland and hill dipterocarp forests, heath forest, peat swamp and secondary forest	Near Threatened ver 3.1	TM + SD	NA			
Nectariniidae	<i>Arachnothera affinis</i>	Streaky-breasted Spiderhunter	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Nectariniidae	<i>Arachnothera juliae</i>	Whitehead's Spiderhunter	√			Commonly found in subtropical or tropical montane rainforest	Least Concern ver 3.1	BO	NA			
Nectariniidae	<i>Arachnothera longirostra</i>	Little Spiderhunter	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Nectariniidae	<i>Hypogramma hypogrammicum</i>	Purple-naped Sunbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Nectariniidae	<i>Nectarinia jugularis</i>	Olive-backed Sunbird	√			Originally from mangrove habitat, but this species has adapted well to humans, and is now common even in fairly densely populated areas	Least Concern ver 3.1	IM	NA			
Oriolidae	<i>Oriolus cruentus</i>	Black-and-Crimson Oriole	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD	NA			
Pachycephalidae	<i>Pachycephala hypoxantha</i>	Bornean Whistler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Passeridae	<i>Passer Montanus</i>	Eurasian Tree Sparrow	√			Commonly found in subtropical or tropical forest	Least Concern ver 3.1	IM	NA			
Phasianidae	<i>Arborophila hyperythra</i>	Red-breasted Partridge	√			Commonly found in subtropical or tropical montane rainforest	Least Concern ver 3.1	BO	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Phasianidae	<i>Argusianus argus</i>	Great Argus	√			Generally found in tall, dry, lowland primary, secondary and logged forests, up to 1,300 m, but principally, below 900 m	Near Threatened ver 3.1	TM + SD	II		√	
Phasianidae	<i>Coturnix chinensis</i>	Blue Quail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD + PH	II			
Phasianidae	<i>Haematortyx sanguiniceps</i>	Crimson-headed Partridge	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	II			
Phasianidae	<i>Lophura bulweri</i>	Bulwer's Pheasant	√			Generally found in primary hill and lower montane forest, from c.300 m up to at least 1,500 m, and at least occasionally down to c.150 m	Vulnerable A2cd+3cd+4cd;C2a(i) ver 3.1	BO	II			
Phasianidae	<i>Lophura ignita</i>	Crested Fireback	√			Generally found in lowland forest, rarely occurring up to 1,000 m	Near Threatened ver 3.1	TM + SD	II			√
Phasianidae	<i>Polyplectron schleiermacheri</i>	Bornean Peacock-Pheasant	√			Generally found in lowland plain and lowland dipterocarp forest	Endangered C2a(i) ver 3.1	BO	II		√	
Phasianidae	<i>Rollulus rouloul</i>	Partridge	√			Generally found in broadleaved evergreen and dense primary lowland and hill forests and bamboo up to 1,550 m	Near Threatened ver 3.1	TM + SD	II			√
Picidae	<i>Blythipicus rubiginosus</i>	Maroon Woodpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Picidae	<i>Dendrocopos moluccensis</i>	Sunda Woodpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Picidae	<i>Dinopium rafflesii</i>	Olive-backed Woodpecker	√			Generally found in mangroves, lowland forest and hill forest, to 1,200 m	Near Threatened ver 3.1	TM + SD	NA			
Picidae	<i>Meiglyptes tristis</i>	Buff-rumped Woodpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Picidae	<i>Mulleripicus pulverulentus</i>	Great Slaty Woodpecker	√			Generally found in primary semi-open moist deciduous and tropical evergreen old growth, lower elevation forest	Vulnerable A2bc ver 3.1	IM	NA			
Picidae	<i>Picus miniaceus</i>	Banded Woodpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Picidae	<i>Sasia abnormis</i>	Rufous Piculet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pittidae	<i>Erythropitta arquata</i>	Blue-banded Pitta	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	II			
Pittidae	<i>Hydrornis baudii</i>	Blue-headed Pitta	√			Restricted to mature, lowland evergreen forest, usually extending upslope to 600 m, rarely to 1,200 m	Vulnerable A2c+3c+4c ver 3.1	BO	II			
Pittidae	<i>Pitta schwaneri</i>	Bornean Banded Pitta	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Pityriaseidae	<i>Pityriasis gymnocephala</i>	Bornean Bristlehead	√			Generally found in peat swamp forest, primary evergreen forest, logged forest and tall secondary forest up to 1,000 m	Near Threatened ver 3.1	BO	II			
Podargidae	<i>Batrachostomus mixtus</i>	Bornean Frogmouth	√			Generally occurs in lower montane forest at 600-1,675 m and may use secondary habitats	Near Threatened ver 3.1	BO	NA			
Psittacidae	<i>Loriculus galgulus</i>	Blue-crowned Hanging Parrot	√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	TM + SD	II		√	
Psittacidae	<i>Psittinus cyanurus</i>	Blue-rumped parrot	√			Generally found in primary, dry-land evergreen and semi-evergreen lowland forest	Near Threatened ver 3.1	TM + SD	II		√	
Pycnonotidae	<i>Alophoixus ochraceus</i>	Ochraceous Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Criniger phaeocephalus</i>	Yellow-bellied Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Hemixos flava</i>	Ashy Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Pycnonotidae	<i>Ixos malaccensis</i>	Streaked Bulbul	√			Generally occurs in mature broadleaved evergreen forest in lowlands and foothills, occasionally up to 1,200 m	Near Threatened ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Pycnonotus atriceps</i>	Black-headed Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Pycnonotidae	<i>Pycnonotus brunneus</i>	Red-eyed Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Pycnonotus erythrophthalmos</i>	Spectacled Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Pycnonotus flavescens leucops</i>	Pale-faced Bulbul	√			Commonly found in montane primary forest, ranging in altitude from about 900 m to 3500 m above sea level	Least Concern ver 3.1	BO	NA			
Pycnonotidae	<i>Pycnonotus goiavier</i>	Yellow-vented Bulbul	√			Commonly found in a wide variety of open habitats, but not deep forest	Least Concern ver 3.1	TM + SD + PH	NA			
Pycnonotidae	<i>Pycnonotus montis</i>	Bornean Bulbul	√			Commonly found in tropical rainforest and dense scrub	Not Evaluated	BO	NA			
Pycnonotidae	<i>Pycnonotus plumosus</i>	Olive-winged Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Pycnonotus simplex</i>	Cream-vented Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Setornis criniger</i>	Hook-billed Bulbul	√			Generally found in peat swamp forest and lowland evergreen forest	Vulnerable A2c+3c+4c ver 3.1	BO	II			
Pycnonotidae	<i>Tricholestes criniger</i>	Hairy-backed Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Ramphastidae	<i>Calorhamphus fuliginosus</i>	Brown Barbet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Ramphastidae	<i>Megalaima australis</i>	Blue-eared Barbet	√			Commonly found in tropical rainforest	Least Concern ver 3.1	IM	NA			
Ramphastidae	<i>Megalaima chrysopogon</i>	Gold-whiskered Barbet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Ramphastidae	<i>Megalaima eximia</i>	Bornean Barbet	√			Commonly found in subtropical or tropical lowland rainforest and and subtropical or tropical montane rainforest	Least Concern ver 3.1	BO	NA			
Ramphastidae	<i>Megalaima henricii</i>	Yellow-crowned Barbet	√			Generally occurs in lowland primary evergreen forests up to 975 m	Near Threatened ver 3.1	TM + SD	NA			
Ramphastidae	<i>Megalaima monticola</i>	Mountain Barbet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Ramphastidae	<i>Megalaima pulcherrima</i>	Golden-naped Barbet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Rhipiduridae	<i>Rhipidura javanica</i>	Malaysian Pied Fantail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD	NA			
Strigidae	<i>Strix leptogrammica</i>	Brown Wood Owl	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Sturnidae	<i>Gracula religiosa</i>	Hill Myna	√			Commonly found in moist or semi-evergreen forest in lowlands, hills and mountains	Least Concern ver 3.1	IM	II		√	
Sylviidae	<i>Orthotomus cuculatus</i>	Mountain Tailorbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Sylviidae	<i>Orthotomus sericeus</i>	Rufous-tailed Tailorbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD + PH	NA			
Sylviidae	<i>Phylloscopus trivirgatus</i>	Mountain Leaf Warbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD + PH	NA			
Sylviidae	<i>Seicercus montis</i>	Yellow-breasted Warbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD + PH	NA			
Timaliidae	<i>Napothera crassa</i>	Mountain Wren-Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Timaliidae	<i>Alcippe brunneicauda</i>	Brown Fulvetta	√			Generally occurs in broadleaved evergreen forest, mature secondary growth and logged forests, from lowlands up to 1,000 m	Near Threatened ver 3.1	TM + SD	NA			
Timaliidae	<i>Garrulax lugubris</i>	Black Laughing Thrush	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Timaliidae	<i>Garrulax paliiatus</i>	Sunda Laughingthrush	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Timaliidae	<i>Macronous bornensis</i>	Bold-striped Tit-babbler	√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Timaliidae	<i>Malacopteron affine</i>	Sooty-capped Babbler	√			Generally found in the lowlands and foothills, up to 700 m, of primary evergreen forests	Near Threatened ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Timaliidae	<i>Napothera atrigularis</i>	Black-throated Wren-Babbler	√			Generally found on the ground and in the lower storey of broadleaved evergreen forest from lowlands up to 1,500 m	Near Threatened ver 3.1	BO	NA			
Timaliidae	<i>Pomatorhinus montanus</i>	Chestnut-backed Scimitar Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Timaliidae	<i>Ptilocichla leucogrammica</i>	Borneon Wren-Babbler	√			Generally found in lowland, tropical evergreen forest and sometimes peat swamp forest, ascending into the foothills locally to 900 m	Vulnerable A2c+3c+4c ver 3.1	BO	II			
Timaliidae	<i>Stachyris erythroptera</i>	Chestnut-winged Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Timaliidae	<i>Stachyris nigriceps</i>	Grey-throated Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Timaliidae	<i>Stachyris poliocephala</i>	Grey-headed Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Timaliidae	<i>Trichastoma bicolor</i>	Ferruginous Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	II			
Timaliidae	<i>Trichastoma pyrogenys</i>	Temminck's Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Timaliidae	<i>Trichastoma rostratum</i>	White-chested Babbler	√			Generally found near water in lowland evergreen forest and secondary growth, as well as mangroves and peatswamp forest, up to 500 m	Near Threatened ver 3.1	TM + SD	II			
Timaliidae	<i>Yuhina everetti</i>	Chestnut-crested Yuhina	√			Commonly found in submontane and montane rainforest	Least Concern ver 3.1	BO	NA			
Trogonidae	<i>Harpactes whiteheadi</i>	Whitehead's Trogon	√			Restricted to primary hill and montane forest at 900-1,500 m	Near Threatened ver 3.1	BO	NA			
Zosteropidae	<i>Oculocincta squamifrons</i>	Pygmy Ibon	√			Commonly found in submontane and montane forest	Least Concern ver 3.1	BO	NA			
Zosteropidae	<i>Zosterops atricapilla</i>	Black-capped White-Eye	√			Commonly found in montane forest	Least Concern ver 3.1	SD	NA			
Zosteropidae	<i>Zosterops palpebrosus</i>	Oriental White-Eye	√			Commonly found in subtropical or tropical rainforest	Least Concern ver 3.1	IM	NA			

Table A.3 List of Amphibian Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Bufo	<i>Ansonia hanitschi</i>	Kinabalu Slender Toad	√			Generally found on the floor of submontane and montane forests	Near Threatened ver 3.1	BO	NA			
Bufo	<i>Ansonia leptopus</i>		√			Generally found in subtropical or tropical moist lowland forests and rivers	Near Threatened ver 3.1	BO	NA			
Bufo	<i>Ansonia longidigita</i>	Long-fingered Slender Toad	√			Generally found on the floor and herb stratum of rainforests	Near Threatened ver 3.1	BO	NA			
Bufo	<i>Bufo asper</i>	Asian Giant Toad	√			Confined to the banks of rainforest streams and rivers throughout its life cycle, and has been recorded only from heavily forested areas	Least Concern ver 3.1	TM + SD	NA			
Bufo	<i>Pedostibes hosii</i>		√			Generally found in forest and other dense vegetation along large lowland rivers	Least Concern ver 3.1	TM + SD	NA			
Bufo	<i>Pedostibes rugosus</i>	Marbled Tree Toad	√			An arboreal species found in hilly lowland, and submontane, tropical primary moist forest	Near Threatened ver 3.1	BO	NA			
Dicroglossidae	<i>Fejervarya limnocharis</i>	Asian Grass Frog	√			Generally inhabits most open wet habitat types and in closed-canopy forest	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Dicroglossidae	<i>Ingerana baluensis</i>	Inger's Dwarf Frog	√			Generally found on the floor of lowland and mid-elevation primary rainforests	Least Concern ver 3.1	BO	NA			
Dicroglossidae	<i>Limnonectes finchi</i>	Finch's Wart Frog	√			Generally found in the litter stratum of pristine lowland forests, but also in old secondary forest	Least Concern ver 3.1	BO	NA			
Dicroglossidae	<i>Limnonectes ingeri</i>	Greater Swamp Frog	√			Generally seen along slow-flowing, sandy-bottomed or slightly silty streams in primary or disturbed lowland rainforest	Near Threatened ver 3.1	BO	NA			
Dicroglossidae	<i>Limnonectes kuhlii</i>	Kuhl's Creek Frog	√			Generally found in small, clear streams in evergreen forest in hilly areas	Least Concern ver 3.1	IM	NA			
Dicroglossidae	<i>Limnonectes leporinus</i>	Giant River Frog	√			Generally lives along the banks of small to large, rocky streams in hilly and secondary rainforest	Least Concern ver 3.1	BO	NA			
Dicroglossidae	<i>Limnonectes palavanensis</i>	Smooth Guardian Frog	√			Generally found in undisturbed and disturbed streams and rivers in lower montane and lowland forests	Least Concern ver 3.1	BO + PH	NA			
Dicroglossidae	<i>Occidozyga baluensis</i>	Seep Frog	√			An aquatic species, most often seen in seepage areas in primary lowland rainforest	Near Threatened ver 3.1	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Dicroglossidae	<i>Occidozyga laevis</i>	Yellow Bellied Puddle Frog	√			Generally inhabits shallow muddy puddles and pools near small forest streams	Least Concern ver 3.1	TM + SD	NA			
Megophryidae	<i>Leptobrachium montanum</i>	Montane Litter Frog	√			Generally found in submontane and montane forest	Least Concern ver 3.1	BO	NA			
Megophryidae	<i>Leptolalax arayai</i>	Asian Toad	√			Generally found in submontane and montane forest	Vulnerable B1ab(iii) ver 3.1	BO	NA			
Megophryidae	<i>Leptolalax dringi</i>	Dring's Asian Toad	√			Generally found in closed-canopy forest	Near Threatened ver 3.1	BO	NA			
Megophryidae	<i>Megophrys nasuta</i>	Malayan Horned Frog	√			Generally inhabits in intact lowland and submontane rainforest within the vicinity of forest streams	Least Concern ver 3.1	TM + SD	NA			
Microhylidae	<i>Kalophrynus heterochirus</i>		√			Generally found on the floor litter of closed-canopy montane and lowland forests	Least Concern ver 3.1	BO	NA			
Microhylidae	<i>Metaphrynella sundana</i>	Tree Hole Frog	√			Generally found in lowland primary forest	Least Concern ver 3.1	BO	NA			
Ranidae	<i>Hylarana chalconota</i>	Schlegel's Frog	√			Generally seen on rocks and vegetation along small lowland forest streams	Least Concern ver 3.1	SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Ranidae	<i>Hylarana erythraea</i>	Common Green Frog	√			Generally found in vegetated floodplain ponds and is also frequently associated with rice fields	Least Concern ver 3.1	TM + SD	NA			
Ranidae	<i>Hylarana luctuosa</i>	Mahogany Frog	√			Generally found in lowland and submontane primary rainforest	Least Concern ver 3.1	TM + SD	NA			
Ranidae	<i>Hylarana picturata</i>	Spotted Stream Frog	√			Generally occurs in primary and slightly disturbed rainforests	Least Concern ver 3.1	BO	NA			
Ranidae	<i>Hylarana signata</i>	Striped Stream Frog	√			Generally found in the riparian vegetation along stream banks and lowland forests, including swamp and heath forest	Least Concern ver 3.1	TM + SD	NA			
Ranidae	<i>Meristogenys kinabaluensis</i>	Kiau Borneo Frog	√			Can be found only in submontane and montane forests	Near Threatened ver 3.1	BO	NA			
Ranidae	<i>Staurois tuberilinguis</i>	Green-spotted Rock Frog	√			Can be found along the banks of clear, small, rocky streams in primary forests	Near Threatened ver 3.1	BO	NA			
Rhacophoridae	<i>Philautus aurantium</i>	Golden-legged Bush Frog	√			Can be found in primary and selectively logged forests	Endangered B2ab(iii) ver 3.1	BO	NA			
Rhacophoridae	<i>Philautus bunitus</i>	Green Bush Frog	√			Can be found in lowland, submontane and montane forest	Vulnerable B1ab(iii) ver 3.1	BO	NA			
Rhacophoridae	<i>Philautus mjobergi</i>		√			Can be found in subtropical or tropical montane forest	Near Threatened ver 3.1	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Rhacophoridae	<i>Polypedates leucomystax</i>	Four-lined Tree Frog	√			Can be found in subtropical or tropical lowland forest	Least Concern ver 3.1	IM	NA			
Rhacophoridae	<i>Polypedates macrotis</i>	Bongao Tree Frog	√			Generally inhabits primary forest and edge areas	Least Concern ver 3.1	TM + SD	NA			
Rhacophoridae	<i>Polypedates ottilophus</i>	File-eared Tree Frog	√			Generally found in lowland forests, in flat and hilly terrain	Least Concern ver 3.1	BO	NA			
Rhacophoridae	<i>Rhacophorus baluensis</i>	Kinabalu Tree Frog	√			Can be found only in submontane and montane forest	Near Threatened ver 3.1	BO	NA			
Rhacophoridae	<i>Rhacophorus everetti</i>	Mossy Tree Frog	√			Generally inhabits arboreal microhabitats, usually beside water system in lower montane and lowland forests	Near Threatened ver 3.1	BO + PH	NA			
Rhacophoridae	<i>Rhacophorus gauni</i>	Short-nosed Tree Frog	√			Confined to primary and old secondary hilly rainforests	Near Threatened ver 3.1	BO	NA			
Rhacophoridae	<i>Rhacophorus reinwardtii</i>	Black-webbed Tree Frog	√			Generally found in primary and secondary evergreen rainforest	Near Threatened ver 3.1	TM + SD	NA			

Table A.4 List of Reptile Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Agamidae	<i>Draco sp.</i>	Flying Dragons	√			Generally found in primary rainforest and strictly arboreal	Least Concern ver 3.1	TM + SD	NA			
Crocodylidae	<i>Crocodylus porosus</i>	Salt-water Crocodile	√			Inland lakes, swamps and marshes as well as coastal brackish waters and tidal sections of rivers	Lower Risk/ Least Concern ver 2.3	IM	II	√		
Gekkonidae	<i>Gekko smithii</i>	Large Forest gekko	√			Generally found in forest and forested areas	Least Concern ver 3.1	TM + SD	NA			
Gekkonidae	<i>Cyrtodactylus baluensis</i>	Balu Bow-fingered Gecko	√			Generally found in forest and forested areas	Not Evaluated	BO	NA			
Geomydidae	<i>Notochelys platynota</i>	Malayan Flat-shelled Turtle	√			Inhabits freshwater, especially mangroves and low lying peat swamp forests	Vulnerable A1cd + 2cd ver 2.3	TM + SD	NA		√	
Pythonidae	<i>Python curtus</i>	Blood Python	√			Generally found in lowland forest, especially moist areas with soft soils	Least Concern ver 3.1	BO	II		√	
Pythonidae	<i>Python reticulatus</i>	Reticulated Python	√			Generally found rainforests, woodlands, and nearby grasslands associated with rivers	Not Evaluated	IM	II		√	
Scincidae	<i>Eutropis rudis</i>	Rough Mabuya	√			Generally found in forest and forested areas	Not Evaluated	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Scincidae	<i>Eutropis multifasciata</i>	Common Sun Skink	√			Generally found in forest and forested areas	Not Evaluated	IM	NA			
Scincidae	<i>Lamprolepis vyneri</i>	Tree-dwelling Lizard	√			Generally found in forest and forested areas	Not Evaluated	TM + SD	NA			
Varanidae	<i>Varanus salvator</i>	Common Water Monitor Lizard	√			Semi-aquatic and opportunistic, inhabits a variety of natural habitats, such as primary forests and mangrove swamps	Least Concern ver 3.1	IM	NA			

Table A.5 List of Fish Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Anabatidae	<i>Anabas testudineus</i>	Climbing Perch	√			Inhabits freshwaters, commonly found in rivers, canals, lakes, ponds, swamps and paddy fields	Data Deficient ver 3.1	IM	NA			
Bagridae	<i>Mystus nemurus</i>	Yellow Catfish	√			Inhabits wide range of habitats, including rivers and streams, lakes, marshlands, and peat swamps	Least Concern ver 3.1	SD	NA			
Cobitidae	<i>Acanthopsis choirorhynchus</i>	Horseface Loach	√			Inhabits wide range of habitats, including rivers and streams, lakes, marshlands, and peat swamps	Not Evaluated	IM	NA			
Cyprinidae	<i>Garra borneensis</i>	Log Suckers	√			Inhabits freshwaters, commonly found in rivers, canals, lakes, ponds, swamps and paddy fields	Not Evaluated	IM	NA			
Cyprinidae	<i>Hampala macrolepidota</i>	Hampala Barb	√			Occurs mainly in clear rivers or streams with running water and sandy to muddy bottoms	Least Concern ver 3.1	TM + SD	NA			
Cyprinidae	<i>Leptobarbus hosii</i>		√			Inhabits freshwaters, this species can be found near or in the deepest part of a body of water	Data Deficient ver 3.1	BO	NA			
Cyprinidae	<i>Nematabramis borneensis</i>		√			Inhabits freshwaters, commonly found in rivers, canals, lakes, ponds, swamps and paddy fields	Not Evaluated	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Cyprinidae	<i>Osteochilus microcephalus</i>	Pla Rong Mai Tub	√			Inhabits lowland freshwater wetlands, as well as canals and artificial habitats	Least Concern ver 3.1	TM + SD	NA			
Cyprinidae	<i>Barbodes sealei</i>		√			Inhabits freshwaters, commonly found in rivers and streams	Not Evaluated	BO	NA			
Cyprinidae	<i>Rasbora borapetensis</i>	Red-tailed Rasbora	√			Inhabits marshlands and shallow standing water bodies (including ponds, ditches, canals and reservoir margins)	Least Concern ver 3.1	TM + SD	NA			
Gastromyzontidae	<i>Gastromyzon borneensis</i>		√			Inhabits freshwaters, commonly found in rivers and streams	Not Evaluated	BO	NA			

Table A.5 List of Insect Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Aeshnidae	<i>Linaeschna polli</i>	(Dragonfly)		√		Recorded from Mt Marapok and the Crocker Range	Data Deficient ver 3.1	BO	NA			
Calopterygidae	<i>Vestalis anacolosia</i>	(Damselfly)	√			Confined to small swift forest streams up to about 800 m	Near Threatened ver 3.1	BO	NA			
Coenagrionidae	<i>Pericnemis triangularis</i>	(Damselfly)	√			This species breeds in phytotelmata (water bodies held by plants) in mixed dipterocarp forest. Occurs in primary forest, and has been recorded in old secondary forest	Vulnerable D2 ver 3.1	BO	NA			
Gomphidae	<i>Leptogomphus pasia</i>	(Dragonfly)		√		Recorded from Mt Kinabalu	Data Deficient ver 3.1	BO	NA			
Libellulidae	<i>Camacinia harterti</i>	(Dragonfly)		√		Recorded from Mt Marapok	Data Deficient ver 3.1		NA			
Megapodagrionidae	<i>Rhinagrion elopuriae</i>	(Damselfly)	√			The species breeds in streams in lowland mixed dipterocarp forest	Near Threatened ver 3.1	BO	NA			
Papilionidae	<i>Trogonoptera brookiana</i>	Rajah Brooke's Birdwing	√			Generally found in tropical rainforest	Not Evaluated	TM + SD	II		√	
Papilionidae	<i>Troides andromache</i>	Borneo Birdwing	√			Generally found in found in rainforest canopy in the mountains of Borneo at an elevation of 1,000 m to 2,900 m	Lower Risk/ Near Threatened ver 2.3	BO	II		√	

Table A.7 List of Flora Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Acanthaceae	<i>Acanthus ilicifolius</i>	Holly Mangrove	√			Commonly grows on the river banks or tidal canal sides or low swampy areas in the mangrove forests and its vicinity	Least Concern ver 3.1	IM	NA			
Anacardiaceae	<i>Melanochyla beccariana</i>		√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Annonaceae	<i>Goniothalamus ridleyi</i>		√			Commonly found in tropical lowland rainforest	Not Evaluated	SD	NA			
Annonaceae	<i>Goniothalamus tenuifolius</i>		√			Commonly found in tropical lowland rainforest	Lower Risk/least concern ver 2.3	BO	NA			
Annonaceae	<i>Polyalthia motleyana</i>		√			Commonly found in the lowland, submontane and montane forest	Lower Risk/least concern ver 2.3	SD	NA			
Apocynaceae	<i>Alyxia reinwardtii</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Aquifoliaceae	<i>Ilex wallichii</i>	Holly	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Araceae	<i>Alocasia cuprea</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Araceae	<i>Arisaema filiforme</i>	Cobra Lilies	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Araceae	<i>Piptospatha bulbidge</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Araliaceae	<i>Arthrophyllum diversifolium</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Araliaceae	<i>Osmoxylon borneense</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Araucariaceae	<i>Agathis borneensis</i>	Borneo Kauri	√			Generally found in lowland to highland tropical rainforest	Endangered A4cd ver 3.1	SD	NA			
Araucariaceae	<i>Agathis dammara</i>	Amboina Pitch Tree	√			Generally found in lowland to highland tropical rainforest	Vulnerable A4cd ver 3.1	SD + PH	NA			
Araucariaceae	<i>Agathis lenticula</i>	Kauri	√			Generally found in lower montane evergreen tropical rainforest (1,050 to 1,700 m)	Vulnerable B1ab(ii,iii,v) + 2 ab(ii,iii,v) ver 3.1	BO	NA			
Araucariaceae	<i>Agathis orbicula</i>	Kauri	√			Generally found in lower altitudes of evergreen tropical rainforest and high kerangas	Endangered B2ab(ii,iii,v) ver 3.1	BO	NA			
Arecaceae (Palmae)	<i>Arenga borneensis</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	II			
Arecaceae (Palmae)	<i>Arenga undulatifolia</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	II			
Arecaceae (Palmae)	<i>Calamus convallium</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Arecaceae (Palmae)	<i>Calamus gonospermus</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Calamus hepburnii</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Calamus pogonacanthus</i>	Rattan Palm	√			Commonly found in lowland and upland areas, often favouring river banks and slightly disturbed sites	Least Concern ver 3.1	BO	NA			
Arecaceae (Palmae)	<i>Calamus scabrifolius</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Calamus tenompokense</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Daemonorops korthalsii</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Daemonorops longistipes</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Pinanga aristata</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Asclepiaceae	<i>Dischidia major</i>	Malayan Urn Vine	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Asclepiaceae	<i>Hoya coriacea</i>	Waxplant	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Asclepiaceae	<i>Hoya finlaysonii</i>	Waxplant	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Bombacaceae	<i>Durio acutifolius</i>	Wild Durian	√			Generally found on poor sandy and clay-rich yellow soils, often in periodically inundated areas in lowland rainforest	Vulnerable A1c ver 2.3	BO	NA			
Burmanniaceae	<i>Burmannia coelestis</i>		√			Commonly found in swampy places, springs, wet fields and sometimes in shallow water and at the edges of pools	Least Concern ver 3.1	IM	NA			
Cardiopteridaceae	<i>Cardiopteris moluccana</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Celastraceae	<i>Celastrus monospermus</i>	Staff Vine	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Celastraceae	<i>Microtropis borneensis</i>		√			Generally found in kerangas and montane forest up to an altitude of 2,400 m	Vulnerable D2 ver 2.3	BO	NA			
Chloranthaceae	<i>Chloranthus erectus</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Commelinaceae	<i>Amischotolype mollissima</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Dilleniaceae	<i>Dillenia borneensis</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Dilleniaceae	<i>Dillenia excelsa</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Dipterocarpaceae	<i>Cotylelobium melanoxydon</i>	Mersawa (Timber)	√			Generally found in mixed dipterocarp forest	Endangered A1cd + 2cd ver 2.3	SD	NA			
Dipterocarpaceae	<i>Dipterocarpus pachyphyllus</i>	Keruing (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	BO	NA			
Dipterocarpaceae	<i>Dipterocarpus validus</i>	Keruing (Timber)	√			Generally found in both primary and secondary forest, especially along rivers and in freshwater swamps	Critically Endangered A1cd + 2cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Dryobalanops lanceolata</i>	Kapur (Timber)	√			Generally found in mixed dipterocarp forest	Endangered A1cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Hopea ferruginea</i>	Giam (Timber)	√			Generally found in mixed dipterocarp forest	Critically Endangered A1c + 2c ver 2.3	SD	NA			
Dipterocarpaceae	<i>Parashorea smythiesii</i>	Gerutu (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	BO	NA			
Dipterocarpaceae	<i>Shorea beccariana</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	BO	NA			
Dipterocarpaceae	<i>Shorea ferruginea</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Shorea gibbosa</i>	Yellow Meranti (Timber)	√			Generally found in lowland rainforest	Critically Endangered A1cd ver 2.3	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Dipterocarpaceae	<i>Shorea hypoleuca</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Critically Endangered A1cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Shorea johorensis</i>	Light Red Meranti (Timber)	√			Generally found in lowland rainforest	Critically Endangered A1cd ver 2.3	SD	NA			
Dipterocarpaceae	<i>Shorea macrophylla</i>	Light Red Meranti (Timber)	√			Generally found in lowland rainforest	Vulnerable A1cd ver 2.3	BO	Yes			
Dipterocarpaceae	<i>Shorea monticola</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Shorea ovata</i>	Dark Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Endangered A1cd ver 2.3	SD	NA			
Dipterocarpaceae	<i>Shorea platyclados</i>	Dark Red Meranti (Timber)	√			Generally found in highland rainforest	Endangered A1cd ver 2.3	SD	NA			
Dipterocarpaceae	<i>Shorea smithiana</i>	Light Red Meranti (Timber)	√			Generally found in lowland rainforest	Critically Endangered A1cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Shorea superba</i>	Balau (Timber)	√			Generally found in mixed dipterocarp forest	Critically Endangered A1cd ver 2.3	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Dipterocarpaceae	<i>Shorea symingtonii</i>	White Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Critically Endangered A1cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Shorea venulosa</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Vatica albiramis</i>		√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Vatica micrantha</i>		√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Vatica umbonata</i>		√			Commonly found by the river banks, but scattered on hillsides up to 1,300 m	Lower Risk/Least Concern ver 2.3	TM + SD	NA			
Elaeocarpaceae	<i>Elaeocarpus pseudopaniculatus</i>		√			Commonly found in primary submontane to montane rainforest	Lower Risk/Conservation Dependent ver 2.3	SD	NA			
Ericaceae	<i>Rhododendron bagononum</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron borneense</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	BO	II			
Ericaceae	<i>Rhododendron burtii</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron crassifolium</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	BO	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Ericaceae	<i>Rhododendron durionifolium</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron javanicum</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron micromalayanum</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron nieuwenhusii</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron orbiculatum</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron yongii</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Vaccinium clementis</i>		√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Vaccinium coriaceum</i>		√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Vaccinium tenerelium</i>		√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Euphorbiaceae	<i>Croton caudatus</i>	Croton	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Euphorbiaceae	<i>Glochidion kerangae</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Euphorbiaceae	<i>Macaranga beccariana</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Fabaceae	<i>Acacia aulacocarpa</i>		√			Commonly found in savannah and monsoon forest up to an altitude of 50 m	Lower Risk/ Near Threatened ver 2.3	Native: AS Introduced: SD	NA			
Fabaceae	<i>Acacia crassicarpa</i>	Red Wattle	√			Commonly found in savannah woodland, monsoon forest and gallery-type forest at altitudes of between 10 and 30 m	Vulnerable A1cd + 2ab cd ver 2.3	Native: AS Introduced: SD	NA			
Fabaceae	<i>Acacia mangium</i>	Black Wattle	√			Commonly found in tropical rainforest	Not Evaluated	Native: AS Introduced: SD	NA			
Fagaceae	<i>Castanopsis acuminatissima</i>	White Oak	√			Commonly found in lower montane forests, lying between 900-1,000 and 2,000 m elevation	Not Evaluated	IM	NA			
Fagaceae	<i>Castanopsis clemensii</i>	Chinquapin	√			Commonly found in montane rainforest	Not Evaluated	IM	NA			
Fagaceae	<i>Castanopsis hypophoenicea</i>	Chinquapin	√			Commonly found in montane rainforest	Not Evaluated	IM	NA			
Fagaceae	<i>Lithocarpus bullatus</i>	Stone Oak	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Lithocarpus elegans</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Lithocarpus ewyckii</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Lithocarpus luteus</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Fagaceae	<i>Lithorcarpus revolutus</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Quercus argentata</i>	Ring-cupped Oak	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Trigonobalanus verticillata</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Gutiferae	<i>Garcinia maingayi</i>		√			Commonly found within lowland to montane forest areas	Lower Risk/Least Concern ver 2.3	SD	Yes			
Hypoxidaceae	<i>Curculigo latifolia</i>	Weevil-wort	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Lamiaceae	<i>Callicarpa maingayi</i>	Beautyberry	√			Commonly found in primary and disturbed hill forests	Lower Risk/Least Concern ver 2.3	SD	NA			
Lamiaceae	<i>Tectona grandis</i>	Teak	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Lecythidaceae	<i>Barringtonia lanceolata</i>		√			Commonly found in tropical rainforest from sea-level to 1,700 m	Not Evaluated	BO	NA			
Moraceae	<i>Artocarpus odoratissimus</i>	Johey Oak	√			Commonly found in tropical rainforest	Not Evaluated	BO	NA			
Nepenthaceae	<i>Nepenthes hirsuta</i>	Hairy Pitcher Plant	√			Commonly found growing in thick peat on sandstone soils along ridgetops at 600-1,000 m alt	Lower Risk/Conservation Dependent ver 2.3	BO	II			
Nepenthaceae	<i>Nepenthes pilosa</i>	Golden-Furred Pitcher Plant	√			Generally found in the ridge top forest at 1,000-1,800 m altitude	Endangered B1 + 2c, D ver 2.3	BO	II		√	

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Nepenthaceae	<i>Nepenthes rajah</i>	Rajah Brooke's Pitcher Plant	√			Generally found in mossy forests, on ridges or landslips (1,500-2,650 m altitude), and is restricted to serpentine soils	Endangered B1 + 2e ver 2.3	BO	I	√		
Nepenthaceae	<i>Nepenthes reinwardtiana</i>	Reinwardt's Pitcher Plant	√			Generally found in lowland peat-swamp forest, high altitude ridges (sandstone or limestone), or more rarely moss forest	Lower Risk/Least Concern ver 2.3	BO	II		√	
Nepenthaceae	<i>Nepenthes stenophylla</i>	Narrow-Leaved Pitcher Plant	√			Generally found in lowland to highland tropical rainforest	Lower Risk/Least Concern ver 2.3	BO	II		√	
Nepenthaceae	<i>Nepenthes tentaculata</i>	Fringed Pitcher Plant	√			Commonly found in mossy forest at 1,200-2,550 m altitude	Lower Risk/Least Concern ver 2.3	BO	II		√	
Nepenthaceae	<i>Nepenthes veitchii</i>	Veitch's Pitcher Plant	√			Commonly found in lowland dipterocarp forest (especially near rivers), and on ridgetops in mossy forest areas (55-1,200 m altitude)	Lower Risk/Near Threatened ver 2.3	BO	II		√	
Oleaceae	<i>Chionanthus pluriflorus</i>		√			Commonly found in mixed dipterocarp forest, often by rivers or in swamps, from sea-level to 1,500 m	Not Evaluated	BO	NA			
Oleaceae	<i>Chionanthus porcatus</i>		√			Commonly found in mixed dipterocarp forest, from sea-level to 650 m	Not Evaluated	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Orchidaceae	<i>Bulbophyllum cernuum</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Bulbophyllum jolandae</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Bulbophyllum malleolabrum</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Bulbophyllum succedaneum</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Coelogyne gibbifera</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Paphiopedilum hookerae</i>	Slipper Orchid	√			Generally found in lowland to highland tropical rainforest	Not Evaluated	BO	I			
Phyllanthaceae	<i>Antidesma neurocarpum</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Phyllanthaceae	<i>Aporosa grandistipula</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Phyllanthaceae	<i>Baccaurea macrocarpa</i>	Tampoi	√			Generally found in lowland to highland tropical rainforest	Not Evaluated	BO	NA			
Picrodendraceae	<i>Austrobuxus nitidus</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Podocarpaceae	<i>Falcatifolium falciforme</i>		√			Commonly found on the mountain ridges	Near Threatened ver 3.1	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Podocarpaceae	<i>Podocarpus brevifolius</i>		√			Commonly found in upper montane to subalpine dwarf forest	Near Threatened ver 3.1	BO	II			
Podocarpaceae	<i>Podocarpus globulus</i>		√			Commonly found in lower to middle montane rainforest on ridges and summits	Endangered B2ab(ii,iii,v) ver 3.1	BO	II			
Rafflesiaceae	<i>Rafflesia</i> sp.	Rafflesia	√			Generally found in lowland evergreen rainforest	Not Evaluated	SD	I			
Rubiaceae	<i>Anthocephalus chinensis</i>	Kadam	√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Salicaceae	<i>Flacourtia rukam</i>	Willow	√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Tetramelaceae	<i>Octomeles sumatrana</i>		√			Generally found in lowland to highland tropical rainforest	Lower Risk/Least Concern ver 2.3	SD	NA			
Thymelaeaceae	<i>Aquilaria malaccensis</i>	Agarwood	√			Generally found in montane rainforest	Vulnerable A1cd ver 2.3	IM	NA		√	
Thymelaeaceae	<i>Gonystylus keithii</i>		√			Generally found in evergreen, non-inundated rainforest	Vulnerable A1cd + 2cd ver 2.3	BO	NA			
Vitaceae	<i>Tetrastigma</i> sp.		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	I			
Zingiberaceae	<i>Globba atrosanguinea</i>		√			Commonly found in primary and secondary evergreen forest	Not Evaluated	SD	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Zingiberaceae	<i>Globba pendula</i>		√			Commonly found in primary and secondary evergreen forest	Least Concern ver 3.1	IM	II			
Zingiberaceae	<i>Globba tricolor</i>		√			Commonly found in primary and secondary evergreen forest	Not Evaluated	SD	II			
Zingiberaceae	<i>Zingiber coloratum</i>	Wild Ginger	√			Commonly found in primary and secondary evergreen forest	Not Evaluated	SD	II			
Zingiberaceae	<i>Zingiber leptostachyum</i>	Wild Ginger	√			Commonly found in primary and secondary evergreen forest	Not Evaluated	SD	II			

Annex B

Stakeholder Consultation

For this Project, initial stakeholder engagement activity was undertaken with a number of local villages within and adjacent to the Concession between the 24th and 26th May 2014. Villagers were asked whether a number of animal species were ever sighted in the area and what the regularity of sightings were. The villages are the same for which social stakeholder engagement was carried out and the locations of these villages is provided in mapping for this work

For this exercise focus was paid on terrestrial mammals and further consultation with regards to arboreal species, birds, flora and other species groups will need to be conducted as part of a more precise and dedicated survey. One village Kampung Pangarwan was consulted in two separate parties with the first consisting of men and the second women and old people. In general men were the main people consulted as they are generally the hunters and enter the forest most often.

The table provided gives ratings for the frequency of sightings as follows:

A – Always
F – Frequently
S – Sometimes
R – Rarely
N – Never

It should also be noted that sightings from hunters at some villages were also often taken at some distance and the exact location of species will need further corroboration as will the species identity as some species in one village may have the same name in Malay as another in a different species.

Table B.1 *Mammal Species records from initial Stakeholder Engagement activities*

Species Name			Location					
Common Name:	Latin Name:	Local Name:	Kampung Pangarwan	Kampung Bamban	Kampung Solop	Kampung Pangarwan (b)	Kampung Kuala Muaya	Kampung Kembawang
Muntjak	<i>Muntiacus sp.</i>	Kijang	N	A	A	N	N	S
Lesser Mouse deer	<i>Tragulus kancil</i>	Pelanduk	N	A	A	N	S	S
Greater Mouse deer	<i>Tragulus napu</i>	Napoh	S	A	A	N	S	S
Bearded Pig	<i>Sus barbatus</i>	Babi hutan	S	A	A	R	S	A
Banteng (wild cattle)	<i>Bos javanicus</i>	Tembadau	N	S	N	N	N	N
Sambar deer	<i>Rusa unicolor</i>	Rusa Jantan	S	A	S	N	S	A
Clouded leopard	<i>Neofelis nebulosa borniensis</i>	Harimau dahan	N	S	S	N	S	S
Leopard cat	<i>Prionailurus bengalensis</i>	Kucing Batu	N	A	A	N	S	A
Marbled cat	<i>Pardofelis marmorata</i>	Kucing dahan	N	A	A	N	S	A
Bay cat	<i>Pardofelis badia</i>	Kucing merah	N	A	A	N	N	A
Flat-headed cat	<i>Prionailurus planiceps</i>	Kucing hutan	N	A	A	R	S	A
Civet	<i>Civet sp.</i>	Musang	S	A	A	R	A	A
Binturong	<i>Arctictis binturong</i>	Musang binturong	S	A	A	N	N	A
		Bambun ekor pendek	N	N	N	N	S	N
Mongoose	<i>Herpestes sp.</i>	pendek	N	N	N	N	S	N
Sun Bear	<i>Helarctos malayanus</i>	Beruang	N	A	S	N	S	S
Malay Badger	<i>Mydaus javanensis</i>	Teledu (kendurau)	A	A	A	N	N	A
Yellow-throated marten	<i>Martes flavigula</i>	Mengkisa (Kakaak Dangan)	S	A	A	Don't know	A	A
Otter	<i>Lutra sp.</i>	Memerang	S	A	A	N	N	A
Pig-tailed Macaque	<i>Macaca nemestrina</i>	Beruk	N	A	A	R (Fruit season)	S	A
Long-tailed Macaque	<i>Macaca fascicularis</i>	Kera	S	A	A	F	A	A
Malayan Pangolin	<i>Manis javanicus</i>	Tenggiling	N	A	N	N	N	N
Porcupine	<i>Hystrix sp.</i>	Landak	S	A	A	F (almost every night)	S	S

Annex C

Ecoregions Species Data

In this Annex species listed from the WWF Ecoregions listings have been provided. This data does not have any information on local status within the ecoregion so it is difficult to accurately predict whether species have the potential to be present within the SFI Concession.

However, the list does provide a high level list of the species that could be present and it also gives an idea of the species that will be more likely to inhabit the Concession.

There are two Ecoregions which cover the Concession, the Bornean Lowland Forest and the Bornean Montane Forest. For the former 99 species were found to be present while for the latter 43 were identified. Some species where their presence is known not to occur were excluded (such as the Chinese Crested Tern).

Species listed include those with a threatened status from going extinct in the wild under the IUCN (VU, Vulnerable; EN, Endangered or Critically Endangered CR).

The data is from the Ecoregions concept is referenced below (*Olson et al, 2001*) along with the reference for the species distribution data. (*WWF, 2006*).

Olson, D. M., E. Dinerstein, E. D. Wikramanayake, N. D. Burgess, G. V. N. Powell, E. C. Underwood, J. A. D'Amico, I. Itoua, H. E. Strand, J. C. Morrison, C. J. Loucks, T. F. Allnutt, T. H. Ricketts, Y. Kura, J. F. Lamoreux, W. W. Wettengel, P. Hedao, and K. R. Kassem. (2001). Terrestrial ecoregions of the world: a new map of life on Earth. *BioScience* 51:933-938.

World Wildlife Fund. (2006). WildFinder: Online database of species distributions, ver. Jan-06. www.worldwildlife.org/WildFinder

Table C.1 *Borneo Lowland Forest Ecoregion Species Data for Threatened and Endemic Species*

Common Name	Latin Name		IUCN Status
False Serotine Bat	Hesperoptenus	doriae	EN
Banteng	Bos	javanicus	EN
Otter Civet	Cynogale	bennettii	EN
Hose's Palm Civet	Diplogale	hosei	VU
*Asiatic Elephant	Elephas	maximus	EN
Malayan Porcupine	Hystrix	brachyura	VU
Pigtail Macaque	Macaca	nemestrina	VU
Hose's Shrew	Suncus	hosei	VU
Clouded Leopard	Neofelis	nebulosa	VU
Sunda Water Shrew	Chimarrogale	phaeura	EN
Flat-headed Cat	Prionailurus	planiceps	EN
Lesser Rane Mouse	Haeromys	pusillus	VU
Small Spiny Rat	Maxomys	baeodon	EN
Marbled Cat	Pardofelis	marmorata	VU
*Orangutan	Pongo	pygmaeus	EN
Coppery Pipistrelle	Arielulus	cuprosus	VU
Cox's Roundleaf Bat	Hipposideros	coxi	VU
Ridley's Roundleaf Bat	Hipposideros	ridleyi	VU
Four-striped Ground Squirrel	Lariscus	hosei	VU
*Proboscis Monkey	Nasalis	larvatus	EN
Bare-backed Rousette	Rousettus	spinalatus	VU
Long-footed Tree Shrew	Tupaia	longipes	EN
Rane Mouse	Haeromys	margarettae	VU
Smooth-coated Otter	Lutrogale	perspicillata	VU
Pinnacle Bubble-nest Frog	Philautus	umbra	VU
*Sumatran Rhinoceros	Dicerorhinus	sumatrensis	CR
Bay Cat	Catopuma	badia	EN
Blue-banded Kingfisher	Alcedo	euryzona	VU
White-winged Duck	Cairina	scutulata	EN
Bonaparte's Nightjar	Caprimulgus	concretus	VU
Short-toed Coucal	Centropus	rectunguis	VU
Silvery Wood-Pigeon	Columba	argentina	CR
Long-billed Blue-Flycatcher	Cyornis	caerulatus	VU
Lesser Adjutant	Leptoptilos	javanicus	VU
Bulwer's Pheasant	Lophura	bulweri	VU
*Crestless Fireback	Lophura	erythrophthalma	VU
Black-browed Babbler	Malacocincla	perspicillata	VU
Black Partridge	Melanoperdix	nigra	VU
Milky Stork	Mycteria	cinerea	VU
Blue-headed Pitta	Pitta	baudii	VU
Fairy Pitta	Pitta	nympha	VU
Bornean Peacock-Pheasant	Polyplectron	schleiermacheri	EN
White-shouldered Ibis	Pseudibis	davisoni	CR
Bornean Wren-Babbler	Ptilocichla	leucogrammica	VU
Straw-headed Bulbul	Pycnonotus	zeylanicus	VU
Wallace's Hawk-Eagle	Spizaetus	nanus	VU
Large Green-Pigeon	Treron	capellei	VU
Gunung Mulu Stream Toad	Ansonia	torrentis	VU
Luidan Stream Toad	Ansonia	platysoma	EN
Mesilau Cave Toad	Ansonia	guibei	EN
North Borneo Stream Toad	Ansonia	fuliginea	VU
Sambas Stream Toad	Ansonia	latidisca	EN
Kalimantan Jungle Toad	Barbourula	kalimantanensis	EN
Sumatra Toad	Bufo	sumatranus	CR
Borneo Narrowmouth Toad	Gastrophrynoides	borneensis	VU
Dotted Grainy Frog	Kalophrynus	punctatus	VU

Common Name	Latin Name		IUCN Status
Sarawak Grainy Frog	Kalophrynus	intermedius	VU
Dring's Borneo Frog	Leptobrachella	brevicrus	VU
Gunung Mulu Borneo Frog	Leptobrachella	parva	VU
Kamborangah Borneo Frog	Leptobrachella	baluensis	VU
Palm Borneo Frog	Leptobrachella	palmata	CR
Serasan Borneo Frog	Leptobrachella	serasanae	VU
Species not found	Leptobrachium	gunungense	VU
Hamid's Asian toad	Leptolalax	hamidi	VU
Painted Slender Litter Frog	Leptolalax	pictus	VU
Species not found	Leptolalax	arayai	VU
Edwardina's Spadefoot Toad	Megophrys	edwardinae	VU
G'nther's Borneo Frog	Meristogenys	jerboa	VU
Mountain Borneo Frog	Meristogenys	amoropalamus	VU
Sabah Rice Frog	Microhyla	maculifera	VU
Black Flathead Toad	Pelophryne	misera	VU
Flathead Toad	Pelophryne	api	EN
G'nther's Flathead Toad	Pelophryne	guentheri	VU
Gunung Mulu Bubble-nest Frog	Philautus	tectus	VU
Inger's Bubble-nest Frog	Philautus	ingeri	VU
Kamboranga Bubble-nest Frog	Philautus	amoenus	VU
Kerangas Bubble-nest Frog	Philautus	kerangae	EN
Malaysian Bubble-nest Frog	Philautus	disgregus	EN
Mendolong Bubble-nest Frog	Philautus	aurantium	EN
Sharp Bubble-nest Frog	Philautus	acutus	VU
Sauer's Bush Frog	Philautus	saueri	VU
Western Lowland Bush Frog	Philautus	refugii	VU
Green Bush Frog	Philautus	bunitus	VU
Banded Flying Frog	Rhacophorus	fasciatus	VU
Kinabalu Flying Frog	Rhacophorus	angulirostris	EN
Asiatic Softshell	Amyda	cartilaginea	VU
Painted Terrapin	Callagur	borneoensis	CR
*Siamese Crocodile	Crocodylus	siamensis	CR
Southeast Asia Box Turtle	Cuora	amboinensis	VU
Spiny Turtle	Heosemys	spinosa	EN
Asian Brown Tortoise	Manouria	emys	EN
Malayan Flatshell Turtle	Notochelys	platynota	VU
Malaysia Giant Turtle	Orlitia	borneensis	EN
Asian Giant Softshell	Pelochelys	bibroni	VU
Black Marsh Turtle	Siebenrockiella	crassicolis	VU
False Gharial	Tomistoma	schlegelii	EN

*Note: Species marked with * are extremely unlikely to be present in the Concession based on site specific data.*

Table C.2 *Borneo Montane Forest Ecoregion Species Data for Threatened and Endemic Species*

Common Name	Latin Name		IUCN Status
Banteng	Bos	javanicus	EN
Bay Cat	Catopuma	badia	EN
Otter Civet	Cynogale	bennettii	EN
Bornean Smooth-tailed Tree Shrew	Dendrogale	melanura	VU
*Sumatran Rhinoceros	Dicerorhinus	sumatrensis	CR
Hose's Palm Civet	Diplogale	hosei	VU
*Asiatic Elephant	Elephas	maximus	EN
Lesser Rane Mouse	Haeromys	pusillus	VU
Ranee Mouse	Haeromys	margarettae	VU
Malayan Porcupine	Hystrix	brachyura	VU
Four-striped Ground Squirrel	Lariscus	hosei	VU
Smooth-coated Otter	Lutrogale	perspicillata	VU
Pigtail Macaque	Macaca	nemestrina	VU
Small Spiny Rat	Maxomys	baeodon	EN
Clouded Leopard	Neofelis	nebulosa	VU
Marbled Cat	Pardofelis	marmorata	VU
*Orangutan	Pongo	pygmaeus	EN
Flat-headed Cat	Prionailurus	planiceps	VU
Bare-backed Rousette	Rousettus	spinalatus	VU
Jentink's Squirrel	Sundasciurus	jentinki	VU
Long-footed Tree Shrew	Tupaia	longipes	EN
Blue-banded Kingfisher	Alcedo	euryzona	VU
Short-toed Coucal	Centropus	rectunguis	VU
Bulwer's Pheasant	Lophura	bulweri	VU
Black Partridge	Melanoperdix	nigra	VU
Fairy Pitta	Pitta	nympha	VU
Bornean Peacock-Pheasant	Polyplectron	schleiermacheri	EN
Mountain Serpent-Eagle	Spilornis	kinabaluensis	VU
Wallace's Hawk-Eagle	Spizaetus	nanus	VU
Large Green-Pigeon	Treron	capellei	VU
Sumatra Toad	Bufo	sumatranus	CR
Dotted Grainy Frog	Kalophrynus	punctatus	VU
Painted Slender Litter Frog	Leptolalax	pictus	VU
Mountain Borneo Frog	Meristogenys	amoropalamus	VU
Black Flathead Toad	Pelophryne	misera	VU
No English Name	Pelophryne	rhophophilus	VU
Western Lowland Bush Frog	Philautus	refugii	VU
Banded Flying Frog	Rhacophorus	fasciatus	VU
Asiatic Softshell	Amyda	cartilaginea	VU
Spiny Turtle	Heosemys	spinosa	EN
Asian Brown Tortoise	Manouria	emys	EN
Malaysia Giant Turtle	Orlitia	borneensis	EN
Black Marsh Turtle	Siebenrockiella	crassicollis	VU

*Note: Species marked with * are extremely unlikely to be present in the Concession based on site specific data.*

Annex A

High Biodiversity Value Species

The following tables present the lists of species for both flora and fauna (ie mammals, birds, amphibians, reptiles, fish and insects) identified in the Concession. The legend presented below is common to all tables.

A.1

LEGEND**Nomenclature**

- **Latin Name** – Nomenclature from most up to date sources of data including IUCN (2012/3) as well as recent publications on species.
- **English Name** – Also known as a common name for a taxon or organism which is generally used within a community, it is often contrasted with the scientific name for the same organism.

1 Presence

- **Observed** – Species directly seen or indirectly recorded from field signs (tracks, droppings, territory markings, skins, feeding remains or other);
- **Potentially Present** – Species not directly or indirectly identified but thought to be potentially present due to suitability of habitat recorded, current range of the species (from literature or records) or both range and habitat suitability together; and
- **Unlikely** – Habitat unsuitable for species and / or species thought to be extinct as no records (from literature) taken recently (within 10 years).

2 Habitat Preference

This describes where possible species habitat preference (based on existing literature) or habitat present where the species was recorded.

3 IUCN Red List

Status of species listed based on level of conservation threat faced nationally and according to IUCN Red List classification system. The IUCN Red list classification system utilises the following categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Lower Risk (LR), Least Concern (LC), Data Deficient (DD), and Not Evaluated (NE).

4 Endemicity

Endemicity is the ecological state of an organism for being unique to a defined geographic location or habitat type. The geographic location is defined as shown in *Table 1*.

Table A.1 **Definition of Geographic Location and Endemism**

Abbrev.	Definition
AS	Australasia region, which includes Australia, New Zealand, New Guinea Island and neighbouring islands in Pacific Ocean
BO	Borneo Island, which includes only Brunei, Sabah, Sarawak and Kalimantan
EA	East Asia region, which includes from Sakhalin to the north, Japan, Korean Peninsula, mainland China, and Taiwan
IC	Indochinese Region, which includes only Cambodia, Laos, Vietnam, Myanmar, Thailand and Southern China
IM	Indomalaya Ecozone, which includes South Asian countries, Southeast Asian countries, Southern China and parts of East Asia
PH	Philippines only
SD	Sundaland, which includes only Borneo, Peninsular Malaysia, Singapore and Indonesia
TM	Thai-Malay Peninsula, which includes only Myanmar, Thailand, Singapore and Peninsular Malaysia

5 *Protected Status*

Legal protection given to the species by the law of Malaysia/ Sabah, with reference to the Wildlife Conservation Enactment (WCE) 1997.

6 *CITES Appendix*

A list of species or population that protected by CITES against over-exploitation through international trade, which reflects the extent of the threat to it and the controls that apply to the trade. The Appendices are divided into 3 lists, namely:

- *Appendix I* – Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances;
- *Appendix II* – Species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival; and
- *Appendix III* – Species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade.

Table A.1 List of Mammal Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Bovidae	<i>Bos javanicus</i>	Banteng		√		Generally avoids evergreen rainforest and is usually within more open dry deciduous forests	Endangered A2cd+3cd+4cd ver 3.1	IC + SD	II			
Cercopithecidae	<i>Macaca fascicularis</i>	Long-tailed Macaque	√			Extremely tolerant of a range of habitats, including mangrove and swamp forests, and can be found in agricultural areas near forest (secondary growth, secondary forest, and primary forest)	Least Concern ver 3.1	TM + SD	II		√	
Cercopithecidae	<i>Macaca nemestrina</i>	Pig-tailed Macaque	√			Commonly found in lowland primary and secondary forest, as well as coastal, swamp and montane forest	Vulnerable A2cd ver 3.1	TM + BO	II		√	
Cercopithecidae	<i>Presbytis hosei</i>	Hose's Langur	√			Occurs in lowland to hill dipterocarp rainforest	Vulnerable A2cd ver 3.1	BO	II		√	
Cercopithecidae	<i>Presbytis rubicunda</i>	Maroon Langur	√			Almost wholly arboreal, prefers primary forest	Least Concern ver 3.1	BO	II		√	
Cervidae	<i>Muntiacus atherodes</i>	Bornean Yellow Muntjac	√			Predominates over the low hill ranges and coastal regions	Least Concern ver 3.1	BO	III		√	
Cervidae	<i>Muntiacus muntjak</i>	Barking Deer	√			Occurs widely in heavily degraded forest and, in areas adjacent to forest, in plantations of coffee, rubber, sugarcane, cassava, coconut, and teak	Least Concern ver 3.1	TM + SD	III		√	
Cervidae	<i>Rusa unicolor</i>	Sambar Deer	√			Occurs in dense evergreen closed-canopy forest, highly	Vulnerable A2cd + 3cd + 4cd ver	IM	III			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						tolerant of forest degradation	3.1					
Cynocephalidae	<i>Cynocephalus variegatus</i>	Sunda Flying Lemur	√			Forest-dependent species, but can be found in secondary habitats close to human populations	Least Concern ver 3.1	TM + SD	II			
Felidae	<i>Neofelis diardi</i>	Sunda Clouded Leopard	√			Occurs in lowland rainforest, a forest-dependent animal and does not go deep into plantations	Vulnerable C1 ver 3.1	BO	I	√		
Felidae	<i>Pardofelis badia</i>	Borneo Bay Cat	√			Forest dependent, with records from hill and lowland forest as well as swamp forest	Endangered C1 ver 3.1	BO	NA		√	
Felidae	<i>Pardofelis marmorata</i>	Marbled Cat	√			Moist and mixed deciduous-evergreen tropical forest, and may prefer hill forest	Vulnerable C1+2a(i) ver 3.1	IM	II	√		
Felidae	<i>Prionailurus bengalensis</i>	Leopard Cat	√			Occurs in a broad spectrum of habitats, from tropical rainforest to temperate broadleaf and, marginally, coniferous forest, as well as shrub forest and successional grasslands	Least Concern ver 3.1	IM	II		√	
Felidae	<i>Prionailurus planiceps</i>	Flat-headed Cat	√			Peat swamp forest, secondary forest, swampy areas, lakes and streams, and riverine forest	Endangered C1 + 2a(i) ver 3.1	BO	NA	√		
Hylobatidae	<i>Hylobates muelleri</i>	Bornean Gibbon	√			Tropical evergreen forests of primary, selectively logged and secondary forest types.	Endangered A2cd ver 3.1	BO	III	√		
Hystriidae	<i>Hystrix brachyura</i>	Malayan Porcupine	√			Can be found in various forest habitats, i.e. in scrubby, open areas close to forest, and	Least Concern ver 3.1	IM	III			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						agricultural areas, but needs to have rocky outcrops or other areas in which it can create a den or dig burrows						
Lorisidae	<i>Nycticebus menagensis</i>	Bornean Slow Loris		√		Occurs in primary and secondary lowland forest, gardens, and plantations	Vulnerable A2cd + 3cd ver 3.1	BO + PH	NA	√		
Manidae	<i>Manis javanica</i>	Malayan Pangolin	√			Found in primary and secondary forest, and is found in cultivated areas including gardens and plantations, including near human settlements.	Endangered A2d + 3d + 4d ver 3.1	IC + SD	II		√	
Muridae	<i>Maxomys baeodon</i>	Small Spiny Rat	√			Terrestrial species living in primary rain forest with preference for microhabitat with a high number of large trees	Data Deficient ver 3.1	BO	NA			
Muridae	<i>Maxomys ochraceiventer</i>	Chestnut-bellied Spiny Rat	√			Restricted to hills occurring in dipterocarp and lower montane forests	Data Deficient ver 3.1	BO	NA			
Mustelidae	<i>Aonyx cinerea</i>	Oriental Small-clawed Otter		√		Wetland systems having pools and stagnant water	Vulnerable A2acd ver 3.1	IM	I		√	
Mustelidae	<i>Lutra sumatrana</i>	Hairy-nosed Otters	√			Inhabits freshwater and coastal areas, especially mangroves and low lying peat swamp forests	Endangered A2cd ver 3.1	TM + SD	II		√	
Mustelidae	<i>Martes flavigula</i>	Yellow-throated Marten	√			Can be found in forests and various other adjacent habitats across a wide altitudinal range, even areas well isolated from old-growth stands	Least Concern ver 3.1	IM	I		√	

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Mustelidae	<i>Mydaus javanensis</i>	Malay Badger	√			Can be found in secondary forests and open grounds such as gardens adjacent to forests	Least Concern ver 3.1	BO	I			
Pteropidae	<i>Pteropus vampyrus</i>	Large Flying fox	√			Occurs in primary, and secondary forest and uses adjacent agricultural areas for feeding	Near Threatened ver 3.1	TM + SD + PH	III		√	
Pteropodidae	<i>Aethalops alecto</i>	Grey Fruit Bat	√			Occurs in hill and montane forests (probably restricted to forest) from 1,000 m up to 2,700 m above sea level	Least Concern ver 3.1	SD	NA			
Pteropodidae	<i>Cynopterus brachyotis</i>	Common Short-nosed Fruit Bat	√			Can be found from habitats ranging from orchards, gardens to forested tracts	Least Concern ver 3.1	IM	NA			
Pteropodidae	<i>Penthetor lucasi</i>	Dusky Fruit Bat	√			Roosts in caves and lives in large colonies with more than 100 individuals within secondary and primary lowland to hill forest	Least Concern ver 3.1	SD	NA			
Sciuridae	<i>Callosciurus baluensis</i>	Kinabalu Squirrel	√			Generally inhabits primary forest, but also occurs in secondary forest and agricultural lands.	Least Concern ver 3.1	BO	NA			
Sciuridae	<i>Callosciurus orestes</i>	Borneo Black-banded Squirrel	√			Restricted to lower montane forest and to upper dipterocarp forest	Least Concern ver 3.1	BO	NA			
Sciuridae	<i>Exilisciurus whiteheadi</i>	Tufted Pygmy Squirrel	√			Generally found in lower sub-montane (up to 3,000 m) forest	Least Concern ver 3.1	BO	NA			
Sciuridae	<i>Pteromyscus</i>	Smoky Flying Squirrel		√		Tree hollows in tall, undisturbed	Endangered	SD	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
	<i>pulverulentus</i>					primary forest.	A2c+A3c+A4c ver 3.1					
Sciuridae	<i>Ratufa affinis</i>	Pale Giant Squirrel	√			Dependent on tall, wet evergreen forests and this species can tolerate plantations and secondary forest	Near Threatened ver 3.1	SD	II		√	
Sciuridae	<i>Rheithrosciurus macrotis</i>	Tufted Ground Squirrel	√			Restricted to primary forest in hilly areas	Vulnerable A4cd ver 3.1	BO	I			
Sciuridae	<i>Sundasciurus jentinki</i>	Jentink's Squirrel	√			Generally found in montane forest	Least Concern ver 3.1	BO	NA			
Soricidae	<i>Chimarrogale phaeura</i>	Bornean Water Shrew		√		Semi-aquatic, can be found in moist habitats in montane forest, and by streams in tropical forests in addition to marshland habitats	Endangered B1ab(iii) ver 3.1	BO	NA			
Suidae	<i>Sus barbatus</i>	Bearded Pig	√			Wide variety of habitat types, ranging from beaches to upper montane cloud forests	Vulnerable A2cd ver 3.1	TM + SD	III			
Tarsiidae	<i>Tarsius bancanus</i>	Horsfield's Tarsier	√			Primary and secondary forest, as well as along the coasts or on the edge of plantations.	Vulnerable A2cd ver 3.1	BO	II		√	
Tragulidae	<i>Tragulus javanicus</i>	Javan Mouse Deer	√			Generally found in lowland/foothill primary and secondary forests	Data Deficient ver 3.1	TM + SD	III			
Tragulidae	<i>Tragulus kanchil</i>	Lesser Mouse Deer	√			Generally found in lowland/foothill primary and secondary forests	Least Concern ver 3.1	TM + SD	III			
Tragulidae	<i>Tragulus napu</i>	Greater Mouse Deer	√			Generally found in lowland/foothill primary and secondary forests	Least Concern ver 3.1	TM + SD	III			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Tupaiaidae	<i>Dendrogale melanura</i>	Bornean Smooth-tailed Treshrew	√			Generally found in submontane and montane pristine forest	Data Deficient ver 3.1	BO	NA		√	
Tupaiaidae	<i>Tupaia gracilis</i>	Slender Treshrew	√			Generally found in lowland old growth forests, secondary forest and in older (>5years) tree plantations	Least Concern ver 3.1	BO	NA		√	
Tupaiaidae	<i>Tupaia minor</i>	Lesser Treeshrew	√			Occurs in both primary and secondary forest	Least Concern ver 3.1	TM + BO	NA		√	
Tupaiaidae	<i>Tupaia montana</i>	Mountain Treeshrew	√			Can be found only in submontane and montane forest, but can tolerate disturbed forest	Least Concern ver 3.1	BO	NA		√	
Ursidae	<i>Helarctos malayanus</i>	Sun Bear	√			Restricted to tropical evergreen rainforest	Vulnerable A2cd + 3cd + 4cd ver 3.1	TM + SD	I	√		
Viverridae	<i>Arctictis binturong</i>	Binturong	√			Generally found in primary and secondary lowland forest	Vulnerable A2cd ver 3.1	IM	II		√	
Viverridae	<i>Arctogalidia trivirgata</i>	Small-toothed Palm Civet	√			Generally found in evergreen and semi-evergreen forest	Least Concern ver 3.1	TM + SD	II			
Viverridae	<i>Cynogale bennettii</i>	Otter Civet	√			Thought to be largely confined to peat swamp forests, though there are recent records from lowland dry forest	Endangered A2ce ver 3.1	SD	II		√	
Viverridae	<i>Hemigalus derbyanus</i>	Banded Palm Civet	√			This species has been recorded from primary lowland rainforest, but also in disturbed habitat, peat swamp forest and acacia plantations as well as elevations up to 1,200 m	Vulnerable A2cd + 3c ver 3.1	TM + SD	II		√	

Table A.2 List of Bird Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Accipitridae	<i>Accipiter gularis</i>	Japanese Sparrowhawk	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Accipitridae	<i>Butastur indicus</i>	Grey-faced Buzzard	√			Commonly found in open land	Least Concern ver 3.1	Native: EA Migrant: SD + PH	NA			
Accipitridae	<i>Haliastur indus</i>	Brahminy Kite	√			Commonly found on the coast and in inland wetlands	Least Concern ver 3.1	IM	II			
Accipitridae	<i>Ichthyophaga humilis</i>	Lessed Fish Eagle	√			Generally found in large forested rivers and wetlands in the lowlands and foothills up to 2,400 m, but usually below 1,000 m	Near Threatened ver 3.1	IM	II		√	
Accipitridae	<i>Ictinaetus malayensis</i>	Black Eagle	√			Commonly found in subtropical or tropical rainforest	Least Concern ver 3.1	IM	II			
Accipitridae	<i>Lophotriorchis kienerii</i>	Rufous-bellied Eagle	√			Commonly found in subtropical or tropical montane rainforest	Least Concern ver 3.1	IM	NA			
Accipitridae	<i>Nisaetus alboniger</i>	Blyth's Hawk-Eagle	√			Generally found in open woodland	Least Concern ver 3.1	SD	NA			
Accipitridae	<i>Pernis ptilorhynchus</i>	Oriental Honey Buzzard	√			Inhabits woodland of various climatic types, preferring broad-leaved forests; it is recorded up to 1,800 m	Least Concern ver 3.1	Native: EA Migrant: SD + PH	II			
Accipitridae	<i>Spilornis cheela</i>	Crested Serpent Eagle	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Aegithinidae	<i>Aegithina viridissima</i>	Green Iora	√			Generally found in mangroves and primary, tall secondary and logged forests, up to 825 m	Near Threatened ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Alcedinidae	<i>Alcedo euryzona</i>	Blue-banded Kingfisher	√			Generally found in subtropical or tropical moist lowland forests, subtropical or tropical mangrove forests, and rivers	Vulnerable A2c+3c+4c ver 3.1	TM + SD	NA			
Alcedinidae	<i>Alcedo meninting</i>	Blue-eared Kingfisher	√			Commonly found in dense evergreen forest	Least Concern ver 3.1	IM	NA			
Alcedinidae	<i>Ceyx rufidorsa</i>	Rufous-backed Kingfisher	√			Commonly found in subtropical or tropical lowland rainforest and streamsides	Least Concern ver 3.1	TM + SD	NA			
Alcedinidae	<i>Lacedo pulchella</i>	Banded Kingfisher	√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Anhingidae	<i>Anhinga melanogaster</i>	Oriental Darter	√			Generally found in shallow inland wetlands including lakes, rivers, swamps and reservoirs	Near Threatened ver 3.1	IM	II			
Apodidae	<i>Aerodramus fuciphagus</i>	Edible-nest Swiftlet	√			Covers a range of habitats from coastal areas to the montane forest, occurring up to 2,800 metres above sea-level	Least Concern ver 3.1	TM + SD + PH	NA			
Apodidae	<i>Collocalia esculenta</i>	Glossy Swiftlet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Apodidae	<i>Rhaphidura leucopygialis</i>	Silver-rumped Spinetail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Ardeidae	<i>Ardea sumatrana</i>	Great-billed Heron	√			Generally found by the coastal such as islands, coral reefs, mangroves, large rivers, found inland in shallow ponds	Least Concern ver 3.1	IM	II			
Bucerotidae	<i>Anorrhinus galeritus</i>	Bushy-crested Hornbill	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	II			
Bucerotidae	<i>Berenicornis comatus</i>	White-crested	√			Commonly found in subtropical	Near	TM + SD	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
		Hornbill				or tropical lowland rainforest	Threatened ver 3.1					
Bucerotidae	<i>Buceros rhinoceros</i>	Rhinoceros Hornbill	√			Generally occurs in extensive areas of primary lowland and hill forest, extending into tall secondary forest and swamp forests, up to 1,400 m	Near Threatened ver 3.1	TM + SD	II		√	
Bucerotidae	<i>Rhinoplax vigil</i>	Helmeted Hornbill	√			Generally found in primary semi-evergreen and evergreen lowland forest	Near Threatened ver 3.1	TM + SD	II	√		
Bucerotidae	<i>Rhyticeros undulatus</i>	Wreathed Hornbill	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Campephagidae	<i>Coracina larvata</i>	Sunda Cuckooshrike	√			Commonly found in subtropical or tropical montane rainforests	Least Concern ver 3.1	SD	NA			
Campephagidae	<i>Hemipus hirundinaceus</i>	Black-winged Flycatcher-shrike	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Campephagidae	<i>Pericrocotus igneus</i>	Fiery Minivet	√			Generally found in broadleaved forest and forest edges, mature secondary growth, dry coastal forest, mangroves and occasionally overgrown plantations and gardens	Near Threatened ver 3.1	TM + SD	NA			
Campephagidae	<i>Pericrocotus solaris</i>	Grey-chinned Minivet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Caprimulgidae	<i>Eurostopodus temminckii</i>	Malaysian Eared Nightjar	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Chloropseidae	<i>Chloropsis cyanopogon</i>	Lesser Green Leafbird	√			Commonly found in canopy and high edge of lowland evergreen forest, including peat-swamp	Near Threatened ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						forest, mature and regenerating secondary forest						
Chloropseidae	<i>Chloropsis kinabaluensis</i>	Bornean Leafbird	√			Commonly found in the canopy and edge of mature or well-regenerated montane moist forest, from 2200 m occasionally to as low as 550 m	Least Concern ver 3.1	BO	NA			
Chloropseidae	<i>Chloropsis sonnerati</i>	Greater Green Leafbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Columbidae	<i>Chalcophaps indica</i>	Emerald Dove	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Columbidae	<i>Ducula badia</i>	Mountain Imperial Pigeon	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Columbidae	<i>Macropygia emiliana</i>	Ruddy Cuckoo-Dove	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Columbidae	<i>Macropygia ruficeps</i>	Little Cuckoo-Dove	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IC + SD	NA			
Columbidae	<i>Treron olax</i>	Little Green Pigeon	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Corvidae	<i>Corvus enca</i>	Slender-billed Crow	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD + PH	NA			
Corvidae	<i>Dendrocitta cinerascens</i>	Bornean Treepie	√			Commonly found in submontane and montane rainforest	Not Evaluated	BO	NA			
Corvidae	<i>Platylophus galericulatus</i>	Crested Jay	√			Generally found in lowland evergreen forest, both primary and tall secondary, up to 1,500 m	Near Threatened ver 3.1	TM + SD	NA			
Corvidae	<i>Platysmurus leucopterus</i>	Black Magpie	√			Generally occurs in dense lowland evergreen forest, swampy woodland, tall secondary forest,	Near Threatened ver 3.1	TM + SD	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						forest edges and mangroves, up to 800 m.						
Cuculidae	<i>Cacomantis merulinus</i>	Plantive Cuckoo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Centropus bengalensis</i>	Lesser Coucal	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Centropus sinensis</i>	Greater Coucal	√			Commonly found in wide range of habitats from forest to cultivation and urban gardens	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Cuculus micropterus</i>	Indian Cuckoo	√			Commonly found in forests and open woodland at up to 3,600 m	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Cuculus saturatus</i>	Himalayan Cuckoo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Cuculidae	<i>Phaenicophaeus chlorophaeus</i>	Raffles Malkoha	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Cuculidae	<i>Phaenicophaeus curvirostris</i>	Chestnut-breasted Malkoha	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD + PH	NA			
Cuculidae	<i>Phaenicophaeus diardi</i>	Black-bellied Malkoha	√			Generally occurs in primary or secondary evergreen forest, swamp forest, bamboo or mangroves to 1,220 m	Near Threatened ver 3.1	TM + SD	NA			
Dicaeidae	<i>Dicaeum everetti</i>	Thick-billed Flowerpecker	√			Generally found in swamp forest, heath forest and secondary forests	Near Threatened ver 3.1	BO	II			
Dicaeidae	<i>Dicaeum monticolum</i>	Bornean Flowerpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Dicaeidae	<i>Dicaeum triognostigma</i>	Orange-bellied Flowerpecker	√			Commonly found in subtropical or tropical lowland rainforests, subtropical or tropical mangrove	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						forests, and subtropical or tropical montane rainforests						
Dicaeidae	<i>Prionochilus xanthopygius</i>	Yellow-rumped Flowerpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Dicruridae	<i>Dicrurus hottentottus</i>	Hair-crested Drongo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Dicruridae	<i>Dicrurus leucophaeus</i>	Ashy Drongo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Dicruridae	<i>Dicrurus paradiseus</i>	Greater Racket-tailed Drongo	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Estrildidae	<i>Lonchura atricapilla</i>	Chestnut Munia	√			Commonly found in open grassland and cultivation	Least Concern ver 3.1	IM	NA			
Estrildidae	<i>Lonchura fuscans</i>	Dusky Munia	√			Commonly found in subtropical or tropical lowland shrubland, forest and grassland habitat	Least Concern ver 3.1	BO	NA			
Eurylaimidae	<i>Calyptomena viridis</i>	Green Broadbill	√			Generally found in the understorey of primary evergreen and mixed dipterocarp forest in the lowlands, principally below 800 m, but occasionally to 1,700 m	Near Threatened ver 3.1	TM + SD	NA			
Eurylaimidae	<i>Calyptomena whiteheadi</i>	Whitehead's Broadbill	√			Commonly found in montane forest	Least Concern ver 3.1	BO	NA			
Eurylaimidae	<i>Eurylaimus javanicus</i>	Banded Broadbill	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Eurylaimidae	<i>Eurylaimus ochromalus</i>	Black-and-Yellow Broadbill	√			Generally found in primary lowland evergreen forest, mixed dipterocarp forest, swamp forest and forest edge, as well as secondary growth and adjacent plantations	Near Threatened ver 3.1	TM + SD	NA			
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon	√			Commonly found along mountain ranges, river valleys and coastlines	Least Concern ver 3.1	SD	II			
Falconidae	<i>Microhierax latifrons</i>	Bornean Falconet	√			Generally occurs in forest-edge habitats and cultivation with scattered trees up to 1,200 m	Near Threatened ver 3.1	BO	II		√	
Hemiprocidae	<i>Hemiprocne comata</i>	Whiskered Treeswiftlet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD + PH	NA			
Irenidae	<i>Irena puella</i>	Asian Fairy-Bluebird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Leiothrichidae	<i>Garrulax treacheri</i>	Chestnut-hooded Laughing Thrush	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Meropidae	<i>Merops viridis</i>	Blue-throated Bee-eater	√			Commonly found in subtropical or tropical mangrove forest	Least Concern ver 3.1	TM + SD + PH	NA			
Meropidae	<i>Nyctyornis amictus</i>	Red-bearded Bee-eater	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Monarchidae	<i>Hypothymis azurea</i>	Black-naped Monarch	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Monarchidae	<i>Terpsiphone paradisi</i>	Asian Paradise Flycatcher	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Muscicapidae	<i>Copsychus malabaricus</i>	White-rumped Shama	√			Commonly found in lowland tropical moist forest, swamp forest, overgrown tree plantations,	Least Concern ver 3.1	IM	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						secondary jungle, mangroves and forest clearings, from sea-level to 1500 m						
Muscicapidae	<i>Copsychus saularis</i>	Oriental Magpie Robin	√			Commonly found in open woodland and cultivated areas close to human habitations	Least Concern ver 3.1	IM	II			
Muscicapidae	<i>Copsychus stricklandii</i>	White-crowned Shama	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	II			
Muscicapidae	<i>Culicicapa ceylonensis</i>	Grey-headed Canary Flycatcher	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Muscicapidae	<i>Cyornis caeruleus</i>	Sunda Blue Flycatcher	√			Generally found in the middle and understoreys of primary, selectively logged and mature secondary dryland rainforest	Vulnerable A2c+3c+4c ver 3.1	BO	II			
Muscicapidae	<i>Cyornis turcosus</i>	Malaysian Blue Flycatcher	√			Generally found in bamboo, swamp and evergreen forest, usually in association with waterways	Near Threatened ver 3.1	TM + SD	NA			
Muscicapidae	<i>Enicurus borneensis</i>	Bornean Forktail	√			Generally found by the streamside habitats in montane primary forest	Not Evaluated	BO	NA			
Muscicapidae	<i>Enicurus leschenaulti</i>	White-crowned Forktail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Muscicapidae	<i>Eumyias indigo</i>	Indigo Flycatcher	√			Commonly found in submontane or montane tropical rain forests between 900m to 3000m	Least Concern ver 3.1	BO	NA			
Muscicapidae	<i>Ficedula narcissina</i>	Narcissus Flycatcher	√			Commonly found in deciduous woodlands	Least Concern ver 3.1	Native: EA Migrant:	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
								SD + PH				
Muscicapidae	<i>Ficedula westermanni</i>	Little Pied Flycatcher	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Muscicapidae	<i>Rhinomyias gularis</i>	Eyebrowed Jungle Flycatcher	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Muscicapidae	<i>Rhipidura perlata</i>	Spotted Fantail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Nectariniidae	<i>Aethopyga mystacalis</i>	Scarlet Sunbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Nectariniidae	<i>Aethopyga siparaja</i>	Crimson Sunbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Nectariniidae	<i>Anthreptes malacensis</i>	Brown-throated Sunbird	√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	TM + SD + PH	NA			
Nectariniidae	<i>Anthreptes rhodolaemus</i>	Red-throated Sunbird	√			Generally occurs in various forest types, including lowland and hill dipterocarp forests, heath forest, peat swamp and secondary forest	Near Threatened ver 3.1	TM + SD	NA			
Nectariniidae	<i>Arachnothera affinis</i>	Streaky-breasted Spiderhunter	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Nectariniidae	<i>Arachnothera juliae</i>	Whitehead's Spiderhunter	√			Commonly found in subtropical or tropical montane rainforest	Least Concern ver 3.1	BO	NA			
Nectariniidae	<i>Arachnothera longirostra</i>	Little Spiderhunter	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Nectariniidae	<i>Hypogramma hypogrammicum</i>	Purple-naped Sunbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Nectariniidae	<i>Nectarinia jugularis</i>	Olive-backed Sunbird	√			Originally from mangrove habitat, but this species has adapted well to humans, and is now common even in fairly densely populated	Least Concern ver 3.1	IM	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						areas						
Oriolidae	<i>Oriolus cruentus</i>	Black-and-Crimson Oriole	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD	NA			
Pachycephalidae	<i>Pachycephala hypoxantha</i>	Bornean Whistler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Passeridae	<i>Passer Montanus</i>	Eurasian Tree Sparrow	√			Commonly found in subtropical or tropical forest	Least Concern ver 3.1	IM	NA			
Phasianidae	<i>Arborophila hyperythra</i>	Red-breasted Partridge	√			Commonly found in subtropical or tropical montane rainforest	Least Concern ver 3.1	BO	II			
Phasianidae	<i>Argusianus argus</i>	Great Argus	√			Generally found in tall, dry, lowland primary, secondary and logged forests, up to 1,300 m, but principally, below 900 m	Near Threatened ver 3.1	TM + SD	II		√	
Phasianidae	<i>Coturnix chinensis</i>	Blue Quail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD + PH	II			
Phasianidae	<i>Haematortyx sanguiniceps</i>	Crimson-headed Partridge	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	II			
Phasianidae	<i>Lophura bulweri</i>	Bulwer's Pheasant	√			Generally found in primary hill and lower montane forest, from c.300 m up to at least 1,500 m, and at least occasionally down to c.150 m	Vulnerable A2cd+3cd+4cd;C2a(i) ver 3.1	BO	II			
Phasianidae	<i>Lophura ignita</i>	Crested Fireback	√			Generally found in lowland forest, rarely occurring up to 1,000 m	Near Threatened ver 3.1	TM + SD	II			√
Phasianidae	<i>Polyplectron schleiermacheri</i>	Bornean Peacock-Pheasant	√			Generally found in lowland plain and lowland dipterocarp forest	Endangered C2a(i) ver 3.1	BO	II		√	
Phasianidae	<i>Rollulus rouloul</i>	Partridge	√			Generally found in broadleaved evergreen and dense primary	Near Threatened	TM + SD	II			√

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						lowland and hill forests and bamboo up to 1,550 m	ver 3.1					
Picidae	<i>Blythipicus rubiginosus</i>	Maroon Woodpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Picidae	<i>Dendrocopos moluccensis</i>	Sunda Woodpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Picidae	<i>Dinopium rafflesii</i>	Olive-backed Woodpecker	√			Generally found in mangroves, lowland forest and hill forest, to 1,200 m	Near Threatened ver 3.1	TM + SD	NA			
Picidae	<i>Meiglyptes tristis</i>	Buff-rumped Woodpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Picidae	<i>Mulleripicus pulverulentus</i>	Great Slaty Woodpecker	√			Generally found in primary semi-open moist deciduous and tropical evergreen old growth, lower elevation forest	Vulnerable A2bc ver 3.1	IM	NA			
Picidae	<i>Picus miniaceus</i>	Banded Woodpecker	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Picidae	<i>Sasia abnormis</i>	Rufous Piculet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pittidae	<i>Erythropitta arquata</i>	Blue-banded Pitta	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	II			
Pittidae	<i>Hydrornis baudii</i>	Blue-headed Pitta	√			Restricted to mature, lowland evergreen forest, usually extending upslope to 600 m, rarely to 1,200 m	Vulnerable A2c+3c+4c ver 3.1	BO	II			
Pittidae	<i>Pitta schwaneri</i>	Bornean Banded Pitta	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Pityriaseidae	<i>Pityriasis gymnocephala</i>	Bornean Bristlehead	√			Generally found in peatswamp forest, primary evergreen forest, logged forest and tall secondary forest up to 1,000 m	Near Threatened ver 3.1	BO	II			
Podargidae	<i>Batrachostomus mixtus</i>	Bornean Frogmouth	√			Generally occurs in lower montane forest at 600-1,675 m and may use secondary habitats	Near Threatened ver 3.1	BO	NA			
Psittacidae	<i>Loriculus galgulus</i>	Blue-crowned Hanging Parrot	√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	TM + SD	II		√	
Psittacidae	<i>Psittinus cyanurus</i>	Blue-rumped parrot	√			Generally found in primary, dry-land evergreen and semi-evergreen lowland forest	Near Threatened ver 3.1	TM + SD	II		√	
Pycnonotidae	<i>Alophoixus ochraceus</i>	Ochraceous Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Criniger phaeocephalus</i>	Yellow-bellied Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Hemixos flava</i>	Ashy Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Pycnonotidae	<i>Ixos malaccensis</i>	Streaked Bulbul	√			Generally occurs in mature broadleaved evergreen forest in lowlands and foothills, occasionally up to 1,200 m	Near Threatened ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Pycnonotus atriceps</i>	Black-headed Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Pycnonotidae	<i>Pycnonotus brunneus</i>	Red-eyed Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Pycnonotus erythrophthalmos</i>	Spectacled Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Pycnonotus flavescens</i>	Pale-faced Bulbul	√			Commonly found in montane	Least Concern	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
	<i>leucops</i>					primary forest, ranging in altitude from about 900 m to 3500 m above sea level	ver 3.1					
Pycnonotidae	<i>Pycnonotus goiavier</i>	Yellow-vented Bulbul	√			Commonly found in a wide variety of open habitats, but not deep forest	Least Concern ver 3.1	TM + SD + PH	NA			
Pycnonotidae	<i>Pycnonotus montis</i>	Bornean Bulbul	√			Commonly found in tropical rainforest and dense scrub	Not Evaluated	BO	NA			
Pycnonotidae	<i>Pycnonotus plumosus</i>	Olive-winged Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Pycnonotus simplex</i>	Cream-vented Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Pycnonotidae	<i>Setornis criniger</i>	Hook-billed Bulbul	√			Generally found in peatswamp forest and lowland evergreen forest	Vulnerable A2c+3c+4c ver 3.1	BO	II			
Pycnonotidae	<i>Tricholestes criniger</i>	Hairy-backed Bulbul	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Ramphastidae	<i>Calorhamphus fuliginosus</i>	Brown Barbet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Ramphastidae	<i>Megalaima australis</i>	Blue-eared Barbet	√			Commonly found in tropical rainforest	Least Concern ver 3.1	IM	NA			
Ramphastidae	<i>Megalaima chrysopogon</i>	Gold-whiskered Barbet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Ramphastidae	<i>Megalaima eximia</i>	Bornean Barbet	√			Commonly found in subtropical or tropical lowland rainforest and and subtropical or tropical montane rainforest	Least Concern ver 3.1	BO	NA			
Ramphastidae	<i>Megalaima henricii</i>	Yellow-crowned Barbet	√			Generally occurs in lowland primary evergreen forests up to	Near Threatened	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						975 m	ver 3.1					
Ramphastidae	<i>Megalaima monticola</i>	Mountain Barbet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Ramphastidae	<i>Megalaima pulcherrima</i>	Golden-naped Barbet	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Rhipiduridae	<i>Rhipidura javanica</i>	Malaysian Pied Fantail	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD	NA			
Strigidae	<i>Strix leptogrammica</i>	Brown Wood Owl	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	II			
Sturnidae	<i>Gracula religiosa</i>	Hill Myna	√			Commonly found in moist or semi-evergreen forest in lowlands, hills and mountains	Least Concern ver 3.1	IM	II		√	
Sylviidae	<i>Orthotomus cuculatus</i>	Mountain Tailorbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Sylviidae	<i>Orthotomus sericeus</i>	Rufous-tailed Tailorbird	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD + PH	NA			
Sylviidae	<i>Phylloscopus trivirgatus</i>	Mountain Leaf Warbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD + PH	NA			
Sylviidae	<i>Seicercus montis</i>	Yellow-breasted Warbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	SD + PH	NA			
Timaliidae	<i>Napothera crassa</i>	Mountain Wren-Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Timaliidae	<i>Alcippe brunneicauda</i>	Brown Fulvetta	√			Generally occurs in broadleaved evergreen forest, mature secondary growth and logged forests, from lowlands up to 1,000 m	Near Threatened ver 3.1	TM + SD	NA			
Timaliidae	<i>Garrulax lugubris</i>	Black Laughing Thrush	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Timaliidae	<i>Garrulax paliiatus</i>	Sunda Laughingthrush	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Timaliidae	<i>Macronous bornensis</i>	Bold-striped Tit-babbler	√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Timaliidae	<i>Malacopteron affine</i>	Sooty-capped Babbler	√			Generally found in the lowlands and foothills, up to 700 m, of primary evergreen forests	Near Threatened ver 3.1	TM + SD	NA			
Timaliidae	<i>Napothera atrigularis</i>	Black-throated Wren-Babbler	√			Generally found on the ground and in the lower storey of broadleaved evergreen forest from lowlands up to 1,500 m	Near Threatened ver 3.1	BO	NA			
Timaliidae	<i>Pomatorhinus montanus</i>	Chestnut-backed Scimitar Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Timaliidae	<i>Ptilocichla leucogrammica</i>	Borneon Wren-Babbler	√			Generally found in lowland, tropical evergreen forest and sometimes peat swamp forest, ascending into the foothills locally to 900 m	Vulnerable A2c+3c+4c ver 3.1	BO	II			
Timaliidae	<i>Stachyris erythroptera</i>	Chestnut-winged Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Timaliidae	<i>Stachyris nigriceps</i>	Grey-throated Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	IM	NA			
Timaliidae	<i>Stachyris poliocephala</i>	Grey-headed Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	NA			
Timaliidae	<i>Trichastoma bicolor</i>	Ferruginous Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	TM + SD	II			
Timaliidae	<i>Trichastoma pyrrogenys</i>	Temminck's Babbler	√			Commonly found in subtropical or tropical lowland rainforest	Least Concern ver 3.1	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Timaliidae	<i>Trichastoma rostratum</i>	White-chested Babbler	√			Generally found near water in lowland evergreen forest and secondary growth, as well as mangroves and peatswamp forest, up to 500 m	Near Threatened ver 3.1	TM + SD	II			
Timaliidae	<i>Yuhina everetti</i>	Chestnut-crested Yuhina	√			Commonly found in submontane and montane rainforest	Least Concern ver 3.1	BO	NA			
Trogonidae	<i>Harpactes whiteheadi</i>	Whitehead's Trogon	√			Restricted to primary hill and montane forest at 900-1,500 m	Near Threatened ver 3.1	BO	NA			
Zosteropidae	<i>Oculocincta squamifrons</i>	Pygmy Ibon	√			Commonly found in submontane and montane forest	Least Concern ver 3.1	BO	NA			
Zosteropidae	<i>Zosterops atricapilla</i>	Black-capped White-Eye	√			Commonly found in montane forest	Least Concern ver 3.1	SD	NA			
Zosteropidae	<i>Zosterops palpebrosus</i>	Oriental White-Eye	√			Commonly found in subtropical or tropical rainforest	Least Concern ver 3.1	IM	NA			

Table A.3 List of Amphibian Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Bufonidae	<i>Ansonia hanitschi</i>	Kinabalu Slender Toad	√			Generally found on the floor of submontane and montane forests	Near Threatened ver 3.1	BO	NA			
Bufonidae	<i>Ansonia leptopus</i>		√			Generally found in subtropical or tropical moist lowland forests and rivers	Near Threatened ver 3.1	BO	NA			
Bufonidae	<i>Ansonia longidigita</i>	Long-fingered Slender Toad	√			Generally found on the floor and herb stratum of rainforests	Near Threatened ver 3.1	BO	NA			
Bufonidae	<i>Bufo asper</i>	Asian Giant Toad	√			Confined to the banks of rainforest streams and rivers throughout its life cycle, and has been recorded only from heavily forested areas	Least Concern ver 3.1	TM + SD	NA			
Bufonidae	<i>Pedostibes hosii</i>		√			Generally found in forest and other dense vegetation along large lowland rivers	Least Concern ver 3.1	TM + SD	NA			
Bufonidae	<i>Pedostibes rugosus</i>	Marbled Tree Toad	√			An arboreal species found in hilly lowland, and submontane, tropical primary moist forest	Near Threatened ver 3.1	BO	NA			
Dicroglossidae	<i>Fejervarya limnocharis</i>	Asian Grass Frog	√			Generally inhabits most open wet habitat types and in closed-canopy forest	Least Concern ver 3.1	IM	NA			
Dicroglossidae	<i>Ingerana baluensis</i>	Inger's Dwarf Frog	√			Generally found on the floor of lowland and mid-elevation primary rainforests	Least Concern ver 3.1	BO	NA			
Dicroglossidae	<i>Limnonectes finchi</i>	Finch's Wart Frog	√			Generally found in the litter	Least Concern	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						stratum of pristine lowland forests, but also in old secondary forest	ver 3.1					
Dicroglossidae	<i>Limnonectes ingeri</i>	Greater Swamp Frog	√			Generally seen along slow-flowing, sandy-bottomed or slightly silty streams in primary or disturbed lowland rainforest	Near Threatened ver 3.1	BO	NA			
Dicroglossidae	<i>Limnonectes kuhlii</i>	Kuhl's Creek Frog	√			Generally found in small, clear streams in evergreen forest in hilly areas	Least Concern ver 3.1	IM	NA			
Dicroglossidae	<i>Limnonectes leporinus</i>	Giant River Frog	√			Generally lives along the banks of small to large, rocky streams in hilly and secondary rainforest	Least Concern ver 3.1	BO	NA			
Dicroglossidae	<i>Limnonectes palavanensis</i>	Smooth Guardian Frog	√			Generally found in undisturbed and disturbed streams and rivers in lower montane and lowland forests	Least Concern ver 3.1	BO + PH	NA			
Dicroglossidae	<i>Occidozyga baluensis</i>	Seep Frog	√			An aquatic species, most often seen in seepage areas in primary lowland rainforest	Near Threatened ver 3.1	BO	NA			
Dicroglossidae	<i>Occidozyga laevis</i>	Yellow Bellied Puddle Frog	√			Generally inhabits shallow muddy puddles and pools near small forest streams	Least Concern ver 3.1	TM + SD	NA			
Megophryidae	<i>Leptobrachium montanum</i>	Montane Litter Frog	√			Generally found in submontane and montane forest	Least Concern ver 3.1	BO	NA			
Megophryidae	<i>Leptolalax arayai</i>	Asian Toad	√			Generally found in submontane and montane forest	Vulnerable B1ab(iii) ver 3.1	BO	NA			
Megophryidae	<i>Leptolalax dringi</i>	Dring's Asian Toad	√			Generally found in closed-canopy forest	Near Threatened ver	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
							3.1					
Megophryidae	<i>Megophrys nasuta</i>	Malayan Horned Frog	√			Generally inhabits in intact lowland and submontane rainforest within the vicinity of forest streams	Least Concern ver 3.1	TM + SD	NA			
Microhylidae	<i>Kalophrynus heterochirus</i>		√			Generally found on the floor litter of closed-canopy montane and lowland forests	Least Concern ver 3.1	BO	NA			
Microhylidae	<i>Metaphrynella sundana</i>	Tree Hole Frog	√			Generally found in lowland primary forest	Least Concern ver 3.1	BO	NA			
Ranidae	<i>Hylarana chalconota</i>	Schlegel's Frog	√			Generally seen on rocks and vegetation along small lowland forest streams	Least Concern ver 3.1	SD	NA			
Ranidae	<i>Hylarana erythraea</i>	Common Green Frog	√			Generally found in vegetated floodplain ponds and is also frequently associated with rice fields	Least Concern ver 3.1	TM + SD	NA			
Ranidae	<i>Hylarana luctuosa</i>	Mahogany Frog	√			Generally found in lowland and submontane primary rainforest	Least Concern ver 3.1	TM + SD	NA			
Ranidae	<i>Hylarana picturata</i>	Spotted Stream Frog	√			Generally occurs in primary and slightly disturbed rainforests	Least Concern ver 3.1	BO	NA			
Ranidae	<i>Hylarana signata</i>	Striped Stream Frog	√			Generally found in the riparian vegetation along stream banks and lowland forests, including swamp and heath forest	Least Concern ver 3.1	TM + SD	NA			
Ranidae	<i>Meristogenys kinabaluensis</i>	Kiau Borneo Frog	√			Can be found only in submontane and montane forests	Near Threatened ver 3.1	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Ranidae	<i>Staurois tuberilinguis</i>	Green-spotted Rock Frog	√			Can be found along the banks of clear, small, rocky streams in primary forests	Near Threatened ver 3.1	BO	NA			
Rhacophoridae	<i>Philautus aurantium</i>	Golden-legged Bush Frog	√			Can be found in primary and selectively logged forests	Endangered B2ab(iii) ver 3.1	BO	NA			
Rhacophoridae	<i>Philautus bunitus</i>	Green Bush Frog	√			Can be found in lowland, submontane and montane forest	Vulnerable B1ab(iii) ver 3.1	BO	NA			
Rhacophoridae	<i>Philautus mjobergi</i>		√			Can be found in subtropical or tropical montane forest	Near Threatened ver 3.1	BO	NA			
Rhacophoridae	<i>Polypedates leucomystax</i>	Four-lined Tree Frog	√			Can be found in subtropical or tropical lowland forest	Least Concern ver 3.1	IM	NA			
Rhacophoridae	<i>Polypedates macrotis</i>	Bongao Tree Frog	√			Generally inhabits primary forest and edge areas	Least Concern ver 3.1	TM + SD	NA			
Rhacophoridae	<i>Polypedates ottilophus</i>	File-eared Tree Frog	√			Generally found in lowland forests, in flat and hilly terrain	Least Concern ver 3.1	BO	NA			
Rhacophoridae	<i>Rhacophorus baluensis</i>	Kinabalu Tree Frog	√			Can be found only in submontane and montane forest	Near Threatened ver 3.1	BO	NA			
Rhacophoridae	<i>Rhacophorus everetti</i>	Mossy Tree Frog	√			Generally inhabits arboreal microhabitats, usually beside water system in lower montane and lowland forests	Near Threatened ver 3.1	BO + PH	NA			
Rhacophoridae	<i>Rhacophorus gauni</i>	Short-nosed Tree Frog	√			Confined to primary and old secondary hilly rainforests	Near Threatened ver 3.1	BO	NA			
Rhacophoridae	<i>Rhacophorus reinwardtii</i>	Black-webbed Tree Frog	√			Generally found in primary and secondary evergreen rainforest	Near Threatened ver 3.1	TM + SD	NA			

Table A.4 List of Reptile Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Agamidae	<i>Draco sp.</i>	Flying Dragons	√			Generally found in primary rainforest and strictly arboreal	Least Concern ver 3.1	TM + SD	NA			
Crocodylidae	<i>Crocodylus porosus</i>	Salt-water Crocodile	√			Inland lakes, swamps and marshes as well as coastal brackish waters and tidal sections of rivers	Lower Risk/ Least Concern ver 2.3	IM	II	√		
Gekkonidae	<i>Gekko smithii</i>	Large Forest gekko	√			Generally found in forest and forested areas	Least Concern ver 3.1	TM + SD	NA			
Gekkonidae	<i>Cyrtodactylus baluensis</i>	Balu Bow-fingered Gecko	√			Generally found in forest and forested areas	Not Evaluated	BO	NA			
Geomydidae	<i>Notochelys platynota</i>	Malayan Flat-shelled Turtle	√			Inhabits freshwater, especially mangroves and low lying peat swamp forests	Vulnerable A1cd + 2cd ver 2.3	TM + SD	NA		√	
Pythonidae	<i>Python curtus</i>	Blood Python	√			Generally found in lowland forest, especially moist areas with soft soils	Least Concern ver 3.1	BO	II		√	
Pythonidae	<i>Python reticulatus</i>	Reticulated Python	√			Generally found rainforests, woodlands, and nearby grasslands associated with rivers	Not Evaluated	IM	II		√	
Scincidae	<i>Eutropis rudis</i>	Rough Mabuya	√			Generally found in forest and forested areas	Not Evaluated	TM + SD	NA			
Scincidae	<i>Eutropis multifasciata</i>	Common Sun Skink	√			Generally found in forest and forested areas	Not Evaluated	IM	NA			
Scincidae	<i>Lamprolepis vyneri</i>	Tree-dwelling Lizard	√			Generally found in forest and forested areas	Not Evaluated	TM + SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Varanidae	<i>Varanus salvator</i>	Common Water Monitor Lizard	✓			Semi-aquatic and opportunistic, inhabits a variety of natural habitats, such as primary forests and mangrove swamps	Least Concern ver 3.1	IM	NA			

Table A.5 List of Fish Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Anabatidae	<i>Anabas testudineus</i>	Climbing Perch	√			Inhabits freshwaters, commonly found in rivers, canals, lakes, ponds, swamps and paddy fields	Data Deficient ver 3.1	IM	NA			
Bagridae	<i>Mystus nemurus</i>	Yellow Catfish	√			Inhabits wide range of habitats, including rivers and streams, lakes, marshlands, and peat swamps	Least Concern ver 3.1	SD	NA			
Cobitidae	<i>Acanthopsis choirorhynchus</i>	Horseface Loach	√			Inhabits wide range of habitats, including rivers and streams, lakes, marshlands, and peat swamps	Not Evaluated	IM	NA			
Cyprinidae	<i>Garra borneensis</i>	Log Suckers	√			Inhabits freshwaters, commonly found in rivers, canals, lakes, ponds, swamps and paddy fields	Not Evaluated	IM	NA			
Cyprinidae	<i>Hampala macrolepidota</i>	Hampala Barb	√			Occurs mainly in clear rivers or streams with running water and sandy to muddy bottoms	Least Concern ver 3.1	TM + SD	NA			
Cyprinidae	<i>Leptobarbus hosii</i>		√			Inhabits freshwaters, this species can be found near or in the deepest part of a body of water	Data Deficient ver 3.1	BO	NA			
Cyprinidae	<i>Nematabramis borneensis</i>		√			Inhabits freshwaters, commonly found in rivers, canals, lakes, ponds, swamps and paddy fields	Not Evaluated	TM + SD	NA			
Cyprinidae	<i>Osteochilus microcephalus</i>	Pla Rong Mai Tub	√			Inhabits lowland freshwater wetlands, as well as canals and artificial habitats	Least Concern ver 3.1	TM + SD	NA			
Cyprinidae	<i>Barbodes sealei</i>		√			Inhabits freshwaters, commonly	Not Evaluated	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						found in rivers and streams						
Cyprinidae	<i>Rasbora borapetensis</i>	Red-tailed Rasbora	√			Inhabits marshlands and shallow standing water bodies (including ponds, ditches, canals and reservoir margins)	Least Concern ver 3.1	TM + SD	NA			
Gastromyzontidae	<i>Gastromyzon borneensis</i>		√			Inhabits freshwaters, commonly found in rivers and streams	Not Evaluated	BO	NA			

Table A.5 List of Insect Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Aeshnidae	<i>Linaeschna polli</i>	(Dragonfly)		√		Recorded from Mt Marapok and the Crocker Range	Data Deficient ver 3.1	BO	NA			
Calopterygidae	<i>Vestalis anacolosia</i>	(Damselfly)	√			Confined to small swift forest streams up to about 800 m	Near Threatened ver 3.1	BO	NA			
Coenagrionidae	<i>Pericnemis triangularis</i>	(Damselfly)	√			This species breeds in phytotelmata (water bodies held by plants) in mixed dipterocarp forest. Occurs in primary forest, and has been recorded in old secondary forest	Vulnerable D2 ver 3.1	BO	NA			
Gomphidae	<i>Leptogomphus pasia</i>	(Dragonfly)		√		Recorded from Mt Kinabalu	Data Deficient ver 3.1	BO	NA			
Libellulidae	<i>Camacinia harterti</i>	(Dragonfly)		√		Recorded from Mt Marapok	Data Deficient ver 3.1		NA			
Megapodagrionidae	<i>Rhinagrion elopuriae</i>	(Damselfly)	√			The species breeds in streams in lowland mixed dipterocarp forest	Near Threatened ver 3.1	BO	NA			
Papilionidae	<i>Trogonoptera brookiana</i>	Rajah Brooke's Birdwing	√			Generally found in tropical rainforest	Not Evaluated	TM + SD	II		√	
Papilionidae	<i>Troides andromache</i>	Borneo Birdwing	√			Generally found in found in rainforest canopy in the mountains of Borneo at an elevation of 1,000 m to 2,900 m	Lower Risk/ Near Threatened ver 2.3	BO	II		√	

Table A.7 List of Flora Species Present or Potentially Present within the Concession

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Acanthaceae	<i>Acanthus ilicifolius</i>	Holly Mangrove	√			Commonly grows on the river banks or tidal canal sides or low swampy areas in the mangrove forests and its vicinity	Least Concern ver 3.1	IM	NA			
Anacardiaceae	<i>Melanochyla beccariana</i>		√			Commonly found in tropical lowland rainforest	Least Concern ver 3.1	BO	NA			
Annonaceae	<i>Goniothalamus ridleyi</i>		√			Commonly found in tropical lowland rainforest	Not Evaluated	SD	NA			
Annonaceae	<i>Goniothalamus tenuifolius</i>		√			Commonly found in tropical lowland rainforest	Lower Risk/least concern ver 2.3	BO	NA			
Annonaceae	<i>Polyalthia motleyana</i>		√			Commonly found in the lowland, submontane and montane forest	Lower Risk/least concern ver 2.3	SD	NA			
Apocynaceae	<i>Alyxia reinwardtii</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Aquifoliaceae	<i>Ilex wallichii</i>	Holly	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Araceae	<i>Alocasia cuprea</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Araceae	<i>Arisaema filiforme</i>	Cobra Lilies	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Araceae	<i>Piptospatha bulbidge</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Araliaceae	<i>Arthrophyllum diversifolium</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Araliaceae	<i>Osmoxylon borneense</i>		√			Commonly found in subtropical or	Not Evaluated	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						tropical lowland rainforest						
Araucariaceae	<i>Agathis borneensis</i>	Borneo Kauri	√			Generally found in lowland to highland tropical rainforest	Endangered A4cd ver 3.1	SD	NA			
Araucariaceae	<i>Agathis dammara</i>	Amboina Pitch Tree	√			Generally found in lowland to highland tropical rainforest	Vulnerable A4cd ver 3.1	SD + PH	NA			
Araucariaceae	<i>Agathis lenticula</i>	Kauri	√			Generally found in lower montane evergreen tropical rainforest (1,050 to 1,700 m)	Vulnerable B1ab(ii,iii,v) + 2 ab(ii,iii,v) ver 3.1	BO	NA			
Araucariaceae	<i>Agathis orbicula</i>	Kauri	√			Generally found in lower altitudes of evergreen tropical rainforest and high kerangas	Endangered B2ab(ii,iii,v) ver 3.1	BO	NA			
Arecaceae (Palmae)	<i>Arenga borneensis</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	II			
Arecaceae (Palmae)	<i>Arenga undulatifolia</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	II			
Arecaceae (Palmae)	<i>Calamus convallium</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Calamus gonospermus</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Calamus hepburnii</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Calamus pogonacanthus</i>	Rattan Palm	√			Commonly found in lowland and upland areas, often favouring river banks and slightly disturbed sites	Least Concern ver 3.1	BO	NA			
Arecaceae (Palmae)	<i>Calamus scabrifolius</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Calamus tenompokense</i>	Rattan Palm	√			Commonly found in subtropical or	Not Evaluated	SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						tropical lowland rainforest						
Arecaceae (Palmae)	<i>Daemonorops korthalsii</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Daemonorops longistipes</i>	Rattan Palm	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Arecaceae (Palmae)	<i>Pinanga aristata</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Asclepiaceae	<i>Dischidia major</i>	Malayan Urn Vine	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Asclepiaceae	<i>Hoya coriacea</i>	Waxplant	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Asclepiaceae	<i>Hoya finlaysonii</i>	Waxplant	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Bombacaceae	<i>Durio acutifolius</i>	Wild Durian	√			Generally found on poor sandy and clay-rich yellow soils, often in periodically inundated areas in lowland rainforest	Vulnerable A1c ver 2.3	BO	NA			
Burmanniaceae	<i>Burmannia coelestis</i>		√			Commonly found in swampy places, springs, wet fields and sometimes in shallow water and at the edges of pools	Least Concern ver 3.1	IM	NA			
Cardiopteridaceae	<i>Cardiopteris moluccana</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Celastraceae	<i>Celastrus monospermus</i>	Staff Vine	√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	IM	NA			
Celastraceae	<i>Microtropis borneensis</i>		√			Generally found in kerangas and montane forest up to an altitude of 2,400 m	Vulnerable D2 ver 2.3	BO	NA			
Chloranthaceae	<i>Chloranthus erectus</i>		√			Commonly found in subtropical or	Not Evaluated	SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						tropical lowland rainforest						
Commelinaceae	<i>Amischotolype mollissima</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Dilleniaceae	<i>Dillenia borneensis</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	BO	NA			
Dilleniaceae	<i>Dillenia excelsa</i>		√			Commonly found in subtropical or tropical lowland rainforest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Cotylelobium melanoxydon</i>	Mersawa (Timber)	√			Generally found in mixed dipterocarp forest	Endangered A1cd + 2cd ver 2.3	SD	NA			
Dipterocarpaceae	<i>Dipterocarpus pachyphyllus</i>	Keruing (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	BO	NA			
Dipterocarpaceae	<i>Dipterocarpus validus</i>	Keruing (Timber)	√			Generally found in both primary and secondary forest, especially along rivers and in freshwater swamps	Critically Endangered A1cd + 2cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Dryobalanops lanceolata</i>	Kapur (Timber)	√			Generally found in mixed dipterocarp forest	Endangered A1cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Hopea ferruginea</i>	Giam (Timber)	√			Generally found in mixed dipterocarp forest	Critically Endangered A1c + 2c ver 2.3	SD	NA			
Dipterocarpaceae	<i>Parashorea smythiesii</i>	Gerutu (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	BO	NA			
Dipterocarpaceae	<i>Shorea beccariana</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	BO	NA			
Dipterocarpaceae	<i>Shorea ferruginea</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Shorea gibbosa</i>	Yellow	√			Generally found in lowland rainforest	Critically	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
		Meranti (Timber)					Endangered A1cd ver 2.3					
Dipterocarpaceae	<i>Shorea hypoleuca</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Critically Endangered A1cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Shorea johorensis</i>	Light Red Meranti (Timber)	√			Generally found in lowland rainforest	Critically Endangered A1cd ver 2.3	SD	NA			
Dipterocarpaceae	<i>Shorea macrophylla</i>	Light Red Meranti (Timber)	√			Generally found in lowland rainforest	Vulnerable A1cd ver 2.3	BO	Yes			
Dipterocarpaceae	<i>Shorea monticola</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Shorea ovata</i>	Dark Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Endangered A1cd ver 2.3	SD	NA			
Dipterocarpaceae	<i>Shorea platyclados</i>	Dark Red Meranti (Timber)	√			Generally found in highland rainforest	Endangered A1cd ver 2.3	SD	NA			
Dipterocarpaceae	<i>Shorea smithiana</i>	Light Red Meranti (Timber)	√			Generally found in lowland rainforest	Critically Endangered A1cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Shorea superba</i>	Balau (Timber)	√			Generally found in mixed dipterocarp forest	Critically Endangered A1cd ver 2.3	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Dipterocarpaceae	<i>Shorea symingtonii</i>	White Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Critically Endangered A1cd ver 2.3	BO	NA			
Dipterocarpaceae	<i>Shorea venulosa</i>	Red Meranti (Timber)	√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Vatica albiramis</i>		√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Vatica micrantha</i>		√			Generally found in mixed dipterocarp forest	Not Evaluated	SD	NA			
Dipterocarpaceae	<i>Vatica umbonata</i>		√			Commonly found by the river banks, but scattered on hillsides up to 1,300 m	Lower Risk/Least Concern ver 2.3	TM + SD	NA			
Elaeocarpaceae	<i>Elaeocarpus pseudopaniculatus</i>		√			Commonly found in primary submontane to montane rainforest	Lower Risk/Conservation Dependent ver 2.3	SD	NA			
Ericaceae	<i>Rhododendron bagononum</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron borneense</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	BO	II			
Ericaceae	<i>Rhododendron burtii</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron crassifolium</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	BO	II			
Ericaceae	<i>Rhododendron durionifolium</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Ericaceae	<i>Rhododendron javanicum</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron micromalayanum</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron nieuwenhuisii</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron orbiculatum</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Rhododendron yongii</i>	Tropical Rhododendron	√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Vaccinium clementis</i>		√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Vaccinium coriaceum</i>		√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Ericaceae	<i>Vaccinium tenerium</i>		√			Commonly found in shaded montane rainforest	Not Evaluated	SD	II			
Euphorbiaceae	<i>Croton caudatus</i>	Croton	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Euphorbiaceae	<i>Glochidion kerangae</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Euphorbiaceae	<i>Macaranga beccariana</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fabaceae	<i>Acacia aulacocarpa</i>		√			Commonly found in savannah and monsoon forest up to an altitude of 50 m	Lower Risk/ Near Threatened ver 2.3	Native: AS Introduced: SD	NA			
Fabaceae	<i>Acacia crassicarpa</i>	Red Wattle	√			Commonly found in savannah woodland, monsoon forest and gallery-type forest at altitudes of between 10 and 30 m	Vulnerable A1cd + 2abcd ver 2.3	Native: AS Introduced: SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Fabaceae	<i>Acacia mangium</i>	Black Wattle	√			Commonly found in tropical rainforest	Not Evaluated	Native: AS Introduced: SD	NA			
Fagaceae	<i>Castanopsis acuminatissima</i>	White Oak	√			Commonly found in lower montane forests, lying between 900-1,000 and 2,000 m elevation	Not Evaluated	IM	NA			
Fagaceae	<i>Castanopsis clemensii</i>	Chinquapin	√			Commonly found in montane rainforest	Not Evaluated	IM	NA			
Fagaceae	<i>Castanopsis hypophoenicea</i>	Chinquapin	√			Commonly found in montane rainforest	Not Evaluated	IM	NA			
Fagaceae	<i>Lithocarpus bullatus</i>	Stone Oak	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Lithocarpus elegans</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Lithocarpus ewyckii</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Lithocarpus luteus</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Lithocarpus revolutus</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Quercus argentata</i>	Ring-cupped Oak	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Fagaceae	<i>Trigonobalanus verticillata</i>		√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Gutiferae	<i>Garcinia maingayi</i>		√			Commonly found within lowland to montane forest areas	Lower Risk/ Least Concern ver 2.3	SD	Yes			
Hypoxidaceae	<i>Curculigo latifolia</i>	Weevil-wort	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Lamiaceae	<i>Callicarpa maingayi</i>	Beautyberry	√			Commonly found in primary and disturbed hill forests	Lower Risk/ Least Concern ver 2.3	SD	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
Lamiaceae	<i>Tectona grandis</i>	Teak	√			Commonly found in tropical rainforest	Not Evaluated	SD	NA			
Lecythidaceae	<i>Barringtonia lanceolata</i>		√			Commonly found in tropical rainforest from sea-level to 1,700 m	Not Evaluated	BO	NA			
Moraceae	<i>Artocarpus odoratissimus</i>	Johey Oak	√			Commonly found in tropical rainforest	Not Evaluated	BO	NA			
Nepenthaceae	<i>Nepenthes hirsuta</i>	Hairy Pitcher Plant	√			Commonly found growing in thick peat on sandstone soils along ridgetops at 600-1,000 m alt	Lower Risk/ Conservation Dependent ver 2.3	BO	II			
Nepenthaceae	<i>Nepenthes pilosa</i>	Golden-Furred Pitcher Plant	√			Generally found in the ridge top forest at 1,000-1,800 m altitude	Endangered B1 + 2c, D ver 2.3	BO	II		√	
Nepenthaceae	<i>Nepenthes rajah</i>	Rajah Brooke's Pitcher Plant	√			Generally found in mossy forests, on ridges or landslips (1,500-2,650 m altitude), and is restricted to serpentine soils	Endangered B1 + 2e ver 2.3	BO	I	√		
Nepenthaceae	<i>Nepenthes reinwardtiana</i>	Reinwardt's Pitcher Plant	√			Generally found in lowland peat-swamp forest, high altitude ridges (sandstone or limestone), or more rarely moss forest	Lower Risk/ Least Concern ver 2.3	BO	II		√	
Nepenthaceae	<i>Nepenthes stenophylla</i>	Narrow-Leaved Pitcher Plant	√			Generally found in lowland to highland tropical rainforest	Lower Risk/ Least Concern ver 2.3	BO	II		√	
Nepenthaceae	<i>Nepenthes tentaculata</i>	Fringed Pitcher Plant	√			Commonly found in mossy forest at 1,200-2,550 m altitude	Lower Risk/ Least Concern ver 2.3	BO	II		√	
Nepenthaceae	<i>Nepenthes veitchii</i>	Veitch's Pitcher Plant	√			Commonly found in lowland dipterocarp forest (especially near rivers), and on ridgetops in mossy	Lower Risk/ Near Threatened ver	BO	II		√	

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						forest areas (55-1,200 m altitude)	2.3					
Oleaceae	<i>Chionanthus pluriflorus</i>		√			Commonly found in mixed dipterocarp forest, often by rivers or in swamps, from sea-level to 1,500 m	Not Evaluated	BO	NA			
Oleaceae	<i>Chionanthus porcatus</i>		√			Commonly found in mixed dipterocarp forest, from sea-level to 650 m	Not Evaluated	BO	NA			
Orchidaceae	<i>Bulbophyllum cernuum</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Bulbophyllum jolandae</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Bulbophyllum malleolabrum</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Bulbophyllum succedaneum</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Coelogyne gibbifera</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	II			
Orchidaceae	<i>Paphiopedilum hookerae</i>	Slipper Orchid	√			Generally found in lowland to highland tropical rainforest	Not Evaluated	BO	I			
Phyllanthaceae	<i>Antidesma neurocarpum</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Phyllanthaceae	<i>Aporosa grandistipula</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Phyllanthaceae	<i>Baccaurea macrocarpa</i>	Tampoi	√			Generally found in lowland to highland tropical rainforest	Not Evaluated	BO	NA			
Picrodendraceae	<i>Austrobuxus nitidus</i>		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Podocarpaceae	<i>Falcatifolium falciforme</i>		√			Commonly found on the mountain ridges	Near Threatened ver	BO	NA			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
							3.1					
Podocarpaceae	<i>Podocarpus brevifolius</i>		√			Commonly found in upper montane to subalpine dwarf forest	Near Threatened ver 3.1	BO	II			
Podocarpaceae	<i>Podocarpus globulus</i>		√			Commonly found in lower to middle montane rainforest on ridges and summits	Endangered B2ab(ii,iii,v) ver 3.1	BO	II			
Rafflesiaceae	<i>Rafflesia</i> sp.	Rafflesia	√			Generally found in lowland evergreen rainforest	Not Evaluated	SD	I			
Rubiaceae	<i>Anthocephalus chinensis</i>	Kadam	√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Salicaceae	<i>Flacourtia rukam</i>	Willow	√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	NA			
Tetramelaceae	<i>Octomeles sumatrana</i>		√			Generally found in lowland to highland tropical rainforest	Lower Risk/ Least Concern ver 2.3	SD	NA			
Thymelaeaceae	<i>Aquilaria malaccensis</i>	Agarwood	√			Generally found in montane rainforest	Vulnerable A1cd ver 2.3	IM	NA		√	
Thymelaeaceae	<i>Gonystylus keithii</i>		√			Generally found in evergreen, non-inundated rainforest	Vulnerable A1cd + 2cd ver 2.3	BO	NA			
Vitaceae	<i>Tetrastigma</i> sp.		√			Generally found in lowland to highland tropical rainforest	Not Evaluated	SD	I			
Zingiberaceae	<i>Globba atrosanguinea</i>		√			Commonly found in primary and secondary evergreen forest	Not Evaluated	SD	II			
Zingiberaceae	<i>Globba pendula</i>		√			Commonly found in primary and secondary evergreen forest	Least Concern ver 3.1	IM	II			
Zingiberaceae	<i>Globba tricolor</i>		√			Commonly found in primary and	Not Evaluated	SD	II			

Family	Latin Name	English name	Presence (1)			Habitat preference (2)	Conservation Status (3)	Endemicity (4)	Protection Status (5)	CITES Appendices (6)		
			Observed	Potentially present	Unlikely		IUCN Red List		Wildlife Conservation Enactment (WCE) 1997	I	II	III
						secondary evergreen forest						
Zingiberaceae	<i>Zingiber coloratum</i>	Wild Ginger	√			Commonly found in primary and secondary evergreen forest	Not Evaluated	SD	II			
Zingiberaceae	<i>Zingiber leptostachyum</i>	Wild Ginger	√			Commonly found in primary and secondary evergreen forest	Not Evaluated	SD	II			

Annex B

Stakeholder Consultation

For this Project, initial stakeholder engagement activity was undertaken with a number of local villages within and adjacent to the Concession between the 24th and 26th May 2014. Villagers were asked whether a number of animal species were ever sighted in the area and what the regularity of sightings were. The villages are the same for which social stakeholder engagement was carried out and the locations of these villages is provided in mapping for this work

For this exercise focus was paid on terrestrial mammals and further consultation with regards to arboreal species, birds, flora and other species groups will need to be conducted as part of a more precise and dedicated survey. One village Kampung Pangarwan was consulted in two separate parties with the first consisting of men and the second women and old people. In general men were the main people consulted as they are generally the hunters and enter the forest most often.

The table provided gives ratings for the frequency of sightings as follows:

A - Always
F - Frequently
S - Sometimes
R - Rarely
N - Never

It should also be noted that sightings from hunters at some villages were also often taken at some distance and the exact location of species will need further corroboration as will the species identity as some species in one village may have the same name in Malay as another in a different species.

Table B.1 Mammal Species records from initial Stakeholder Engagement activities

Species Name			Location					
Common Name:	Latin Name:	Local Name:	Kampung Pangarwan	Kampung Bamban	Kampung Solop	Kampung Pangarwan (b)	Kampung Kuala Muaya	Kampung Kembawang
Muntjak	<i>Muntiacus sp.</i>	Kijang	N	A	A	N	N	S
Lesser Mouse deer	<i>Tragulus kancil</i>	Pelanduk	N	A	A	N	S	S
Greater Mouse deer	<i>Tragulus napu</i>	Napoh	S	A	A	N	S	S
Bearded Pig	<i>Sus barbatus</i>	Babi hutan	S	A	A	R	S	A
Banteng (wild cattle)	<i>Bos javanicus</i>	Tembadau	N	S	N	N	N	N
Sambar deer	<i>Rusa unicolor</i>	Rusa Jantan	S	A	S	N	S	A
Clouded leopard	<i>Neofelis nebulosa borniensis</i>	Harimau dahan	N	S	S	N	S	S
Leopard cat	<i>Prionailurus bengalensis</i>	Kucing Batu	N	A	A	N	S	A
Marbled cat	<i>Pardofelis marmorata</i>	Kucing dahan	N	A	A	N	S	A
Bay cat	<i>Pardofelis badia</i>	Kucing merah	N	A	A	N	N	A
Flat-headed cat	<i>Prionailurus planiceps</i>	Kucing hutan	N	A	A	R	S	A
Civet	<i>Civet sp.</i>	Musang	S	A	A	R	A	A
		Musang						
Binturong	<i>Arctictis binturong</i>	binturong	S	A	A	N	N	A
		Bambun ekor						
Mongoose	<i>Herpestes sp.</i>	pendek	N	N	N	N	S	N
Sun Bear	<i>Helarctos malayanus</i>	Beruang	N	A	S	N	S	S
		Teledu						
Malay Badger	<i>Mydaus javanensis</i>	(kendurau)	A	A	A	N	N	A

Species Name			Location						
Yellow-throated marten	<i>Martes flavigula</i>	Mengkisa (Kakaak Dangan)	S	A	A	Don't know	A	A	
Otter	<i>Lutra sp.</i>	Memerang	S	A	A	N	N	A	
Pig-tailed Macaque	<i>Macaca nemestrina</i>	Beruk	N	A	A	R (Fruit season)	S	A	
Long-tailed Macaque	<i>Macaca fascicularis</i>	Kera	S	A	A	F	A	A	
Malayan Pangolin	<i>Manis javanicus</i>	Tenggiling	N	A	N	N	N	N	
Porcupine	<i>Hystrix sp.</i>	Landak	S	A	A	F (almost every night)	S	S	

Annex C

Ecoregions Species Data

In this Annex species listed from the WWF Ecoregions listings have been provided. This data does not have any information on local status within the ecoregion so it is difficult to accurately predict whether species have the potential to be present within the SFI Concession.

However, the list does provide a high level list of the species that could be present and it also gives an idea of the species that will be more likely to inhabit the Concession.

There are two Ecoregions which cover the Concession, the Bornean Lowland Forest and the Bornean Montane Forest. For the former 99 species were found to be present while for the latter 43 were identified. Some species where their presence is known not to occur were excluded (such as the Chinese Crested Tern).

Species listed include those with a threatened status from going extinct in the wild under the IUCN (VU, Vulnerable; EN, Endangered or Critically Endangered CR).

The data is from the Ecoregions concept is referenced below (*Olson et al, 2001*) along with the reference for the species distribution data. (*WWF, 2006*).

Olson, D. M., E. Dinerstein, E. D. Wikramanayake, N. D. Burgess, G. V. N. Powell, E. C. Underwood, J. A. D'Amico, I. Itoua, H. E. Strand, J. C. Morrison, C. J. Loucks, T. F. Allnutt, T. H. Ricketts, Y. Kura, J. F. Lamoreux, W. W. Wettengel, P. Hedao, and K. R. Kassem. (2001). Terrestrial ecoregions of the world: a new map of life on Earth. *BioScience* 51:933-938.

World Wildlife Fund. (2006). WildFinder: Online database of species distributions, ver. Jan-06. www.worldwildlife.org/WildFinder

Table C.1 *Borneo Lowland Forest Ecoregion Species Data for Threatened and Endemic Species*

Common Name	Latin Name		IUCN Status
False Serotine Bat	Hesperoptenus	doriae	EN
Banteng	Bos	javanicus	EN
Otter Civet	Cynogale	bennettii	EN
Hose's Palm Civet	Diplogale	hosei	VU
*Asiatic Elephant	Elephas	maximus	EN
Malayan Porcupine	Hystrix	brachyura	VU
Pigtail Macaque	Macaca	nemestrina	VU
Hose's Shrew	Suncus	hosei	VU
Clouded Leopard	Neofelis	nebulosa	VU
Sunda Water Shrew	Chimarrogale	phaeura	EN
Flat-headed Cat	Prionailurus	planiceps	VU
Lesser Rane Mouse	Haeromys	pusillus	VU
Small Spiny Rat	Maxomys	baeodon	EN
Marbled Cat	Pardofelis	marmorata	VU
*Orangutan	Pongo	pygmaeus	EN
Coppery Pipistrelle	Arielulus	cuprosus	VU
Cox's Roundleaf Bat	Hipposideros	coxi	VU
Ridley's Roundleaf Bat	Hipposideros	ridleyi	VU
Four-striped Ground Squirrel	Lariscus	hosei	VU
Proboscis Monkey	Nasalis	larvatus	EN
Bare-backed Rousette	Rousettus	spinalatus	VU
Long-footed Tree Shrew	Tupaia	longipes	EN
Rane Mouse	Haeromys	margarettae	VU
Smooth-coated Otter	Lutrogale	perspicillata	VU
Pinnacle Bubble-nest Frog	Philautus	umbra	VU
*Sumatran Rhinoceros	Dicerorhinus	sumatrensis	CR
Bay Cat	Catopuma	badia	EN
Blue-banded Kingfisher	Alcedo	euryzona	VU
White-winged Duck	Cairina	scutulata	EN
Bonaparte's Nightjar	Caprimulgus	concretus	VU
Short-toed Coucal	Centropus	rectunguis	VU
Silvery Wood-Pigeon	Columba	argentina	CR
Long-billed Blue-Flycatcher	Cyornis	caerulatus	VU
Lesser Adjutant	Leptoptilos	javanicus	VU
Bulwer's Pheasant	Lophura	bulweri	VU
*Crestless Fireback	Lophura	erythrophthalma	VU
Black-browed Babbler	Malacocincla	perspicillata	VU
Black Partridge	Melanoperdix	nigra	VU
Milky Stork	Mycteria	cinerea	VU
Blue-headed Pitta	Pitta	baudii	VU
Fairy Pitta	Pitta	nympha	VU
Bornean Peacock-Pheasant	Polyplectron	schleiermacheri	EN
White-shouldered Ibis	Pseudibis	davisoni	CR
Bornean Wren-Babbler	Ptilocichla	leucogrammica	VU
Straw-headed Bulbul	Pycnonotus	zeylanicus	VU
Wallace's Hawk-Eagle	Spizaetus	nanus	VU
Large Green-Pigeon	Treron	capellei	VU
Gunung Mulu Stream Toad	Ansonia	torrentis	VU
Luidan Stream Toad	Ansonia	platysoma	EN
Mesilau Cave Toad	Ansonia	guibei	EN
North Borneo Stream Toad	Ansonia	fuliginea	VU
Sambas Stream Toad	Ansonia	latidisca	EN
Kalimantan Jungle Toad	Barbourula	kalimantanensis	EN
Sumatra Toad	Bufo	sumatranus	CR

Common Name	Latin Name		IUCN Status
Borneo Narrowmouth Toad	Gastrophrynoides	borneensis	VU
Dotted Grainy Frog	Kalophrynus	punctatus	VU
Sarawak Grainy Frog	Kalophrynus	intermedius	VU
Dring's Borneo Frog	Leptobrachella	brevicrus	VU
Gunung Mulu Borneo Frog	Leptobrachella	parva	VU
Kamborangah Borneo Frog	Leptobrachella	baluensis	VU
Palm Borneo Frog	Leptobrachella	palmata	CR
Serasan Borneo Frog	Leptobrachella	serasanae	VU
Species not found	Leptobrachium	gunungense	VU
Hamid's Asian toad	Leptolalax	hamidi	VU
Painted Slender Litter Frog	Leptolalax	pictus	VU
Species not found	Leptolalax	arayai	VU
Edwardina's Spadefoot Toad	Megophrys	edwardinae	VU
G'nther's Borneo Frog	Meristogenys	jerboa	VU
Mountain Borneo Frog	Meristogenys	amoropalamus	VU
Sabah Rice Frog	Microhyla	maculifera	VU
Black Flathead Toad	Pelophryne	misera	VU
Flathead Toad	Pelophryne	api	EN
G'nther's Flathead Toad	Pelophryne	guentheri	VU
Gunung Mulu Bubble-nest Frog	Philautus	tectus	VU
Inger's Bubble-nest Frog	Philautus	ingeri	VU
Kamboranga Bubble-nest Frog	Philautus	amoenus	VU
Kerangas Bubble-nest Frog	Philautus	kerangae	EN
Malaysian Bubble-nest Frog	Philautus	disgregus	EN
Mendolong Bubble-nest Frog	Philautus	aurantium	EN
Sharp Bubble-nest Frog	Philautus	acutus	VU
Sauer's Bush Frog	Philautus	saueri	VU
Western Lowland Bush Frog	Philautus	refugii	VU
Green Bush Frog	Philautus	bunitus	VU
Banded Flying Frog	Rhacophorus	fasciatus	VU
Kinabalu Flying Frog	Rhacophorus	angulirostris	EN
Asiatic Softshell	Amyda	cartilaginea	VU
Painted Terrapin	Callagur	borneoensis	CR
*Siamese Crocodile	Crocodylus	siamensis	CR
Southeast Asia Box Turtle	Cuora	amboinensis	VU
Spiny Turtle	Heosemys	spinosa	EN
Asian Brown Tortoise	Manouria	emys	EN
Malayan Flatshell Turtle	Notochelys	platynota	VU
Malaysia Giant Turtle	Orlitia	borneensis	EN
Asian Giant Softshell	Pelochelys	bibroni	VU
Black Marsh Turtle	Siebenrockiella	crassicolis	VU
False Gharial	Tomistoma	schlegelii	EN

*Note: Species marked with * are extremely unlikely to be present in the Concession based on site specific data.*

Table C.2 *Borneo Montane Forest Ecoregion Species Data for Threatened and Endemic Species*

Common Name	Latin Name		IUCN Status
Banteng	Bos	javanicus	EN
Bay Cat	Catopuma	badia	EN
Otter Civet	Cynogale	bennettii	EN
Bornean Smooth-tailed Tree Shrew	Dendrogale	melanura	VU
*Sumatran Rhinoceros	Dicerorhinus	sumatrensis	CR
Hose's Palm Civet	Diplogale	hosei	VU
*Asiatic Elephant	Elephas	maximus	EN
Lesser Rane Mouse	Haeromys	pusillus	VU
Ranee Mouse	Haeromys	margarettae	VU
Malayan Porcupine	Hystrix	brachyura	VU
Four-striped Ground Squirrel	Lariscus	hosei	VU
Smooth-coated Otter	Lutrogale	perspicillata	VU
Pigtail Macaque	Macaca	nemestrina	VU
Small Spiny Rat	Maxomys	baeodon	EN
Clouded Leopard	Neofelis	nebulosa	VU
Marbled Cat	Pardofelis	marmorata	VU
*Orangutan	Pongo	pygmaeus	EN
Flat-headed Cat	Prionailurus	planiceps	VU
Bare-backed Rousette	Rousettus	spinalatus	VU
Jentink's Squirrel	Sundasciurus	jentinki	VU
Long-footed Tree Shrew	Tupaia	longipes	EN
Blue-banded Kingfisher	Alcedo	euryzona	VU
Short-toed Coucal	Centropus	rectunguis	VU
Bulwer's Pheasant	Lophura	bulweri	VU
Black Partridge	Melanoperdix	nigra	VU
Fairy Pitta	Pitta	nympha	VU
Bornean Peacock-Pheasant	Polyplectron	schleiermacheri	EN
Mountain Serpent-Eagle	Spilornis	kinabaluensis	VU
Wallace's Hawk-Eagle	Spizaetus	nanus	VU
Large Green-Pigeon	Treron	capellei	VU
Sumatra Toad	Bufo	sumatranus	CR
Dotted Grainy Frog	Kalophrynus	punctatus	VU
Painted Slender Litter Frog	Leptolalax	pictus	VU
Mountain Borneo Frog	Meristogenys	amoropalamus	VU
Black Flathead Toad	Pelophryne	misera	VU
No English Name	Pelophryne	rhophophilus	VU
Western Lowland Bush Frog	Philautus	refugii	VU
Banded Flying Frog	Rhacophorus	fasciatus	VU
Asiatic Softshell	Amyda	cartilaginea	VU
Spiny Turtle	Heosemys	spinosa	EN
Asian Brown Tortoise	Manouria	emys	EN
Malaysia Giant Turtle	Orlitia	borneensis	EN
Black Marsh Turtle	Siebenrockiella	crassicollis	VU

*Note: Species marked with * are extremely unlikely to be present in the Concession based on site specific data.*

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