Asrama Raya Sdn Bhd

(ARSB)

Environmental

Monitoring

Report

2024

December 2024

	ASRAMA RAYA SDN BHD
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	ENVIRONMENTAL MONITORING REPORT

1. MONITORING OF VULNERABLE AND STEEP AREAS AND ENCROACHMENT IN THE CONCESSION

Monitoring activities for vulnerable and steep areas within the ARSB HS Petuang concession are carried out through the following approaches:

i. Topographic Mapping

- Satellite imagery and digital topographic maps (**Figure 1 and Figure 2**) are utilized to assess the topography and land conditions of the concession area.
  - Refer Monitoring of Protected Area through Satellite Image File.

- Prior to any harvesting operations, Forest Manager examined the maps to identify sensitive areas, particularly steep slopes exceeding 40 degrees. These areas are strictly avoided for forest road construction and harvesting activities.

- Based on the periodic reviews of satellite images and digital maps, **no unusual land cover changes or patterns** detected which indicate no illegal encroachment or unauthorized land use within the concession area.

ii. Field examination

- ARSB also collaborates with the Terengganu State Forestry Department (TSFD) to carry out field inspections and ground-based observations of vulnerable soil conditions and steep terrain.

- The Forest Manager monitored the construction of forest roads and all harvesting operations (Figure 3).
  - All of the forest operation activities were **not conducted on sensitive or steep slopes of more than 40 degrees and steep areas at elevations greater than 1,000 m above sea level (a.s.l**).
  - All the forest operation activities were conducted and compliance with the Garis Panduan Jalan Hutan 2024 and Guidelines for Reduced Impact Logging in Peninsular Malaysia (Revised 2020) from Forestry Department Peninsular Malaysia (FDPM).
  - Field visits are also detected that is **no signs of encroachment**, such as illegal land clearing, farming, or unauthorized settlements.

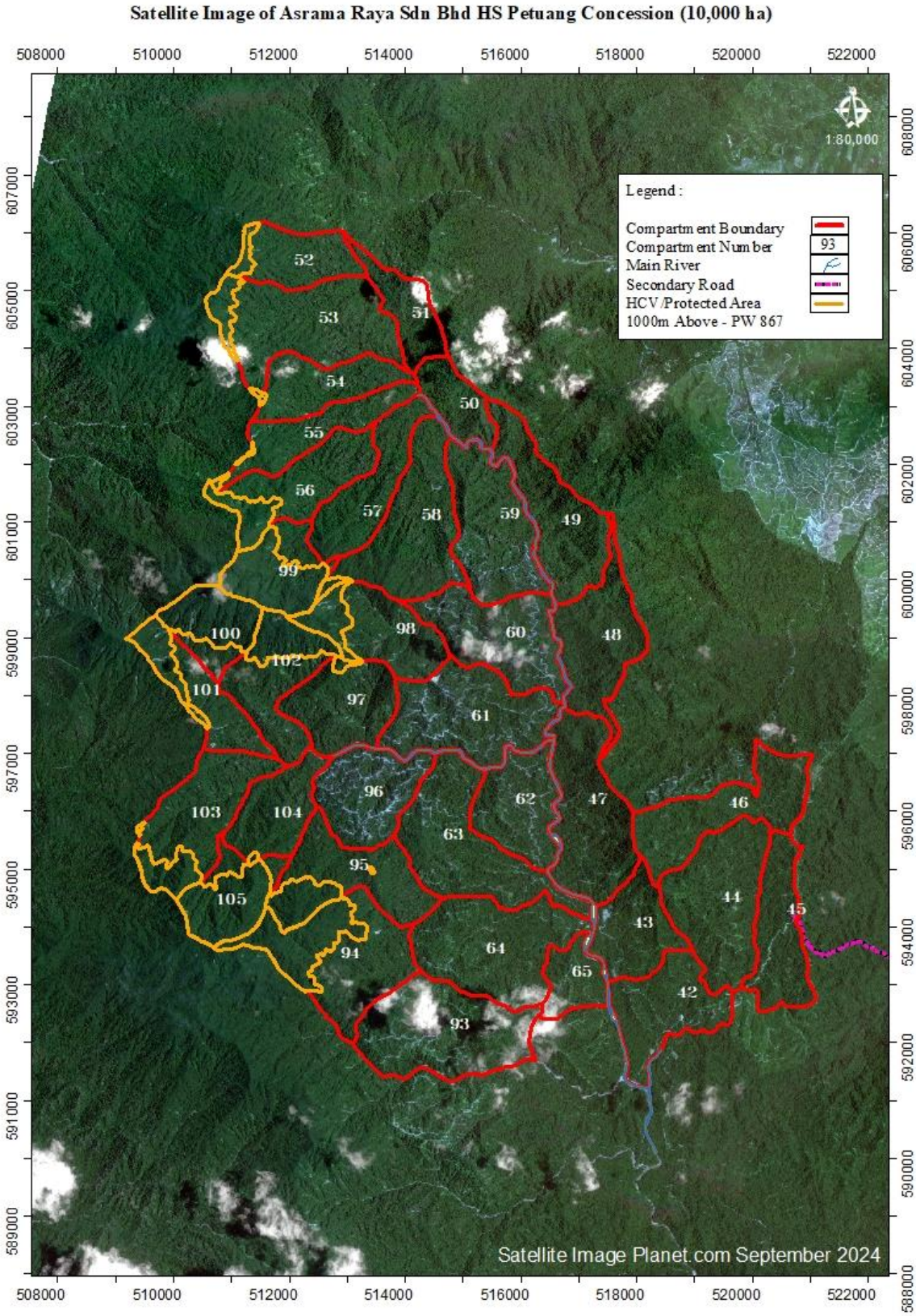

Figure 1. The satellite image of the 10,000 ha of ARSB HS Petuang concession in September 2024. The protected area boundary (orange colour boundary) is mountainous area which is greater than 1,000 m above sea level (a.s.l) covering 1,087.74 ha. *Note: Map is not being to scale.

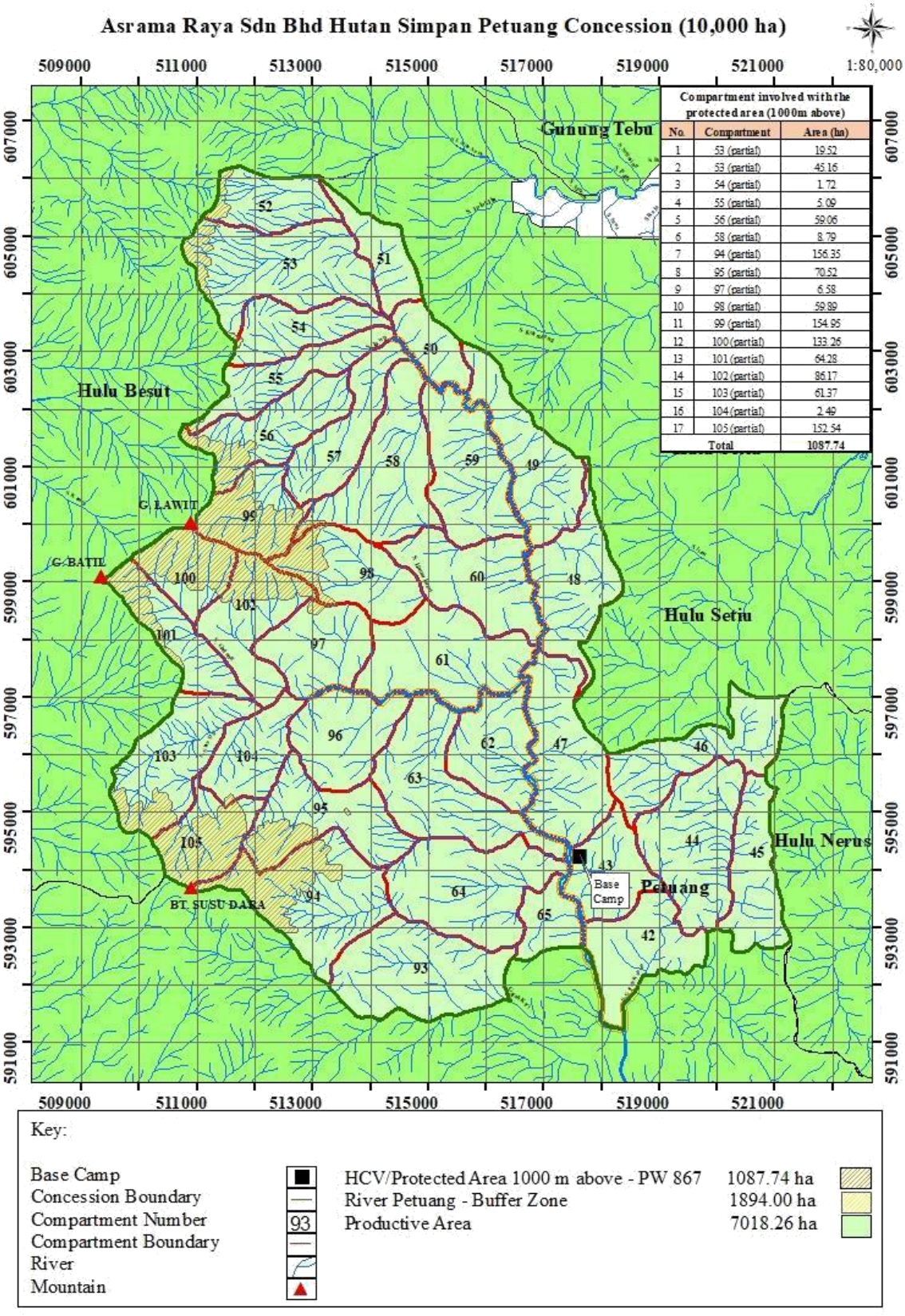

Figure 2. Map of ARSB HS Petuang concession. *Note: Map is not being to scale.

Figure 3. Forest manager is monitoring the forest harvesting activities.

2. LOGGING BASE CAMP AND LOGGING WORKSHOP MONITORING

- Forest manager and forest supervisor monitored the cleanness and conditions of the logging base camp and logging workshop to ensure they are well maintained.

  Observation and monitoring record

  - The logging base camp and logging workshop were clean and well maintained (Figure 4 and 5).
  - All the hazardous substances for forest harvesting operations were handled, stored and disposed based on the standard of procedure (SOP).
  - The conditions and usage of fuel tank and lubricant oil were recorded and under controlled condition.
  - All the wastes and scheduled wastes were taken out from ARSB HS Petuang concession / forest for disposing.

Figure 4. Logging camp of ARSB HS Petuang concession is clean and well maintained.

Figure 5. Notice board and rest areas are provided at logging camp of ARSB HS Petuang concession for forest workers.

3. WATERCOURSE AND WATER QUALITY MONITORING

- Forest manager monitored the buffer zones of watercourse and identified watercourses which needed for protection.
  Observation and monitoring record
  - The trees located along the border of buffer zones are not harvested.
  - The trees located along the are painted with one (1) yellow ring at not more than 10 meter intervals.
- Forest manager and forest supervisor always monitor and ensure all the buffer zones of watercourse are established in accordance with the FDPM standard and Garis Panduan Jalan Hutan 2024.

- ARSB also monitored water quality of river in ARSB HS Petuang concession once per year.
  Observation and monitoring record
  - Most of the rivers in ARSB HS Petuang concession are clean and river shows greenish colours (Figure 6).

Figure 6. River at compartment 62 block B, ARSB HS Petuang concession shows greenish colours.

Water Quality Monitoring Record

In 29 August 2024, water sampling was conducted to determine water quality status at Sg. Petuang, ARSB HS Petuang concession. Water samples were collected at two sections, which are upstream and downstream. Two water sampling stations were selected at compartment 60 block B and another sampling stations at compartment 61 block A and compartment 62B.

Table 1. GPS coordinates of water sampling stations in 2024

Year	Station	Compt.	GPS Coordinates	Stream
2024	S1	C60B	N: 599934, E: 515054	Downstream
	S2	C60B	N: 599519, E: 514929	Upstream
	S3	C61A	N: 597497, E: 515987	Upstream
	S4	C62B	N: 597118, E: 516028	Downstream

In situ measurement was conducted for temperature, pH and dissolved oxygen (DO) and turbidity. Temperature and pH were measured using Horiba LAQUA pH210 pH/ temperature meter, dissolved oxygen (DO) was measured using YSI 550A dissolved oxygen instrument and turbidity was measured using Eutech Tn100 turbidity meter. Water for total suspended solid (TSS), chemical oxygen demand (COD) and ammoniacal-nitrogen (NH_3-N) analysis was collected using plastic bottle. All samples were preserved using ice (<4 °C) before being taken to the laboratory for analysis.

Figure 7. Horiba LAQUA pH210 pH/ temperature meter was used for measuring pH and temperature directly at site.

Figure 8. YSI 550A dissolved oxygen instrument was used for measuring dissolved oxygen directly at site.

Figure 9. Eutech Tn100 turbidity meter was used for measuring turbidity at site.

Water Quality Monitoring Result

Result of water quality parameters (DO, BOD, COD, NH3-N, TSS, pH and turbidity) measured at Petuang river, ARSB HS Petuang concession is shown in Table 2. Dissolved oxygen (DO) measures the amount of oxygen dissolved in the water. It is a vital indicator in supporting aquatic life as aquatic organisms need oxygen to survive in the river. In 2024, the least value was 7.3 mg/L observed at S6, the maximum value was 8.4 mg/L observed at S5. The DO value which is above 7 mg/l showed that the rivers are categorized as healthy river with good water flow (Ibrahim & Kutty, 2013). The DO for all stations was fell within the Class I category of the National Water Quality Standards (NWQS), Malaysia. The water temperature obtained recorded that the minimum value of temperature was 24°C and maximum value was 26°C. The water temperature levels for all stations were within the normal temperature value for river water. Increases of the river temperature also can cause problems to sensitive organisms as the oxygen demand increased which in turn lowered the oxygen saturation and increase the toxicity of river with harmful materials and effect the aquatic life (Chapman,1996). However, the correlation analysis in this water sampling has indicate temperature has no correlation with dissolve oxygen (r = -0.30).

The pH value for all the stations ranged from 6.9 to 8.3 which indicated the water is neutral and fell within Class I category of the NWQS, Malaysia. The pH in the river effect types of organisms can live in the river, water in neutral pH is optimal for most organisms (Murdock et al., 2001).

Biochemical oxygen demand (BOD) measures the amount of oxygen used by microorganisms in decomposing organic matter in the water. The BOD values for most of the stations were 1 mg/L, while BOD recorded at S2 was 2 mg/L. The BOD values in this assessment are fell within Class I category of the National Water Quality Standards (NWQS), Malaysia. Low BOD values indicate that the water is uncontaminated with microbes as when there are low levels of organic waste in the water, there are fewer bacteria present (Giller & Malmqvist, 1998).

Chemical oxygen demand (COD) uses chromate as an oxidizing agent to measures the amount of oxygen required to chemically oxidize the organic material in the water to carbon dioxide. In 2024, the maximum values are 6 mg/L at S5, whereas the COD values for S6, S7, S8 are also 4 mg/L. All the COD values were fell into the class I except COD value recorded at S2 are categorized under class II. This COD values was found to be within recommended level by NWQS, Malaysia. The rapid movement of river water and high organic matter content will affect COD reading. However, dilution of organic substances by the high volume of water will reduce the concentration of COD in river water (Ibrahim & Kutty, 2013).

Total suspended solids (TSS) refer to small solid particles which remain in suspension in water as a colloid or due to the motion of the water. TSS for all stations were 2 mg/L which show that low suspended solid in the river water. TSS for four rivers were categorized under Class I water category of the NWQS, Malaysia.

Ammoniacal nitrogen is a measure for the amount of ammonia in the water which associated with pollution compound of animal and human waste, domestic waste and cleaning agents (Ahmad et al., 2015). Ammoniacal nitrogen level in all rivers was at or below 0.2 mg/L. The ammoniacal nitrogen presented in eight rivers were fell within Class II water category of the

NWQS, Malaysia. At all events, higher NH_3-N values can be toxic to fish, but in small concentrations, it could serve as nutrients for excessive growth of algae (Corwin et al., 1990).

In 2024, the turbidity values of water samples analyzed range from 4.1 to 11 mg/L. All of this turbidity values were fell within Class II water category of the NWQS, Malaysia.The turbidity of the water could be due to the suspended solids or particles from the soil transported through surface run-off from the watershed (Mohd-Asharuddin et al., 2016). Turbidity of water is highly dependent on seasonal variations specially raining season (Yisa & Jimoh, 2010).

Malaysian's water quality index (WQI) formula was used to calculate the subindex six water parameters (DO, BOD, COD, NH3-N, TSS and pH) as shown in Table 2. Based on Malaysian WQI formula, all the four stations showed high water quality index (WQI), ranged from 92 to 95 (Table 2). All these rivers were classified as Class I with status as clean river. Sg. Petuang is classified as very clean and can be used for conservation of natural environment. The rivers are very sensitive for aquatic species and practically no treatment is needed for the water. Water quality index result in this assessment indicated that no differences between WQI of upstream and downstream.

Table 2. Result of water quality parameter measured for eight water sampling stations in ARSB HS Petuang concession (2024).

Year	Sampling point	Compt.	Stream	Temp (°C)	DO (mg/L)	DO (%)	BOD (mg/L)	COD (mg/L)	NH3-N (mg/L)	TSS (NTU)	pH	Turbidity
2024	S5	C60B	Downstream	24	8.4	97.7	1	6	0.2	2	8.3	11
	S6	C60B	Upstream	24	7.3	84.9	1	4	0.2	2	6.9	7.4
	S7	C61A	Upstream	25	7.8	92.3	1	4	0.2	2	6.9	4.1
	S8	C62B	Downstream	25	7.5	88.7	1	4	0.2	2	6.9	6.0

Table 3. Subindex and water quality index (WQI) for eight water sampling stations in 2024.

Year	Sampling point	siDO	siBOD	siCOD	siNH3-N	siTSS	sipH	WQI	Class
2024	S5	100	96	91	80	96	86	93	I
	S6	93	96	94	80	96	100	93	I
	S7	100	96	94	80	96	100	95	I
	S8	96	96	94	80	96	99	94	I

4. PLANT MONITORING

- Forest manager conducted the plants / trees monitoring and make sure all the protected tree species, rare and endangered tree species, mother trees are not harvested.

Permanent Sample Plot (PSP)

ARSB had set up two PSP areas in compartment 42 and compartment 63 in ARSB HS Petuang concession (Figure 11). Each PSP area is about 1 ha. The PSP in compartment 42 was set up in 2020 and the tree diameter was remeasured after three years in 2023. Another new PSP in compartment 63 was set up in 2023. ARSB is expected to set up ten PSPs in the FMU in the coming years.

ARSB set up the PSP with 100 m x 100 m plot size (Figure 12). Those mature trees which were larger than 15 cm diameter were measured in all 20 m x 20 m plot. The small trees, saplings and seedlings were only measured in plot 1, 7, 13, 19 and 25. In these plots, only those seedlings with 0.15 m - 1.5 m height were measured in 2 m x 2 m plot. Small trees with 1.5 m height and less than 5 cm diameter were measured in 5 m x 5 m plot. Those trees with 5 cm –15 cm diameter were measured in 10 m x 10 m plot.

All of the PSP trees were properly tagged with species names and tree diameter (Figure 13). The PSP trees were painted with one (1) red ring and labelled with the numbering and plot number. All of the tree diameter are recorded for analysis. In addition, the dipterocarp and non-dipterocarp composition also are recorded. The data are collected every three years to measure growth rate of the trees and to determine the mean annual increment (MAI).

PSP monitoring record

- The tree DBH and stand volume were recorded and calculated.
- The PSP were monitored annually and the measurement of tree growth will be conducted after 3 years.
- **Refer permanent sample plot (PSP) data for PSP monitoring records.**

Figure 10. PSP setup and tree inventory

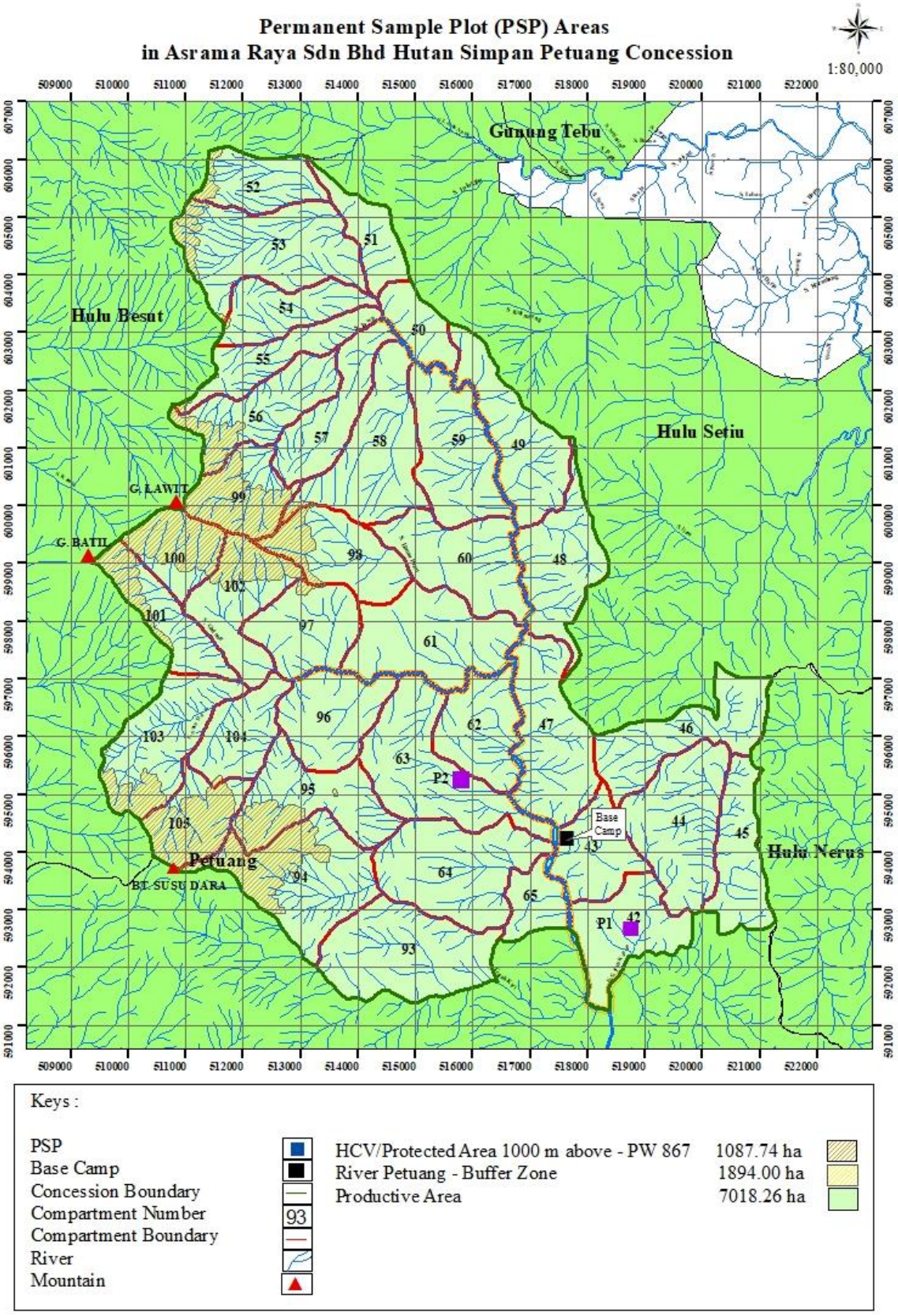

Figure 11. Map of PSP in ARSB HS Petuang concession set up in compartment 42 (2020 and 2023) and compartment 63 (2023). *Note: Map is not being to scale.

Figure 12. Set up plot of PSP with 100 m x 100 m plot size.

5. WILDLIFE MONITORING

- ARSB regular monitor ARSB HS Petuang concession from encroachment, illegal activities and hunting.

- ARSB engaged with local community of Kg. Petuang and TSFD for helping in monitoring ARSB HS Petuang concession from encroachment and hunting.

- ARSB conducted periodic monitoring of wildlife.
  I. Monitored the occurrence of animals through camera trapping.
     - **Refer camera trapping data and results for monitoring results.**

  II. Monitored the occurrence of animals through opportunistic sightings.
     - **Refer opportunistic sightings data for monitoring results.**

Figure 13. Forest supervisor/ 'Kepala Hutan' set up the camera trap by mounting up the camera at the tree.

Table 4. List of wildlife found in ARSB HS Petuang concession based on camera trap result in 2024.

No.	Common name	Species name	IUCN
1	Banded civet	*Hemigalus derbyanus*	Near Threatened
2	Barking deer	*Muntiacus muntjak*	Least Concern
3	Brush-tailed porcupines	*Hystrix macroura*	Least Concern
4	Horse-tailed squirrel	*Sundasciurus hippurus*	Near Threatened
5	Lesser mouse-deer	*Tragulus kanchil*	Least Concern
6	Long-tailed macaque	*Macaca fascicularis*	Least Concern
7	Malayan tapir	*Tapirus indicus*	Endangered
8	Malaysian wood rat	*Rattus tiomanicus*	Least Concern
9	Monitor lizard	*Varanus salvator*	Least Concern
10	Plantain squirrel	*Callosciurus notatus*	Least Concern
11	Rufous-tailed tailorbird	*Orthotomus sericeus*	Least Concern
12	Southern pig-tailed macaque	*Macaca nemestrina*	Vulnerable
13	Sun bear	*Helarctos malayanus*	Vulnerable
14	Wild boar	*Sus scrofa*	Least Concern

- Refer camera trapping data for more details.
- The camera trapping did not record any wildlife habitat and pattern of wildlife distribution or diversity in ARSB HS Petuang concession.

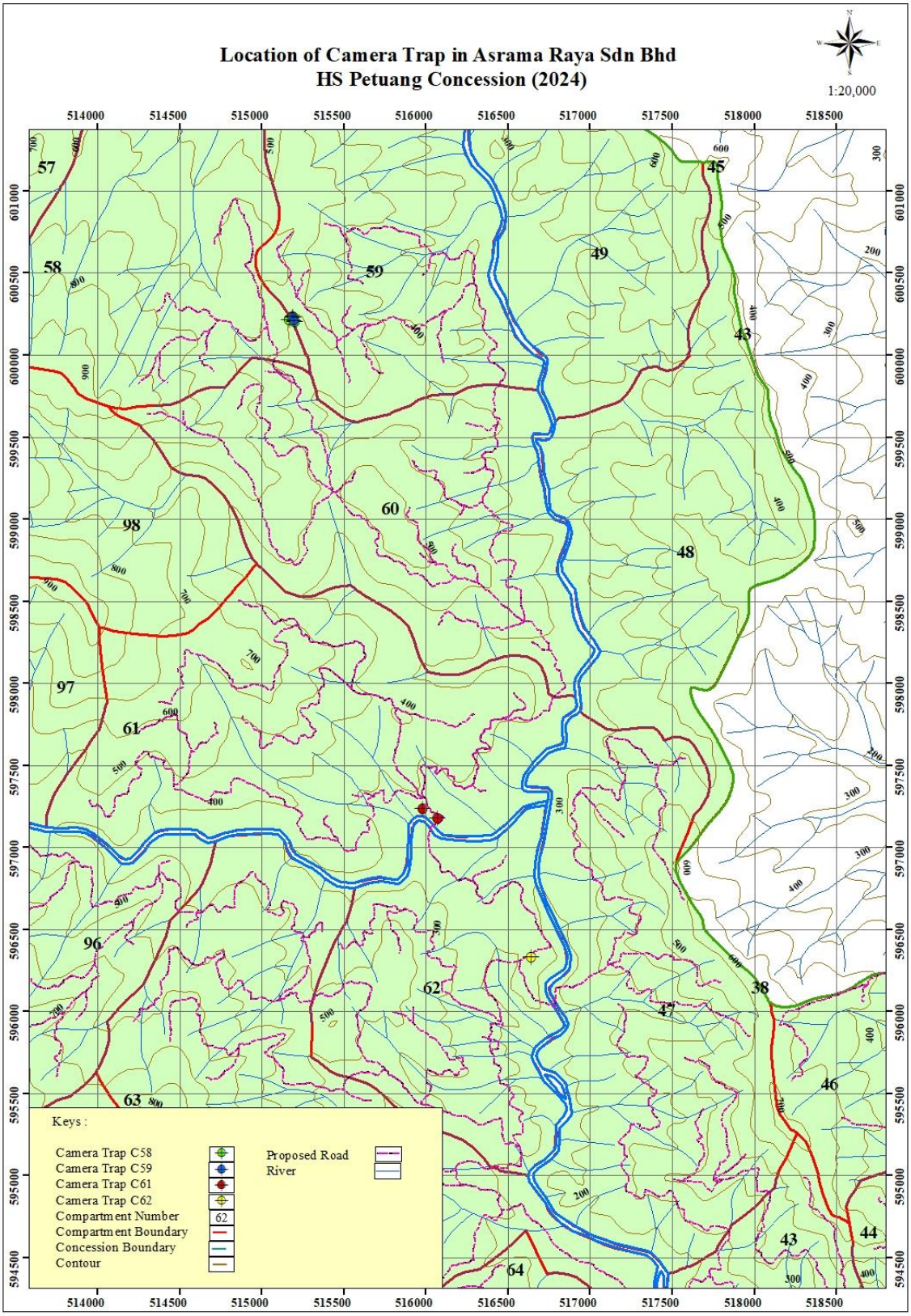

Figure 14. Location of camera traps of ARSB HS Petuang concession in 2024. *Note: Map is not being to scale.

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Appendix 1. Environmental Risk Matrix for 2024

Potential Significant Environment Impacts	Mitigation Measures	Actions taken
Soil erosion and surface runoff	– Erosion is controlled through RIL method. – Logfisher is used for pulling logs from deep ravine to reduce soil damage. – None of the forest operations activities will be conducted at the areas at elevations more than 1,000 m a.s.l.	– Monitored road construction and harvesting activities.
Subsequent sediments pollution in river	– Mark buffer zones along large river and streams to reduce the suspended sediments directly entering the streams.	– Monitored buffer zones and identified watercourses needed for protection on map and field. – Monitored water quality
Increased Access to the Forest Concession by Hunter or Poacher	– Control of access by constructing boom gate – Engage with local community of Kg. Petuang and forest ranger (TSFD) for helping in monitoring of ARSB HS Petuang concession from encroachment and hunting.	– Boom gate constructed at the main entrance of ARSB HS Petuang concession. – Local community report the illegal activity and submit the form 'Borang Pelaporan Pencerobohan atau Aktiviti Haram dalam Konsesi ARSB (Kg. Payong)' to Forest Manager. – Forest worker report the illegal activity case and submit the form 'Borang Pelaporan Pencerobohan atau Aktiviti Haram dalam Konsesi ARSB' to '*Kepala Hutan*'.

Health Problems and Contagious Diseases among Forest Workers and Local Community	– Proper management and maintenance of logging camp, workshop and store.	– Monitored logging camp and waste. – Recorded usage of fuel and lubricants oil. – Recorded collection and disposal of scheduled waste.
Reduction of flora diversity in the forest Changes in Forest Canopy Structure	– Practice selective logging under RIL methods. – Not conduct clear-cutting. – Not harvest seed trees and the protected trees species listed by TFSD.	– Conducted RIL. – Conducted selective cutting tree. – Recorded tree species and PSP data.
Loss of shelter and food supply for animals Changes in animal species composition	– Do not permit any hunting and poaching of wildlife. – Any trees with bird nests would not be disturbed and harvested.	– Monitored wildlife through camera trapping and opportunistic sighting.