PULTEX ENVIRONMENT SDN. BHD.

Proposed Iron Ore Mining Operation on Lot 113017 & Lot 113018 (ML 3/2023), Lot 113019 (ML 1/2023) and Lot 113020 (ML 4/2023), an area of 242.95 Ha, Locality of Bukit Besi, Mukim Jerangau, District of Dungun, Terengganu Darul Iman

EXECUTIVE SUMMARY

PROJECT PROPONENT

Immacal Mining Sdn Bhd (361130-T)
A5-11, Block A, 5th Floor,
Plaza Dwi Tasik, Bandar Sri Permaisuri,
56000 Kuala Lumpur.

Contact Person: Dato' Mahyu Zamizi Bin A. Rahman (Director)

Contact Number: 019-9345199

EIA CONSULTANT

Pultex Environment Sdn. Bhd. (1330403-U)
No 130-M, Jalan Mega Mendung, Jalan Klang Lama,
58200, Kuala Lumpur,
Wilayah Persekutuan Kuala Lumpur.
Contact Person: Prof Datin Dr. Nik Norulaini Nik Ab. Rahman
CEP-C0598 (Lead Consultant)
Dr Taha bin Mohd Omar
(Project Manager)
Contact Number: 03 7972 4516 / 011 2111 7754/ 012 401 5222

PROJECT OVERVIEW

Project Location

Lot 113017 & Lot 113018 (ML 3/2023), Lot 113019 (ML 1/2023) and Lot 113020 (ML 4/2023), an area of 242.95 Ha, Locality of Bukit Besi, Mukim Jerangau, District of Dungun, Terengganu Darul Iman

Mining Lease Duration

5 years
(20th February 2023 – 19th February 2028)

Environmental Sensitive Area

Rank 1

Mining Phase

Lot No.	Phase	Area (Ha)
113017 & 113018	Phase 1	15.15
	Phase 2	19.69
	Phase 3	14.10
113019	Phase 1	40.56
	Phase 2	19.66
113020	Phase 1	28.92
	Phase 2	22.43

Zoning

- Forest Zone within the *Blok Perancangan Kecil (BPK)* 9.2 at Mukim Jerangau based on RTD Dungun 2035 (*Pengubahan*) (Gazette No. 831)
- Besul Forest Reserve degazetted on 8th December 2016

STATEMENT OF NEEDS

Economic Benefit

In Terengganu, the production of iron ore is about 939,197 tonnes from 13 operating mines.

- Royalty 5% of the market value to the State based on Terengganu Mineral Enactment 2002.
- Royalty 10% to Lembaga Tabung Amanah Warisan Negeri Terengganu (LTAWNT)

Socio – Economic Benefit

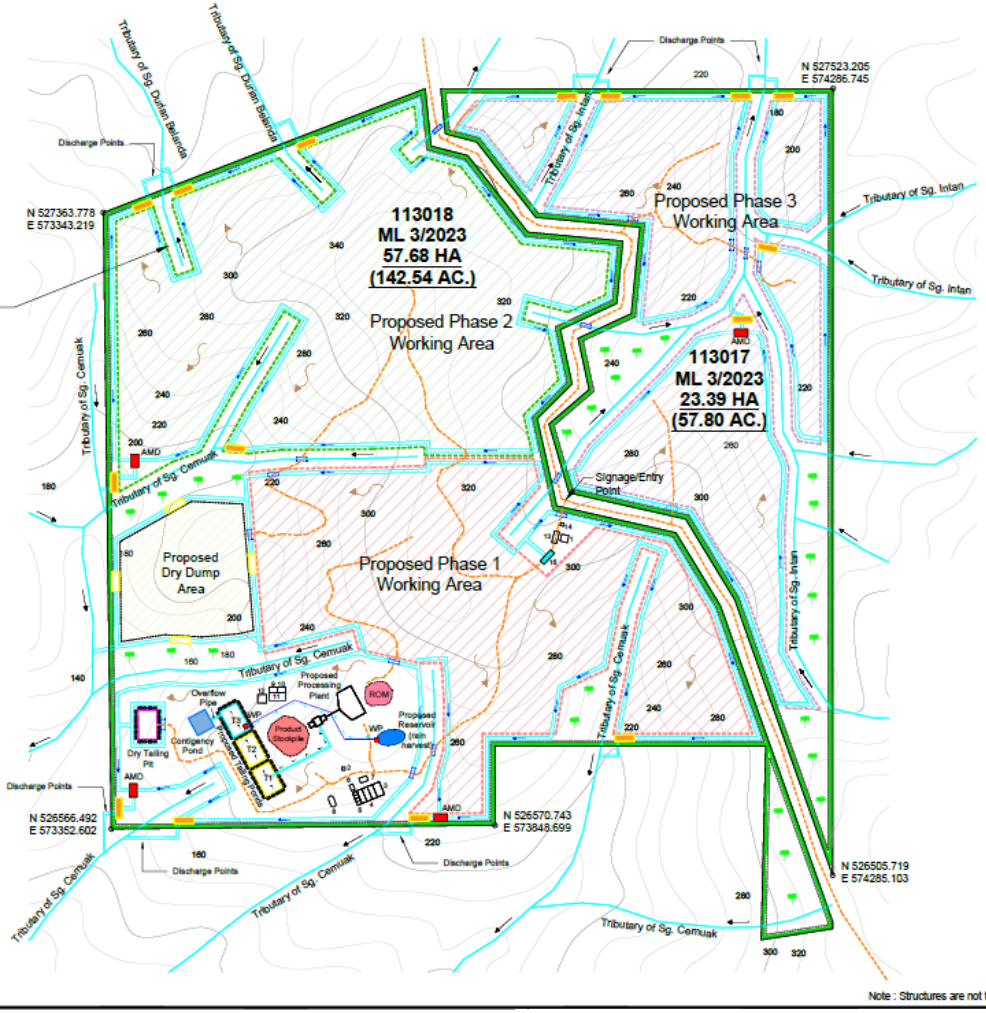
- Employment opportunities for the locals
- Business opportunities for the locals (food business, vehicle repair, land clearing and road construction)

Local Planning Strategy

Thrust 1: Expansion of Mineral Sector of the NMP2

DAERAH : DUNGUN
MUKIM : JERANGAU
SCALE 1:4000
TOPO NO : 4663

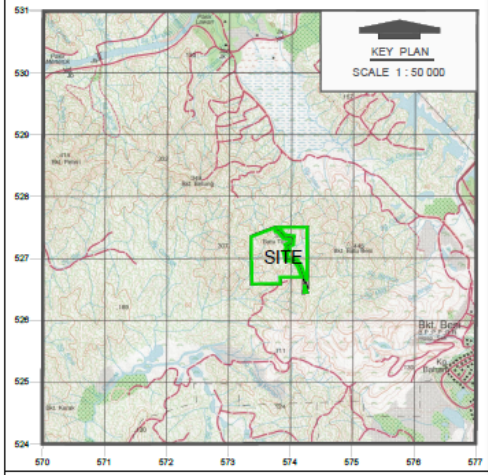
River Buffer Zone (50m each side)



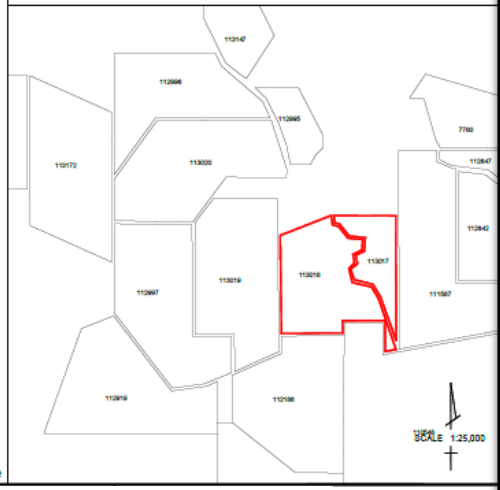
FACILITIES
1. SITE OFFICE
2. GENSET
3. CANTEEN
4. KONGSI
5. TOILET/SHOWER
6. SEPTIC TANK
7. DOMESTIC WASTE PIT
8. SKID TANK
9. NEW OIL
10. USED OIL
11. WORKSHOP
12. STORE EQUIPMENT
13. PROPOSED WEIGHBRIDGE
14. PROPOSED GUARD HOUSE
15. PROPOSED WASHTROUGH

Note : Structures are not to scale

Key Plan



Location Plan



Legend

- MINING LEASE AREA
- PROPOSED PHASE 1 WORKING AREA
- PROPOSED PHASE 2 WORKING AREA
- PROPOSED PHASE 3 WORKING AREA
- PROPOSED DRY DUMP AREA
- PROPOSED STOCKPILE
- PROPOSED TAILING POND AREA
- SEDIMENT BASIN (SB)
- PROPOSED SEDIMENT CONTROL/ SILT TRAP AREA
- PROPOSED INFRASTRUCTURE
- PROPOSED DRY TAILING PIT
- PROPOSED POND/RESERVOIR (RAIN HARVEST)
- PROPOSED HAULAGE ROAD
- OVERLAND FLOW
- RIVER/ STREAM
- PROPOSED DRAIN
- DRAIN WATER FLOW
- PROPOSED CULVERT
- PROPOSED PIPE
- CONTOUR LINE
- UNDISTURBED AREA
- PROPOSED AMD (ACID MINE DRAINAGE)
- BOUNDARY BUFFER (50M)

KEY, LOCATION AND SITE PLAN (LOT 113017 & LOT 113018)

PULTEX ENVIRONMENT SDN. BHD
30-M, Jalan Mega Mendung
58200 W.P. Kuala Lumpur
Tel: 603-79724516 / 6012-4100788
Email: pultexenviron@gmail.com

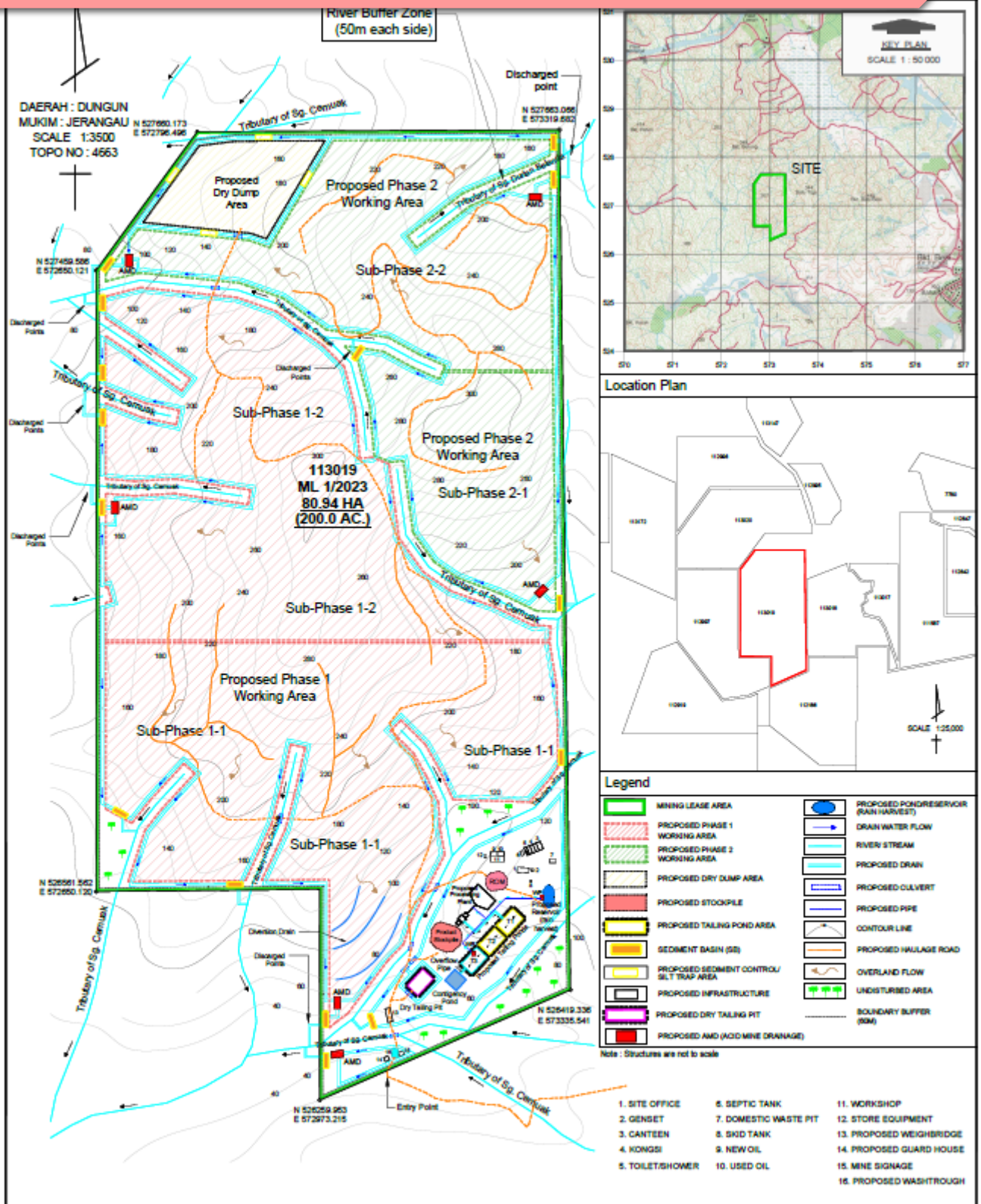
AREA APPLIED FOR ENVIRONMENTAL IMPACT ASSESSMENT ON LAND MEASURING 81.07 HA (200.34 AC.)

PULTEX ENVIRONMENT SDN BHD

PREPARED BY	:	AMIRUL HAKIMI
CHECKED BY	:	PROF. DATIN DR. NIK NORULAINI NIK ABD. RAHMAN
DATE	:	19.06.2024
PLAN NO.	:	PESS/IMS&ID1

SIGNATURE OF CONSULTANT

KEY, LOCATION AND SITE PLANS (LOT 113019)



KEY, LOCATION AND SITE PLAN (LOT 113019)

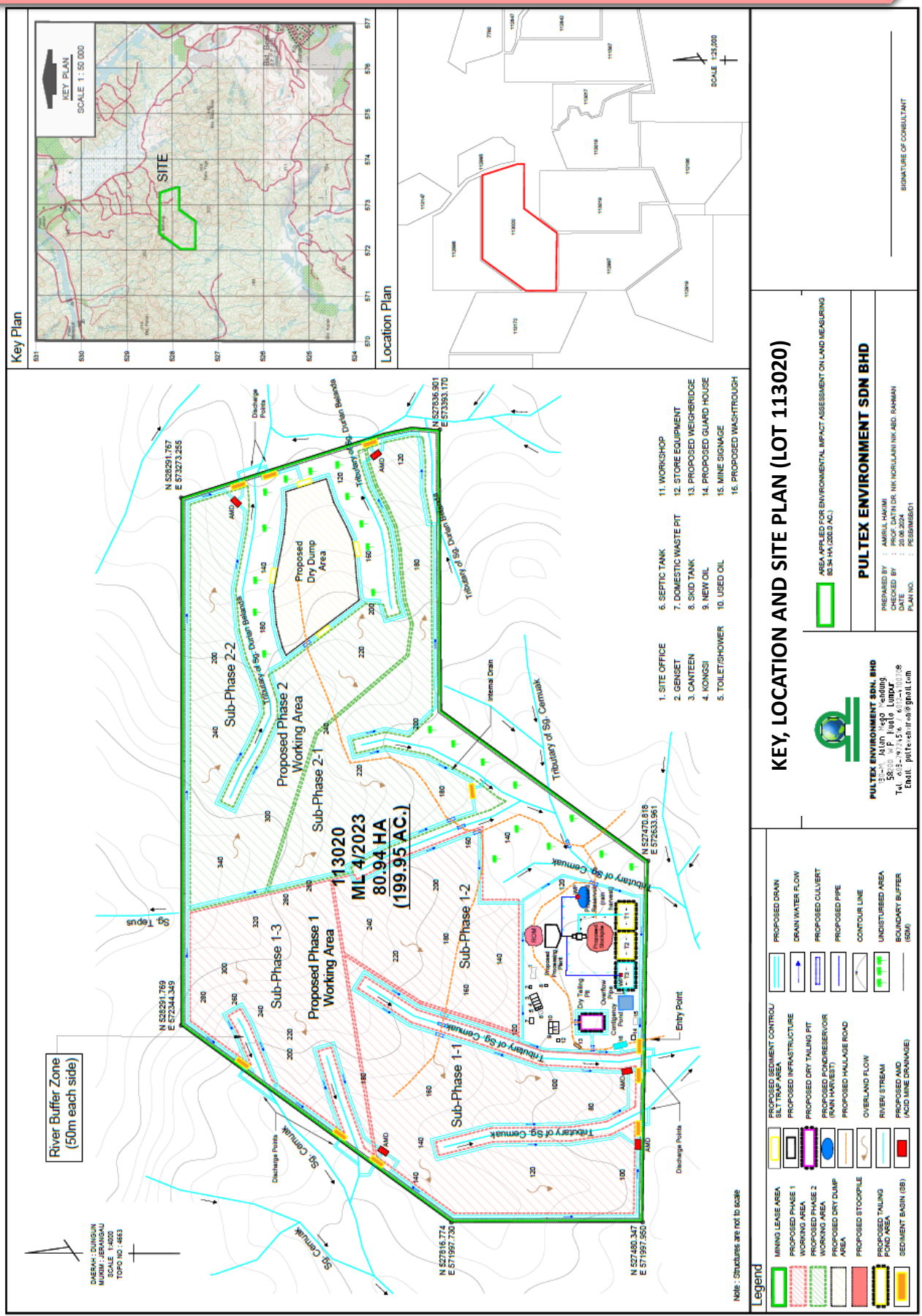
PULTEX ENVIRONMENT SDN. BHD

AREA APPLIED FOR ENVIRONMENTAL IMPACT ASSESSMENT ON LAND MEASURING 80.94 HA (200.00 AC.)

PULTEX ENVIRONMENT SDN. BHD.

SIGNATURE OF CONSULTANT

KEY, LOCATION AND SITE PLANS (LOT 113020)



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Proposed Iron Ore Mining Operation on Lot 113017 & Lot 113018 (ML 3/2023), Lot 113019 (ML 1/2023) and Lot 113020 (ML 4/2023), an area of 242.95 Ha, Locality of Bukit Besi, Mukim Jerangau, District of Dungun, Terengganu Darul Iman

EXECUTIVE SUMMARY

PROJECT CONCEPT

- Open-cast Mining (Dry)
- Internal Ore Haulage
- Ore Processing (Wet)

IRON ORE RESERVES AND MINE OPERATIONAL LIFE

Lot	Mining Area	Estimated Fe Ore Reserves	Estimated Mine Life
Lot 113017 & Lot 113018	48.94 Ha	2,035,904 T	11.90 years
Lot 113019	60.23 Ha	2,505,568 T	14.64 years
Lot 113020	51.35 Ha	2,136,160 T	12.50 years

CAPACITY AND OPERATIONAL LIFE OF DRY DUMP AREA

Lot	No. of Dry Dump	Area	Total Volume Capacity
Lot 113017 & Lot 113018	1	26,300 m^2	184,100 m^3
Lot 113019	1	23,400 m^2	163,800 m^3
Lot 113020	1	31,300 m^2	219,100 m^3

TAILING POND CAPACITY FOR EACH LOT

Lot	No. of Tailing Ponds	Total Volume Capacity for each Operating Area
Lot 113017 & Lot 113018	3	29,000 m^2
Lot 113019	3	29,000 m^2
Lot 113020	3	29,000 m^2

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EXECUTIVE SUMMARY

Open-cast Mining Operation

1. Excavation of the reserves around 2 m to 5 m (overburden and ores).
2. Hauling of excavated ores (ROM) to the processing plant.
3. Transporting excavated overburden to dry-dump area for temporary stockpiling and re-use in reclamation.
4. Ore processing.
5. Drying and stockpiling of products (high-grade iron).
6. The maintenance and monitoring of the tailing ponds, BMP structures, and pollution mitigation measures, both within and outside the site area.
7. Reclamation of completed mine sites concurrent to ore excavation in a new area.

Tailing Pond Water Recycling for ore processing

1. Closed circuit water recirculation
2. There will be no effluent discharge from the tailing ponds
3. Desilting of the ponds will be carried out periodically to restore the tailing pond retention capacity.

Production Capacity

13,016 T/month
≈ 156,192 T/year

Product and Transportation of Product

Final product (high-grade iron) with granular size < 10 mm and between 10 mm and 40 mm (on average with 65 % high grade Fe) will be transported to Eastern Steel Sdn. Bhd. and Alliance Steel Sdn. Bhd.

FLOWCHART

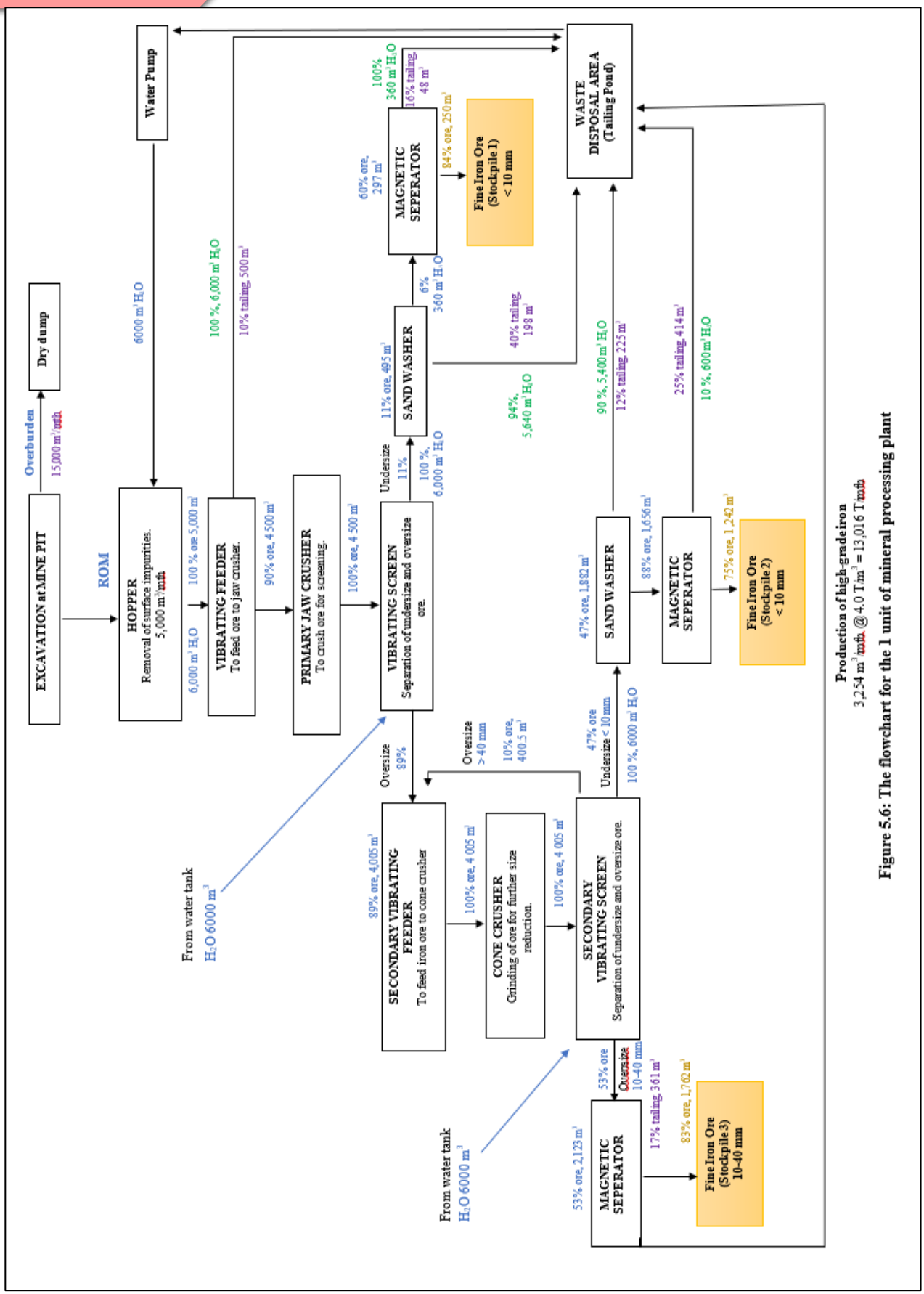

Figure 5.6: The flowchart for the 1 unit of mineral processing plant

PROJECT ACTIVITIES

BEFORE OPERATION

EXPLORATION AND INVESTIGATION

- Exploration of mineral deposits

BEFORE OPERATION

DEVELOPMENT AND PLANNING

- Demarcation of boundary and setting-out survey
- Mobilization of manpower, machineries and materials for construction
- Land clearing of areas for mine pit, processing plant and infrastructures.
- Internal haulage road construction (repair, upgrade pre-existing haul roads and build new ones)
- Pre-operation rehabilitation of exposed areas
- Construction of tailing ponds
- Constructions of P2M2 and Best Management Practices (BMPs) structures (sediment ponds, drains etc.)
- Mobilization of equipment for processing plant
- Construction of Infrastructures & facilities
  - *Site office and facilities for employees*
  - *Procurement of utilities (power and water supply)*
  - *Diesel storage facility*
  - *Sewerage*
  - *Solid waste & scheduled waste*
  - *Perimeter fence, entrance gate/guard post and workshop*
  - *Washing bay*

DURING OPERATION

MINING AND PROCESSING

- Benching
- Ore excavation
- Overburden haulage to dry dump area.
- ROM haulage to the processing plant
- Ore Processing
- Stockpiling of processed ores (products)
- Management and maintenance of tailing and tailing ponds, P2M2 / BMPs maintenance, haulage and access roads and handling solid and scheduled wastes.
- Environmental audit
- Periodical monitoring (Performance, Compliance and Impact)
- Continuous reclamation
- Transportation of products

AFTER OPERATION

REHABILITATION & ABANDONMENT

- Plan for mine closure
- Decommissioning
- Reclamation and backfilling
- Rehabilitation

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EXECUTIVE SUMMARY

EXISTING ENVIRONMENT

Land Use

- Immediate surrounding: combination of forest and secondary vegetations.
- Existing iron ore mines (total of 10 active mines) located to the east and south side of project site.
- Nearest settlements: Taman Cahaya (2.6 km-eastern side of the proposed project site). Based on Zone of Study (ZOS), a radius of 5 km, there are a total of eighteen (18) settlements located within this region.

Topography

- Hilly, rugged and undulating area.
- The highest elevation exceeding 300 m and the lowest is 40m.
- Lot 113017 & Lot 113018: 120 m to 344 m (highest point is Batu Tiga)
- Lot 113019: as low as 40 m that rises up to 307 m high.
- Lot 113020: from 80 m to 349 m (highest point Bukit Betung)

Surface Hydrology

- Proposed development area lies within the Sg. Dungun and Sg. Paka.
- Four (4) WTPs located nearest to Project Site, which are Tepus WTP, Kemudi WTP, Serdang WTP and Bukit Bauk WTP. Water intake is from Sg. Dungun and Sg. Paka.

Soil Characteristic

- Mainly under soil series of Steepland (STP)
- The soil series are characterized by land with very steep slopes (>50% or 25°)

Site Geology

- Site is underlain by the Permian-Triassic granite of the Eastern Belt which commonly found in shale, and some were found in limestone skarn and granite.

Climate and Meteorology

Hospital Dungun (2014 – 2023)

Monthly Rainfall

Highest : December 2023 (1306.5 mm)
Lowest : April 2016, June & September 2019 (0 mm)

Hospital Dungun (2014 – 2023)

Rain Days

Highest : December 2023 (27 days)
Lowest : April 2016, June & September 2019 (0 days)

Kerteh, Terengganu (2018 – 2022)

Wind Speed

Highest : Northeast (NE) (2.6 m/s)
Lowest : Northwest (SW & NW) (1.3 m/s)

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EXECUTIVE SUMMARY

EXISTING ENVIRONMENT

Water Quality

- Eighteen (18) sampling points
- Water Quality Index (WQI) for most sampling points classify as Class II
- River water status for all sampling points is considered as "clean" except for point W9 and W16 which are "slightly polluted".

Air Quality

- Two (2) monitoring stations.
- NO_2, SO_2, O_3 are not detected at all stations.
- All PM_{10}, $PM_{2.5}$ and CO are within the permissible limits as per Malaysia Ambient Air Quality Standards (Standard value by 2020) (MAAQS).

Groundwater Quality

- Seven (7) sampling points.
- All the parameters are within the limit of National Drinking Water Quality Standards (MOH, 2004) and Malaysia Groundwater Quality Standards (DOE, 2019).
- (COD) in sample GW2, GW3 and GW4 was recorded higher than the limit of 10 mg/L.
- Ammoniacal nitrogen concentration in sample GW4 exceeded the specified limit of 0.2 mg/L.
- Manganese was high at GW4 with 0.383 mg/L

Noise Level

- Two (2) monitoring stations.
- Daytime period level: 60.1 to 61.9 dB(A) Nighttime period level: 50.1 to 54.2 dB(A)
- Noise level were below the limit under Schedule 1 (Sub-urban) of 60 dB(A) for daytime and 55 dB(A) for nighttime.
- Noise sources are from vehicles movement

Geotechnical

- Slope gradients classes are as follow:

Slope gradient classes		Percentage (%)
Gently sloping	0° – 5°	9.64
Gently to moderately sloping	> 5° – 15°	6.54
Moderately sloping	> 15° – 25°	36.35
Steep	> 25° – 35°	38.87
Very steep	> 35° – 60°	8.60

EXISTING ENVIRONMENT

Terrestrial Fauna (Wildlife)

- Mammalia - 56 mammalian species.
- Birds - 137 species of birds.
- Amphibians - 23 species of frogs.
- Reptiles - 38 species of reptiles

Species	Protection Status: Wildlife Conservation Act 2010 (Act 716)			IUCN Red List of Threatened Species (2020)						Red List of Mammals for Peninsular Malaysia (2017)					
	TP	P	NP	CR	EN	VU	NT	LC	DD	CR	EN	VU	NT	LC	DD
Mammalia	11	9	37	0	4	2	7	43	-	0	5	5	3	43	-
Birds	113	13	11	0	2	5	14	116	-	-	-	-	-	-	-
Amphibians	0	3	20	-	0	0	1	21	1	-	-	-	-	-	-
Reptiles	2	23	13	-	2	1	0	35	-	-	-	-	-	-	-

(TP) Totally Protected (P) Protected (NP) Not Protected (EN) Endangered (VU) Vulnerable
(NT) Near Threatened (LC) Least Concern (CR) Critically Endangered (DD) Data Deficient

Aquatic

- Fish – Five (5) species, consisted of 4 families
- Macrobenthos – 6 taxon with four order

Terrestrial Flora

- Categorized as lowland forest.

Plant Habit	Number of species
Tree(T)	257
Shrub (S)	22
Herbaceous (H)	53
Fern (F)	11
Palm (P)	12
Climber (C)	70

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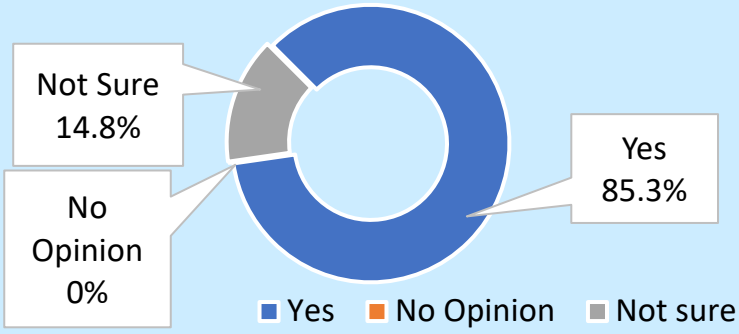
EXECUTIVE SUMMARY

EXISTING ENVIRONMENT

Socio-economic

Respondents' Acceptance toward Proposed Project



Total Respondent: 400

- ❑ Taman Cahaya
- ❑ Taman Perkasa
- ❑ Kampung Bukit Besi
- ❑ Kampung Besol
- ❑ Kampung Rantau Panjang
- ❑ Kampung Seren
- ❑ Taman Harmoni
- ❑ Perumahan Paya Lawas
- ❑ Kampung Lecah
- ❑ Kampung Tepus
- ❑ Kampung Dendang

85.3% respondents expressing agreement. This support stems from the recognition of the project's potential to stimulate economic activity, contribute to state revenue, boost local trader incomes, and create job opportunities for villagers. While 14.8% of respondents remain uncertain, they acknowledge the project's potential for income generation.

Community Health

Existing Burden Disease at Dungun District
(Incidence as per 100,000 population)

Dungun District

Food and Waste-Borne Disease
- Dysentery Cases (Incidence rate 0.25)
- Food poisoning Cases (Incidence rate 103.38)

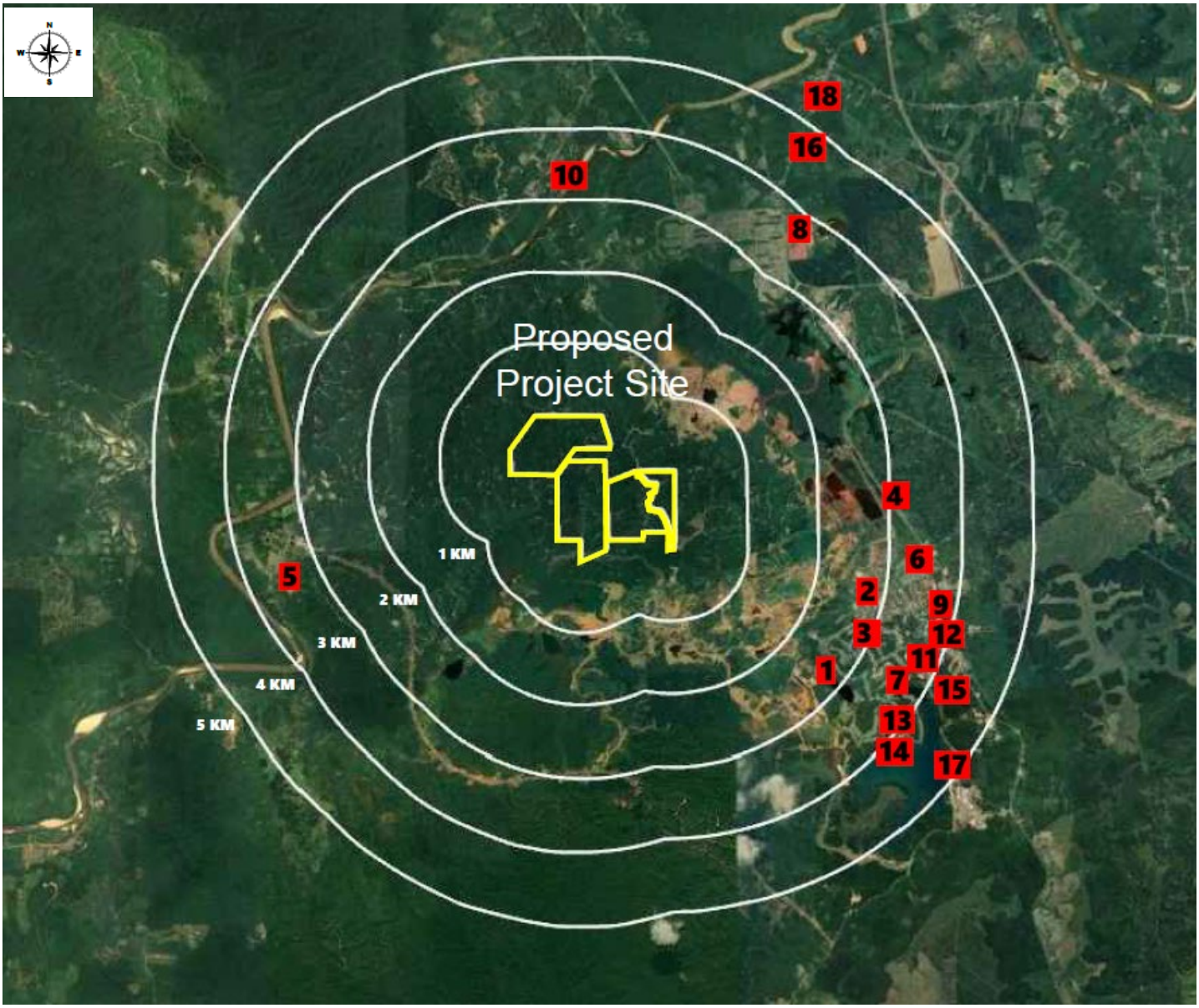
Vector-Borne Disease
- Dengue Cases (Incidence rate 5.54)
- Malaria Cases (Incidence rate 13.54)

Sexually transmitted Infections
- Gonorrhea Cases (Incidence rate 4.92)
- HIV Cases (Incidence rate 7.38)
- AIDS Cases (Incidence rate 4.92)
- Syphilis Cases (Incidence rate 6.15)

Viral Hepatitis Disease
- Hepatitis A (Incidence rate 1.23)
- Hepatitis B (Incidence rate 14.15)
- Hepatitis C (Incidence rate 5.54)

Other Disease
- Tuberculosis (Incidence rate 58.46)
- Leprosy (Incidence rate 0.61)
- Leptospirosis (Incidence rate 23.38)
- COVID-19 (Incidence rate 844.92)

SENSITIVE RECEPTORS (5 KM ZOS)

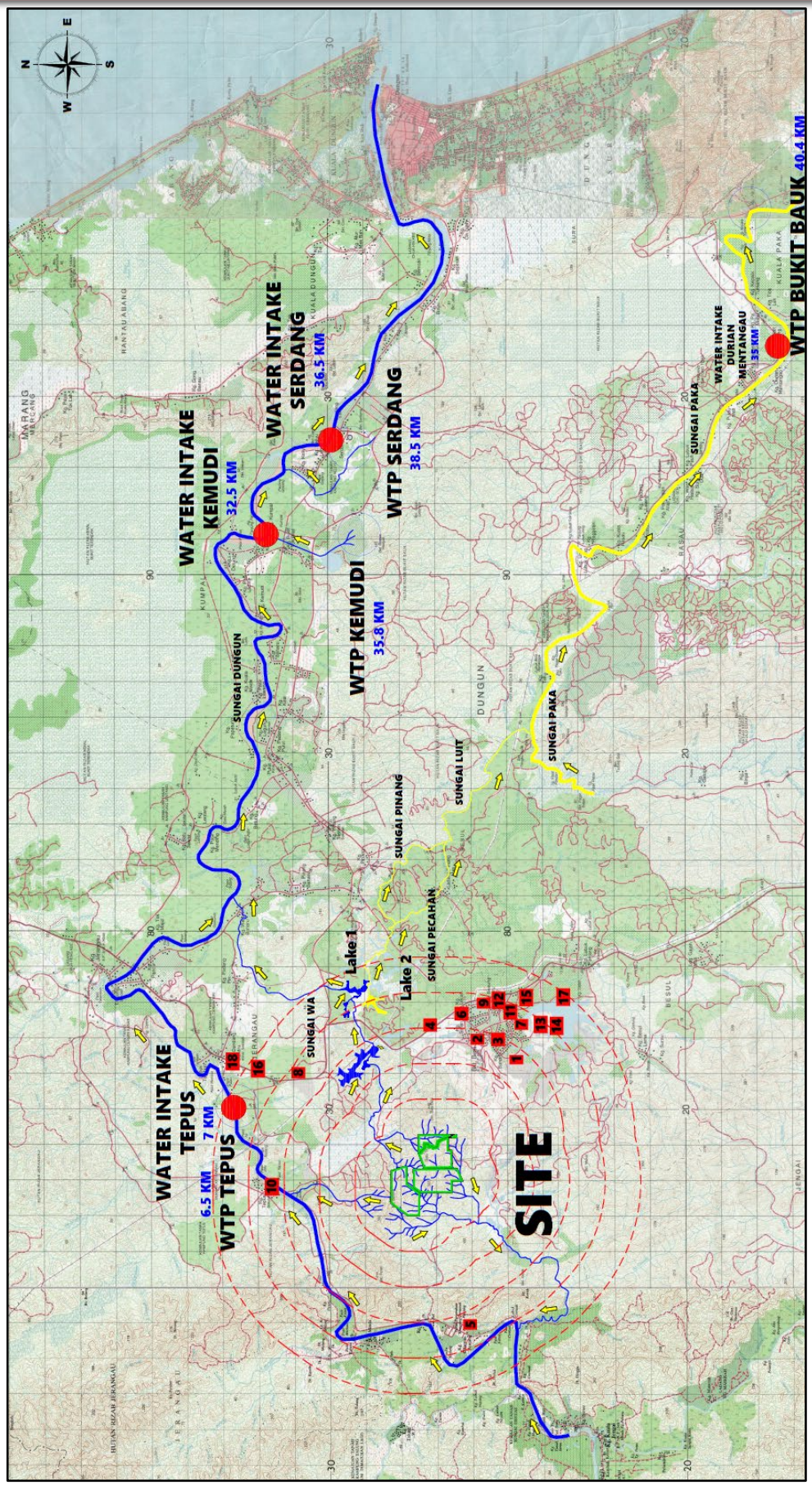


LEGEND

MINING LEASE AREA

1.	Taman Cahaya	2.6 KM
2.	Taman Perkasa	2.8 KM
3.	Kampung Bukit Besi	2.9 KM
4.	RTD Enforcement	3.1 KM
5.	Kampung Tersusun Rantau Panjang	3.3 KM
6.	Kampung Seren	3.3 KM
7.	Taman Harmoni	3.4 KM
8.	Perumahan Paya Lawas	3.5 KM
9.	Kampung Lecah	3.5 KM
10.	Kampung Tepus	3.7 KM
11.	Kampung Besol	3.8 KM
12.	Kampung Besul Baharu	3.9 KM
13.	Golf Club Bukit Besi	4.0 KM
14.	Puteri Golf Resort	4.1 KM
15.	Asrama Perkaya (Pra Tahfiz)	4.3 KM
16.	Institut Tahfiz Al Mizan (Lelaki)	4.3 KM
17.	Taman Rekreasi Tasik Puteri	4.7 KM
18.	Kampung Dendang	5.2 KM

The five-kilometre radius of Zone of Study (ZoS)



SETTLEMENTS

1.	Taman Cahaya	2.6 KM
2.	Taman Perkasa	2.8 KM
3.	Kampung Bukit Besi	2.9 KM
4.	RTD Enforcement	3.1 KM
5.	Kampung Tersusun Rantau Panjang	3.3 KM
6.	Kampung Seren	3.3 KM
7.	Taman Harmoni	3.4 KM
8.	Perumahan Paya Lawas	3.5 KM
9.	Kampung Lecah	3.5 KM
10.	Kampung Tepus	3.7 KM
11.	Kampung Besol	3.8 KM
12.	Kampung Bersu Baharu	3.9 KM
13.	Golf Club Bukit Besi	4.0 KM
14.	Puteri Golf Resort	4.1 KM
15.	Asrama Perkaya (Pra Tahfiz)	4.3 KM
16.	Institut Tahfiz Al Mizan (Lelaki)	4.3 KM
17.	Taman Rahsia Tasik Puteri	4.7 KM
18.	Kampung Dendang	5.2 KM

LEGEND

MINING LEASE AREA | WATER INTAKE POINTS (WI) | RIVER/ STREAM | RIVER WATER FLOW | SETTLEMENTS | 5KM ZoS

DISTANCE VIA RIVER TO WTP TREATMENT PLANT

FROM SITE TO WTP TEPUS	6.5 KM
FROM SITE TO WTP KEMUDI	35.8 KM
FROM SITE TO WTP SERDANG	38.5 KM
FROM SITE TO WTP BUKIT BAUK	40.4 KM

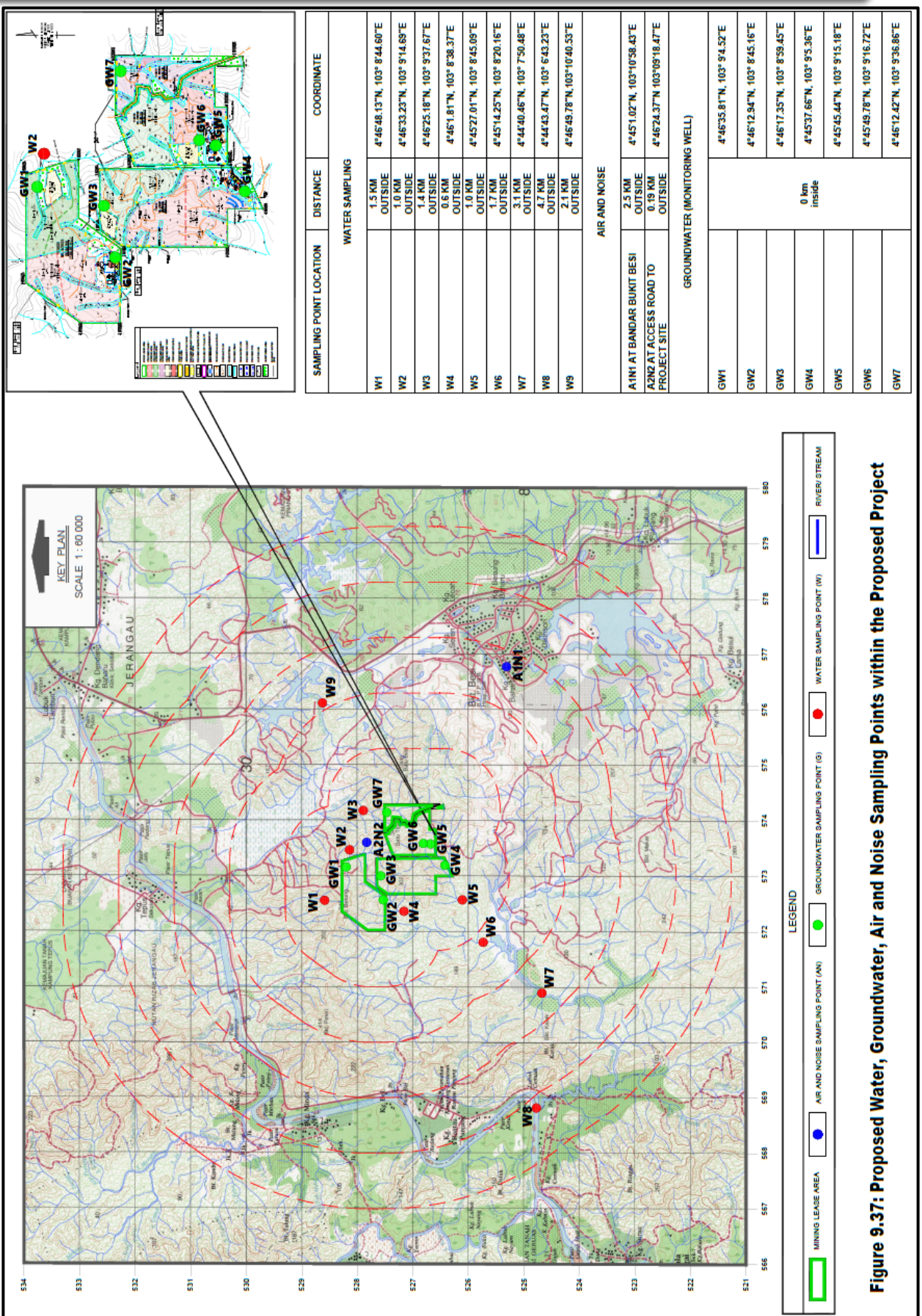
DISTANCE VIA RIVER TO WATER INTAKE

FROM SITE TO WI TEPUS	7 KM
FROM SITE TO WI KEMUDI	32.5 KM
FROM SITE TO WI SERDANG	36.5 KM
FROM SITE TO WI DURIAN MENTANGAU	40.4 KM

WATER TREATMENT PLANT & WATER INTAKE

WTP TEPUS	4°48'59.30"N, 103°10'10.76"E
WTP KEMUDI	4°47'07.70"N, 103°18'53.88"E
WTP SERDANG	4°47'15.98"N, 103°20'13.18"E
WTP BUKIT BAUK	4°41'08.96"N, 103°23'44.14"E
WI DURIAN MENTANGAU	4°40'41.01"N, 103°21'39.16"E

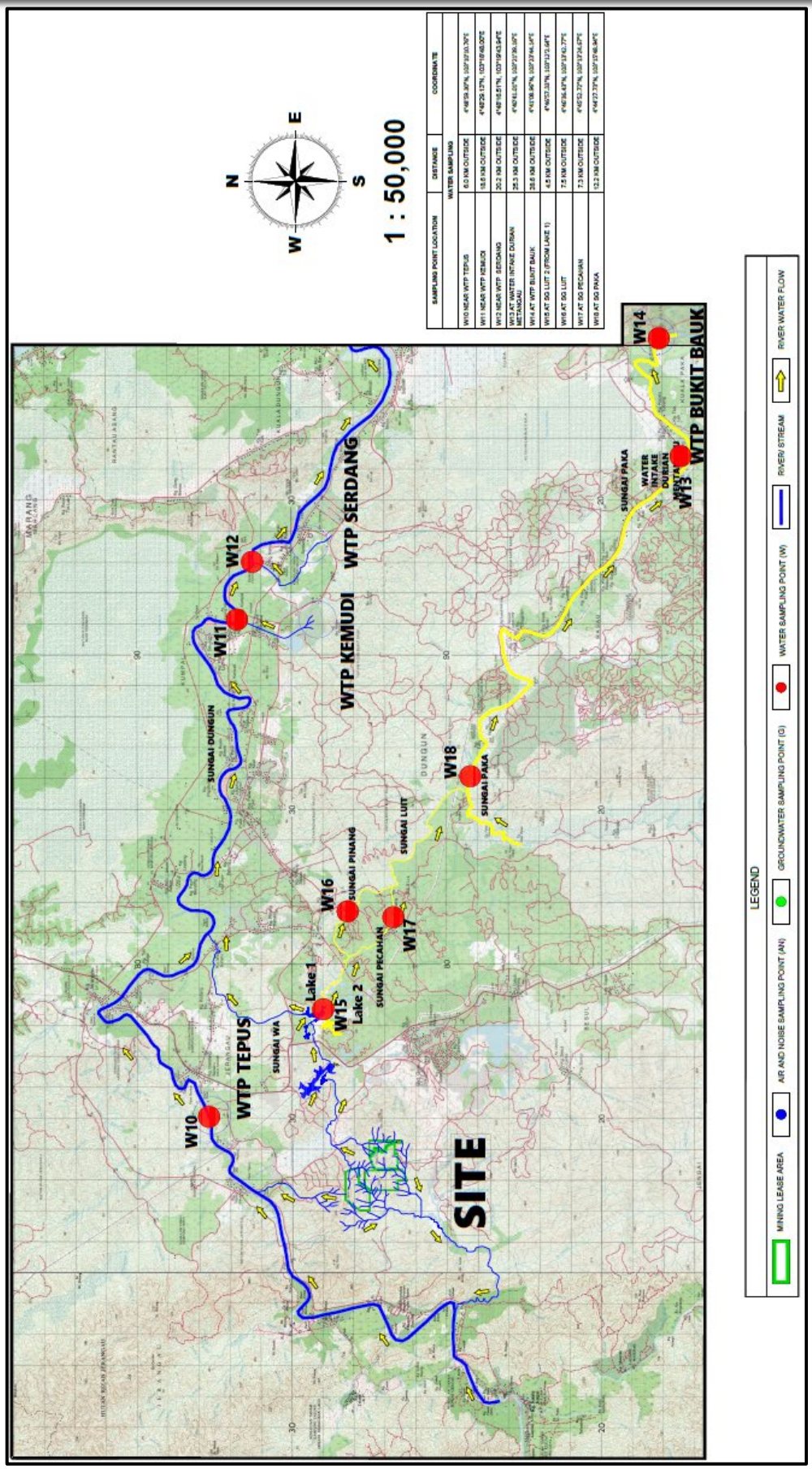
WATER, GROUNDWATER, AIR & NOISE SAMPLING POINTS



SAMPLING POINT LOCATION	DISTANCE	COORDINATE
WATER SAMPLING		
W1	1.5 KM OUTSIDE	4°46'48.13"N, 103° 8'44.60"E
W2	1.0 KM OUTSIDE	4°46'33.23"N, 103° 9'14.69"E
W3	1.4 KM OUTSIDE	4°46'25.18"N, 103° 9'37.67"E
W4	0.6 KM OUTSIDE	4°46'1.81"N, 103° 8'38.37"E
W5	1.0 KM OUTSIDE	4°45'27.01"N, 103° 8'45.09"E
W6	1.7 KM OUTSIDE	4°45'14.25"N, 103° 8'20.16"E
W7	3.1 KM OUTSIDE	4°44'40.46"N, 103° 7'50.48"E
W8	4.7 KM OUTSIDE	4°44'43.47"N, 103° 6'43.23"E
W9	2.1 KM OUTSIDE	4°46'49.78"N, 103°10'40.53"E
AIR AND NOISE		
A1N1 AT BANDAR BUKIT BESI	2.5 KM OUTSIDE	4°45'1.02"N, 103°10'58.43"E
A2N2 AT ACCESS ROAD TO PROJECT SITE	0.19 KM OUTSIDE	4°46'24.37"N 103°09'18.47"E
GROUNDWATER (MONITORING WELL)		
GW1	0 km inside	4°46'35.81"N, 103° 9'4.52"E
GW2		4°46'12.94"N, 103° 8'45.16"E
GW3		4°46'17.35"N, 103° 8'59.45"E
GW4		4°45'37.66"N, 103° 9'5.36"E
GW5		4°45'45.44"N, 103° 9'15.18"E
GW6		4°45'49.78"N, 103° 9'16.72"E
GW7		4°46'12.42"N, 103° 9'36.86"E

Figure 9.37: Proposed Water, Groundwater, Air and Noise Sampling Points within the Proposed Project

WATER SAMPLING POINTS (W10 - W18)



EVALUATION OF POTENTIAL IMPACT

HYDROLOGY

- The project site is located within undulating area at the upstream area of Sg. Dungun and Sg. Paka River Basin, and could potentially affect the downstream area with frequent flooding.
- Land use changes (secondary forest to mining) in the upstream area could result in the tremendous increase in surface runoff.
- Experiences flooding which resulted in loss of income to the villagers during flood season last year.

SOIL EROSION AND SEDIMENTATION

- Extensive land clearing and modification of flow water at the site and its surrounding land will result in soil erosion and sedimentation.
- Modification of surface and subterranean water flows may result in drying and flooding.
- Inadequate mitigation measures to control soil erosion and sedimentation may result in the transportation of substantial amounts of sediment into existing water bodies.

OVERBURDEN STRIPPING

- Overburden mounds may be exposed to soil erosion. Surface runoffs carrying sediments from the mounds into nearby rivers.
- Dumping mound is unsightly, and more importantly, pose safety hazard to workers if landslide occur.
- Activities carried out during the drier period can cause problems with air pollution.

RIVERINE RIPARIAN ZONE

- Clearing of vegetations from riverbanks will leave the area and river unprotected from erosion and sedimentation respectively. Causing a decrease in water quality through the loss of filtration effects.
- Clearing also leads to loss of critical species habitat. A river buffer zone of 50 m on either side of the river (total of 100 m riparian buffer zone), should be kept along the rivers/streams.

EVALUATION OF POTENTIAL IMPACT

WATER QUALITY

- Water quality in mines is indirectly affected by soil erosions that carry sediments and these sediments are not controlled or managed well.
- Release of sediments into rivers will impact the water quality: turbidity, total suspended solids, and mineral contaminants.
- Fine silt increases the suspended solids and turbidity of the water bodies and can be detrimental to aquatic life.
- AMD can potentially impact water quality
- The use of machinery and equipment on site may lead to water pollution through leakage of oil, grease, and fuel into the water courses.

GROUNDWATER QUALITY

- Groundwater quality might be deteriorated due to activity on the surface during operation such as spill of chemical or any leakage on the machine or storage area.
- The potential threats to the groundwater is a contaminate from the point sources in the development project.

AIR QUALITY

- Dust dispersion due to vehicular movement especially on dry days may lower air quality.
- Fume emission and dust dispersion from haul road, process plant and stockpile.
- Types of air quality impacts: dust (total suspended particulate TSP, PM_{10}, $PM_{2.5}$) and vehicles (gaseous: CO).
- Elevation, wind direction, and wind speed greatly influence the dispersion of air pollutants with hotspots mainly lying downwind of the dominant wind directions.

TERRESTRIAL FLORA

- Timber extraction contributed to the loss of tree species and subsequently mining activities conducted post the vegetation removal is one of the critical impacts on flora diversity.
- Wildlife natural habitats and their source of food would be severely affected.
- Removal of vegetation could increase water runoff and siltation during rain which affect the water quality in nearby water source and stream.

EVALUATION OF POTENTIAL IMPACT

TERRESTRIAL FAUNA (WILDLIFE)

- Cause both direct and indirect impacts on wildlife due to the complete loss of habitat.
- Leading to the sudden displacement of wildlife to adjacent or nearby forested areas.
- Birds, as well as medium and large mammals are accustomed to roaming across extensive areas are likely to experience navigation challenges during foraging and daily movements..
- Cause wildlife to lose their sense of orientation, leading them to stray from their regular paths and end up outside their home range.
- Human-wildlife conflicts can pose risks to both parties, which are injury or death to humans and wildlife, and economic losses due to damage caused by wildlife in orchards, plantations, and villages.
- Unsupervised workers may engage in poaching, which not only jeopardizes the survival of wildlife but also endangers their own safety.
- Movement of heavy machinery during vegetation removal, mining site preparation, and related activities will inevitably increase noise levels within the project site and surrounding areas.

AQUATIC

- Land clearing to access project areas (road), set up mining office, worker accommodation, workshop and mining machines; The impact of this activity will lead to high soil erosion and sedimentation to nearby water bodies such as streams or rivers.
- Setup workshops within the project areas will potentially lead to oil and grease discharged from broken lorries or mining machines to the nearby water bodies; The impact of these activities is oil and grease pollution.

EVALUATION OF POTENTIAL IMPACT

NOISE QUALITY

- The main source of operating noise is primarily from equipment and machinery.
- Excessive and prolonged exposure to noise can cause disruption and cause high noise levels, potentially causing hearing problems.
- Cumulative impact can significantly affect humans and wildlife and create annoyance to the local community.

SOLID & HAZARDOUS WASTE

- Significant amount of solid waste (tree trunks, branches, shrubs, and green vegetative material) will be generated due to the clearing and site preparation.
- Poor storage and handling of general refuse resulting in odor problems and attraction of pest, disease vectors and scavenging animals (insects, rodents etc.) to the site.
- Scheduled wastes (lubricating oils, diesel and hydraulic fluids) may spill and affect the surface quality and aquatic ecology if they infiltrate to the surrounding water bodies.

SEWERAGE

- If the domestic sewage is not well designed and maintained, odor and diseases might be triggered.
- Organic matter, coliform bacteria and suspended solids is the primary contaminants in sanitary effluents which will result in decreasing dissolved oxygen content elevated organic and coliform levels in downstream watercourses.
- Bad odor will cause lost in appetite, impaired respiration, nausea, vomiting and mental perturbations.

EVALUATION OF POTENTIAL IMPACT

SOCIO-ECONOMIC

Potential Negative Impact:

- Mining presence disturb communities' daily life.
- Noise annoyance exposure.

Potential Positive Impact:

- Increased job opportunities to locals.
- Enhanced local's economic growth.
- Improve locals' socio-economic.

COMMUNITY HEALTH

- Air pollution and elevated noise levels might have greater impact on workers but minimal impact on Dust emissions from soil disturbance, construction machinery, and transportation may elevate particulate matter (PM10 and PM2.5) levels.
- Such emissions, if not managed, may affect respiratory health in nearby housing areas and other sensitive receptors.
- The operation of heavy machinery and transportation vehicles may generate significant noise pollution, potentially disrupting nearby communities.
- Noise production is assumed to be significant during its construction phase.
- The existing surface water bodies may naturally contain certain hazardous substances, such as physical, chemical and biological elements.
- The proposed new road project is less likely to disrupt the present ambient air quality throughout its development.

MITIGATION MEASURES

HYDROLOGY

- The sediment basins (trap sediment) during clearing works will be converted to flood detention pond.
- Provide temporary storage for the excess runoff during storm event. Detention pond consists of storage area, inlet to the pond and outlet of the pond.
- Build sufficient diversion and earth drains and other BMPs on site to direct the surface runoff flows to sedimentation ponds, or silt ponds.
- The design storm should accommodate storm of 50-year ARI with enough storage to control flood, while its spillway should be able to cater for 100-year storm.
- Build sufficient diversion and earth drains and other BMPs on site to direct the surface runoff flows within the site to the sedimentation ponds, or silt ponds.

SOIL EROSION & SEDIMENTATION

- Integrate project design including the site layout plan with site constraints.
- Preserve and stabilize drainageways.
- Minimize the extent and duration of disturbance.
- Control stormwater flows onto, though, and from the site in stable drainage structures.
- Install perimeter runoffs controls.
- Stabilize and covering disturbed land areas promptly in a timely manner to minimize the exposure to rain.
- Protect steep slopes.
- Use sediment controls to prevent off-site damage.
- Protect inlets, storm drain outfalls, and culverts.
- Provide access and general construction controls.
- Inspect and maintain control measures.

OVERBURDEN

- Dispose of the overburden at the designated dumping site as identified in the plant layout plan.
- Install silt fence at the base of the mounds.
- Diversion of surface runoffs into drains and silt ponds.
- Surplus excavated material will be disposed of in suitable identified areas.
- Dumping areas will be biologically reclaimed.
- Proper drainage facilities shall be provided surrounding the overburden dump sites.

MITIGATION MEASURES

RIVERINE RIPARIAN ZONE

- No clearing of vegetation from stream banks to prevent soil erosion and decrease in water quality through the loss of filtration services and the loss of critical species habitat.
- Maintenance of riparian reserve to ensure no disturbance to the natural vegetation.
- The riparian areas of all tributaries should be monitored and reported.
- No mining or other activities to be conducted within the restricted stream/river buffer zones.

WATER QUALITY

- Implementation of water management techniques.
- Preservation and stabilization of drainage and waterways.
- Minimize the extent and duration of disturbance.
- Control of runoff flows into, through and from the site via stable drainage structures.
- Installation of perimeter controls (silt fence, perimeter drains, etc.)
- Fuel, grease, and engine oil storage must be carefully sited to avoid contamination of the surface waters.
- Proper drainage and sanitation facilities.
- Ensure minimum sediment discharge. Provide vegetated filter strips between exposed soil surfaces and receiving waters.
- Protect inlets, storm drain outfalls and culverts.
- Inspect and maintain BMPs for control measures.
- Streams must be protected with a vegetated buffer zone.
- Prepare an emergency plan on used oil spills and pond overflow.
- It is not permitted to drain slime or water from this mine area into drains or ditches in the road reserve.

GROUNDWATER QUALITY

- Monitoring the water level change and early detection of contaminant movement from the developed area.
- Monitoring of groundwater conditions at the existing groundwater monitoring well.
- Established to monitor the performance of soil layer as in situ natural barrier is crucial
- Construction of monitoring wells.
- A suitable monitoring programme shall be implemented for regular monitoring of groundwater quality and groundwater level in all groundwater monitoring wells during operation.

MITIGATION MEASURES

AIR QUALITY

- Open burning within or outside mining site is strictly prohibited.
- To reduce emission, the developer could also consider reducing the number of vehicles used simultaneously.
- Minimizing the falling distance when discharging, adjusting the equipment to the respective bulk material and increasing materials humidity.
- Transport vehicles should be closed receptacles (silo vehicles, containers, tarpaulin)
- The machines, equipment, or other systems used to work solid substances shall be encapsulated or fitted with emission-reducing technologies of similar effect.
- To reduce the air pollution concentration due to the transport and open pit sources, a “green belt” around the mine and mitigating controls on the sources can reduce the concentrations by 50%, resulting in the compliance of the Malaysia Air Ambient Air Quality Standard (MAAQS) 2020 at sensitive receptors.

NOISE QUALITY

- All machinery should be properly checked and maintained during the operation.
- Impose and enforce a speed limit on all vehicles at maximum of 30 km/h.
- Install effective noise suppression systems.
- Noise level can be reduced by undertaking the mining activity on phase by phases basis
- Restricted the hours of operation.
- Provide appropriate Personal Protective Equipment (PPE) such as earmuffs or earplugs for the workers .
- Carry out a noise monitoring program.
- Project Proponent shall monitor and act closely on any local community complaints and concerns pertaining to the noise generation from the mining activity at Bandar Bukit Besi.

SEWERAGE

- Use of septic tanks. The septic tanks must be maintained by regular desludging, and it will be prohibited from throwing used oil down the toilets or sinks.
- No direct discharge is allowed from any toilet facility to rivers or streams.

MITIGATION MEASURES

TERRESTRIAL FLORA

- Only vegetation directly in the path of the proposed access roads to be removed.
- Vegetation on higher elevation and steep slope will be left undisturbed to minimize soil erosion and filter the run-off during rainy days.
- Vegetation strips shall be planted in around ponds and waterways to create buffer and filter the net delivery of silt during runoff from higher ground area to the lower areas.
- Progressive rehabilitation of affected areas to restore ecosystem function, where possible with fast growing trees and leguminous creeper species.
- Removal of vegetation should be restricted to the relevant infrastructure footprints only.
- Invasive alien species will be prevented from occurring on site, through interval vegetation assessment.

TERRESTRIAL FAUNA (WILDLIFE)

- Include wildlife awareness information in regular safety and environmental inductions.
- Mining in an orderly sequence to minimize habitat disruption and facilitate gradual movement of wildlife away from the mining areas.
- Site clearing direction must be towards the forest reserve
- Placed warning signs at specific locations to reduce road kills.
- Advise mining workers to not interfere or harass wildlife.
- No hunting by project personnel permitted while working or residing on site.
- Any sightings of wildlife especially endangered mammals need to be reported by workers to the authority (PERHILITAN) for further action. Seek the assistance and advice of PERHILITAN on how to handle wildlife and human conflicts.
- Project site security shall not exit the project compound.
- Proper signage on prohibition of bird hunting or trapping.
- No domesticated animal in the project site and in the surrounding area to stop the possible spread of Canine Distemper Disease to the local wildlife.
- Contractors, workers, and local villagers must be strictly prohibited from engaging in illegal wildlife hunting and poaching.

MITIGATION MEASURES

AQUATIC

- Chose the best access or location that give less disturbed to nearby water body.
- Avoid cross the existing streams or rivers
- Built temporary bridge if cannot avoided stream
- Maintain the existing riparian zone
- Install appropriate size of treatment ponds at the lowest part within the proposed project areas before discharging to nearby water bodies
- Replant wetland plants at this treatment ponds that acting as filter system

DOMESTIC SOLID WASTE

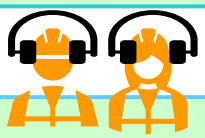
- To be segregated and disposed appropriately so as not to create potential vector source.
- No haphazard disposal on site or off site.
- No open burning can be carried out at all (strictly prohibited) within and outside the mining site area.
- A good solid waste management system is to be provided. All wastes (non-scheduled) are to be disposed at approved dumping ground.
- The domestic solid waste from the basecamp and site office can be either dumped at designated area within the mining site.
- Provide dust bin and to ensure all workers on-site will involve in regular housekeeping exercise.
- A proper signage shall be made in order to create awareness among the workers in term of good waste management within the mining site area.
- A comprehensive waste management shall be prepared by project proponent before execution of the mining activity.

MITIGATION MEASURES

SOCIO-ECONOMIC

- Implement a staged mining program to minimize environmental disturbances and ensure sustainable resource extraction.
- Installation of a weighbridge to monitor the weight of trucks and machinery before offloading to ensure compliance with load limits and prevent road damage.
- Ensure the reservoir is designed to withstand the heavy rainfall associated with the annual Northeast Monsoon.
- Inform the relevant authorities (e.g., JPKK) in advance of any planned water releases from the reservoir into drainage systems or rivers, including the timing and duration of the release.
- Shall strictly prohibit foreign workers from keeping pet dogs on the mining site.
- The company must implement strict measures to prevent the release of any pets, particularly dogs, by foreign workers on or near the mining site.
- Developers must collaborate with the Department of Fisheries (DOF) to conduct periodic fish releases throughout the duration of the mining activity.

COMMUNITY HEALTH



- Project proponent should take necessary measures for the control of disease-bearing insects by the destruction of breeding places and the use of insecticides.
- Effective housekeeping help in the control and prevention of disease outbreaks.
- All workers have to be monitored to identify changes in health status due to potential infectious, especially malaria and STIs.
- Frequent and regular monitoring is required to eliminate any vector breeding sites every week.
- The project proponent shall not allow an infected worker to carry on with their employment and shall transfer him from the site or he is likely to expose other workers to the disease agent.
- Vaccination for certain diseases like COVID-19, hepatitis B and typhoid.
- The project proponent may give awareness about waste minimisation and segregation to communities and their workers as part of Corporate Social Responsible (CSR).
- Religious talks or health awareness is also advisable to be conducted particularly by Ustaz or Medical Doctors, respectively about STIs.

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

PERFORMANCE MONITORING (PM)

LD-P2M2	PM Parameters	Recommended Limits	Frequencies
Silt Trap	Silt marker	-	Weekly or after rain event
Sediment Basin	Silt marker	-	
Earth Drains with check dam	Sediment level		Quarterly
Earth Bund	Diverts Overland Flow	-	
Silt Fence	Control silt transport in overland flow	-	
Roadside Drain	Performance	-	
Overburden stockpile	Performance	20 m away from any watercourse	
River Riparian Buffer Zone	Performance	25 m or more at both sides	
Boundary Buffer	Performance	20 m away from site boundary	

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

COMPLIANCE MONITORING (CM)

Item	Monitoring Frequency	Environmental Quality Standards
Water Quality	Once a month	i. National Water Quality Standards (NWQS). ii. Mineral Development (Effluent) Regulations 2016
Air Quality	Once a month	i. Malaysia Ambient Air Quality Standards (Standard value by 2020).
Ground water Quality	Twice a year	i. National Standard for Drinking Water Quality (Revised December 2000), Second Version (MOH, 2004). ii. Malaysia Groundwater Quality Standards and Index – for Conventional use of Raw Water Treatment (Drinking Water) (DOE, 2019).
Noise Level	Once a month Daytime 15 hours (from 7.00 am to 10.00 pm) Nighttime 9 hours (from 10.00 pm to 7.00 am)	i. Guidelines for Environmental Noise Limits & Control, Third Edition (DOE, 2019), First Schedule of Permissible Sound Levels.

IMPACT MONITORING (IM)

Item	Impact Monitoring
Water Quality	i. Records regular maintenance of the drainage structure provided on site and ensure there is no blockage to the water flow or excessive siltation. ii. Monitor perimeter control of surface runoffs especially those adjacent to streams. iii. Follow surface water flow during rainy periods to ensure no fugitive release to water courses (on site or off site) iv. Dry natural water paths that flow only during wet season should also be protected and prevented from being disturbed or buried.
Groundwater Quality	i. Continuous groundwater quality monitoring. ii. Records the measured water level. iii. Records regular maintenance of monitoring well to prevents well water quantity and quality deteriorating in longer term.
Air Quality	i. Records that show regular maintenance of equipment, machinery, and vehicles used for this project development. ii. Records of provision of adequate dust protective device to workers working in dusty areas. iii. Records of provision of dust suppression facilities (e.g., water bowser). iv. Records on air quality monitoring results. v. Checking on the soil surface to ensure proper soil compaction is practiced onsite especially on exposed area.
Noise Level	i. Records that show regular maintenance of equipment, machineries and vehicles used for this project development. ii. Records of provision of adequate noise protective device to workers working in high noise level areas. iii. Schedule of working hours, transportation in and out of the project site showing the type of loading and maintenance tasks carried out for vehicles.

IMPACT MONITORING (IM)

Item	Impact Monitoring
Surface Runoff Discharge from the sedimentation basin	i. Continuous water quality monitoring of the effluent for turbidity and TSS. ii. The silt trap/sediment containment structure must be regularly monitored and maintained iii. Record any release via the spillway in the event of heavy rainfall iv. Observe and measure the flow rate and discharge points. v. Interpret the effluent sampling data to assess impacts downstream and compare to the regulatory standards (NWQS) vi. Consider additional train of BMPs prior to the surface runoffs entering the sediment basin.
Riparian Monitoring Program (Photo)	i. Riparian zone on either side of the channel must be preserved and no human disturbance or any activity transgressing the riparian boundary. ii. The width of the riparian zone maintained based on the width of the channel, nature of existing development and flora and fauna iii. Restoration of riparian zones with indigenous specie iv. Monitoring the flow of the streams that might displace the riparian zones and impact the bank stability
Aerial View	Use of drones to video record and monitor the changes and potential risks areas

CONCLUSIONS

The major activities that can potentially spawn impacts : Site clearing, Ore excavation, Ore haulage and Ore processing.

The aspects of the activities annexed to impacts: Dust formation (air quality), Noise generation (noise level), Soil erosion and river sedimentation (water quality).

The major impacts ensuing these aspects; Air pollution (PM_{10}, $PM_{2.5}$, etc.), Noise pollution (increase dBA) and Water pollution (turbidity, total suspended solids, DO and metal contaminants).

Abatement of impacts:

- Pollution prevention and impact mitigating measures on land disturbance, operations and post operation.
- Maintenance and Monitoring of BMPs
- Environmental Management Plan
- Environmental Auditing
- Self Regulation
- Rehabilitation program.

The proposed project of iron ore mining at Locality of Bukit Besi will not incur significant impacts if appropriate mitigating measures especially for air, noise, water and groundwater quality control are employed followed by rigorous environmental management plan, environmental monitoring and environmental auditing.