

	TABLE OF CONTENT	
	TABLE OF CONTENT	i
	LIST OF TABLES	ix
	LIST OF FIGURES	xvi
	LIST OF PLATES	xxi
	LIST OF APPENDICES	xxvii
EXECUTIVE SUMMARY		
1.0	PROJECT TITLE	ES-1
2.0	PROJECT DESCRIPTION	ES-1
3.0	CONTACT DETAILS OF LAND OWNER, PROJECT PROPONENT, PROJECT DEVELOPER AND EIA CONSULTANT	ES-4
4.0	PROJECT LOCATION	ES-5
	4.1. Project Location	ES-5
	4.2. Access to the Project Site	ES-6
	4.3. Proposed Access Road Network	ES-6
5.0	PROJECT ACTIVITIES	ES-9
6.0	SUMMARY OF MAGNITUDE OF POTENTIAL IMPACTS AND MITIGATION MEASURES (P2M2)	ES-11
7.0	PERFORMANCE MONITORING (PM)	ES-23
8.0	COMPLIANCE MONITORING (CM)	ES-24
9.0	IMPACT MONITORING (IM)	ES-25
RINGKASAN EKSEKUTIF		
1.0	TAJUK PROJEK	RE-1
2.0	PENERANGAN PROJEK	RE-1
3.0	MAKLUMAT PEMILIK TANAH, PENGGERAK PROJEK, PEMAJU PROJEK DAN KONSULTAN EIA	RE-4
4.0	LOKASI PROJEK	RE-5
	4.1. Lokasi Projek	RE-5
	4.2. Jalan Akses ke Tapak Projek	RE-6
	4.3. Cadangan Rangkaian Jalan Akses	RE-6
5.0	AKTIVITI PROJEK	RE-9
6.0	RINGKASAN KESAN BERPOTENSI, MAGNITUD DAN CADANGAN P2M2	RE-11
7.0	PEMANTAUAN PRESTASI (PM)	RE-23
8.0	PEMANTAUAN PEMATUHAN (CM)	RE-24
9.0	PEMANTAUAN IMPAK (IM)	RE-25

CHAPTER 1: INTRODUCTION		
1.1	TITLE OF PROJECT	1-1
1.2	PROJECT LOCATION	1-3
	1.2.1 Project Location	1-3
	1.2.2 Accessibility to the Project Site	1-6
	1.2.3 Access Road Network	1-8
1.3	LAND OWNER, PROJECT PROPONENT AND PROJECT DEVELOPER	1-10
1.4	QUALIFIED PERSON	1-10
2.1	LEGAL ASPECTS	1-16
	2.1.1 Prescribed Activity Subject to Section 34A, Environmental Quality Act, 1974	1-16
	2.1.2 Other Legal Requirements	1-16
	2.1.3 Conformance of the Project to Government's Development Plans	1-17
CHAPTER 2: TERMS OF REFERENCE		
2.1	APPROVAL OF TERMS OF REFERENCE (TOR)	2-1
2.2	TERMS OF REFERENCE (TOR) CHECKLIST	2-1
CHAPTER 3: STATEMENT OF NEED		
3.1	MALAYSIAN PALM OIL INDUSTRY	3-1
3.2	PROJECT NEED – IMPORTANCE OF PALM OIL TO MALAYSIA	3-1
3.3	PAHANG PALM OIL INDUSTRY	3-3
	3.3.1 Tabung Haji Plantation (THP)	3-4
CHAPTER 4 PROJECT OPTIONS		
4.1	SITE LOCATION	4-1
4.2	BUILT OPTION	4-1
4.3	NO PROJECT OPTION	4-2
4.4	TECHNOLOGY, RAW MATERIAL, CONSTRUCTION METHOD AND OPERATION OPTIONS	4-2
CHAPTER 5 PROJECT DESCRIPTION		
5.1	PROJECT DESCRIPTIONS	5-1
	5.1.1 Size and Capacity	5-1
	5.1.2 Land Requirements	5-5
5.2	PROJECT CONCEPT	5-5
	5.2.1 Plantation Concept & Methodology	5-9
	5.2.2 Project Components	5-12
	5.2.3 Good Practices On-Site (Phase 1)	5-16
5.3	PROJECT ACTIVITIES	5-19
	5.3.1 Pre-Development Stage	5-19
	5.3.1.1 Preliminary Investigation	5-19
	5.3.2 During Development Stage	5-21
	5.3.2.1 General Construction Methodology	5-21
	5.3.2.2 Land Clearing	5-22

	5.3.2.3 Site Preparation for Oil Palm Plantation	5-24
	5.3.2.4 Establishment of Temporary Base Camp	5-35
	5.3.2.5 Nursery Establishment (Oil Palm Seedlings)	5-36
	5.3.2.6 Field Establishment	5-37
	5.3.3 Post Development / During Operation	5-41
	5.3.3.1 Field Maintenance	5-41
	5.3.3.2 Harvesting	5-52
	5.3.3.3 Post-Harvest Field Management	5-54
	5.3.3.4 Abandonment and Replanting	5-55
	5.3.3.5 Maintenance of Infrastructure (Roads, Drainage & Irrigation)	5-55
5.4	PHASE OF DEVELOPEMENT	5-56
5.5	PROJECT ORGANIZATION CHART	5-64
5.6	SUMMARY OF TECHNICAL, ECONOMIC AND ENVIRONMENTAL FEATURES	5-65
	5.6.1 Technical Features	5-65
	5.6.2 Economic Features	5-65
	5.6.3 Environmental Features	5-65
CHAPTER 6 EXISTING ENVIRONMENT		
6.1	INTRODUCTION	6-1
6.2	AREA OF THE STUDY	6-1
	6.2.1 Physico-chemical Aspects	6-3
6.3	LAND USE	6-3
	6.3.1 Project Site	6-7
	6.3.2 Current Development of Oil Palm Plantation (Phase 1)	6-8
	6.3.3 Current Development of Oil Palm Plantation in Phase 1 (6,000 acres)	6-10
	6.3.4 Agriculture	6-11
	6.3.5 Settlements	6-13
	6.3.6 Forest	6-14
	6.3.7 Kuala Tembeling Tourism Complex	6-14
	6.3.8 Taman Negara Pahang	6-15
	6.3.9 Aquaculture	6-17
	6.3.10 Water Intakes	6-18
6.4	TOPOGRAPHY	6-21
	6.4.1 Drainage	6-22
6.5	CLIMATE	6-26
	6.5.1 Rainfall	6-26
	6.5.2 Temperature	6-28
	6.5.3 Relative Humidity	6-28
	6.5.4 Wind Speed and Wind Rose	6-29
6.6	GEOLOGY	6-31
6.7	MINERALS	6-33
6.8	HYDROLOGY	6-35
	6.8.1 River System and Drainage Pattern	6-35
	6.8.2 Hydrology	6-40
	6.8.2.1 Low Flow Analysis	6-40

	6.8.2.2 Water Balance	6-44
	6.8.2.3 Hydraulic Modelling	6-46
	6.8.3 Hydrogeology	6-48
	6.8.3.1 Hydrogeologic Setting	6-49
	6.8.3.2 Groundwater Levels	6-53
	6.8.3.3 Groundwater Flow	6-55
	6.8.3.4 Groundwater Quality	6-61
	6.8.3.5 Groundwater Usage	6-73
	6.8.4 Water Quality	6-74
	6.8.4.1 River Water Quality	6-74
	6.8.4.2 Existing Water Quality (In-situ Readings)	6-82
	6.8.4.3 Existing Water Quality - Physico-Chemical Parameters (Laboratory Analysis)	6-84
	6.8.4.4 Water Quality Index (WQI)	6-91
	6.8.4.5 Pesticides and NPK	6-95
6.9	AMBIENT AIR QUALITY	6-98
6.10	AMBIENT NOISE	6-100
6.11	SOIL	6-102
	6.11.1 Soil-Crop Suitability Evaluation	6-105
	6.11.2 Estimation Of Sediment Yield	6-108
6.12	ECOLOGY	6-109
	6.12.1 Flora Diversity Assessment	6-109
	6.12.1.1 Methodology	6-109
	6.12.1.2 Study Findings	6-120
	6.12.2 Fauna Diversity Assessment	6-138
	6.12.2.1 Introduction	6-138
	6.12.2.2 Methodology	6-139
	6.12.2.3 Study Findings	6-154
6.13	TRAFFIC STUDY	6-192
	6.13.1 Existing Traffic Situation	6-192
	6.13.2 Traffic Count Survey	6-192
	6.13.3 Traffic Assessment	6-194
	6.13.4 Evaluation of Existing Road Network	6-199
	6.13.5 Evaluation of Existing Junction	6-202
6.14	PUBLIC HEALTH	6-203
6.15	SOCIO-ECONOMIC	6-205
	6.15.1 Background of the Study Area	6-205
	6.15.2 Community Profile of the Study Area	6-207
	6.15.2.1 Respondent Age Group	6-208
	6.15.2.2 Educational Level	6-209
	6.15.2.3 Family Size	6-209
	6.15.2.4 Employment	6-210
	6.15.2.5 Household Income	6-211
	6.15.3 Sensitive Receptor	6-211
	6.15.3.1 Orang Asli Community	6-211
	6.15.3.2 Aquaculture	6-212

	6.15.3.3 Water Intake Kampung Batu Balak	6-212
	6.15.4 Facilities & Amenities	6-213
	6.15.5 Awareness and Perception	6-218
	6.15.6 Public Participation and Consultation	6-222
CHAPTER 7 EVALUATION OF IMPACTS		
7.1	IDENTIFICATION AND PREDICTION OF IMPACTS	7-1
7.2	BASIS OF ASSESSMENT	7-1
7.3	IMPACTS DURING PRE-DEVELOPMENT	7-3
7.4.	IMPACTS DURING DEVELOPMENT	7-4
	7.4.1 Existing Sensitive Receptors	7-4
	7.4.2 Project Activities and Associated Impacts	7-7
7.5.	ASSESSMENT OF THE SIGNIFICANT ENVIRONMENTAL IMPACTS (DURING DEVELOPMENT)	7-10
	7.5.1 Soil Erosion	7-10
	7.5.2 Hydrology	7-13
	7.5.3 Flood Risk	7-23
	7.5.4 Water Quality	7-23
	7.5.5 Water Quality Modelling	7-24
	7.5.5.1 Introduction	7-24
	7.5.5.2 Objectives and Scenarios	7-25
	7.5.5.3 Objectives	7-25
	7.5.5.4 Potential Point Source and Selected Scenarios	7-26
	7.5.5.5 Study Location and Description	7-27
	7.5.5.6 Source of Discharge (Point Source)	7-29
	7.5.5.8 Conclusion	7-46
	7.5.6 Cumulative Water Quality Modelling	7-47
	7.5.6.1 Introduction	7-47
	7.5.6.2 Study Area	7-47
	7.5.6.3 TSS Discharges and Schematic Diagrams	7-49
	7.5.6.4 Results and Discussion	7-53
	7.5.6.5 Conclusion	7-61
	7.5.7 Ecology	7-63
	7.5.7.1 Flora	7-63
	7.5.7.2 Fauna	7-66
7.6.	ASSESSMENT OF THE LESS SIGNIFICANT ENVIRONMENTAL IMPACTS (DURING DEVELOPMENT)	7-71
	7.6.1 Hydrogeology and Groundwater	7-71
	7.6.2 Air Quality	7-74
	7.6.3 Noise	7-74
	7.6.4 Traffic	7-75
	7.6.5 Public health	7-76
	7.6.6 Waste Management	7-77
	7.6.7 Socio Economy	7-78
7.7.	ASSESSMENT OF THE SIGNIFICANT ENVIRONMENTAL IMPACTS (DURING OPERATION AND MAINTENANCE)	7-80
	7.7.1 Soil Erosion	7-80

	7.7.2 Hydrology and Hydraulic	7-82
7.8.	ASSESSMENT OF THE LESS SIGNIFICANT ENVIRONMENTAL IMPACTS (DURING OPERATION AND MAINTENANCE)	7-83
	7.8.1 Water Quality	7-83
	7.8.2 Hydrogeology and Groundwater	7-84
	7.8.3 Air Quality	7-84
	7.8.4 Noise	7-84
	7.8.5 Ecology	7-84
	7.8.6 Traffic	7-85
	7.8.7 Public Health	7-88
	7.8.8 Waste Management	7-88
	7.8.9 Socio Economy	7-90
7.9	PROJECT EVALUATION	7-91
7.10	ECONOMIC EVALUATION OF ENVIRONMENTAL IMPACTS	7-91
	7.10.1 Introduction	7-91
	7.10.2 Objective	7-92
	7.10.3 Methodology	7-92
	7.10.4 Identification of Incremental Costs and Benefits	7-94
	7.10.5 Valuation of Costs and Benefits	7-94
	7.10.6 Overall Assessment	7-111
CHAPTER 8 MITIGATION MEASURES		
8.1	LAND DISTURBING POLLUTION PREVENTION AND MITIGATION MEASURES	8-1
	8.1.1. Project Activity and Implementation	8-8
8.2	MITIGATION MEASURES	8-20
	8.2.1. Adherence to DOE Guidelines	8-20
	8.2.2. Proposed Mitigation Measures	8-20
8.3	MITIGATION MEASURES DURING DEVELOPMENT PHASE	8-23
	8.3.1. Pollution Prevention and Mitigation Measures (P2M2)	8-24
	8.3.1.1 Scheduled Site Meeting	8-24
	8.3.1.2. Construction Markers	8-24
	8.3.1.3. Stabilized Construction Entrance	8-25
	8.3.1.4. Stream / Drainage / Waterways Buffers	8-26
	8.3.1.5. Preserving Top Soil & Other Assets	8-28
	8.3.1.6. Runoff Management and Perimeter Control	8-28
	8.3.1.7. Sediment Control Management	8-34
	8.3.1.8. Erosion Control Management	8-39
	8.3.1.9. Stockpile Management	8-43
	8.3.1.10. Spoil Management	8-43
	8.3.1.11. Maintenance	8-44
	8.3.1.12. Standards and Specifications for P2M2s	8-45
	8.3.1.13. Mitigation Measures for Road Construction on Slope Terrain	8-45
	8.3.2. Water Quality	8-47
	8.3.2.1. Sewage	8-47
	8.3.2.2. Accident Spillage from Skid Tanks, Oil and Grease	8-49
	8.3.3. Waste Management	8-51
	8.3.3.1. Biomass Wastes	8-51

	8.3.3.2. Solid Wastes	8-52
	8.3.3.3. Scheduled Wastes	8-53
	8.3.4. Hydrology and Hydraulics	8-54
	8.3.5. Air Quality	8-54
	8.3.6. Noise	8-57
	8.3.7. Ecology	8-57
	8.3.7.1. Flora	8-57
	8.3.7.2. Fauna	8-60
	8.3.7.3. Central Forest Spine (CFS)	8-68
	8.3.8. Physical Safety and Public Health	8-72
	8.3.9. Traffic	8-72
	8.3.10. Socio Economy	8-73
8.4	MITIGATION MEASURES DURING OPERATION AND MAINTENANCE PHASE	8-76
	8.4.1. Soil Erosion and Sedimentation	8-76
	8.4.2. Waste Management	8-77
	8.4.3. Water Quality	8-77
	8.4.3.1. Water System	8-77
	8.4.3.2. Sewage	8-78
	8.4.4. Hydrology / Hydraulics / Flooding	8-79
	8.4.5. Hydrogeology and Groundwater	8-79
	8.4.6. Air Quality	8-80
	8.4.7. Noise	8-81
	8.4.8. Ecology	8-82
	8.4.8.1. Flora	8-82
	8.4.8.2. Fauna	8-83
	8.4.9. PUBLIC HEALTH/PHYSICAL SAFETY	8-88
	8.4.10. TRAFFIC	8-88
8.5	PROJECT ABANDONMENT & REHABILITATION	8-89
CHAPTER 9 ENVIRONMENTAL MANAGEMENT PLAN		
9.1	INTRODUCTION	9-1
9.2	MAINSTREAMING OF ENVIRONMENTAL AGENDA AND SELF-REGULATION CULTURE	9-4
	9.2.1. General Considerations	9-4
9.3	ALLOCATION OF RESPONSIBILITY	9-6
	9.3.1. Responsibilities of Project Proponent	9-6
	9.3.2. Responsibility of Estate Manager	9-8
	9.3.3. Responsibilities of Environmental Consultant	9-9
	9.3.4. Responsibilities of Environmental Officer (EO)	9-9
	9.3.5. Organization Structure	9-11
9.4.	RELATED ENVIRONMENTAL COMPLIANCE	9-12
	9.4.1. Water Quality	9-12
	9.4.2. Air Quality	9-13
	9.4.3. Ambient Noise	9-14
	9.4.4. Solid Waste	9-15
	9.4.5. Scheduled Waste Management	9-16

9.5.	ENVIRONMENTAL MONITORING PROGRAM	9-17
	9.5.1. Types of Environmental Monitoring	9-17
	9.5.1.1. Performance Monitoring (PM)	9-17
	9.5.1.2. Compliance Monitoring	9-18
	9.5.1.3. Impact Monitoring	9-19
	9.5.2. Descriptions of Environmental Monitoring	9-20
	9.5.2.1. Water Quality Monitoring	9-20
	9.5.2.2. Air Quality Monitoring	9-21
	9.5.2.3. Noise Level Monitoring	9-21
9.6.	ENVIRONMENTAL AUDIT PROGRAM	9-22
9.7.	REMEDIAL ACTION	9-23
	9.7.1. EMP during Development Phase	9-23
	9.7.2. EMP during Operational and Maintenance Phase	9-28
9.8.	WILDLIFE MANAGEMENT PLAN (WMP)	9-29
	9.8.1. Tapir and Sun Bear Strategy Program	9-29
	9.8.2. Wild Boar Strategy Program	9-30
	9.8.3. Elephant Strategy Program	9-31
	9.8.3.1. Management Strategy	9-31
	9.8.4. Macaque Strategy Program	9-33
9.9.	FIRE FORTIFICATION PLAN	9-34
9.10.	EMERGENCY RESPONSE PLAN (ERP)	9-37
	9.10.1. Objectives of ERP	9-37
	9.10.2. Basis for Emergency Response Plan	9-37
	9.10.3. Emergency Response Plan (ERP) for the Proposed Project	9-39
	9.10.3.1. Organization	9-39
	9.10.3.2. Emergency Classification Levels	9-42
	9.10.4. General Responsibility of On Scene Commander (OSC) and Emergency Response Team	9-43
	9.10.5. Emergency Equipment	9-45
9.11.	COMMITMENT FROM PROJECT PROPONENT	9-45
CHAPTER 10 STUDY FINDINGS		
10.1	INTRODUCTION	10-1
10.2	PRINCIPAL FINDINGS	10-1
10.3	PRINCIPAL RECOMMENDATIONS	10-7
10.4	CONCLUSION	10-9

LIST OF TABLES

		Page
Table 2.1	Settlements within 5 km Radius of the Project Site	ES-2
Table 4.1	Coordinate Points of the Project Site	ES-5
Table 5.1	Project Development Schedule	ES-10
Table 6.1	Potential Impacts, Magnitude and Proposed P2M2 and other Mitigation Measures	ES-11
Table 7.1	The Performance Monitoring (PM) Components	ES-23
Table 8.1	The Compliance Monitoring (CM) Components	ES-24
Table 9.1	The Impact Monitoring Component (IM)	ES-25
Jadual 2.1	Kawasan Penempatan dalam 5 km Radius dari Tapak Projek	RE-2
Jadual 4.1	Titik Koordinat Tapak Projek	RE-5
Jadual 6.1	Kesan Berpotensi, Magnitud dan Cadangan P2M2	RE-11
Jadual 7.1	Komponen Pemantauan Prestasi (PM)	RE-23
Jadual 8.1	Komponen Pemantauan Pematuhan (CM)	RE-24
Jadual 9.1	Komponen Pemantauan Impak (IM)	RE-25
Table 1.2.1	Coordinate Points of the Project Site	1-4
Table 1.3.1	EIA Study Team	1-7
Table 1.4.1	List of Registered Environmental Consultants	1-11
Table 1.4.2	List of Registered Assistant Environmental Consultants	1-14
Table 2.1.1	Other Relevant Legislation/Policies/Guidelines Requirements	1-16
Table 2.1.2	Components of ESA surrounding the Project Site	1-18
Table 2.2.1	Senarai Semak Bagi Pematuhan Kepada Kemaskini Bidang Rujukan (Revised TOR)	2-1
Table 3.3.1	Oil Palm Planted Area as at December 2017 (Hectares)	3-3
Table 5.1.1	Total Acreage of Other EIAs' Projects in the Vicinity of Project Site	5-1
Table 5.2.1	Project Facilities	5-6
Table 5.2.2	Example of Planting Density for Equilateral Triangular Planting	5-10
Table 5.2.3	Example of Planting Distance for Terrace Planting	5-11
Table 5.2.4	Current Water Consumption of Oil Palm Plantation in Phase 1	5-16
Table 5.2.5	Estimation of Water Consumption of Oil Palm Plantation in Phase 2 & 3	5-16
Table 5.2.6	Good Practices On-site (Phase 1)	5-17
Table 5.3.1	Specification and Function of Drains	5-26
Table 5.3.2	Specification of Drains in Oil Palm Plantation	5-30
Table 5.3.3	List of Vehicles/Machineries	5-33

		Page
Table 5.3.4 (a)	Maximum Permissible Gross Vehicle (MGWW) Weight Accordance with List 1 (Peninsular Malaysia) of the Road Transport Act, Weight Restrictions Order 2003.	5-34
Table 5.3.4 (b)	Maximum Axle Load (MAL) accordance with List 1 (Peninsular Malaysia) of the Road Transport Act, Weight Restrictions Order 2003.	5-34
Table 5.3.5	Number of Workers	5-35
Table 5.3.6	Recommendation to Control the Weeds	5-42
Table 5.3.7	Manuring Program for Oil Palm Trees	5-44
Table 5.3.8	Pest and Disease of the Oil Palm	5-45
Table 5.3.9	Type of Traps and Description	5-51
Table 5.4.1	Area of Phase Development	5-57
Table 6.3.1	Settlements within 5 km Radius of the Project Site	6-13
Table 6.3.2	Water Intake Points	6-19
Table 6.4.1	Terrain Analysis of the Project Site	6-21
Table 6.5.1	Meteorological Station for the Climate Study of the Project Site	6-26
Table 6.5.2	Percentage Frequency of Various Directions and Speeds (2009- 2018)	6-30
Table 6.5.3	Summary of Wind Speed	6-30
Table 6.8.1	Peak Flow for the Contributing River in the Project Site	6-37
Table 6.8.2	Mean Annual minimum flow (MAM) for Every Catchment Outlets	6-41
Table 6.8.3	Annual Minimum Flow for the study area based on ungauged site estimation	6-42
Table 6.8.4	Low Flow Estimation Based on Regional Analysis (Pahang)	6-43
Table 6.8.5	Estimated Runoff (mm/month)	6-45
Table 6.8.6	Evaporation Rate Measured in Muadzam Shah	6-45
Table 6.8.7	River Cross-Sections at Catchment Outlets	6-47
Table 6.8.8	Ranges of permeability and hydraulic conductivity for a few types of sediments and rocks	6-50
Table 6.8.9	Range of porosity for sediments	6-50
Table 6.8.10	Summary of result for grain-size analysis of soil samples	6-51
Table 6.8.11	Hydraulic conductivity of soils in the drilled borehole	6-52
Table 6.8.12	Groundwater monitoring wells and water levels at the proposed Project site	6-55
Table 6.8.13	Groundwater monitoring wells and water levels at the previous Project site	6-55

		Page
Table 6.8.14	Thirty-one (31) groundwater quality parameters for five sampling stations (Samples collected and analysed in 2016)	6-67
Table 6.8.15	Thirty-one (31) groundwater quality parameters for six sampling stations (Samples collected and analysed in 2019)	6-69
Table 6.8.16	Major cations and anions for groundwater facies classification	6-71
Table 6.8.17	Groundwater facies / types for all sampling stations	6-73
Table 6.8.18	Hydrogeochemical Facies as worked out by Piper Diagram	6-73
Table 6.8.19	Locations of the Water Quality Sampling Stations	6-75
Table 6.8.20	Water Quality Within and Outside the Project Site (<i>In-Situ</i> Readings)	6-82
Table 6.8.21	Water Quality Physico-Chemical Parameters (Laboratory Analysis)	6-87
Table 6.8.22	Best-Fit Equations for the Estimation of the Sub-Indexes Values	6-91
Table 6.8.23	Water Quality Classification Based on Water Quality Index	6-92
Table 6.8.24	Water Quality Index and its Status	6-92
Table 6.8.25	Water Quality Index (WQI)	6-93
Table 6.8.26	Water Quality Status Based on NWQS	6-95
Table 6.8.27 (a)	The NPK Content in the Water at the Selected Water Quality Station	6-96
Table 6.8.27 (b)	The Pesticides Content in the Water at the Selected Water Quality Station	6-96
Table 6.9.1	Ambient Air Quality Results for All Sampling Stations	6-98
Table 6.10.1	Ambient Noise Levels for All Sampling Stations	6-101
Table 6.11.1	Soil Series and Its Area	6-102
Table 6.11.2	Classification of Soil Loss	6-106
Table 6.11.3	Estimation of Existing Soil Loss by Catchment Area (DOA method)	6-106
Table 6.11.4	Estimation of Existing Soil Loss by Catchment Area (DID method)	6-107
Table 6.11.5	Estimation of Potential Sediment Yield for Existing Conditions	6-108
Table 6.12.1	Location, details and aerial image (~100m altitude from the ground) of Plot 1 – Plot 22	6-113
Table 6.12.2	Habitat classification and description at the Project Area	6-124
Table 6.12.3	Five most speciose tree families at the Project area	6-127
Table 6.12.4	Biomass calculation at all 22 plots from above-ground and below-ground method	6-135
Table 6.12.5	Biomass Estimation at the Project Area	6-136
Table 6.12.6	Type of fauna assessment based on distance from fauna observation point.	6-144

		Page
Table 6.12.7	Location and details of Camera Trap 1 – 24 (including 2 unit of lost camera trap)	6-147
Table 6.12.8	Habitat classification and description at the Project Area	6-157
Table 6.12.9	List of volant mammal species found and expected to be found in the Project Area	6-163
Table 6.12.10	List of non-volant mammal species found and expected to be found in the Project Area	6-163
Table 6.12.11	Recorded mammals by camera traps within the Project Area (post-analysed from photo and video)	6-166
Table 6.12.12	Recorded foot print within the Project Area (Francis, 2008)	6-170
Table 6.12.13	List of bird species recorded in the Project Area.	6-178
Table 6.12.14	Recorded mammals by camera traps within the Project Area – continued. (post-analysed from photo and video)	6-185
Table 6.12.15	List of amphibian species recorded in the Project Area	6-187
Table 6.12.16	List of reptile species recorded in the Project Area	6-188
Table 6.13.1	Existing Information of the Census Station	6-194
Table 6.13.2	Vehicles Classification	6-195
Table 6.13.3	Average 16-Hour Traffic Volume and Composition by Vehicles Types 2017	6-195
Table 6.13.4	Total Vehicles for Ten Years (2008-2017) and Annual Traffic Growth Rate for Year 2017	6-195
Table 6.13.5	Level of Service Definition	6-197
Table 6.13.6	Definition Level of Service Based on Average Delay	6-198
Table 6.13.7	Traffic Composition a Jalan Jerantut– Kerambit	6-198
Table 6.13.8	PCU Factors by Vehicle Type	6-198
Table 6.13.9	Level of Service Definition	6-199
Table 6.13.10	Operational Performance of Existing Roads in Year 2017	6-200
Table 6.13.11	Definition Level of Service for Junction	6-202
Table 6.13.12	Operational Performance of Existing Junctions in Year 2017	6-202
Table 6.14.1	Number of Cases Health in Jerantut from 2011 to 2015 and 2013 to 2017	6-203
Table 6.15.1	Total Population in Mukim Tembeling and Mukim Kuala Tembeling, 2010	6-206
Table 6.15.2	Population Age Distribution in Mukim Tembeling and Mukim Kuala Tembeling, 2010	6-206

		Page
Table 6.15.3	Ethnic Composition of Mukim Tembeling and Mukim Kuala Tembeling, 2010	6-207
Table 6.15.4	Settlements located in Mukim Tembeling and Mukim Kuala Tembeling	6-207
Table 6.15.5	Facilities and Amenities in the Study Area	6-213
Table 6.15.6	Public Involvement and Consultation	6-222
Table 7.2.1	Basis Assessment Matrix	7-2
Table 7.5.1	Estimation of Potential Soil Loss (DOA Method)	7-11
Table 7.5.2	Estimation of Potential Soil Loss (DID Method)	7-11
Table 7.5.3	Estimation of Total Sediment Yield for All Soil Series	7-12
Table 7.5.4	Estimated tc values	7-14
Table 7.5.5	IDF Curves for Various Stations Within Pahang.	7-16
Table 7.5.6	Storm Pattern for Region 2: Pahang, Negeri Sembilan, Melaka and Johor	7-16
Table 7.5.7	Rainfall Intensity (mm/hr) for various duration (minutes)	7-17
Table 7.5.8	Rainfall depth (mm) for various duration (minutes)	7-17
Table 7.5.9	Temporal Pattern for 6 hour Storms	7-18
Table 7.5.10	Tc and R for the Study Area	7-19
Table 7.5.11	Comparison of estimated flow using Time-Area Method with Rational Method (50 Year ARI)	7-20
Table 7.5.12	Comparison of Peak Flow (50 Year 6 Hour Storm) at Each Catchment Outlet	7-20
Table 7.5.13	Peak Flow Estimation (50 Year 6 Hour Storm) at Each Catchment (Within Project Site)	7-21
Table 7.5.14	Summary of Observed Water Level at Kuala Sedili	7-21
Table 7.5.15	Estimated Sedimentation Within River System	7-22
Table 7.5.16	Water Intake and Air Tandak	7-27
Table 7.5.17	TSS Monitoring Result	7-27
Table 7.5.18	Point Source for the Affected River	7-29
Table 7.5.19	Simulation Profile	7-32
Table 7.5.20	Existing TSS Concentration at the Water Intake and NWQS Class	7-33
Table 7.5.21	Point Source of Sg Yong	7-36
Table 7.5.22	Point source for Sg Tembeling	7-38
Table 7.5.23	Point Source of Sg Jelai	7-41
Table 7.5.24	Point source for Sg Pahang	7-41
Table 7.5.25	Description of Project Development	7-47

		Page
Table 7.5.26	Affected River and Water Intake	7-49
Table 7.5.27	Point Source of Sg Yong	7-53
Table 7.5.28	Point Source of Sg Tembeling	7-55
Table 7.5.29	Point source of Sg Jelai	7-57
Table 7.5.30	Point source for Sg Pahang	7-59
Table 7.6.1	Groundwater contamination potential as influenced by pesticide characteristics, soil characteristics and site conditions	7-72
Table 7.6.2	Equipment Noise Emission Levels	7-75
Table 7.6.3	Total Trips in Passenger Car Unit For Each Phase	7-76
Table 7.6.4	Activities and Potential Health Impacts during Development Phase	7-76
Table 7.7.1	Estimation of Soil Loss during Operation Phase (DOA Method)	7-80
Table 7.7.2	Estimation of Soil Loss during Operation Phase (DID Method)	7-81
Table 7.7.3	Estimation of Total Sediment Yield for All Soil Series	7-82
Table 7.8.1	Trips Generation Equation and Percentage of Trips In and Out	7-85
Table 7.8.2	Trips Generated Base on Equation	7-86
Table 7.8.3	Future LOS of Jalan Jerantut – Kerambit (FR234) in year 2026	7-87
Table 7.8.4	Activities and Potential Health Impacts during Operation Phase	7-88
Table 7.10.1	Potentially Affected Environmental Services	7-95
Table 7.10.2	Cost Parameters for Establishment and Operation of Oil Palm Plantation Per Hectare	7-108
Table 7.10.3	Oil Palm Fresh Fruit Bunch Yield	7-109
Table 7.10.4	Estimates of the Discounted Environmental Costs/Benefits (8% Discount Rate)	7-111
Table 7.10.5	Estimates of the Discounted Environmental Costs/Benefits (6% Discount Rate)	7-113
Table 7.10.6	Estimates of the Discounted Environmental Costs/Benefits (4% Discount Rate)	7-114
Table 8.1.1	Area of Phases Development for Oil Palm Development Activity	8-8
Table 8.1.2	Land Disturbing Activities and Phasing for 2 and 3	8-15
Table 8.1.3	Simplified Project Sequence	8-19
Table 8.2.1	General BMP's Category and Objectives	8-22
Table 8.3.1	Buffer Zone for Rivers in the Project Site	8-27
Table 8.3.2	River Buffer Zone	8-27
Table 8.3.3	Number of Best Management Practice (BMP) Tools	8-33
Table 8.3.4	Sediment Basin Types and Design Considerations	8-37

		Page
Table 8.3.5	Various Types of Legume Cover Crops	8-41
Table 8.3.6	Best Management Practices for Control of Fugitive Dusts	8-55
Table 9.4.1	NWQS for Some Parameters Concern	9-12
Table 9.4.2	Water Classes and its Uses	9-13
Table 9.4.3	New Malaysia Ambient Air Quality Standard	9-14
Table 9.4.4	Guidelines for Environmental Noise Limits and Control	9-15
Table 9.5.1	The Performance Monitoring Descriptions	9-17
Table 9.5.2	The Compliance Monitoring Descriptions	9-18
Table 9.5.3	The Impact Monitoring Descriptions	9-19
Table 9.10.1	Internal and External Emergency Phone List	9-40
Table 9.11.1	Proposed Commitment from Project Proponent	9-46

LIST OF FIGURE

		Page
Figure 4.1	Key Plan, Location Plan, Access Road and Coordinate Points of the Project	ES-7
Figure 4.2	The Access Road Network	ES-8
Figure 5.1	Project Activities	ES-9
Figure 5.2	Project Development Schedule	ES-10
Rajah 4.1	Pelan Lokasi, Jalan Akses dan Titik Koordinat bagi Tapak Projek	RE-7
Rajah 4.2	Rangkain Jalan Akses	RE-8
Rajah 5.1	Aktiviti Projek	RE-9
Rajah 5.2	Jadual Pembangunan Projek	RE-10
Figure 1.2.1	Location Plan, Access Road, Coordinate Points and Sensitive Receptors of the Project Site	1-5
Figure 1.2.2	The Access Road Network	1-9
Figure 2.1.1	Location of the Project Site within the Central Forest Spine Corridor	1-21
Figure 5.1.1	Map of Previous and Proposed EIAs in the Vicinity of the Project Site	5-4
Figure 5.2.1	Layout Plan of the Project Site	5-8
Figure 5.2.2	Triangular System for Oil Palm Plantation	5-9
Figure 5.2.3	Triangular system for terracing oil palm plantation	5-10
Figure 5.3.1	Planting Platforms on Gentle Slopes	5-26
Figure 5.3.2	Planting Platforms on Steep Slopes	5-27
Figure 5.3.3	Installation of Temporary Bridge	5-27
Figure 5.3.4	Cross-Sectional of Culvert	5-28
Figure 5.3.5	Foothill drain at terrace cross section	5-30
Figure 5.3.6	Planting Pattern of <i>Mucuna Bracteata</i>	5-33
Figure 5.3.7	Hole-in-hole Planting	5-39
Figure 5.3.8	Types of Noxious Weeds	5-41
Figure 5.4.1	Undeveloped Area in the Project Site	5-59
Figure 5.4.2	Phase of Development	5-60
Figure 5.4.3	Development Schedule for Phase 1 (PT4858 and PT4859 (4,000 acres)	5-61
Figure 5.4.4	Development Schedule for Phase 1 (PT4856 and PT4860 (6,000 acres)	5-62
Figure 5.4.5	Development Schedule for the Project	5-63
Figure 5.5.1	Proposed Project Organization Chart	5-64
Figure 6.2.1	Zone of Study within 5 km Radius	6-2
Figure 6.3.1	Land Use up to a 5 km Radius from the Perimeter of the Project Site	6-4
Figure 6.3.2	Land Use within the Project Site	6-5
Figure 6.3.3	Land Use surrounding the Project Site	6-6
Figure 6.3.4	Buffer Zone of Taman Negara Pahang with Project Site boundary	6-16
Figure 6.3.3	Location of Water Intake Points	6-20

Figure 6.4.1	Topography of the Project Site	6-23
Figure 6.4.2	Elevation of the Project Site	6-24
Figure 6.4.3	Terrain Analysis of the Project Site	6-25
Figure 6.5.1	Average Monthly Rainfall at Batu Embun Station for 10 Years (Year 2009- 2018)	6-27
Figure 6.5.2	Average Annual Rainfall at Batu Embun Station for 10 Years (Year 2009- 2018)	6-27
Figure 6.5.3	Monthly Average Temperature at Batu Embun Station for 10 Years (Year 2009- 2018)	6-28
Figure 6.5.4	Average Monthly Relative Humidity at Batu Embun Station for 10 Years (2009- 2018)	6-29
Figure 6.5.5	Wind Rose Summary for Batu Embun Station (Year 2009-2018)	6-30
Figure 6.6.1	Geological Map of the Project Site	6-32
Figure 6.7.1	Mineral Map of the Project Site	6-34
Figure 6.8.1	Sub-Catchments of Sg. Tembeling in the Project Site	6-36
Figure 6.8.2	Trend of Groundwater Recharge	6-46
Figure 6.8.3	Distribution of groundwater monitoring wells and tube wells at the Project site	6-54
Figure 6.8.4	Topographic condition of the Project site and the vicinity areas that may determine the trend of groundwater flow in the area	6-56
Figure 6.8.5	Distribution of groundwater pressure head denotes groundwater flow pattern at the Project site	6-59
Figure 6.8.6	Velocity vectors show potential direction of groundwater flow at the Project site and the vicinity area	6-60
Figure 6.8.7	Monitoring well distribution at the proposed project site	6-62
Figure 6.8.8	Eight (8) observation and sampling stations for groundwater study at the proposed Project site	6-63
Figure 6.8.9	Procedures for groundwater sampling (a) accessing the well; (b) pumping the stagnant water (clean up well); (c) collecting samples using bailer; (d) pouring groundwater sample into the bottle; (e, f) some of the boreholes at the proposed project site	6-64
Figure 6.8.10	Groundwater samples collected from old and new boreholes for this current study using pre-labelled bottles	6-65
Figure 6.8.11	The groundwater major cations and anions plotted on piper diagram using AquaChem software	6-72
Figure 6.8.12	Environmental Sampling Stations of the Project Site	6-81
Figure 6.8.13	Water Quality Index in September 2018	6-94
Figure 6.8.14	Water Quality Index in December 2018	6-94
Figure 6.11.1	Soil Map of the Project Site	6-104
Figure 6.12.1	Satellite image of the Project area and location of Plot 1 – Plot 22 at the Project Area	6-112

Figure 6.12.2	Layout of the 10 m x 10 m plot with the grid lines and 4 sub-plots	6-117
Figure 6.12.3	Layout for line transect sampling. Green area illustrated the observation area.	6-119
Figure 6.12.4	Location of the Project area within Yong, Yong (Lipis) and Yong (Tambahan B) Forest Reserves as delineated by JPSM database (2016)	6-121
Figure 6.12.5	Zonation of the Project area based on logging cycle. Note that almost 77.25% of the Project area was categorized as Virgin Forest (lowland/hill) as delineated by JPSM database (2016)	6-121
Figure 6.12.6	Zonation of the Project area based on logging cycle. Note that almost 23% of the Project area is categorized as protected forest as delineated by JPSM database (2016)	6-122
Figure 6.12.7	Normalized Differentiate Vegetation Index (NDVI) of the Project area generated from Landsat 8 satellite image dated on 9th May 2019. Note that darker green represents high vegetation area and red represented by no/less vegetation area (Courtesy: USGS Database)	6-123
Figure 6.12.8	Distribution of tree families and species between Overall, Plot 1, and Plot 2	6-127
Figure 6.12.9	Distribution of DBH classes for trees in the Plot 1 and Plot 2 based on plot record	6-128
Figure 6.12.10	Species accumulation curve on the number of plant species recorded over the number of sampling days. The curve has approaching asymptote but not in constant, thus suggesting more work on flora survey should be conducted to have adequate sample of recorded species.	6-128
Figure 6.12.11	The structure of IUCN Red List Categories (IUCN, 2012)	6-129
Figure 6.12.12	Satellite image of the Project area and location of Fauna Observation Points (1-22)	6-140
Figure 6.12.13	Layout of fauna observation point with 3 survey categories	6-144
Figure 6.12.14	The structure of IUCN Red List Categories (IUCN, 2012)	6-153
Figure 6.12.15	Location of the Project Area within Yong, Yong (Lipis) and Yong (Tambahan B) Forest Reserves as delineated by JPSM database (2016)	6-155
Figure 6.12.16	Zonation of the Project Area based on logging cycle. Note that almost 77.25% of the Project Area was categorized as Virgin Forest (lowland/hill) as delineated by JPSM database (2016)	6-155
Figure 6.12.17	Central Forest Spine Master Plan within the Project Area under CFS1 – SL2. Note that almost 64% of the Project Area is a part of proposed corridor as delineated by PLAN Malaysia (2010).	6-156
Figure 6.12.18	Relative percentage of recorded fauna as captured by camera traps	6-161
Figure 6.12.19	Projected Asian Elephant Daily Home Range	6-175
Figure 6.13.1	Road Network	6-193
Figure 6.13.2	Location of the Project Site and Census Station (CR501, CR502 & CR 806)	6-194
Figure 6.13.3	Total Vehicles for Ten Years (2008-2017)	6-196

Figure 6.13.4	Existing Road Performance in Year 2017	6-201
Figure 6.15.1	Age Structure of the Respondents in the Study	6-208
Figure 6.15.2	Educational Level in the Study Area	6-209
Figure 6.15.3	Family Size	6-210
Figure 6.15.4	Employment	6-210
Figure 6.15.5	Household Income of the respondents	6-211
Figure 6.15.6	Percentage of Acceptance	6-219
Figure 6.15.7	Public Perception with Regards to the Project	6-220
Figure 6.15.8	Socio Economic Study Area	6-221
Figure 7.4.1	Zone of Impacts	7-6
Figure 7.5.1	Representation of Sub_catchments in HEC-HMS	7-15
Figure 7.5.2	Study Area and the Selected Design Storm Station	7-16
Figure 7.5.3	National Water Quality Standards for Malaysia	7-26
Figure 7.5.4	Study Area and Water Quality Stations	7-28
Figure 7.5.5	Point Sources for Sg Tembeling and Sg Yong	7-30
Figure 7.5.6	Schematic for Sg Tembeling, Sg Yong and Sg Pahang	7-31
Figure 7.5.7	Calibrated Data for Sg Yong	7-34
Figure 7.5.8	Calibrated Data for Sg Jelai	7-34
Figure 7.5.9	Calibrated Data for Sg Tembeling	7-35
Figure 7.5.10	Calibrated Data for Sg Pahang	7-35
Figure 7.5.11a	TSS Profile for Sg Yong in September 2018	7-36
Figure 7.5.11b	TSS Profile for Sg Yong in December 2018	7-37
Figure 7.5.12a	TSS Profile for Sg Tembeling in September 2018	7-39
Figure 7.5.12b	TSS Profile for Sg Tembeling in December 2018	7-39
Figure 7.5.13a	TSS Profile for Sg Jelai in September 2018	7-42
Figure 7.5.13b	TSS Profile for Sg Jelai in December 2018	7-42
Figure 7.5.14a	TSS Profile for Sg Pahang in September 2018	7-44
Figure 7.5.14b	TSS Profile for Sg Pahang in December 2018	7-45
Figure 7.5.15	Study Area	7-48
Figure 7.5.16	Discharge Area for the Current Project	7-50
Figure 7.5.17	Discharges from the Undeveloped Area	7-51
Figure 7.5.18	Schematic for Sg Tembeling, Sg Yong and Sg Pahang	7-52
Figure 7.5.19a	TSS Profile for Sg Yong in September 2018	7-53
Figure 7.5.19b	TSS Profile for Sg Yong in December 2018	7-54
Figure 7.5.20a	TSS Profile for Sg Tembeling in September 2018	7-55
Figure 7.5.20b	TSS Profile for Sg Tembeling in December 2018	7-56
Figure 7.5.21a	TSS Profile for Sg Jelai in September 2018	7-58
Figure 7.5.21b	TSS Profile for Sg Jelai in December 2018	7-58
Figure 7.5.22a	TSS Profile for Sg Pahang in September 2018	7-60
Figure 7.5.22b	TSS Profile for Sg Pahang in December 2018	7-60
Figure 7.8.1	LOS Traffic Flow in Year 2026	7-87
Figure 7.10.1	Total Economic Value of Forest Area	7-100
Figure 8.1.1	Components and Project Activities in Block	8-12
Figure 8.1.2	List of Environmental Method Statements (EMS)	8-14
Figure 8.1.3	Illustration of Overall Project Staging	8-16
Figure 8.1.4	Proposed Work Phasing in Each Block	8-17

Figure 8.1.5	Sequence of Work	8-18
Figure 8.2.1	Components of Generic Guidelines for ESCP (DID, 2000)	8-21
Figure 8.3.1	Sediment Marker	8-36
Figure 8.3.2	Sediment Basin	8-37
Figure 8.3.3	Typical Design of Silt Fence	8-46
Figure 8.3.4	Design of the Skid Tank	8-50
Figure 8.3.5	Example of Label for Scheduled Wastes Container	8-53
Figure 8.3.6	Proposed Projected wildlife movement. The development should start from south towards north-west in order to provide efficient wildlife escape route to the forest remnant.	8-63
Figure 8.3.7	Example of No Hunting Sign	8-67
Figure 8.3.8	Secondary Linkage (SL2)	8-69
Figure 8.3.9	Implementation Strategy Plan for CFS1-SL2: Krau WR – Bencah FR – Som FR – Yong FR	8-71
Figure 8.3.10	Examples of Relevant Traffic Signs	8-73
Figure 8.4.1	Example of Appropriate Protective Gears During Spraying Activities	8-81
Figure 8.4.2	Animal Ditch and Fence for Human-Wildlife Conflict Prevention	8-86
Figure 8.4.3	e-Aduan/e-Complaint at https://apps.wildlife.gov.my/e_aduan/index.php	8-87
Figure 9.3.1	The Organization Structure	9-11
Figure 9.7.1	Example of Proper Labelling of Scheduled Wastes	9-26
Figure 9.9.1	Fire / Explosion Emergency Response Flow Chart	9-36
Figure 9.10.1	Six Elements of Emergency Response Plan	9-39
Figure 9.10.2	Categories of Emergencies in Project Facility Area	9-41

LIST OF PLATE

		Page
Plate 1.2.1	Existing condition of the Project Site	1-3
Plate 1.2.2	Federal Route 234 (Jerantut - Kuala Lipis)	1-6
Plate 1.2.3	The Concrete Bridge to cross Sg. Jelai	1-7
Plate 1.2.4	Unpaved Access Road to the Project Site	1-7
Plate 1.2.5	Entrance to the Project Site	1-8
Plate 5.2.1	Oil Palm Seedlings in Existing Nursery	5-7
Plate 5.2.2	Cover Crop in Existing Nursery	5-7
Plate 5.2.3	Example of Terracing	5-12
Plate 5.2.4	Existing Nursery in Phase 1	5-13
Plate 5.2.5(a)	Plantation Site Office(Kompleks Dato Radin)	5-13
Plate 5.2.5(b)	Living Quarters Development	5-13
Plate 5.2.6	Watch Tower in Phase 1	5-14
Plate 5.2.7	Pesticide and Fertilizers Storage nearby Nursery Area	5-15
Plate 5.3.1	Stabilized Access Road in Phase 1	5-22
Plate 5.3.2	No Burning Signage in Phase 1	5-23
Plate 5.3.3	Biomass Stacking in Phase 1	5-24
Plate 5.3.4	Construction of Culvert	5-27
Plate 5.3.5	River Buffer Zone in Phase 1	5-29
Plate 5.3.6(a)	Example of leguminous cover crop establishment	5-32
Plate 5.3.6(b)	<i>Mucuna bracteata</i> sp. cover crop establishment in Phase 1	5-32
Plate 5.3.6(c)	<i>Mucuna</i> Sp.	5-32
Plate 5.3.6(d)	<i>Pueraria javanica</i> sp. cover crop establishment in Phase 1	5-32
Plate 5.3.7	Germinated Seeds	5-36
Plate 5.3.8	Destroy Culled Seedlings with Blade	5-37
Plate 5.3.9	Crinkled Leaf	5-37
Plate 5.3.10	Narrow Pinnae Seedling	5-37
Plate 5.3.11	Example of Fence at the Perimeter Boundary	5-38
Plate 5.3.12	Example of weeding activity with appropriate PPE	5-42
Plate 5.3.13	Example of Pruning the Oil Palm Trees	5-43
Plate 5.3.14	Damage caused by rhinoceros beetles	5-46
Plate 5.3.15	Pheromone trap for rhinoceros beetles	5-46
Plate 5.3.16	Ganoderma at the oil palm trunk	5-46
Plate 5.3.17	Bagworms Attack the Oil Palm Leaf	5-47
Plate 5.3.18	<i>Cassia cobanensis</i>	5-47
Plate 5.3.19	<i>Antigonon leptopus</i>	5-47
Plate 5.3.20	<i>Turnera subulata</i>	5-48
Plate 5.3.21	<i>Neprosis</i> sp. at the Palm Trunk	5-48
Plate 5.3.22	Example of Termites Bait	5-48
Plate 5.3.23	Damaged Caused by Rat Populations	5-49
Plate 5.3.24	Barn Owl to Control Rat Populations	5-49
Plate 5.3.25	Zinc Sheet to Protect the Young Palm Trees	5-50
Plate 5.3.26	Red Palm Weevil	5-50
Plate 5.3.27	Harvesting tall palm using sickle	5-52
Plate 5.3.28	Harvesting short palm using chisel	5-52

Plate 5.3.29	Example of Mechanical Loader Used	5-53
Plate 5.3.30	Collecting loose oil palm fruits at the base of the palm using the roller picker	5-54
Plate 6.3.1	Existing Conditions in the Project Site	6-7
Plate 6.3.2	Aerial Photos at the North of Project Site	6-8
Plate 6.3.3 (a)	Current Site Condition of Phase 1 (4,000 acres) in April 2019	6-9
Plate 6.3.3 (b)	Current Site Condition of Phase 1 (4,000 acres) in January 2020	6-10
Plate 6.3.3 (c)	Project Boundary of Phase 1 (4,000 acres)	6-10
Plate 6.3.3 (d)	Current Site Condition of Phase 1 (6,000 acres) in January 2020	6-11
Plate 6.3.3 (e)	Project Boundary of Phase 1 (6,000 acres)	6-11
Plate 6.3.4	Oil Palm and Rubber Plantations owned by FELCRA, Private Ownership near the project site.	6-12
Plate 6.3.5	Corn Farm and Orchard (Private Ownership)	6-12
Plate 6.3.6	Some Settlements and Amenities	6-14
Plate 6.3.7	Kuala Tembeling Jetty in Kompleks Pelancongan Kuala Tembeling	6-14
Plate 6.3.8	Aquaculture Activity	6-17
Plate 6.12.1a	Garmin GPSMAP 64S was used to record GPS tracks and points.	6-110
Plate 6.12.1b	Ground Control Station (GCS) for UAV operation with First Person View (FPV) capability by using Mavic 2 Pro	6-110
Plate 6.12.2	Tree Tagging and DBH Measure	6-117
Plate 6.12.3	Study Tools and Equipment	6-118
Plate 6.12.4a	Mixed lowland forest remnant with several tree DBH classes forming different layers of forest canopy. Less forest floor vegetation indicates the forest succession was towards the final phase.	6-124
Plate 6.12.4b	Aerial view of the forest remnant with different size of tree crown. Note that the function of tree crown size is positively correlated with tree DBH.	6-124
Plate 6.12.5a	Logged-over forest with >50% vegetation coverage. Several big trees were excluded during previous logging operation and the formation of homogeneous tree canopy layer of regenerating forest.	6-125
Plate 6.12.5b	Logged-over forest with <50% vegetation coverage. Note that the exposed forest floor with leftover biomass wastes and disruption of natural ecosystem due to recent logging operation	6-125
Plate 6.12.6	Secondary forest formation dominated by pioneer and late-seral trees with thicket of ferns	6-125
Plate 6.12.7	Mixture of secondary vegetation, alien species and fruit trees at the abandoned worker quarters.	6-125
Plate 6.12.8a	Stream vegetation along the river bank with slow-flowing water and fallen trees.	6-125
Plate 6.12.8b	Vegetation surrounding the water-logged area dominated by weeds and ferns.	6-125
Plate 6.12.9a	The homogeneous growth of secondary vegetation forming shrubland	6-126

Plate 6.12.9b	Abandoned land with temporary water-logged soil forming grassland.	6-126
Plate 6.12.10	a) Hampas Tebu, <i>Gironniera nervosa</i> (Ulmaceae) b) c) Mata Keli, <i>Gynotroches axillaris</i> (Rhizophoraceae) d) Pucuk Kaduk, <i>Piper sarmentosum</i> (Piperaceae) e) Betel palm, <i>Areca</i> spp. (Arecaceae) f) Pulai tree, <i>Alstonia</i> spp. (Apocynaceae).	6-129
Plate 6.12.11	a) Sesenduk tree, <i>Endospermum diadenum</i> (Euphorbiaceae) b) Petai tree, <i>Parkia speciosa</i> (Leguminosae) c) Mengkirai, <i>Trema</i> d) Kesinai, <i>Streblus ilicifolius</i> (Moraceae) e) Kasai Daun Besar, <i>Pometia pinnata</i> (Sapindaceae) f) Ketup-ketup, <i>Bauhinia kockiana</i> (Leguminosae)	6-130
Plate 6.12.12	a) Pecah Periok, <i>Ixora finlaysoniana</i> (Rubiaceae) b) Flowering Meranti Melantai tree, <i>Shorea macroptera</i> (Dipterocarpaceae) c) Balik Angin, <i>Mallotus macrostachyus</i> (Euphorbiaceae) d) Setawar Halia Merah, <i>Costus speciosus</i> (Costaceae) e) Kempas tree, <i>Koompasia malaccensis</i> (Leguminosae) f) Mahang Gajah tree, <i>Macaranga gigantea</i> (Euphorbiaceae).	6-131
Plate 6.12.13	a) Flower of Beberas, b) <i>Chassalia chartacea</i> (Rubiaceae) Kelempayan fruit, <i>Neolamarckia cadamba</i> (Rubiaceae) c) Tepus Tanah, <i>Zingiber spectabile</i> (Zingiberaceae) d) Kabung fruit, <i>Arenga pinnata</i> (Wurmb) Merr. (Arecaceae) e) Stilt root of Simpoh Gajah tree, <i>Dillenia reticulata</i> (Dilleniaceae) f) Tree trunk of Kelat, <i>Syzygium glaucum</i> (Myrtaceae).	6-132
Plate 6.12.14a	Garmin GPSMAP 64S was used to record GPS tracks and points.	6-142
Plate 6.12.14b	Tree canopy surveillance for potential wildlife habitat using Mavic 2 Pro as UAV platform.	6-142
Plate 6.12.15a	Fauna observation by using a pair of binoculars	6-144
Plate 6.12.15b	Usage of DSLR camera with telephoto lens for wildlife photography. Both methods required camouflage attire during day assessment to reduce visibility and become concealed within the forested habitat.	6-144
Plate 6.12.16a	Night observation by assessing forest trail with the aid of headlamp and DSLR camera	6-145
Plate 6.12.16b	Night observation by 4WD driving to observe nocturnal wildlife along the logging tracks.	6-145
Plate 6.12.17a	Fresh dung piles with intact boli (Stage 1 – 2) – included in the count	6-146
Plate 6.12.17b	Dried dung piles with no intact boli (Stage 3 – 5) – excluded from the count.	6-146
Plate 6.12.18a	Mounted camera trap (Bushnell Natureview HD Essential Trail Camera) and securely locked with metal clamp and padlock.	6-147
Plate 6.12.18b	Final inspection on camera trap (batteries, SD card, functionality) before operation.	6-147
Plate 6.12.19a	Mixed lowland forest remnant with several tree DBH classes. Clear forest terrain indicates the final stage of forest succession and becomes a good spot to observe wildlife.	6-157

Plate 6.12.19b	Muddy ground within the forest remnant becomes wildlife hotspot as foraging ground and wallow area for wildlife such as wild boars	6-157
Plate 6.12.20	Logged-over forest with patches of open cleared terrain and logging track. These disturbed terrains provide a network of wildlife movement for foraging and home range.	6-158
Plate 6.12.21 a	Homogeneous secondary vegetation of Mengkirai trees with broken trunks and fallen branches. The damages due to wildlife's activities, possibly by foraging activity by Asian Elephants.	6-158
Plate 6.12.21 b	Wildlife foot prints on muddy terrain and vegetation trail at the fringe of secondary forest.	6-158
Plate 6.12.22	Abandoned worker quarters with modified landscape becomes a good spot for herptiles assessment. Most of herptiles were found hiding and adapting with the disturbed environment.	6-159
Plate 6.12.23 a	Foot prints and dung piles were observed at the stream bank, thus indicates wildlife crossing activities across the stream (towards the open cleared land for oil palm plantation).	6-159
Plate 6.12.23 b	Forest stream becomes a good hotspot for aquatic wildlife such as tortoises and otters.	6-159
Plate 6.12.24 a	Forest island with clear edge effect. Existing wildlife are expected to utilize the open ground as foraging niche and pathway to other forest remnant.	6-160
Plate 6.12.24 b	Muddy terrain at open cleared area becomes wallow area and foraging ground for wildlife.	6-160
Plate 6.12.25	Sightings of mammals within the Project Area; a) Asian Elephant, <i>Elephas maximus</i> b) Plainain Squirrel, <i>Callosciurus notatus</i> c) Long-tailed Macaque, <i>Macaca fascicularis</i> d) Grey-bellied Squirrel, <i>Callosciurus caniceps</i> .	6-165
Plate 6.12.26	a) Fresh Asian Elephant dung piles adjacent to the Project Area's entrance (~200m) from oil palm plantation b) Asian Elephant dung piles inside the newly open-cleared forest for oil palm plantation c) Aerial view of improper wildlife trench which still allow wildlife crossing including Asian Elephant to go outside the Project Area d) Trace of Asian Elephant's resting and foraging ground.	6-174
Plate 6.12.27	a) Possibly track of Malayan Tiger foot print within the Project Area. b) Possible foot print of Malayan Tiger with the length of 150mm and c) width of 93.48mm.	6-176
Plate 6.12.28	Sightings of birds within the Project Area: a) Black Hornbill, <i>Anthracoceros malayanus</i> b) Black-thighed Falconet, <i>Microhierax fringillarius</i> c) Chestnut-breasted Malkoha, <i>Phaenicophaeus curvirostris</i> d) Greater Racquet-tailed Drongo, <i>Dicrurus paradiseus</i> e) White-headed Munia (adult and juvenile), <i>Lonchura maja</i> .	6-180
Plate 6.12.29	Sightings of birds within the Project Area: a) Brahminy Kite, <i>Haliastur indus</i> b) White-breasted Waterhen, <i>Amourornis</i>	6-182

	phoenicurus c) Dollarbird, Eurystomus orientalis d) Rhinoceros Hornbill, Buceros rhinoceros e) Yellow-vented Bulbul, Pyncnonotus goiavier f) Whiskered Treeswift, Hemiprocne comata g) Grey Wagtail, Motacilla cinerea h) Pink-necked Green Pigeon, Treron vernans.	
Plate 6.12.30	Sightings of birds within the Project Area: a) Spotted Dove, Streptopelia chinensis b) Red-wattled Lapwing, Vanellus indicus c) Javan Myna, Acridotheres javanicus d) Richard's Pipit, Anthus richardi e) Lesser Coucal, Centropus bengalensis f) Savanna Nightjar, Caprimulgus affinis f) Barred Buttonquail, Turnix suscitator.	6-184
Plate 6.12.31	Sightings of amphibians within the Project Area: a) Ornate Narrow-mouthed Frog, Microhyla fissipes b) White-lipped Frog, Chalcorana labialis c) Tadpoles of Narrow-mouthed Frog (Microhyla spp.) in the water-logged area next to logging track d) Grass Frog, Fejervarya limnocharis e) Butler's Narrow-mouthed Frog, Microhyla butleri f) Malayan Slender Treefrog, Polypedates discanthus g) Asian Common Toad, Duttaphrynus melanostictus.	6-190
Plate 6.12.32	Sightings of reptiles within the Project Area: a) Common Garden Lizard, Calotes versicolor b) Many-lined Sun Skink, Eutropis multifasciata c) Painted Bronzeback Tree Snake, Dendrelaphis pictus d) Water Monitor Lizard, Varanus salvator e) f) Possibly Golden Tree Snake (Chrysopelea ornata) hiding in the tree hollow g) Asian Leaf Turtle, Cyclemys dentata.	6-191
Plate 7.5.1	a) The invasion of secondary vegetation forming a blanket-like vegetation cover b) Growing secondary vegetation dominated by Mengkirai tree and Paku Resam	7-63
Plate 7.5.2	Border of the Project Area with adjacent forest reserve delineated by logging road	7-65
Plate 7.5.3	Absolute forest type conversion between forest remnant and oil palm plantation delineated by deep wildlife trench.	7-65
Plate 7.5.4	a) Asian Elephant dung piles and foot prints were recorded within the oil palm plantation on the west of the Project Area b) A sounder of wild boars adjacent to the oil palm plantation.	7-67
Plate 7.5.5	a) Two intruders were recorded finding/hunting unknown things/wildlife along the stream bank b) An intruder in action by a record of walking further inside the wildlife trail with a machete.	7-68
Plate 7.5.6	Network of riparian buffer zone across the oil palm plantation. For wildlife habitat, the width of buffer zone should be ~100m at each side.	7-69
Plate 7.8.1	Example "No Burning" Signage	7-89
Plate 8.3.1	Example of Water Bowser	8-26
Plate 8.3.2(a)	Example of Stream Buffer	8-28
Plate 8.3.2(b)	Stream Buffer in Phase 1	8-28
Plate 8.3.3(a)	Example of Buffer Zone Signage	8-28

Plate 8.3.3(b)	Riparian Reserve in Phase 1	8-28
Plate 8.3.4	Example of Perimeter Drain as a Perimeter Control in Phase 1	8-29
Plate 8.3.5	Example of Temporary Earth Drain	8-30
Plate 8.3.6	Example of Road Side Drain	8-31
Plate 8.3.7	Example of Check Dam	8-32
Plate 8.3.8	Example of Culvert	8-33
Plate 8.3.9	Example of Bridge	8-33
Plate 8.3.10(a)	Example of Sediment Trap	8-34
Plate 8.3.10(b)	Example of Silt Trap Constructed in Phase 1	8-35
Plate 8.3.11	Example of Sediment Basin	8-35
Plate 8.3.12	Example of Cover Crop	8-40
Plate 8.3.13	Planting Platform on Gentle Slope	8-42
Plate 8.3.14	Planting Platform on Slope 12° - 20°	8-42
Plate 8.3.15	Example of Toilet	8-48
Plate 8.3.16	Skid/Storage on Stable Ground	8-49
Plate 8.3.17	Example of Recycling Bins	8-52
Plate 8.3.18	Example of Bung-hole Plastic Drum	8-54
Plate 8.3.19	Example of Open Top Steel Drum with Cover and Clam	8-54
Plate 8.3.20	Unpaved Road Sprayed with Water	8-55
Plate 8.3.21 (a)	Allocation of Riparian Buffer Zone in Phase 1 (4,000 acres)	8-58
Plate 8.3.21 (b)	Allocation of Riparian Buffer Zone in Phase 1 (6,000 acres)	8-58
Plate 8.3.22	Riparian area should be protected with proper mitigation measures.	8-59
Plate 8.3.23	Example of Riparian Reserve Signage	8-61
Plate 8.3.24	Offence and Penalty for Wildlife Trapping or Hunting	8-65
Plate 8.3.25	Example of Warning Sign for Wildlife Poaching in Phase 1	8-65
Plate 8.3.26	Example of Permanent Guard House	8-65
Plate 8.4.1	Pruned Frond Stacking between Oil Palm Rows	8-76
Plate 8.4.2	Example of Leguminous Cover Crops in the Oil Palm Plantation	8-76
Plate 8.4.3	Barn Owl to Control Rat Population	8-78
Plate 8.4.4	Blue LED signal light is found to be efficient to scare away the Asian Elephants	8-84
Plate 9.7.1	Example of Improper and Proper Storage of Scheduled Waste	9-26
Plate 9.7.2	Example of Storage Tanks for Waste Oil	9-27
Plate 9.8.1	Example of Signage for Elephants	9-33
Plate 9.9.1	Example of Watch Tower	9-35
Plate 9.9.2	Example of Open Burning Warning Post	9-35
Plate 9.9.3	Example of Signage of Fire Assembly Point	9-35
Plate 9.10.1	Example of Signage of Government Emergency Phone List	9-41

LIST OF APPENDICES

Appendix 1	Standard Sheet
Appendix 2	RTD Jerantut & Kelas Guna Tanah
Appendix 3	JPBD
Appendix 4	Land Status (Pejabat Daerah dan Tanah Jerantut)
Appendix 5	ESA (Environmentally Sensitive Area)
Appendix 6	Environmental Scoping Information (ESI)
Appendix 7	Hydrology Calculation
Appendix 8	Hydrology Report
Appendix 9	Letter of Majlis Mesyuarat Kerajaan (MMK)
Appendix 10	Certificate of Laboratory Analysis (Water Quality) Certificate of Laboratory Analysis (Groundwater Quality) Certificate of Laboratory Analysis (Ambient Air Quality) Certificate of Laboratory Analysis (Ambient Noise)
Appendix 11	Soil Suitability Report
Appendix 12	Soil Loss Calculation
Appendix 13	Socio Economic Questionnaire & Minute Meeting of Focus Group Discussions (FGD)
Appendix 14	List of Flora & Total Biomass Value
Appendix 15	The Mike 'S System' for dung pile classification
Appendix 16	Air Burner's Technology
Appendix 17	Guidelines For Packaging, Labeling & Storage of Scheduled Wastes In Malaysia
Appendix 18	Borang As/Pub/N-Jana (Written Approval For Generator)
Appendix 19	Borang 11AK (Geran Tanah)
Appendix 20	Wildlife Management Plan (WMP)
Appendix 21	SSM
Appendix 22	Surat Lantikan Pemaju
ATTACHMENT 1	Land Disturbing - Pollution Prevention and Mitigation Measures (LD-P2M2)