Environmental Impact Assessment

Project Number: 42362-013
July 2013

INO: Java–Bali 500 kV Power Transmission Crossing Project

Prepared by PT Perusahaan Listrik Negara (Persero)

Currency Equivalents

(Inter-bank average exchange rate as of May 2013)

Currency Unit	-	Rupiah (Rp)
Rp 1.00	=	US$ 0.000101
US$ 1.00	=	9,900 Rp

For the purpose of calculations in this report, an exchange rate of $1.00 = 9,900 Rp has been used.

Abbreviations, Weights and Measures

AC	Alternate Current
ACSR	Aluminum Conductors Steel-Reinforced
ADB	Asian Development Bank
AIF	ASEAN Infrastructure Fund
AMDAL	Analisa Mengenai Dampak Lingkungan (Environmental Permit)
ANDAL	Analisis Dampak Lingkungan (EIA Report)
AP	Affected Person
AQMS	Air Quality Monitoring Network System
BAPEDAL	Badan Pengendalian Dampak Lingkungan (Environmental Impact Management Agency)
BPKH	Badan Pemantapan Kawasan Hutan (Forest Area Consolidation Center Agency)
CAP	Corrective Action Plan
CEMP	Contractors Environmental Management Plan
CHSP	Community Health and Safety Plan
CSR	Corporate Social Responsibility
DWRD	Department of Water Resources Development
EA	Executing Agency
EHS	Environment, Health and Safety
EHT	Elevated High Tension
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRM	Grievance Redress Mechanism
ha	Hectare
HTLS	High Temperature Low Sag
HVAC	High Volt Alternate Current
HVDC	High Volt Direct Current
IA	Implementing Agency
ICNIRP	International Commission on Non-Ionizing Radiation
IEE	Initial Environment Examination

IFC	International Finance Corporation
IUCN	International Union for the Conservation of Nature
kV	Kilo Volt
LARP	Land Acquisition and Resettlement Plan
m	Meter
masl	meters above sea level
MEMR	Ministry of Energy and Mineral Resources
mg	Milligram
MMAF	Ministry of Marine Affairs and Fisheries
MoE	Ministry of Environment
MoF	Ministry of Forestry
MVA	Mega Volt Ampere
MVMC	Multi Voltage Multi Circuit
MW	Mega Watt
NGO	Non-governmental Organization
Nm^3	Normal Cubic Meter
O&M	Operation and Maintenance
O_3	Ozone
OHSP	Occupational Health and Safety Plan
PAH	Project Affected Household
PCB	Polychlorinated Biphenyls
PCR	Physical Cultural Resources
PE	Probability of Exceedance
PGA	Peak Ground Acceleration
PHKA	Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam (Directorate General of Forest Protection and Natural Conservation)
PLN	Perusahaan Listrik Negara (State Electric Company)
PM	Particulate Matter
PMU	Project Management Unit
PPE	Personal Protective Equipment
PPLH	Pusat Penelitian Lingkungan Hidup (Center for Environmental Research)
REA	Rapid Environmental Assessment
RKL	Rencana Pengelolaan Lingkungan
RoW	Right of Way
RPJMN	Indonesia's Medium Term Development Plan
RPL	Rencana Pemantauan Lingkungan
SF_6	Sulfur hexafluoride
SNI	Standard Nasional Indonesia (Indonesian National Standard)
SO_2	Sulfur Dioxide
SPS	ADB's Safeguard Policy Statement 2009
SR1	Environmental Safeguard Requirements
TA	Technical Assistance
TL	Transmission Line
ToR	Terms of Reference

UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
US EPA	United States Environment Protection Agency
WHO	World Health Organization
µg	Microgram
µT	microtelsa

TABLE OF CONTENTS

ABBREVIATIONS, WEIGHTS AND MEASURES II

EXECUTIVE SUMMARY XIII

I. INTRODUCTION 1
A. Project Background 1
B. Purpose of the Report 1
C. Report Structure 3
D. Approach and Methodology to the EIA Preparation 4
E. Scope of EIA Report 6

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK 7
A. ADB Environmental Safeguards 7
1. Safeguard Policy Statement 7
2. Project Environmental Categorization 8
3. Information Disclosure 8
B. Government Environmental Assessment Requirements 8
1. Institutions 8
2. EIA Legal and Regulatory Framework 9
3. Comparison of Government and ADB Requirements 9
4. EIA Process 10
5. Status of the Project's AMDAL 11
6. Indonesia's Environmental Standards 12
7. Forest Management and Conservation 15
8. International Agreements 21

III. DESCRIPTION OF THE PROJECT 22
A. Project Overview 22
B. Project Rationale 22
C. Project Proponent 24
D. Project Location and Area 24
E. Project Components 26
1. Component 1: Extension of Paiton Substation 26
2. Component 2: Paiton to Watudodol Transmission Line 27
3. Component 3: Watudodol to Segara Rupek Overhead Sea Crossing 500 kV TL 30
4. Component 4: Segara Rupek to Gilimanuk TL 30
5. Component 5: Gilimanuk to New Kapal Transmission Line 36
6. Component 6: New Kapal Substation 36
7. Component 7: Substation Upgrading and Extension 36
F. Right-of-Way and Transmission Towers 41
G. Access Roads and Jetties 45
H. Construction Materials 45
I. Workforce 45
J. Budget and Implementation Schedule 46

IV. DESCRIPTION OF THE ENVIRONMENT ... 47
A. Physical Environment ... 47
1. Topography ... 47
2. Seismology ... 49
3. Land Use ... 50
4. Soils ... 53
5. Climate ... 53
6. Water Resources ... 54
7. Air Quality ... 55
B. Ecological Environment ... 57
1. Terrestrial Ecology ... 57
2. Project RoW Encroachment ... 62
3. Protected Areas: National Parks ... 66
a. Baluran National Park in East Java ... 66
b. Biodiversity Study for the TL Alignment through Baluran National Park ... 74
c. Bali Barat National Park in Bali ... 87
c. Biodiversity Study for the TL alignment through Bali Barat National Park ... 93
C. Socio-economic Environment ... 107
1. East Java and Bali Population ... 107
2. Socio-economic conditions in Java and Bali ... 109
3. Affected Persons ... 109
4. Settlements, Physical and Cultural Resources in Transmission Lines Right-of-Way (RoW) ... 115

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES ... 116
A. General Environmental Impacts and Mitigation Measures ... 116
1. Preconstruction ... 116
a. Land Acquisition and Resettlement ... 116
b. Sensitive Receptors and Existing Infrastructure ... 117
c. Physical Cultural Resources ... 117
d. National Parks ... 117
e. Temporary Borrow and Disposal Pits, Quarries and Temporary Construction Camps 118
f. Ministry of Environment and Ministry of Forestry Clearances Prior to Commencement of Physical Works ... 119
2. Construction ... 120
a. Erosion, Borrow and Spoil Pits, and Sourcing of Aggregates ... 120
b. River Crossings, Streams, Irrigation Channels ... 122
c. Fuels, Oils and Chemicals ... 122
d. Solid Waste Management ... 123
e. Air Quality ... 123
f. Electromagnetic Fields ... 124
g. Climate ... 124
h. Noise ... 124
i. Temporary Construction Camps ... 125
j. Physical Cultural Resources ... 126
k. Religious Sensitivities ... 127
l. Aesthetic Impacts ... 127
m. Occupational Health and Safety ... 128
n. Community Health and Safety ... 129
o. Substation Upgrading and Extension ... 129

3. Operation 130
a. Oils, Fuel Spills and Dangerous Goods 130
b. Health Impacts 131
c. Human Exposure to Electromagnetic Fields (EMF) 131
d. Electrocution and Induced Current 132
e. Use of Polychlorinated Biphenyls (PCBs) and Sulfur hexafluoride 133
f. Occupational and Community Health and Safety 133
g. Wind, Fire and Earthquake Hazards 134
h. Electromagnetic Interference 135

B. Potential Impacts and Mitigation Measures on the Status of Biodiversity in National Parks 136
1. Baluran National Park in East Java 136
a. Biodiversity study on the Impacts of the TL in Baluran National Park 136
b. Mitigation Measures on the Baluran National Park 144
2. Bali Barat National Park in Bali 145
a. Biodiversity study on the Impacts of the TL in Bali Barat National Park 145
b. Mitigation Measures on the Bali Barat National Park 153
3. Collaborative Agreements between the National Parks and PLN 154
4. Standard Vegetation Clearing Mitigation Measures 155
5. Standard Fauna Mitigation Measures 156

VI. ANALYSIS OF ALTERNATIVES 159
A. No Project Alternative 159
B. Technological Alternatives 160
C. Alternatives for the Java-Bali Interconnection 160

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION 170
A. Framework for Public Disclosure, Consultation and Participation 170
B. Stakeholder Consultations 172
C. Public Consultations 172
D. Results of Public and Stakeholder Consultations 173
E. Due Diligence Consultations 179
F. Disclosure and Consultations undertaken by Udayana University 179
G. EIA Disclosure 180
H. Recommendations and Future Consultation Activities 180

VIII. GRIEVANCE REDRESS MECHANISM 181

IX. ENVIRONMENTAL MANAGEMENT PLAN (EMP) 183
A. Environmental Mitigation Plan 183
1. Construction schedule in Baluran National Park 215
2. Construction schedule in Bali Barat National Park 216
B. Environmental Monitoring Plan 217
C. Institutional Framework for EMP Implementation 223
D. Capacity Building for EMP Implementation 225
E. Budget for EMP Implementation 226

X. CONCLUSIONS AND RECOMMENDATIONS 229

APPENDICES

Appendix 1: Rapid Environmental Assessment (REA) Checklists 233
Appendix 2: Questionnaires and Formats used for Environmental Surveys 239
Appendix 3a: References for the EIA Report 246
Appendix 3b: References for the Biodiversity Study 250
Appendix 4a: Ministry of Environment Approval of Terms of Reference for Java Bali 500 kV Transmission Line (*Bahasa original and unofficial English translation*) 252
Appendix 4b: Summary of Terms of Reference for Java Bali 500 kV Transmission Line (*unofficial English summary translation)* 257
Appendix 5a: AMDAL Environmental Permit (Bahasa original) 261
Appendix 5b: Environmental Certificate (unofficial English translation)..................................262
Appendix 6: Project TL Detailed Strip Maps 286
Appendix 7: Detailed Features and Land Use along TL Alignment......................................317
Appendix 8: Due Diligence Review Components 3 and 4..337
Appendix 9: Due Diligence Review of Component 7 359
Appendix 10: MoF Forestry Rent Use Permit in Principle..376
Appendix 11: Public Consultation Photos...379
Appendix 12: Public Consultation Signed Attendance Sheets 382
Appendix 13: Due Diligence Stakeholder Consultations and National Park Site Visits 388
Appendix 14: Project Public Communication Framework 399
Appendix 15: Bird Species in Gilimanuk Bay 404
Appendix 16: PLN Standard Operating Procedures for Environmental Management, Emergency Preparedness and Response and Health and Safety 408

LIST OF TABLES

Table 2.1: Comparison of Government and ADB project environmental categorization 10
Table 2.2: Relevant Government ambient air quality standards and international guidelines....... 13
Table 2.3: Government water quality standards 14
Table 2.4: Government noise standards and relevant international guidelines 14
Table 2.5: ICNIRP exposure limits for general public exposure to electric and magnetic fields.... 15
Table 2.6: Administrative and technical requirements for obtaining a Forest Utilization Rent Use Permit 20
Table 2.7: Relevant international environmental agreement and conventions 21
Table 3.1: Project area 25
Table 3.2: Details of the Project Components 26
Table 3.3: Substations to be upgraded or extended, Component 7 40
Table 3.4: Transmission tower RoW minimum horizontal clearance (m) 42
Table 3.5: Minimum vertical conductor clearance (m) 43
Table 4.1: Distribution of land use along the Project RoW based on field surveys 51
Table 4.2: Distribution of land use along the TL RoW based on Bakosurtanal mapping 52
Table 4.3: Monthly meteorological data, East Java, 2008 53
Table 4.4: Meteorological data for Bali by District/Municipality, 2007 54
Table 4.5: Surface water potential and available low flow for selected islands 55
Table 4.6: Ambient air quality in major cities 56
Table 4.7: Flora in the overall Project area 59
Table 4.8: Fauna in the Project area 61
Table 4.9: Project RoW encroachment on Production and Limited Production Forests 63
Table 4.10: Endangered fauna in Baluran National Park 71
Table 4.11: Endangered Avian-fauna in Baluran National Park 71
Table 4.12: Project TL area within Baluran National Park 74
Table 4.13: Plants species found at Teak and Gmelina Forests, TNB 76
Table 4.14: List of birds observed during fieldwork 78
Table 4.15: Protected Vegetation in Bali Barat National Park 89
Table 4.16: Protected Fauna in Bali Barat National Park 93
Table 4.17: List of Plant Species within the Transmission Line RoW 94
Table 4.18: Mangroves species in Gilimanuk Bay 97
Table 4.19: Birds observed during fieldwork between Crossing Tower to T022 100
Table 4.20: Population, Project area Provinces and Districts 108
Table 4.21: Project area demographics 108
Table 4.22: Population growth by province 108
Table 4.23: Number of electricity consumers and annual growth in Bali Province 109
Table 4.24:Type of PAH settlements 110
Table 4.25: Distribution of PAHs by family type 110
Table 4.26: Affected Persons (AP) age groups 110
Table 4.27: Religious affiliations of PAHs 111
Table 4.28: Education levels of adult members of PAHs 111
Table 4.29: Occupations of PAH workers 112
Table 4.30: Crop types, land used and crop yields 112
Table 4.31: House ownership 112
Table 4.32: Indebtedness (thousand Rp) 113
Table 4.33: Source of drinking water, PAHs 113
Table 4.34: Sanitation access, PAHs 113
Table 4.35: Cooking fuel sources 114
Table 4.36: Electricity use by PAHs 114

Table 4.37: Use of electricity alternatives 114
Table 5.1: Typical noise levels of construction equipment (noise level in dB (A) at 15 m).......... 125
Table 5.2: Population of Banteng and Water Buffalo 137
Table 5.3: Impact Assessment for Baluran National Park 141
Table 5.4: Impact Assessment for Bali Barat National Park 149
Table 6.1: Assessment of features, issues and mitigation strategies for Project alternatives 162
Table 6.2: Environmental indicators used in Project options impact evaluation 168
Table 6.3: Scoring scale used in Project options impact evaluation 168
Table 6.4: Weighting assigned to environmental components in Project options impacts evaluation 169
Table 6.5: Project options impact evaluation scores 169
Table 7.1: Stakeholder consultations conducted 173
Table 7.2: Summary of public consultations 176
Table 7.3: Summary of major issues discussed during public consultations 176
Table 9.1: Summary of Environmental Impacts and Mitigation Measures 185
Table 9.2: Mitigation Measures in Bali Barat National Park 205
Table 9.3: Mitigation Measures in Baluran National Park 210
Table 9.4: Tower construction schedule in Baluran National Park 215
Table 9.5: Tower construction schedule in Bali Barat National Park 216
Table 9.6: Environmental Monitoring Plan 219
Table 9.7: Summary of Roles and Responsibilities for EMP Implementation 223
Table 9.8: Summary of the EMP Budget Estimate 226
Table 9.9: Detailed EMP Budget Estimate 227

LIST OF FIGURES

Figure 1.1: Java - Bali 500 kV Transmission Crossing Project Location Map 2
Figure 2.1: Forest Utilization Rent Use Permit process 19
Figure 3.1: Paiton Substation (Component 1), East Java 27
Figure 3.2: Proposed Paiton Substation expansion location and layout plan, Component 1 .. 28
Figure 3.3: Paiton to Watudodol TL map, Component 2 29
Figure 3.4: Watudodol to Segara Rupek TL Overhead Sea Crossing, Component 3............. 31
Figure 3.5: Conceptual Diagram of Bali Strait Overhead Sea Crossing, Component 3.......... 32
Figure 3.6: Near Crossing Tower site on Bali side, looking towards East Java 32
Figure 3.7: Mangroves on south end of Gilimanuk Bay, near suspension tower site 33
Figure 3.8: Burung and Gadung Islands, Gilimanuk Bay 33
Figure 3.9: Site of the proposed jetty, near Component 4 Tower No.15 34
Figure 3.10: Segara Rupek to Gilimanuk TL, Bali Barat National Park (Component 4).......... 35
Figure 3.11: Gilimanuk to New Kapal TL, Component 5 37
Figure 3.12: Location map of proposed 500 kV substations at New Kapal, Component 6 38
Figure 3.13: Substation Upgrading, East Java and Bali (Bali (Component 7) 39
Figure 3.14: Site conditions, proposed 500 kV substation at New Kapal (Component 6)....... 41
Figure 3.15: Generic 500 kV transmission tower design (height: 50 – 84 m; RoW: 34 m)...... 44
Figure 3.16: Profile of 500 kV Bali Strait Overhead Sea Crossing Towers, Component 3...... 44
Figure 4.1: Java and Bali topography and TL alignment 48
Figure 4.2: Indonesia Seismic Hazard Map in Indonesian Earthquake Code......................... 50
Figure 4.3: Mixed forest vegetation in the overall Project area 57
Figure 4.4: Mixed plantations in the overall Project area 58
Figure 4.5: Shrub areas in the overall Project area.. 58
Figure 4.6: Production Forest and Project RoW, East Java 64
Figure 4.7: Limited Production Forest and Project RoW, Bali 65
Figure 4.8: Baluran National Park and Project RoW.. 68
Figure 4.9: Baluran National Park topography 73
Figure 4.10a: Savanna at the Wilderness Zone.. 75
Figure 4.10b: Gmelina Forest... 75
Figure 4.10c: Teak forest 75
Figure 4.11: Bajulmati corridor (water source).. 77
Figure 4.12: Dark basaltic andesite rock (Lava flow) 77
Figure 4.13: Crested Serpent Eagle nest observed during the field survey at 150 KV TL tower .. 79
Figure 4.14: Distribution of ebony leaf monkey... 80
Figure 4.15a: Banteng (*Bos javanicus*)... 81
Figure 4.15b: Banteng excrement observed in Bitakol area 81
Figure 4.16: Distribution of Banteng (field work data) 82
Figure 4.17: Banteng Home Range at Bitakol 83
Figure 4.18: Puddle at Panggang river bed 84
Figure 4.19: Water source Bajulmati river (Panjaitan area) at Bajulmati corridor 85
Figure 4.20: Tlogo, water source for big mammals.. 86
Figure 4.21: Bali Barat National Park Location and Project RoW 88
Figure 4.22: Bali Barat National Park Topography... 90
Figure 4.23: Bali Starling of the Bali Barat National Park... 91
Figure 4.24: Mixed monsoon forest 94
Figure 4.25: Salt Lick pond at Prapat Agung 96
Figure 4.26: Gilimanuk Bay, part of the Bali Barat National Park... 98
Figure 4.27: Bivalves collected by local people 99
Figure 4.28: Sand bank at Gilimanuk Bay during low spring tide 101

Figure 4.29: Great thick knee at Prapat Agung beach 102
Figure 4.30a: Lesser Adjutant Stork at reef flat and on mangrove tree 103
Figure 4.30b: Grey tailed tattler (*Heteroscelus brevipes*), specie of bird 103
Figure 4.30c: Little Wimbrel (*Nemenius minutus*), specie of bird 103
Figure 4.30d: Wimbrel (*Nemenius phaeopus*), specie of bird 103
Figure 4.30e: Little Stern (*S.albifrons pusssila*), specie of bird 103
Figure 4.31: Reef flat, a feeding ground for coastal bird and long tailed Macaque at Prapat Agung 104
Figure 4.32: Mud flat, a feeding ground during low tide for coastal birds and long tailed Macaque at Gadung island 105
Figure 4.33: Salt Licking Area (in the vicinity of Prapat Agung, Bali Barat National Park).... 107
Figure 4.34: Big Mammal around the brackish water puddles at Prapat Agung 107
Figure 5.1: Segara Rupek Temple, Bali Barat National Park 127
Figure 5:2: Teak forest after forest fire 139
Figure 5.3: Cattle herding inside the National Park area 139
Figure 5.4: Location of cattle herding and area of grass collection in the National Park....... 139
Figure 5.5: Grass and wood collection from Baluran National Park 140
Figure 5.6: Recommended route for the transport of materials and equipments in Burung and Gadung Islands (Green line) 146
Figure 6.1: Map showing Options 1A and 1B of the Project: overhead crossing and submarine cable crossing of the Bali Strait 161
Figure 8.1: Grievance redress mechanism (GRM) 182

EXECUTIVE SUMMARY

INTRODUCTION

The Asian Development Bank (ADB) is considering providing a loan to the Government of Indonesia to co-finance the Java-Bali 500 kV Power Transmission Crossing Project (the Project). The proposed Project will construct a 220 km long extra high voltage (500 kV) transmission line and associated substations for transmitting 1,500 MW of power from the Paiton Power Complex in East Java to Bali. The objective is to assist the government in expanding the Java-Bali transmission grid and meet the power demand in Bali that is a major tourist destination and a nationally important source of Gross Domestic Product (GDP). The project is an outcome of long-term power system studies and techno-economic analysis conducted by PT (Persero) Perusahaan Listrik Negara (PLN), the State Electricity Company and the Project proponent and included in the government power development plan.

The Project has been classified by ADB based on its rapid environmental assessment as Environment Category A and requires an Environmental Impact Assessment (EIA). This EIA report is based on the technical, environmental, financial, social, and economic due diligence for the proposed Project carried out under a technical assistance provided by ADB[1].

This EIA is an update of the draft EIA uploaded in the ADB website on August 2012. This report includes a supplementary biodiversity study for the TL alignment through Baluran and Bali Barat National Parks.

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

<u>ADB Environmental Assessment Requirements</u>

This report has been prepared in accordance with the ADB's Safeguard Policy Statement (SPS 2009), which outlines the requirements that borrowers are required to meet when delivering environmental safeguards for projects supported by the ADB. These requirements include assessing impacts, planning and managing impact mitigations, preparing environmental assessment reports, disclosing information and undertaking consultation, establishing a grievance mechanism, and monitoring and reporting.

The SPS also requires the borrower to follow environmental standards consistent with good international practice, as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines* (hereafter referred to as the EHS Guidelines).[2] With respect to the proposed Project the most applicable EHS Guidelines are *General Environmental, Health, and Safety Guidelines* (2007), *Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution* (2007), and *Environmental, Health, and Safety Guidelines for Construction Materials Extraction* (2007). In terms of ambient standards, the Government standards for air quality, surface water quality and noise have been reviewed; in most cases Government standards meet or exceed relevant international guidelines.

[1] ADB TA 7325-INO: Java-Bali 500 kV Power Transmission Crossing Project.
[2] The EHS Guidelines are available at: http://www.ifc.org/ifcext/sustainability.nsf/Content/EHSGuidelines.

Government Environmental Assessment Requirements

In Indonesia a project proponent is required to undertake an *Analisa Mengenai Dampak Lingkungan* (AMDAL or EIA) as the major environmental prerequisite for project commencement. The EIA process in Indonesia dates back more than 20 years, and is specifically mandated by Article 2 of Law Number 32/2009 on *Protection and Management of the Environment*. MoE Regulation No. 5/2012 imposes a "positive list" for projects and/or activities that require a full EIA according to the type, scale and location of the activity. For the power sector, Regulation No. 5/2012 requires that any TL greater than 150 MW must undergo an EIA. In addition, any project located at the border or inside a protected area, no matter what is the type or scale, requires an EIA.

PLN has recruited the Environmental Research Center of the University of Udayana to undertake the Project AMDAL process. The AMDAL ToR was approved by the Ministry of Environment (MoE) in July 2012. The AMDAL report was finalized in September 2012 and submitted to the MoE, which issued the AMDAL or Environmental Permit of the Project in April 2013.

DESCRIPTION OF THE PROJECT

Rationale

Bali is an internationally renowned tourist and cultural destination and its tourism contributes 6% of the national gross domestic product (GDP) The tourism industry generates 67% of Bali's gross regional domestic product and about 70% of the island's residents are directly or indirectly dependent on the tourism industry. Commercial sector accounts for about 46% of the total energy consumption in Bali. At present, electricity demand in Bali averaged around 600 MW and according to the load forecast of PLN, it is expected to grow to about 2,300 MW by 2025. The current aggregate supply capacity in Bali is only 632 MW and the reserve margin is very low, less than 15% which is far below the 30% safe margin. In addition, the capacity of the transmission network is limited due to lack of investments in the past. Low reserve margin coupled with transmission bottlenecks has resulted to power outages and blackouts in the Bali power system that takes an average of 2-3 hours to restore. The current and planned generation capacity in Bali Island is not sufficient to meet future demands in power and electricity.

Construction of new thermal power stations in Bali is restricted, as the provincial government has classified Bali as an environmentally protected area. Java, on the other hand, has excess generation capacity. Power consumption in Bali is approximately 2.5% of the total consumption of Java and Bali and transmission of power from East Java to Bali at the 500 kV level has been identified as the most techno-economically feasible option by PLN through system studies to address Bali's power shortage. The Project will contribute to the long-term energy security in Bali and ensure provision of an adequate and reliable power supply, which is vital for economic development activities.

Project outputs and physical components

The project comprises three outputs: (i) expanded transmission network by the construction of 220 km of double circuit 500 kV overhead power transmission line (TL) from East Java to Bali with a capacity of 1,800 MW; (ii) one 500 kV substation established, upgrading of one 500 kV substation in Java, and upgrading 26 numbers of 150 kV substations in Java and Bali; and (iii) non-physical activities such as project management and advisory services. Physical activities consist of seven components which are described below.

Component 1: Extension of the existing Paiton substation in East Java. The Paiton Substation is a major 500 kV pooling substation located approximately 100 km southeast of Surabaya on the north coast of East Java. The substation will be expanded through the establishment of two new 500 kV TL circuits and two number 50 MVAR switching reactors in an existing empty bay.

Component 2: Construction of a 131 km 500 kV overhead TL from Paiton to Watudodol in East Java. As with all Project TL components, double circuit on quadruple zebra (400 mm^2) conductors will be utilized. The TL will start at the Paiton substation extension and terminate at Watudodol, the location for the Java side Bali Strait crossing tower, and will include an estimated 308 transmission towers. The RoW alignment runs roughly parallel to an existing 150 kV TL alignment and the Surabaya to Banyuwangi highway, and passes through a generally flat coastal plain predominantly used for agriculture and production forests. Approximately 18 km length of the TL will pass through a teak monoculture plantation in Baluran National Park. A permit has been received from the Ministry of Forestry (MoF) to undertake the works.

Component 3: Construction of 4 km (including 2.68 km single span across the Strait) 500 kV double circuit TL overhead crossing of the Bali Strait from Watudodol (Java side) to Segara Rupek (Bali Side). The crossing and anchor towers on the Bali side will be located at the Northwest edge of the Wilderness Zone of Bali Barat National Park where there is already an access road for pilgrimage of Hindu devotees to Segara Rupek temple in the vicinity of the proposed tower; a permit has been received from the MoF to undertake the works. Two towers (363 m high on the Java side and 376 m high on the Bali side) will be the tallest such towers in the world. However, there are a number of similar power pylons around the world, the oldest constructed in 1980s and the technology is proven to be effective.

Component 4: Construction of a 10 km of 500 kV double circuits TL through the Bali Barat National Park from Segara Rupek to Gilimanuk (24 transmission towers). The TL will pass through the national park's Wilderness, Marine, Traditional and Utilization zones, and will cross Gilimanuk Bay where construction of one transmission tower on Gadung mangrove island.

Component 5: Construction of a 75 km 500 kV overhead TL from Gilimanuk to New Kapal (Antosari), Bali. Again, the alignment runs parallel to an existing 150 kV TL and passes through generally flat terrain used primarily for agriculture.

Component 6: Construction of a new 500/150 kV distribution substation at New Kapal in Bali. The substation will allow for onward transmittal of power to 150 kV substations throughout Bali. It will occupy 12 ha of privately owned rice paddy across the main road from Denpasar to Bali Gillimanuk.

Component 7: Upgrading of 26 150-kV substations: 21 in Java and 5 in Bali.

Components 1, 2, and 5 will be co-financed by ADB and PLN; Components 3 and 4 will be financed directly by PLN; Component 6 will be co-financed by ADB, PLN and the ASEAN Infrastructure Fund (AIF); and Component 7 will be co-financed by ADB and PLN. This EIA covers the environmental impacts of all the seven components of the Project.

Project costs

The total project cost is estimated at $ 414.5 million, including physical and price contingencies, financing charges during implementation, and taxes and duties. Total estimated loan amount by ADB and AIF is $251.7 million. PLN will finance $162.8 million including land acquisition and environmental mitigation, duties and taxes, and financing charges during implementation. The Project will be implemented over a period of approximately three (3) years.

Location and Area

The proposed TL alignment will originate in Paiton in East Java and terminate in New Kapal, Bali, with substation upgraded at Paiton and established at Antosari, New Kapal, at the alignment starting point and terminus, respectively. The TL route will span three regencies in East Java (Probolinggo, Situbondo and Banyuwangi) and two regencies in Bali (Jembrana and Tabanan). The TL alignment will be 220 km long and 34 m wide, giving a total Right of Way (ROW) area of 757 ha. The alignment includes 18.6 km through Baluran National Park (63 ha) and 11.8 km through Bali Barat National Park (40 ha). In addition, 21 existing 150 kV substations in East Java and four existing 150 kV Bali will be upgraded.

The Project will include an estimated 512 transmission towers, consisting of 437 suspension towers, 63 tension (angle) towers, 2 crossing towers and 4 anchor towers for crossing Bali Strait, and 2 anchor towers and 4 suspension towers for crossing Gilimanuk Bay. Towers will be steel lattice frame and the standard tower span will be 450 m. Four 500 kV DC aluminum conductors steel-reinforced (ACSR) 400 mm^2 Zebra conductors will be installed on each tower. Minimum conductor clearance will be based on Indonesian standards.

The TL alignment is well serviced by the current road network, which will be used for the transportation of equipment and materials. Additional access road requirements should be minimal.

Construction Materials and Workforce

The civil works will require construction material such as soil, aggregates, cement and steel. Soil will be sourced locally from borrow pits and aggregates will be sourced from existing licensed quarries. The locations of the borrow areas and quarries will be selected during detailed engineering design prior to commencement of civil works. The suppliers for cement, tower materials, conductors, etc., will be identified and procured through competitive bidding.

It is estimated that 100 to 150 workers will be required on a rolling basis during the construction phase. Local qualified workers will be employed, though outside skilled workers will also be required. Temporary worker camps will be established along the route of the TL. The number and locations of the camps will be identified during detailed engineering design and prior to commencement of civil work. No camps will be allowed inside the National Parks.

DESCRIPTION OF THE ENVIRONMENT

Physical Environment

Terrain in East Java and Bali provinces varies from flat low elevation plains to steep mountains, and is dominated by a series of volcanoes which greatly limit TL route options. Java is almost entirely of volcanic origin and contains 38 mountains forming an east-west spine, all of which have at one time been active volcanoes. The central part of Bali Island is also covered with a range of hills and volcanic mountains, which form a rough dividing line between the northern and southern parts of the island. The hill slopes in the north are steep while the southern slopes tend to be gentler. Given topographical constraints, the TL alignment predominantly follows the flat coastal plains of the north and northeast coasts of Java and the southwest coast of Bali. On each island the alignment runs parallel to main highways and existing 150 kV TLs.

Like many tropical areas, soils are predominantly infertile in Indonesia due to leaching as a result of high rainfalls. However, the soils of Java and adjacent islands such as Bali are more fertile than typical due to soil nutrient replenishment by frequent volcanic eruptions. Land use within the TL RoW is a mixture of barren/open/shrub land, agriculture, forests and residential areas.

The climate in the Project region is tropical monsoon. Temperatures are influenced by topography, with the coastal plains averaging 28°C, the inland and mountain areas averaging 26°C, and the higher mountain regions averaging 23°C. Relative humidity ranges between 70 to 90%. There are extreme variations in rainfall linked with the dry season (generally May to September) and the monsoon rainy season (generally October to April).

Project Ecological Environment

Forest Utilization Permitting

Forests within the Project area as classified by the Ministry of Forestry (MoF) include Permanent Production Forest, Limited Production Forest, and Protected Forests within national parks.[3] Under Government Regulation No. 24 on *Utilization of Forest Areas* and further to MoF Regulation No. P.18/Menhut-II/2011 *Regarding Guidance in Respect of Rent Use Permits for Forest Areas*, utilization of forested areas for non-forestry activities may only be carried out in Production Forest Areas and Protected Forest Areas with an appropriate Forest Rent Use permit from the MoF, and only in respect of activities with a clear strategic purpose including installation of generators, and the transmission and distribution of electricity. These required permits have been already issued for the project.

Based on the topographic, environmental and socio-economic surveys, 27 km of the RoW will pass through five areas of Production Forest in East Java, 9 km of the RoW will pass through two areas of Limited Production Forest in Bali. In addition, 19 km of the RoW will pass through the Wilderness and Special Utilization Zones of Baluran National Park, and 12 kms of the RoW will pass through the Wilderness, Utilization and other zones of Bali Barat National Park.

[3] This refers to forest on public land under the responsibility of the MoF, and not private plantations.

Baluran National Park

Baluran National Park is located in Situbondo District of East Java Province at the northeastern extremity of Java. The park is a rough circle in shape with the extinct Baluran volcano at its center. The park has an area of 25,000 ha consisting of five zones: the Core Zone (12,000 ha), the Wilderness Zone (5,637 ha), the Intensive Utilization Zone (800 ha), the Special Utilization Zone (5,780 ha) and the Rehabilitation Zone (783 ha).

It has a relatively dry climate and consists of lowland forests, savanna, mangrove forests and hills. There are a reported 444 species of plant growing in the Park including savanna, mountainous rain forest on Mount Baluran, lowland monsoon forest, plantation forest, coastal forest, sea grass, and coral reefs. Savanna covers about 40% of the park, the largest savanna area on Java.

Approximately 18.6 km (Towers 212 to 260) of the proposed TL alignment of Component 2 will pass through Baluran National Park. The alignment in this section is running parallel to an existing 150 kV TL, which is about 50-100 m away, and the existing Surabaya – Watudodol highway. The row will encompass a total of 63 hectares of Wilderness (5 ha) and Special Utilization Zone (58 ha).

Vegetation type of the wilderness zone at the TL Row is a savanna characterized by grasses and shrubs land with few trees, no protected or endangered species have been identified in this wilderness zone, probably because the area is used by the villager on herding their cattle for grazing. Vegetation type of the special utilization zone is a monoculture plantation, with a mix of native and exotic and plant species. This is a production forest of teak (*Tectona grandis*) and Gmelina (*Gmelina asiaticum*). The production forest was managed by Perum Perhutani a State Forestry Company and at present by the Baluran National Park.

There are 26 species of mammal in the Baluran National Park, including the endangered Banteng (*Bos javanicus, IUCN Endangered*). There are only an estimated 20 Banteng remaining in the savannas of the Park from an estimated population of 206 in 2002 (IUCN, 2008). Banteng is an important mammal because it is protected under the Indonesian law and classified as an endangered species according to the International Union for the Conservation of Nature (IUCN) Red List of Threatened species. Based on the reports from the National Park, published research papers and personal communications with several biodiversity and Banteng experts, the possible reasons on the decline of the Banteng population in Baluran National Park are : ((i) Water shortage at Bekol Area during dry season; (ii) Change in land cover and fodder quality, (iii) Poaching and hunting, (iv) Presence of predator predominantly the dhole (a wild dog), and (v) Activities of local people inside the National Park such as cattle grazing, fuel wood and grass collection.

A total of 189 species of avian-fauna have been recorded in Baluran National Park. While the Banteng is the mammalian icon of Baluran National Park, the endangered Green Peafowl (*Pavo muticus*) is its avian equivalent. Other important avian species include the Red Jungle Fowl (*Gallus gallus*), Malabar Hornbill (*Anthracoceros coronatus conversus*), Rhinoceros Hornbill (*Buceros rhinoceros silvestris*), Koel (*Eudynamys scolopacea*), and Lesser Adjutant Stork (*Leptoptilos javanicus*).

Bali Barat National Park

Bali Barat National Park is located on the northwestern portion of Bali Island. It is mountainous and has steep and undulating topography, though the RoW makes use of the flatter near shore area. It has a tropical monsoon climate; the rainy season lasts from October to April, average temperature is 33°C, and rainfall varies between about 950 to 1550 mm/year.

The Park was founded in 1941 with the aim of protecting the Bali Starling *(Leucopsar rothschildi)* and the last few of the wild Banteng, from which most Balinese cattle descended. The Park has an area of approximately19,080 ha (about 5% of Bali's total land area), consisting of an 8,023 ha Core Zone; a 6,174 ha Wilderness Zone; a 4,294 ha Utilization Zone; a 222 ha maritime zone; a 51 ha Cultural Utilization Zone; a 311 ha Traditional Zone; and a 4 ha Special Utilization Zone. The Park includes savanna, monsoon forest, mangrove forest, montane and mixed-monsoon forests, sea grasses, coral reefs, sandy beaches, and both shallow and deep-sea waters. Given its relatively small area the Park is rich in biodiversity. It has 175 recorded species of plants, 14 of which are vulnerable, endangered or protected; approximately 160 species of avifauna, including the endemic and critically endangered Bali Starling *(Leucopsar rothschildi),*; and a variety of mammals and reptiles including*;,* Wild Boar *(Sus scrofa),* Rusa Deer *(Cervus timorensis),* Ebony Leaf Monkey *(Trachypithecus auratus auratus),* Leopard Cat *(Prionailurus bengalensis),* and Hawksbill Turtle *(Eretmochelys imbricata).*

Approximately 11.8 km of the proposed alignment of components 3 and 4 will pass through Bali Barat National Park, the majority of which will be in the Wilderness Zone. The Wilderness Zone of the Park includes home range of several endangered species such as Ebony Leaf Monkey (*Trachypithecus auratus auratus,* IUCN vulnerable) and, Rusa Deer (*Cervus timorensis*, IUCN Vulnerable). The Park authorities confirmed there are no more Bantengs (*Bos javanicus*, IUCN Endangered) in the park.

<u>Socio-economic Environment</u>

The Project TL will pass through five districts of East Java and Bali provinces with a total population of 4.1 million. Java and Bali are the largest contributors to Indonesia's economic growth; in 2009 they contributed 59% of the national GDP.

The alignment passes though the residential areas of two villages in Component 2 (Paiton – Watudodol section) and six villages in Component 5 (Gilimanuk to New Kapal); however the alignment has avoided housing and commercial areas to the maximum extent possible. None of the substations (Components 1, 6 and 7) are in settlement areas.

A detailed draft Land Acquisition and Resettlement Plan (LARP) has been prepared based on the preliminary design and updated tower schedule provided by PLN. There are no houses or structures, which will be totally or partially demolished due to any of the project Components. Therefore there is no physical relocation involved in the Project. However, there are about 128 structures, mostly boundary walls located within right of way (RoW) of the transmission line, which will be affected.

A total of 717 hectares (ha) of land will be required for the project comprising forestry land (172 ha), PLN-owned land (2 ha for Component 1), and private or company land (536 ha). The identification of affected persons (APs) and Inventory of Loss (IOL) carried out in November 2010- May 2011 identified that a total of 1,198 households (3,892 people) in the two provinces (East Java and Bali) who will be affected by the project due to the loss of single or multiple types of land that include residential lands, crop lands, and forestry lands. Out of 1,198 households, 305 households are considered vulnerable groups and 143 households are severely affected (more than 10% of productive lands affected) and therefore they will be entitled to involvement in a livelihood restoration program. The total estimated budget for compensation is about $34 million. The draft LARP will be updated following the final detailed engineering design during project implementation.

The project location permits have been obtained by PLN from all districts, Probolinggo, Situbondo, and Banyuwangi in East Java where transmission line traversed and the proposed project has also been included in the districts' spatial planning. The permit in Bali for construction of the transmission line was issued in July 2012.

The TL RoW also crosses a number of public utilities such as roads at eight locations, existing power TLs at 16 locations, railway tracks at two locations. In Bali, the RoW is within 350 m of the Segara Rupek Hindu Temple in Bali Barat National Park where permits for construction of the transmission line have been issued by the Bali Governoor. Other than this, based on site surveys, there are no well-known sites of archaeological, historical or national importance within the RoW, nor any famous places/sites of cultural, religious and tourist interests, and defense installations.

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Anticipated environmental impacts were evaluated for all the project components. The potential impacts of the construction and operation of the transmission line in the Baluran and Bali Barat National Parks are the following:

- Loss of trees, including rare species during land clearing and potential growth of invasive species;
- Noise during land clearing, land excavation, transportation of tower materials to the tower site and construction activities have the potential to disturb the habitat of animals such as nesting ground and feeding ground ;
- Excavation of land to establish the towers foundations to the size of 48 (4x4x3) m^3 may accidentally trap animals;
- Impact to arboreal animals because of tree trimming to maintain safe distance of 9.5m between transmission cable and tip of tree within the transmission line RoW;
- Impact on animals due to construction waste and debris that may harm wildlife;
- Workers' activity can cause forest fires;
- Poaching activities on animals and other forest products by construction workers;
- Buzzing noise (corona) from operation of the transmission line disturbs mammals' movement and food hunting.

In addition, other environmental impacts of the Project specifically on Bali Barat National Park are the following:

- Construction of temporary jetty for mobilization of construction material and heavy equipment at Prapat Agung will disturb animal activity at the Prapat Agung reef flat;
- Operation of the temporary jetty may damage the coral reefs at the Prapat Agung reef from the increase in oil, grease, total suspended and dissolved solids in water;
- Land excavation for the tower foundation near the salt lick area will cause siltation in lick pond;
- Construction of tower foundation at mangrove area will cause silt and sediment entering water bodies near the project area.

Pre-construction Phase

Potential preconstruction phase impacts are primarily related to Project siting including i) land acquisition and resettlement; ii) potential impacts on existing infrastructure (roads, railways, TLs); iii) potential impacts on physical cultural resources (PCRs); iv) potential impacts on national parks; and iv) potential impacts related to the siting of temporary borrow and disposal pits, quarries and temporary worker camps. Mitigations are primarily related to careful selection of the RoW alignment and site specific construction schedule and protocols so as to avoid or minimize impacts, and the development and implementation of the Land Acquisition and Resettlements Plan (LARP), which has been prepared.

Construction Phase

General impacts and mitigation measures associated from the construction of transmission lines

Construction phase impacts include soil erosion and landslides; impacts on surface and groundwater; solid waste management; air pollution from dust generation; noise generation; vegetation removal or cutting of trees, impacts on ecological resources - flora and fauna; aesthetic impacts; and occupational and community health and safety risks.

Mitigation measures for the general impacts during construction of the Project are the following: provision of catchments/cut-off drains and drains to minimize soil erosion; rehabilitation of areas used for temporary construction; construction materials for tower foundations and access roads will be sourced from established quarries approved by relevant local authorities; rehabilitate and repair all damaged public properties (i.e. road, water piper system, power lines) to their original state upon completion of the Project; emissions from construction-related activities must be within the levels of international and government standards on solid waste, air, water and noise pollution; strictly implement Occupational and Community Health and Safety Plan and Emergency Response Plan; and strictly implement the site-specific mitigation measures for the construction activities in National Parks. The complete list of mitigation measures for the Project is discussed in Chapter 9 as part of the Environmental Management Plan (EMP).

Impacts and mitigation measures for the construction activities inside the National Parks

Concerns on the potential threat of the construction activities of the Project to the status of biodiversity Bali Barat and Baluran National Parks were raised during the initial environment assessment of the Project. In order to address the impacts of the Project on National Parks, a detailed supplementary biodiversity study in the two National Parks was conducted.

Baluran National Park

Transmission line RoW for T236 to T260 will cross an area known as the Banteng home range at the special utilization zone. It also crosses a teak plantation that function as a seasonal wildlife corridor known as the Bajulmati corridor (TL RoW Tower T239 - T242), which serves as a water source to Banteng and other large mammals during dry season. This RoW crosses a migration route used by one herd of Banteng and other mammals in the dry season to travel from their home habitat in the savanna (Bekol) to Bitakol to access water sources outside of the Park through the Bajulmati corridor. Bitakol area is considered a good Banteng habitat and is home to a herd of seven Banteng wild cattle. The search of Banteng for water source makes them vulnerable to the risk of poaching and hunting, which is considered a key threat to the species by the Park Authorities. Thus, the protection of Banteng from poaching and hunting has been included in the national protected area management plan and collaborative agreements between PLN and MOF has been signed covering assistance in this activity, among other assistance.

General Impacts on Flora. Within Baluran National Park, 18.6 km of the RoW passes through the western portion of the Park. The construction of the TL will result in clearing of vegetation at the tower sites and trimming of vegetation within the RoW covering a total of 63.3 ha (6.3 ha for tower base and 57 Ha TL RoW) of low ecological value Teak (*Tectona grandis)* and Gmelina *(Gmelina aciatica)* plantations. The RoW will encompass an estimated 25,320 plantation trees. Based on the latest information from the National Park officers, only teak with height of more than 20.5m will be trimmed.

Land clearing will result to the following impacts: reduce ecological integrity of the forest and probably cutting of *Swietenia macrophylla*, an IUCN status vulnerable; accelerated soil erosion; and the potential growth of invasive species *Acasia Nilotica*. On the other hand, land clearing for 48 tower bases will create an open area of about 6.3 ha. The open area will give an opportunity for grass and other sun loving shrubs to grow, which may be used as a food source for mammals or give an opportunity for invasive species to grow. Water pollution and disposal of waste during the construction phase may also have a temporary negative impact on flora.
Overall, given that the routing is through Teak and Gmelina plantation, the construction impacts to flora in the Baluran National Park is considerably low since the Project location is adjacent to an existing national highway; and any plantation removed will be rehabilitated after the TL construction is complete.

General Impacts on Fauna. The impacts of the project construction and operation on the flora and fauna within Baluran National Park are considered significant because the TL RoW will pass through home range of three mammal species, Ebony Leaf Monkey (*Trachypithecus auratus auratus,* IUCN vulnerable), Rusa Deer (*Cervus timorensis*, IUCN Vulnerable), and Banteng (*Bos javanicus*, IUCN Endangered). Approximately 19 km (Towers 212 to 260) of the proposed TL alignment of Component 2 will pass through the park. This includes a disturbed area of teak plantations that function as a seasonal wildlife corridor for a small population of the endangered Banteng (*Bos javanicus*). Baluran National Park is an important habitat of Banteng, however, this is not the only habitat of Banteng in Java. Other habitats of Banteng in Java are in Meru Betiri National Park, in Alas Purwo National Park and in Ujung Kulon National Park.

The alignment of the proposed TL in this section is running mostly parallel to the existing 150 kV TL which is about 50-100 m away. It will also run parallel and adjacent to the existing Paiton – Watudodol highway. The TL RoW alignment area between T236-T260 passing through Teak and Gmelina forest is known as the Banteng home range. It includes an area of non-plantation forest which is known to have high biodiversity value and a corridor for big mammals (T245-T246). Based on field surveys, there are Ebony leaf monkey (IUCN endangered), Banteng and some other big mammals, Deer and wild pig observed to thrive in this area. Project activities like tower construction, land clearing, land excavation and erection of tower and conductors may disturb and temporarily displace any wildlife found in the Project area.

Bali Barat National Park

Approximately 11.8 km of the proposed alignment of components 3 and 4 will pass through the Bali Barat National Park. The alignment of the RoW will encompass a total of 40.12 hectares of Special Utilization Zone (4.42 ha) and Wilderness Zone (35.7 ha). The Wilderness Zone of the Park includes the home range of several vulnerable species such as Ebony Leaf Monkey (*Trachypithecus auratus auratus,* IUCN Vulnerable) and, Rusa Deer (*Cervus timorensis*, IUCN Vulnerable). The Park authorities confirmed that there are no more Bantengs (*Bos javanicus*, IUCN Endangered) in the park. The RoW will also pass across mangrove areas at Gilimanuk Bay. Gilimanuk Bay may provide seasonal habitat for migratory birds, however survey and experts indicate that the bird populations are not considered to be of international significance.

General Impacts on Flora. The RoW will also pass across Gilimanuk Bay (Component 4) and towers will be placed on one mangrove island (Gadung Island) and on two mangrove flats within the Wilderness Zone. Vegetation clearing and cutting of trees may reduce the ecological integrity of the mixed monsoon forest and mangrove area, enhance soil erosion and probably will impact IUCN vulnerable plants species such as *Cycas rumphii* and *Dalbergia lastifolia* and some protected plants species such as *Manicara kauki (L) Dubard*, *Cassia fistula* and *Schleichera oleosa*. On the other hand, land clearing for 19 tower base within Bali Barat NP (excluding mangrove) will create an open area of about 2.5ha.The open area will give an opportunity for grass and other sun loving shrubs to grow and may be a source of food source for mammals or an area for invasive species to grow.

The mangroves at mangrove islands of Gilimanuk Bay are considered as sensitive ecosystems and will require best construction practices to preserve their present state. No cutting of mangroves will be done except for the tower base at Gadung Island (23 ha) which will reduce the mangrove area at Gilimanuk bay by less than 1%. During field survey in September 2012 except annelid, no animal was found at these islands but according to local people different species of birds used to come to the islands. The anticipated impacts in the mangrove ecosystem brought about the TL construction are: reduction of mangrove trees; disturbance of bird habitat; feeding ground disturbance by construction worker; and siltation to the Gilimanuk aquatic system because of earthwork.

Transporting tower materials to Gadung Island using boat during low tide can damage seaweed around the Burung and Gadung mangrove islands. A recommended route is to be followed for the transport of materials and equipments in Burung and Gadung Islands based on the consultation with the management of the National Park.

General Impacts on Fauna and Wildlife. In Bali Barat National Park 11.80 km of the proposed alignment of components 3 and 4 will pass through the Wilderness and Utilization Zones and will also cross overhead (e.g. no tower bases) the Core Zone, Traditional Zone, and Marine Protection Zone. The Wilderness Zone of the Park includes several endangered species.

The following activities may disturb and temporarily displace the wildlife in the surrounding area.

- Crossing tower will generate noise and other disturbance especially during land clearing and earthworks to nesting areas of birds.
- The potential risk to animals getting trap in the excavating pit.
- Disturbance to mammal due the construction activities close to salt lick pond (tower T12 and T13)
- Construction worker activities such as smoking, cooking, and campfire can cause forest fire.
- Animal poaching by the construction workers.
- Land clearing at tower base will result in grass and shrubs growing in the area. These grass and shrub are a source food for mammal, but cleared land also can also be infested by invasive species such as *Lantana camara* with very thick growth.

The TL and crossing tower are not located in an area occupied by the Bali Starling bird. The main habitat area for Bali Starling is in the wild and for release through the captive breeding program is in the Berumbun Peninsula close to Menjangan Island, approximately 10 km to the east of the main Crossing Tower. It is expected that any birds displaced by construction will be relocated to adjacent habitat.

The RoW will also pass across Gilimanuk Bay (Component 4) and one tower will be placed on one of the two mangrove islands (Gadung Island) and on two mangrove flats within the marine protection zone. These are sensitive ecosystems and also serve as a resting and feeding ground for resident and migrant birds.

The land use in the Utilization Zone is mostly mixed forest vegetation. According to the park authority, the presence of wildlife in Utilization Zone is very rare, and there are no reports of endangered species of flora and fauna in the zone. Tower construction, land clearing land excavation and erection of tower and conductors will involve the presence of people and the use of equipment. These activities may disturb and temporarily displace any nearby wildlife.

Site-specific mitigation measures

A comprehensive package of environmental mitigation and offset measures has been designed to support biodiversity conservation in the two national parks. Specifically, the environmental management plan includes measures to: (i) avoid negative impacts to sensitive wildlife species through careful construction timing and poaching prevention; (ii) minimize vegetation clearing to TL bases, with limited or no clearing and trimming along the project RoW; (iii) offset vegetation clearing through targeted restoration actions and the management of invasive species. In addition, PLN will provide financial resources to the national parks through Collaborative Agreements. Further, ADB will implement an associated TA, which will provide long term conservation benefits through the strengthening of operational management, monitoring and enforcement capacity of the park authorities.

In Baluran National Park, the Collaborative Agreement includes provision of new water sources within the Park, protection and enhancement of Banteng habitat, and a captive breeding program, which collectively, should significantly contribute to increasing the protection and enhancement of Banteng in the Park.

In Bali Barat National Park, the Collaborative Agreement includes habitat monitoring and restoration in the TL RoW area, control of invasive species, and Bali Starling captive breeding, release and monitoring in the wild. With the implementation of the Collaborative Agreements, and EMP to support for the conservation of the endangered Banteng, Bali Starling and other wildlife will be substantially increased.

<u>Operation Phase</u>

Environmental Impacts

Impacts from TLs are primarily related to the construction phase, and there are relatively few low to medium impacts during the operation phase. Potential operational issues include spills or release of oils or hazardous materials, occupational and community health and safety risks, and risks from fires and earthquakes. Mitigation measures have been incorporated into the design to minimize these to acceptable levels and to maintain environmental and occupational safety.

Project operation will also result in positive environmental impacts including reductions in GHG emissions through the reduced use of low efficiency generators by individuals, businesses and hotels for power generation in Bali; reductions in NOx, SO_2 and particulate emissions through the reduced use of low efficiency generators without emission control systems for power generation in Bali; and, energy savings through the reduction of power losses due to the improved efficiency of the 500 kV transmission system.

Socio-economic Impacts

The impact of the Project will be a long-term energy supply security to support a sustainable socio-economic growth in Bali and the outcome will be the expansion of Java-Bali power transmission system.

Project operation will result in a number of significant positive socio-economic impacts in Bali by meeting the power demand including: contributing to long-term energy supply security; supporting sustained socio-economic growth by providing power to existing industries and new business activities including the hotel sector; increasing the tourist inflow due to improved services (tourism in Bali contributes significantly to both the provincial and national GDP); improving the electrification rate through the provision of connections to industries and rural areas which are currently waiting for power connections; improving access to health, education and other social services; generating employment and improving the technical skills of the implementing agency in both Java and Bali.

In Indonesia, generally women are responsible for household activities such as agriculture, cooking, collection of wood or other alternative fuel for cooking and lighting. With the improved supply of electricity, time and effort spent on these activities would be significantly reduced for women, allowing them to engage in income-generating activities and spend more time with their family. It is expected that a reliable source of electricity will have a positive impact on the use of household equipment, especially kitchen equipment. This could lessen the workload of women in upper and middle-income households. Women who manage their own business at home and other enterprises might experience lower production costs and increased revenue.

The negative impact of the Project is associated to the loss of income for women, possibly the ppor, to land acquisition. Specific actions to address gender issues have been included in the resettlement plan.

ANALYSIS OF ALTERNATIVES

A number of options for supplying the electricity to meet Bali power demand were assessed:

Option 1: Interconnecting Java and Bali through a 500 kV TL from Paiton to New Kapal, with a 500 kV substation at Kapal with two sub-options:
- **Option 1(a)**: Overhead 500 kV TL crossing of the Bali Strait; or,
- **Option 1(b)**: Submarine 500 kV cable crossing of the Bali Strait.

Option 2: Construction of a 500 kV TL from Paiton to Banuwangi at East Java and transmittal of power across the Bali Strait using existing 150 kV submarine cables combined with new 150 kV submarine cables. The 150 kV TL from Gilimanuk (Bali side) to load centers in and around Denpasar would also need to be strengthened.

Option 3: Construction of a 500 kV TL from Paiton to Gilimanuk with a 500 kV submarine crossing of the Bali Strait and a 500/150 kV substation at Gilimanuk, transmitting the power at 150 kV level to the load center at Kapal.

Option 4: Meeting the power demand of Bali through local generation at suitable locations and reinforcement of North (probable locations for coal fired power plants) to South (major load centers) 150 kV TLs.

Option 5: Meeting the short-term power demand of Bali with local generation at suitable locations and strengthening of existing and proposed 150 kV TL/submarine cables with the long-term solution of using Java–Bali 500 kV interconnection after choosing the most optimal and technically suitable solution.

A comprehensive assessment of technical, economic, social and environmental considerations associated with the various options was undertaken. Based on the power system studies and analysis of the alternatives, options 1A and 1B had the lowest environmental impact score and the lowest overall combined (technical, economic, environmental and social) impact score for meeting Bali's power needs. However, given that it was the least cost option and citing concerns for ecological impacts on coral reefs, it was decided by PLN that it would proceed with Option 1A, a 500kV transmission interconnection with an overhead crossing of the Bali Strait.

The majority of the options (1a, 1b, 2 and 3) called for a 500 kV TL from Paiton to Banuwangi on East Java. Java's steep volcanic topography severely limits corridor options, and the routing of the existing 150 kV line, the existing east-west roads, and the routing of the proposed 500 kV TL from the Paiton Power Complex to Watudodol (the Java side crossing point of the Bali Strait) follows the flat coastal plains of the north and northeast coasts of Java, which was found to be most feasible.

The no-Project option was also analyzed and found not acceptable for the following reasons: i) the existing electrical power generation capacity in Bali is not sufficient to meet existing or future demands; ii) at present the construction of new thermal power stations in Bali is restricted because the provincial government has classified Bali as an environmentally protected area.

INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

Information disclosure, consultation and participation have been undertaken by the Project Preparatory TA consultant as part of the preparation of this EIA, supported by subsequent due diligence activities undertaken by ADB, and by Udayana University as part of the national AMDAL process. In addition PLN is engaged in an ongoing consultation process with the stakeholders, which will continue during the Project construction and operation.

The public disclosure, consultation and participation process was initiated early in the feasibility stage, with the affected public informed about the proposed project by PLN through communications to and through local government. During the subsequent TA implementation and preparation of this EIA, the TA consultants undertook extensive stakeholder consultations and a three-phase public consultation process. In addition, during surveys PLN field officials met the affected people and informed them about the routing of TLs and siting of substations. The disclosure and consultation process was undertaken in accordance with ADB *Public Consultation and Information Disclosure Guidelines* and the communication framework is based on ADB *Public Communications Policy* (2011).

Result of the Public Consultation

The level of engagement varied among stakeholders with some registering minor comments and other proving more detailed feedback. The key concerns and issues expressed and recorded during the consultations with stakeholders and affected people were:

i. Appreciation and gratitude from residents towards the government for initiating the project to solve the unreliable supply and increasing demand for electricity in Bali;
ii. Concerns regarding the time required for processing various clearances and the completion of the Project on schedule;
iii. Park officials anticipated that the Project will have some impacts on the parks, but assured full support and cooperation in the implementation of the EMP;
iv. Affected people in Java expressed concerns on how the project will benefit them. As a result 21 of 150 kV substations upgrading was added to the project to enhance the capacity of substations.

There is also a requirement for ongoing consultation related to land acquisition and compensation, which is documented separately in the Land Acquisition and Resettlement Plan (LARP). During the preparation of the AMDAL report, Udayana University has also undertaken Project related information dissemination and consultations.

EIA and AMDAL Disclosure

The EIA executive summary, in both English and Bahasa Indonesia, will be made available for public review at the PLN regional offices in Bali and Java. The full EIA will be posted on the ADB website and will be available at the PLN headquarters in Jakarta and PLN regional offices in Bali and Java. The AMDAL, prepared by the Udayana University, will also be disclosed to the public.

Conclusion and Future Consultation Activities

Overall, the consultations taken to date show that affected residents and local communities expressed support for the Project, as they clearly understand the benefits to the community as well as to the region. Environment related public consultation process will continue through the Project construction phase and operation phase as part of the Project Public Communications Framework. This will include disclosure of Project information and public consultation by conducting public meetings, small group meetings, informal meetings, informative brochures, advertisements, signage and other outreach activities.

GRIEVANCE REDRESS MECHANISM

A Project grievance redress mechanism (GRM) has been developed to receive and facilitate resolution of affected persons (APs) concerns and complaints about the Project’s environmental performance. The GRM includes procedures for receiving grievances, recording/ documenting key information, and evaluating and responding to complainants in a timely, transparent and effective manner. It consists of five stages, with an emphasis on addressing problems locally on site if possible, and escalating to the next management level if a resolution cannot be reached. A Grievance Redress Committee will be formed in each district with locally elected members, which will act as third party to ensure a fair and just resolution, and assist in grievance mediation. If the grievance cannot be resolved within the Project to the satisfaction of the AP, the AP may choose to access the local judicial system or appeal to ADB under the Accountability Mechanism.

A record of grievances filed will be kept by each District Office and will be maintained centrally by the Project Management Unit (PMU). It will be evaluated periodically to determine common complaints in order to avoid such grievance in the future, if possible, and to improve procedures in handling them. Lessons learned from the complaints will be incorporated in revising and streamlining of the grievance process. PLN has overall responsibility for establishing, maintaining and implementing the GRM and the District Grievance Redress Committees.

ENVIRONMENTAL MANAGEMENT PLAN

The Project environmental management plan (EMP) includes mitigation measures, environmental monitoring and implementation, roles and responsibilities of institutions and agencies in EMP monitoring and implementation, and capacity building. The estimated EMP budget is $1.8 million, with almost half provided for mitigation measures.

PLN will supervise the EMP implementation with assistance of the PMU and the Project Implementation Consultants (PIC). PLN will ensure that the PMU is staffed with environmental safeguards specialist to undertake the day to day supervision.

Mitigation Measures

Construction and operation phase mitigation measures are summarized in the EMP, along with timeframe, lead responsibility for implementation and source of funds. The EMP includes general measures for the overall transmission line as well as specific measures for the sections through the two national parks. Collaborative Agreements between National Parks and PLN should also be implemented for the conservation, protection and preservation of the status of biodiversity within the national parks. Other than Collaborative Agreements, costs for the mitigation measures are typically included in the Project base costs.

Environmental Monitoring Plan

The Environmental Monitoring Plan (EMoP) includes compliance inspection monitoring and ambient monitoring. Compliance inspection monitoring will be undertaken by the Project Implementation Consultants (PIC). The PIC will include two environment, health, and safety (EHS) specialists, a biodiversity specialist, communication and outreach specialists who will work routinely with the PMU safeguards staff on the safeguards implementation.

Quarterly monitoring for ambient air quality, water quality and noise levels will be undertaken by qualified national environmental monitoring consultants. In addition, monitoring on the status of biodiversity within the national parks will also be implemented. Compliance monitoring involves inspections to verify compliance with EMP requirements and with relevant laws and regulations. Ambient monitoring is undertaken to provide useful feedback on the extent and severity of actual air, water and noise impacts against predicted impacts and relevant ambient standards specified in the EMP.

During the construction phase semiannual environmental monitoring reports will be submitted to ADB and the MoE. The reports will be prepared by the PIC based on the results of the EMoP and the GRM. Monitoring reports will first be submitted to the PMU, which will review and finalize the reports and then convey them to the ADB. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has already been addressed, the report should explain the manner by which the issue was resolved. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has not yet been addressed, a corrective action plan (CAP) should be developed. During the operation phase it is expected that ADB will require annual reporting during the first two years of operation. These environmental monitoring reports will be uploaded to ADB website upon receipt.

In the event of any change of alignment or the identification of unanticipated environmental impact during project implementation, PLN will revise the EMP and will submit to ADB for approval.

Roles and Responsibilities

Key roles and responsibilities with respect to EMP implementation are as follows:

PLN and Project Management Unit: PLN will be the Executing Agency (EA) for the Project. A Project Management Unit (PMU) headed by a full-time Project Director (PD) and supported by technical and administrative staff has been established by PLN and will have direct responsibility for Project management and supervision, including overall responsibility for EMP implementation. The PMU will include environmental and social safeguards staff who will have day-to-day responsibility for EMP implementation and supervision.

Project Implementation Consultant: A Project Implementation Consultant (PIC) will be recruited to support the PMU in project administration, management of detailed design, procurement, management and supervision of works, and monitoring and reporting. The PIC will be headed by a Director who will report to the PMU PD.

PIC EHS Specialists: The PIC will include two Environment Health and Safety (EHS) Specialists, a Biodiversity Specialist, and a Communications and Outreach Specialist. The specialists will report to the PIC Director but will work routinely with the PMU safeguards staff. The EHS Specialists responsibilities will include ensuring EMP commitments are appropriately incorporated into contract documents; reviewing and approving Contractors Environmental Management Plans (CEMPs); ensuring appropriate EMP implementation; development of occupational and community health and safety plans; environmental monitoring; capacity building; and assisting in the implementation of the Grievance Redress Mechanism (GRM).

The **Biodiversity Specialist** will be responsible for supporting Baluran and Bali Barat National Parks on the implementation of the activities, EMP, Biodiversity Conservation Plan, Collaboration Agreement, and for providing technical assistance for any tree trimming, cutting and removal

The **Communications and Outreach Specialist** will be responsible for developing and implementing outreach materials, public communication plan and programs and for supporting the PMU with ongoing public participation activities, including liaison with NGOs and affected community representatives.

Component Contractors: The Contractor for each component will be responsible for the implementation of civil and other works, including the EMP mitigations. As part of the bidding process each component contractor will be required to prepare a Contractors Environmental Management Plan (CEMP) which details the means by which the contractor will comply with the Project EMP. The contractors will also be required to prepare monthly monitoring reports, which document CEMP implementation, including any environmental, health or safety incidents that occurred and the manner in which such incidents were resolved.

Baluran and Bali Barat National Park Authorities: The Park Authorities will be responsible for implementing the respective Collaborative Agreements. The Park Authorities will also coordinate with the PMU and EHS Specialists in relation to mitigation implementation in and around the Park boundaries. Construction of access roads will be minimized by transporting tower materials manually.

Capacity Building

PLN has extensive experience in transmission line construction and operation in Indonesia. Nonetheless, PLN, contractors and other stakeholders will benefit from training on the EMP requirements. The EHS Specialists will develop construction phase and operation phase training programs on all aspects of the EMP, including mitigation requirements, health and safety requirements, and monitoring. The training will be aimed at PLN staff, PMU staff and contractors. Relevant government departments in Bali and East Java such as the MoE will also be invited to participate. The training programs will be delivered at least twice before the start of construction, and twice before the start of the operation phase.

CONCLUSION

In conclusion, the following are the key environmental benefits of the Project: reductions in GHG emissions through the reduced use of low efficiency generators by individuals, businesses and hotels for power generation in Bali; reductions in NOx, SO_2 and particulate emissions through the reduced use of low efficiency generators without emission control systems for power generation in Bali; and, energy savings through the reduction of power losses due to the improved efficiency of the 500 kV transmission system.

As a result of the project, a significant number of households living in rural areas will be benefitted by having improved access to reliable electricity. Improved rural access to power supply, directly contributes to access to technology, employment opportunities, better living standards and higher income.

The overall environmental impacts of the Project can be minimized by the implementation of the EMP. The EMP includes general measures for the transmission line as well as specific measures for the sections through the two national parks. Collaborative Agreements between National Parks and PLN should also be implemented for the conservation, protection and preservation of the status of biodiversity within the national parks.

I. INTRODUCTION

A. PROJECT BACKGROUND

1. ADB is considering providing a loan to the Government of Indonesia to co-finance the proposed Java-Bali 500 kV Power Transmission Crossing Project (the Project) in the Republic of Indonesia. The proposed Project will construct a 220km long extra high voltage (500 kilo volt [kV]) transmission line (TL) and associated substations or substation extensions/upgrades for transferring power from the Paiton Power Complex in East Java to the Bali power grid, thereby enhancing the reliability of power supply to a province which is a major tourist destination and a nationally important source of Gross Domestic Product (GDP). The power transmission capacity of the TL will be 1,800 MW.

2. PT. PLN (Persero) will be the Project proponent. PLN (*Perusahaan Listrik Negara* or the State Electricity Company) is a state owned corporation, which has a monopoly on electricity distribution in Indonesia.

3. The proposed Project consists of seven components located in East Java and Bali provinces (Figure 1.1):

Component 1: Paiton substation extension, East Java.
Component 2: Paiton to Watudodol 500 kV overhead TL (including a segment through Baluran National Park), East Java.
Component 3: Watudodol (East Java) to Segara Rupek 500 kV TL overhead crossing of the Bali Strait (including a crossing tower in Bali Barat National Park).
Component 4: Segara Rupek to Gilimanuk 500 kV overhead TL (including a segment through Bali Barat National Park), Bali.
Component 5: Gilimanuk to New Kapal 500 kV overhead TL, Bali.
Component 6: New Kapal 500/150 kV distribution substation, Bali.
Component 7: Upgrading or extension of twenty-six (26) 150/20 kV substations in Java and Bali.

4. Components 1, 2 and 5 will be co-financed by ADB and PLN; Components 3 and 4 will be financed directly by PLN; Component 6 will be co-financed by ADB, PLN and the ASEAN Infrastructure Fund (AIF); and Component 7 will be co-financed by ADB and PLN.

B. PURPOSE OF THE REPORT

5. ADB's environmental safeguard requirements are presented in the Safeguard Policy Statement (SPS).[4] The proposed Project has been classified by ADB as Environment Category A based on the preparation of a power sector Rapid Environmental Assessment (REA) form (Appendix 1), therefore, a full-scale environmental impact assessment (EIA) including an environmental management plan (EMP) is required.

6. This report forms the EIA for the proposed Project. It has been prepared under the ADB *TA 7325-INO: Java-Bali 500 kV Power Transmission Crossing Project*, which undertook the technical, environmental, financial, social, and economic due diligence for the proposed Project, supported by additional due diligence undertaken by ADB.

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[4] ADB. 2009. *Safeguard Policy Statement.* Available at: www.adb.org/Documents/Policies/Safeguards/default.asp. The SPS became effective on 20 January 2010.

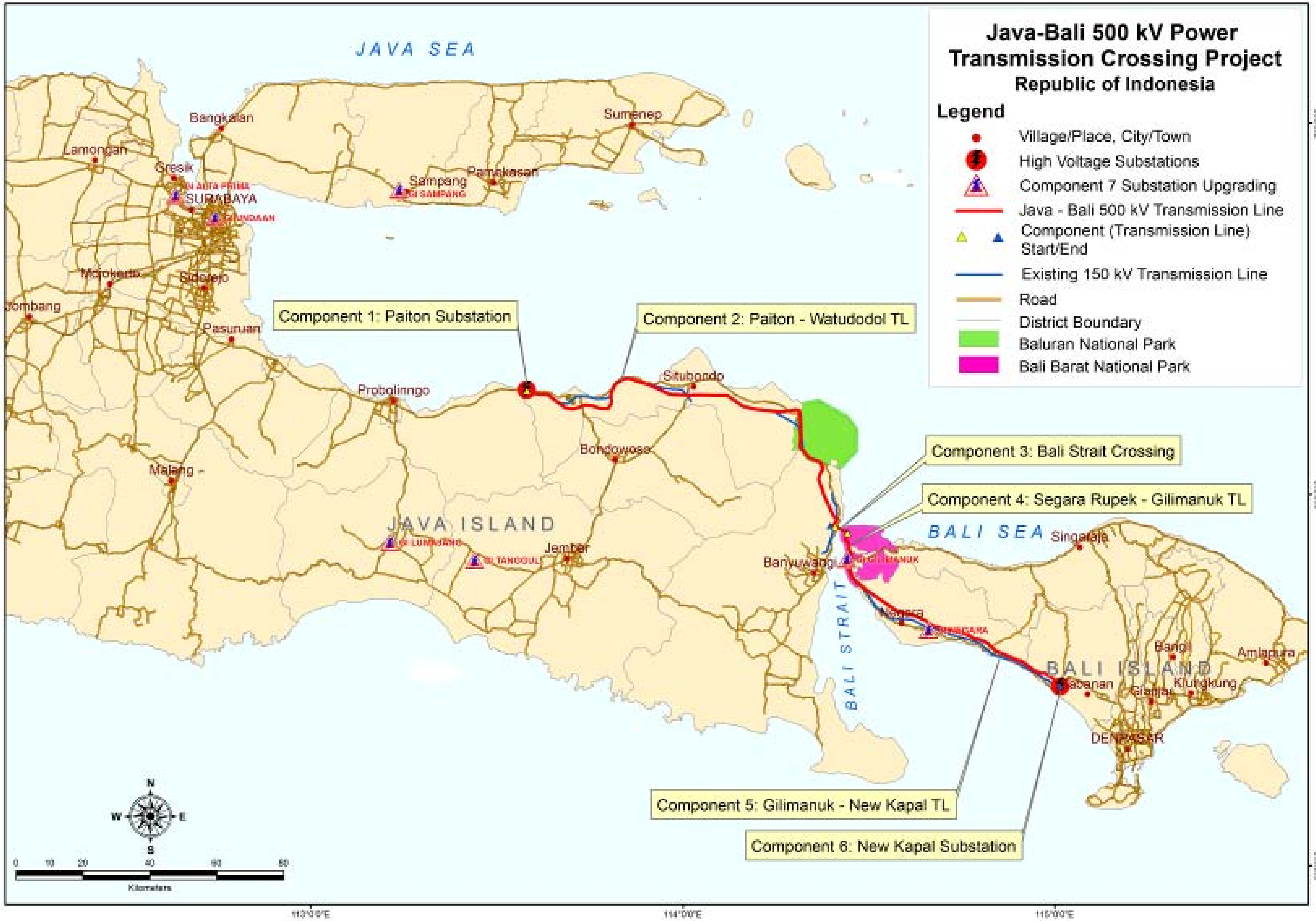

Figure 1.1:Java - Bali 500 kV Transmission Crossing Project Location Map

C. REPORT STRUCTURE

7. This report is structured as follows:

Executive Summary
Summarizes critical facts, significant findings, and recommended actions.

I Introduction
Introduces the proposed Project, components, purpose of the report, and approach to EIA preparation.

II Policy, Legal, and Administrative Framework
Discusses ADB's and Indonesia's environmental assessment legal and institutional frameworks; and the permitting process for construction of TLs in Indonesia.

III Description of the Project
Describes the Project type, rationale, location, cost, budget and implementation schedule; and presents detailed description of the Project's component.

IV Description of the Environment
Describes relevant physical, biological, and socioeconomic conditions within the Project area.

V Anticipated Environmental Impacts and Mitigation Measures
Describes anticipated impacts as a result of the Project, and identifies appropriate mitigation measures.

VI Analyses of Alternatives
Presents an analysis of alternatives of various Project aspects.

VII Information Disclosures, Consultation, and Participation
Describes the process undertaken during Project design and preparation for engaging stakeholders; summarizes concerns raised and actions taken to address concerns; and describes planned information measures for carrying out consultation with affected people during Project implementation.

VIII Grievance Redress Mechanism
Describes the Project grievance redress mechanism (GRM) for resolving complaints.

IX Environmental Management Plan
Presents the environmental management plan (EMP), including the required mitigation measures during the construction and operation phase, an environmental monitoring plan (EMoP), occupational and community health and safety plans, reporting requirements, and environmental, health and safety capacity building.

X Conclusions and Recommendation
Presents conclusions drawn from the assessment and recommendations.

Appendices
Provides references and supporting documentation and information, including detailed alignment strip maps and due diligence review.

D. APPROACH AND METHODOLOGY TO THE EIA PREPARATION

8. This report has been prepared based on;

- Detailed line route surveys undertaken by PLN;
- Line surveys and field studies conducted by the TA 7325 consultant in 2011 (questionnaires and forms used for consultations and the inventory of environmental features are presented in Appendix 2);
- Preliminary design work undertaken by the TA consultant in 2011 for the components to be financed by ADB;
- Data collected from a variety of secondary sources including Government documents, census statistics data, and government agencies (references for the main report and biodiversity component of the EIA are presented in Appendix 3a and 3b, respectively);
- Public consultations organized with the project affected communities, stakeholders, and government officers to gather inputs as to existing environmental conditions in and around the proposed TL alignment and substations and potential Project impacts;
- A draft EIA developed by the TA 7325 consultant (*TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Appendix 5: Environmental Impact Assessment Report*));
- Additional due diligence including site visits and consultations undertaken by ADB's due diligence consultants in January, February and July 2012 and from September 2012 to April 2013 for the additional biodiversity study.
- The approved ToR in Bahasa and its English translation for the AMDAL is presented in Appendix 4.

This report is a revised version of the EIA report prepared in August 2012. It includes a more detailed impact assessment on the status of biodiversity in Bali Barat and Baluran National Parks and the site specific environmental management plan especially during construction in the two national parks.

Some of the TL alignments of the proposed Project are within the special utilization zone of the Baluran and Bali Barat National Parks. To ensure that the Project will not have a significant impact on the status of biodiversity within the national parks, a biodiversity study was conducted by a consultant from September 2012 to April 2013.

The objectives of the biodiversity study are the following: to identify the flora, fauna and avian-fauna species of concern (i.e. vulnerable, endangered, least concerned) in the national parks; to identify the potential impacts of the Project on the status of biodiversity in the national parks; and to prepare and implement site specific mitigation measures to minimize the anticipated impacts.

The component on the discussion of the biodiversity status in the national parks is an added information from the earlier version of the EIA report (August 2012).The approach applied for the biodiversity study are the following:

i. Consultations and personal communications with the national park officers, concerned NGOs and biodiversity experts.

(a) List of NGO contacted:

- Bird Indonesia, Bogor contact person: Hanun
- Wet land Indonesia , Bogor, Contact person: Ferry
- Raptor Indonesia, Bogor, Contact person: Asman Adi Purwanto

(b) List of Expert contacted
(The contact details of the experts are included in Appendix 3b)
Banteng /big mammal experts

- Dr. Ali Kodra, Bogor
- Dr. Setyawan Pudyatmoko, Jogya
- Dr. Ahmad Sarmidi, Bandung
- Dr. Eric Meijaard, Bali

Bird expert (ornithologist)

- Dr. NurJito, Bogor
- Irham Msc, Bogor

(c) List of National Park Officers Contacted
Bali Barat National Park

- Surahnan
- Herry Kusumanegara
- Sugiarto

Baluran National Park

- Joko Susilo
- Gatot
- Birowo

ii. Field survey to gather information based on actual observations on the flora, fauna and avian-fauna species in the affected area. The following field survey were conducted for the study:
   a. September 2012: Gilimanuk, Bali Barat and Baluran NP to observe the biodiversity status during dry season
   b. November 2012: Gilimanuk, Bali Barat and Baluran NP for verification of data with the management of the national parks
   c. January 7-11, 2013: Denpasar, Gilimanuk, Bali Barat site visits with the ADB team to present the initial report on biodiversity
   d. January 27-31, 2013: Gilimanuk Bay and Bali Barat NP for bird survey
   e. March 2013; Gilimanuk Bay and Bali Barat NP for bird survey
   f. April 2013: personal communications and consultation with biodiversity experts and NGOs

iii. Review of literature. Documented studies from published books, technical papers and articles about the biodiversity status on the two national parks.

E. Scope of EIA Report

9. The EIA study covers all seven Project components. Components 3, 4 and 7, which are not financed by ADB, are included in the overall assessment and considered as part of the Project.

10. The study area at minimum includes a zone:

- 100 m perpendicular to both sides of the 220km long TL center alignment;
- Within 200 m of the boundary of substations and transmission tower base boundaries; and,
- Within 500 m of the boundary Bali Strait crossing tower base boundaries.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB ENVIRONMENTAL SAFEGUARDS

1. Safeguard Policy Statement

11. This report has been prepared in accordance with the ADB's Safeguard Policy Statement (SPS), which governs the environmental and social safeguards of ADB's operations. Environmental Safeguard Requirements 1 (SR1) of the SPS outlines the requirements that borrowers/clients are required to meet when delivering environmental safeguards for projects supported by the ADB. These requirements include assessing impacts, planning and managing impact mitigations, preparing environmental assessment reports, disclosing information and undertaking consultation, establishing a grievance mechanism, and monitoring and reporting. SR1 also includes specific environmental safeguard requirements pertaining to biodiversity conservation and sustainable management of natural resources, pollution prevention and abatement, occupational and community health and safety, and conservation of physical cultural resources (PCRs).

12. At an early stage in the project cycle (typically the project identification stage) ADB screens and categorizes proposed projects based on the significance of potential project impacts and risks. A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Project screening and categorization are undertaken to:

- Reflect the significance of the project's potential environmental impacts;
- Identify the type and level of environmental assessment and institutional resources required for the safeguard measures proportionate to the nature, scale, magnitude and sensitivity of the proposed project's potential impacts;[5] and,
- Determine consultation and disclosure requirements.

13. Rapid environmental assessment (REA) checklists are used to assist in the screening and categorization of proposed projects. ADB assigns a proposed project to one of the following categories:

i) **Category A.** Proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented; impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale environmental impact assessment (EIA) including an environmental management plan (EMP) is required.

ii) **Category B**. Proposed project's potential environmental impacts are less adverse and fewer in number than those of category A projects; impacts are site-specific, few if any of them are irreversible, and impacts can be readily addressed through mitigation measures. An initial environmental examination (IEE), including an EMP, is required.

iii) **Category C**. Proposed project is likely to have minimal or no adverse environmental impacts. No EIA or IEE is required although environmental implications need to be reviewed.

[5] 'Type' refers to strategic environmental assessment (SEA), project environmental assessment, or compliance audit; 'Level' refers to a full environmental impact assessment for Category A projects, and an initial environmental examination for Category B projects.

iv) **Category FI**. Proposed project involves the investment of ADB funds to, or through, a financial intermediary.

14. It is important to note that environmental categorization is an ongoing process and is subject to change as more detailed information becomes available as the project preparation proceeds.

15. During the design, construction, and operation of a project the SPS requires the borrower to follow environmental standards consistent with good international practice, as reflected in internationally recognized standards such as the IFC/World Bank Group's *Environment, Health and Safety* Guidelines (hereafter referred to as the EHS Guidelines).[6] With respect to the proposed Project the most applicable EHS Guidelines are *General Environmental, Health, and Safety Guidelines* (2007), *Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution* (2007), and *Environmental, Health, and Safety Guidelines for Construction Materials Extraction* (2007). IFC *Guidance Note 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources* is also applicable.

2. Project Environmental Categorization

16. The Project was tentatively classified in 2009 by ADB as environment category A based on the preparation of a preliminary Rapid Environmental Assessment (REA, see Appendix 1), requiring the preparation of an EIA. In 2012, ADB undertook due diligence reviews of the TA 7325 outputs, including the draft EIA. The A categorization was subsequently confirmed through the preparation of a revised detailed power sector REA (Appendix 1).

3. Information Disclosure

17. Information disclosure involves delivering information about a proposed project to the general public and to affected communities and other stakeholders beginning early in the project cycle and continuing throughout the life of the project. Information disclosure is intended to facilitate constructive engagement with affected communities and stakeholders over the life of the project.

18. In order to make key documents widely available to the general public the SPS requires that the borrower submit to ADB the following documents for disclosure on ADB's website:

i) A draft full EIA (including the draft EMP) at least 120 days prior to ADB Board consideration;
ii) the final EIA;
iii) A new or updated EIA and corrective action plan prepared during project implementation, if any; and
iv) The environmental monitoring reports.

B. GOVERNMENT ENVIRONMENTAL ASSESSMENT REQUIREMENTS

1. Institutions

19. Government agencies mandated with the responsibility for environment and natural resources management in Indonesia include the Ministry of Environment (MoE), Ministry of Forestry (MoF), Ministry of Marine Affairs and Fisheries (MMAF), the Ministry of Energy and Mineral Resources (MEMR), and the Department of Water Resources Development (DWRD).

[6] The EHS Guidelines are available at: http://www.ifc.org/ifcext/sustainability.nsf/Content/EHSGuidelines.

After its merger with the Environmental Impact Management Agency (BAPEDAL) in 2002, the MoE is the key agency responsible for environmental assessment. Other environmental roles and functions of the MOE include policy formulation; coordination and integration of plans and programs; monitoring; analyses; promotion of public participation; and, information dissemination. The long-term objective of the MoE is the promotion of effective sustainable development.

2. EIA Legal and Regulatory Framework

20. In Indonesia a project proponent is required by to undertake an *Analisa Mengenai Dampak Lingkungan* (AMDAL or EIA) as the major environmental prerequisite for project commencement.[7] The EIA process in Indonesia dates back more than 25 years, and is specifically mandated by Article 2 of Law Number 32/2009 on *Protection and Management of the Environment*. This is the most current environmental protection and management law, and was derived from the amendment of two previous laws, Law Number 23/1997 on *Environmental Management*, and Law Number 4/1982 on *Principles of Environmental Management*.

21. Appendix I of MoE Regulation No. 5/2012 imposes a “positive list” for projects and/or activities that require a full EIA according to the type, scale and location of the activity for a variety of sectors. With reference to the power sector, Regulation No. 5/2012 requires that any TL greater than 150 MW must undergo an EIA. In addition, any project located at the border or inside a protected area, no matter type or scale, requires an EIA. Projects not listed are only obliged to prepare Environmental Management efforts (*Upaya Pengelolaan Lingkungan or UKL)* and an Environmental Monitoring Efforts (*Upaya Pemantauan Lingkungan or UPL)* in accordance with Article 34 of the 2009 *Protection and Management of the Environment Law*.

22. Articles 22 and 26 of Law Number 32/2009 on *Protection and Management of the Environment* and articles 9 of Government Regulation No. 27/2012 define the need for public involvement. Guidance on public involvement is set forth in the Bapedal Decree No. 08/2000.

3. Comparison of Government and ADB Requirements

23. In general there is a considerable similarity between the Government and ADB environmental assessment requirements, as summarized in Table 2.1. Essentially, an ADB Category A which requires an EIA corresponds to a Government AMDAL, and an ADB Category B which requires an IEE corresponds to a GovernmentUKL/UPL study. However, differences in categorization procedures may result in each party applying differing categories to the same project. For example, the Government regulations categorize projects based on specific selection criteria, whereas ADB categorizes based on the significance of adverse environmental impacts.

7 In addition to the relevant legislation, this section is based in part on “The AMDAL Process and the Equator Principles, Common themes and apparent differences”, a paper presented in “Mining Indonesia 2009 Conference: Unlocking Mineral Potential”, Jakarta 14 -16 October 2009.

Table 2.1: Comparison of Government and ADB project environmental categorization

Categorization of Projects by ADB	Categorization of Projects in Indonesia
Category A: Projects with potential for significant adverse environmental impacts, requiring an environmental impact assessment (EIA)	**AMDAL**: Projects requiring an EIA
Category B: Projects judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for category A projects, and requiring an initial environmental examination (IEE)	**UKL/UPL**: Projects requiring Environmental Management Efforts (UKL) and Environmental Monitoring Efforts (UPL)
Category C: Projects unlikely to have adverse environmental impacts.	**Exempt**: Projects that do not require AMDAL or UKL/UPL. Project proponent should sign a SPPL (Environmental Management Statement)

4. EIA Process

24. Prior to commencing AMDAL work, the project proponent is required to notify the relevant environmental impact management agency. Based on the type, scale and location of the project, AMDAL approval may be granted at the central level by the MoE, at the provincial level by the relevant Provincial Environmental management board Impact Management Agency (*Provincial BLH or BPLHD*), or at the District level Environmental management board or office (*District BLH/KLH*). In the case of the power sector, if projects are trans-provincial, review and approval occurs at the central level by the MoE.

25. The first step of the AMDAL process is the preparation of the ToR (*KA-ANDAL*) and approval by the AMDAL Committee. This defines:

i) Scope of the study;
ii) Type of activities of the project that may cause impact to environment;
iii) Environmental parameters likely to be affected by the project'
iv) Method of data collection and analysis;
v) Potential and important impact identification; and,
vi) Methods of impact prediction and evaluation.

26. Before preparing the ToR, the proponent is required to make a public announcement of the proposed project through publication in a local newspaper, and stakeholders have a month to submit their comments and suggestions for the ToR. A public consultation meeting is held prior to finalizing the ToR. During this meeting the project proponent is expected to present a full description of the project and the potential impacts it may generate.

27. The format of the AMDAL documentation is prescribed in Section 2.1b of MoE Regulation No. 08/2006. The EIA process results in five AMDAL documents: i) the ToR (*KA-ANDAL*) ii) the *Analisis Dampak Lingkungan* (ANDAL or Environmental Impact Assessment report; iii) the *Rencana Pengelolaan Lingkungan* (RKL or Environmental Management Plan); iv) the *Rencana Pemantauan Lingkungan* (RPL or Environmental Monitoring Plan); and v) the Ringkasan *Eksekutif* (Executive Summary).

28. Based on the approved ToR, the proponent prepares the ANDAL, RKL and RPL Document and submits it for evaluation. There is a two-step review process. In the first round, the documents are reviewed by the Technical AMDAL Committee then revised by the proponent and re-submitted. If the revised report is accepted by the Technical AMDAL Committee it is forwarded

to the EIA Appraisal Committee, and the same review and revision (if necessary) process will take place. During the review of the ANDAL, RKL AND RPL report, an additional public consultation is held to disclose the project assessment and to obtain feedback from stakeholders. Comments received from the AMDAL commission and public/stakeholders are considered in revising/finalizing the ANDAL report.

29. The AMDAL Appraisal Committee consists of officials and experts from related agencies and universities and NGOs, as well as representative of the affected people. If the review finds the AMDAL process satisfactory, the respective government agency (MoE or provincial or district BPLHD or BLH) will issue a letter of "approval to proceed with the project". If the study demonstrates that impacts cannot be mitigated by current available technology, the government may decide to reject the proposed project. Once the AMDAL document is approve by the commission and the project get environmental feasibility approval, then the project proponent is required to obtain an environmental permit before it can commence, subject to obtaining other required permits such as permit for land clearing etc . The Environmental Permit becomes invalid if the proposed project is not undertaken within three years of the issuance of the Environmental Permit (Government Regulation No. 27/2012, Article 50 paragraph 2e. 4a and 4b).

30. The RKL and RPL are important operational documents, which last throughout the lifetime of the project. The documents contain commitments of proponent to prevent, control, mitigate and monitor the environmental impacts at all stages of the project; they also specify reporting requirements of the environmental management and monitoring activities. All commitments in the RKL and RPL documents are legally binding and are used as references by the MoE, provincial or district BLH, or third party auditors during audits of the implementation of the RKL and RPL commitments. The approving authority has the power to check conformance with the commitments and enforce compliance with the applicable laws and regulations.

5. Status of the Project's AMDAL

31. Based on the recommendation of the Bali Governor, PLN has recruited the Environmental Research Center (*Pusat Penelitian Lingkungan Hidup* or PPLH) of the University of Udayana in Denpasar, Bali, to undertake the Project AMDAL process. A draft AMDAL ToR was prepared by PPLH, which underwent extensive review; and final approval of the ToR was granted by the MoE in July 2012 (Appendix 4a and 4b).

32. The AMDAL certificate with the Environmental Permit from the Minister of Environment of the Republic of Indonesia was issued in April 16, 2013. The copy of the environmental permit in Bahasa and its corresponding English translation is in Appendix 5a and 5b, respectively.

33. In designing the TLs and substations, including the selection of tower materials and components, PLN should refer to the MEMR Decree Number 1457 K/28/MEN/2000 on *Technical Guidelines of Environmental Management in Mining and Power Sectors*, and Decree Number 1899 K/09/MPE/1994 on *Implementation of Environmental Monitoring of Electricity Power*. Furthermore, standards related to TLs are presented in Indonesia National Standard (SNI) Number 04-6918-2002 on *Free Space and Minimum Free Distance of High-voltage Transmission Lines and Extra High-voltage Transmission Lines*; and SNI Number 04-6950-2003 on *Air Spaces for High-voltage Transmission Lines and Extra High-voltage Transmission Lines - Threshold Values of Magnetic Field and Electricity Field*.

34. Relevant requirements with respect to health and safety include Law No. 1/1970 on *Worker Safety* and Ministry of Workforce Decree No. Kep-51/MEN/1999 on *Reference Standard on Activities in the Working Area*.

35. Requirements related to Project activities in production forests and national parks are discussed in the section on Forest Management and Conservation.

6. Indonesia's Environmental Standards

38. During the design, construction, and operation of a project, the SPS requires the borrower to follow environmental standards as reflected in internationally recognized standards such as the *EHS Guidelines*. These guidelines contain discharge effluent, air emissions and other numerical guidelines and performance indicators from sources such as the World Health Organization (WHO), as well as prevention and control measures that are normally acceptable to ADB and are generally considered to be achievable at reasonable costs by existing technologies. When host country regulations differ from these levels and measures, the borrower is to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower is required to provide full and detailed justification for any proposed alternatives.

36. Table 2.2 presents the relevant Government Ambient Air Quality Standards (Government Regulation No. 41/1999) compared with relevant international guidelines. With the exception of SO_2 the Government 24-hour average ambient standards meet or exceed international guidelines (e.g. WHO and the United States Environmental Protection Agency (US EPA)) and are utilized in this report.[8] In the case of SO_2 both the Government and the WHO standards are utilized.

37. Table 2.3 presents the Government Surface Water Quality Standards (Government Regulation No 82/2001). The *EHS Guidelines* do not provide ambient surface water standards but state that wastewater discharges should not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality. Therefore the Government surface water quality standards are utilized in this report.

38. Table 2.4 presents the relevant Government noise standards compared with relevant international guidelines from the WHO. There is no significant difference between Government and WHO standard for most categories, with the exception that Government does not have nighttime standards.

39. There are no EMF exposure guidelines or standards in Indonesia. The *EHS Guidelines* recommend evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation (ICNIRP); average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure (Table 2.5).[9]

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[8] The EHS Guidelines refer to WHO ambient air quality guidelines.

[9] ICNIRP published the "Guidelines for Limiting Exposure to Time-varying Electric, Magnetic, and Electromagnetic Fields" following reviews of all the peer-reviewed scientific literature, including thermal and non-thermal effects. The standards are based on evaluations of biological effects that have been established to have health consequences. The main conclusion from the WHO reviews is that exposures below the limits recommended by the ICNIRP international guidelines do not appear to have any known consequence on health.

Table 2.2: Relevant Government ambient air quality standards and international guidelines

Pollutant	Monitoring Duration	Government Standard (mg/Nm^3)	International Standards	Remarks
PM_{10}	Annual Average	No annual standard for PM_{10}.	WHO 0.070 (Interim target-1) 0.050 (Interim target-2) 0.030 (Interim target-3) 0.020 (guideline) US EPA: No applicable standard	For PM_{10} no Government standard available However, annual averages are not used in this report.
	24-hour Average	0.15	WHO: 0.150 (Interim target-1) 0.100 (Interim target-2) 0.075 (Interim target-3) 0.050 (guideline) US EPA: 0.15 mg/Nm^3	Government standard meets WHO Interim target-1, and US EPA standard
$PM_{2.5}$	1- year	15µg/ Nm^3	WHO 35 (interim target -1) 25 (interim target -2) 15 (Interim target-3) 10 (guideline)	Government standard meets WHO Interim target-3
	24 hour	65µg/ Nm^3	WHO 75 (interim target -1) 50 (interim target -2) 37.5 (Interim target-3) 25 (guideline)	Government standard below WHO Interim target-1,
Ozone (O_3)	1 hour	235µg/ Nm^3	WHO 160 (interim target-1) 100 (guideline)	WHO standard is more stringent than Government
	1 year	50 µg/ Nm^3	No WHO standard	
SO_2	1-hour Average	0.900		No comparable standard
	24-hour Average	0.365	WHO: 0.125 (Interim target-1) 0.050 (Interim target-2) 0.020 (guideline)	WHO hour and annual average standards are more stringent or equivalent to Government; WHO standard will be applied.
	Annual Average	0.100		No comparable standard
NO_2	1-hour Average	0.400	WHO: 0.20	WHO standard is more stringent than Government
	24-hour Average	0.150	No comparable WHO or US EPA standard	No comparable standard
	Annual Average	0.100	WHO: 0.040	WHO standard is more stringent than Government

Source: Unofficial translation of Government Regulation No. 41. Year 1999 and EHS Guidelines.

Table 2.3: Government water quality standards

No	Parameter	Unit	Class I	Class II	Class III	Class IV
			10.00	25.00	50.00	100.00
1.	BOD_5		2	3	6	12
2.	DO	mg/l	6	4	3	0
3.	N-Nitrite	mg/l	0.06	0.06	0.06	(-)
4.	Sulfide (H_2S)	mg/l	0.002	0.002	0.002	-
5.	Temperature	^{o} C	Dev. 3	Dev. 3	Dev. 3	Dev. 5
6.	pH	-	6 - 9	6 – 9	6 - 9	5 - 9
7.	Electric Conductivity	mS/cm	-	-	-	-
8.	TDS	NTU	1000	1000	1000	2000
9.	NO_3	mg/l	10.00	10.0	10.00	20.00
10.	PO_4	mg/l	0.2	0.2	1	5
11.	SO_4	mg/l	400.00	(-)	(-)	(-)
12.	Iron (Fe)	mg/l	0.30	(-)	(-)	(-)
13.	Manganese (Mn)	mg/l	0.10	(-)	(-)	(-)
14.	Copper (Cu)	mg/l	0.02	0.02	0.02	0.20
15.	Zinc (Zn)	mg/l	0.05	0.05	0.05	2.00
16.	Lead (Pb)	mg/l	0.03	0.03	0.03	1.00
17.	Cadmium (Cd)	mg/l	0.01	0.01	0.01	0.01
18.	Chromium	mg/l	0.05	0.05	0.05	1.00
19.	Oil & Grease	µg/l	1,000	1,000	1,000	-
20.	Radiation Total α	Bq/l	0.10	0.10	0.10	0.10
21.	Radiation Total β	Bq/l	1.00	1.00	1.00	1.00
22.	Fecal Coliform	no/100 ml	100	1,000	2,000	2,000
23.	Total Coliform	no/100 ml	1,000	5,000	10,000	10,000

Source: Government Regulation No 82 Year 2001

Notes:

Class I: water can be used for drinking and other uses that require similar water quality.
Class II: water can be used for infrastructure/water recreation facilities, the cultivation of freshwater fish, livestock, irrigating crops, and other uses that require similar water quality.
Class III: water can be used for freshwater fish farming, animal husbandry, irrigating crops, and other uses that require similar water quality.
Class IV: water allocation can be used to irrigate crops, and other uses that require similar water quality

Table 2.4: Government noise standards and relevant international guidelines

<table>
<tr><th colspan="3">Government Standards
One Hour Leq dB(A)</th><th colspan="2">International Standards
One Hour Leq dB(A)</th><th rowspan="2">Comparison</th></tr>
<tr><th>Category</th><th>Day</th><th>Night</th><th>Day</th><th>Night</th></tr>
<tr><td>Green Areas</td><td>50</td><td></td><td rowspan="3">WHO Class I: residential, institutional, educational: 55</td><td rowspan="3">WHO Class I: Residential, institutional, educational: 45</td><td rowspan="7">There is no significant difference between Government and WHO standard for most categories, with the exception that Government does not have nighttime standards.</td></tr>
<tr><td>Hospitals and Health zone</td><td>55</td><td>-</td></tr>
<tr><td>Mixed residential, education and religious areas</td><td>55</td><td>-</td></tr>
<tr><td>Office and commercial</td><td>65</td><td>-</td><td rowspan="4">WHO Class II: industrial, commercial: 70</td><td rowspan="4">WHO Class II: Industrial, Commercial: 70</td></tr>
<tr><td>Government and public Facilities</td><td>70</td><td></td></tr>
<tr><td>Recreation</td><td>70</td><td></td></tr>
<tr><td>Industrial areas</td><td>70</td><td>-</td></tr>
</table>

Source: Unofficial translation of MoE Decree No 48/MNLHJ III/ 1996 and *EHS Guidelines*.

Table 2.5: ICNIRP exposure limits for general public exposure to electric and magnetic fields

Frequency	Electric Field (V/m)	Magnetic Field (µT)
50 Hz	5000	100
60 Hz	4150	83

Source: ICNIRP (1998): “Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), in World Bank *Electric Power Transmission and Distribution EHS Guidelines, 2007*.

7. Forest Management and Conservation

a. Institutions

40. Key institutions involved in forest management in Indonesia include:

i. Ministry of Forestry (MoF)

- The MoF has overall responsibility for the management of Indonesia’s Kawasan Hutan (Forest Zone).
- MoF approves permits for construction of TLs in Production Forests and Protected Areas.

ii. Directorate General of Forest Protection and Nature Conservation (*Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam - PHKA*) of the MoF

- Directorate General under the MoF. Its tasks and functions include planning and implementation of policy in the fields of forest protection and nature conservation.
- Provides recommendations to the MoF regarding permits for use of national parks and for other applications.

iii. Directorate General Forestry Planning of the MoF

- Forest inventory and spatial planning.

iv. Provincial Governors

- Provides recommendations regarding applications for changes of forest function and utilization at the Provincial level.

v. District Bupatis

- Provides recommendations regarding application for changes of forest function and utilization at the district level.

vi. Provincial and District Forest Agencies of the MoF

- Forest management at the provincial and district levels, including providing recommendations on applications for changes in forest function and utilization.

b. Forest Laws and Regulations

41. Key forest laws and regulations relevant to power TL construction include:

- Law of the Republic of Indonesia No. 41/1999, *Forestry Law*.
- Government Regulation No. 2/2008 *Regarding Type and Tariff PNBP (Government Income Outside Tax) of Forest Area Application*
- Government Regulation No. 10/2010, *Regarding Procedures for Changes in Designation of Forest Area and its Functions*.
- Government Regulation No. 24/2010,*Regarding Utilization of Forest Areas*.
- Government Regulation No. 28/2011 *Regarding the Management of Natural and Conservation Areas.*
- MoF Regulation No. P.18/Menhut-II/2011 *Regarding Guidance in Respect of Rent Use Permits for Forest Areas.*
- MoF of Republic of Indonesia Regulation No. P.32/Menhut-II/2010, *Regarding Swaps of Forest Area.*
- MoF of Republic of Indonesia Regulation No. P.33/Menhut-II/2010, *Regarding Procedure of Releasing of Production Forest Area that can be Converted* and amendments (e.g.MoF Regulation No. P.33/Menhut-II/2010 *Regarding Procedures for the Release of a Production Forest Area which can be Converted*).
- MoF of Republic of Indonesia Regulation No. P. 34/Menhut -II/2010 *Regarding Procedures for Changes in Function of Forest Area.*
- MoF of Republic of Indonesia Regulation No. P. 36/Menhut-II/2010 *Regarding Integrated Team Appointment in the Framework of Research of Forest Area Application and Its Functions Changes.*
- MoF Regulation No P.56/Menhut-II/2006 *Regarding National Park Zoning.*
- MoFRegulation No.P.56/Menhut-II/2008 Regarding Procedure to Determine Encroachment Area and Reclamation Area for PNBP (State Revenue Calculation) of Application for Using Forest Area.
- MoF Decree No. P.19/Menhut-II/2004 on *Collaborative Management of Nature Reserves and Protected Areas.*
- MoF Decree No. 390/Kpts/II/2004 *Regarding Procedures for Cooperation in the areas of Conservation of Natural Resources.*
- Permendagri. No 61/2010 on Guidelines for Organizations and Administration of Protection Forest Management Unit and Production Forest Management Unit in the Region.

c. Forest Zoning

42. The 1999 Forestry Law empowers the Department of Forestry to determine and manage Indonesia's Kawasan Hutan (Forest Zone). The law categorizes forests as:

i. **Conservation Forest:** a forest area having specific characteristics for the purposes of conservation of animal and plant species and their ecosystems.

ii. **Protection Forest:** a forest area designated to serve life support systems; maintain hydrological systems; prevent floods; provide erosion control; prevent seawater intrusion; and, maintain soil fertility.

iii. **Production forest:** a forest area designated to promote sustainable forest production.

43. **Conservation forests** are divided into:

- Sanctuary Reserve Areas which consist of Strict Nature Reserves and Wildlife Sanctuaries;
- Nature Conservation Areas which consist of National Parks, Grand Forest Parks and Nature Recreation Parks; and
- Game Hunting Parks.

44. Sanctuary Reserves are specific terrestrial or aquatic areas having specific criteria for preserving the biodiversity of plants and animals as well as ecosystems, and which also serves as a life support system. A Nature Conservation area is a specific terrestrial or aquatic area whose main functions are to serve as a life support system, preserve diversity of plant and animal species, and provide a sustainable utilization of living resources and their ecosystems. A Game Hunting Park is a forest area devoted for game hunting recreation.

45. Production forests include permanent production forests, limited production forests, and convertible production forests.

d. National Park Zoning

46. MoF Regulation No. P.56/Menhut-II/2006 *Regarding National Park Zoning* defines national park zonings the spatial arrangement of the park in zones according to function and existing ecological, socioeconomic and cultural conditions. The decree states that a national park can have several types of zones:

i. **Core Zone**: strictly reserved for biodiversity conservation, can only be utilized in the interest of research and development supporting utilization, science, and education and or supporting culture.

ii. **Utilization Zone**: can be utilized for nature resorts and recreation, research and development supporting utilization, education and cultural support activities.

iii. **Other Zones:** Wilderness Zone, Traditional Use Zone, Rehabilitation Zone, Religious Use Zone, Culture and History Protection Zone, and Special Use Zone. A Special Use Zone is to accommodate local communities that have been residing in the area since before it was designated a national park, or to accommodate public facilities and infrastructure such as telecommunication towers, roads and electricity installations.

e. Forest Utilization Permitting

i. Permitting Process

47. Under articles 2 to 5 of Government Regulation No. 24 on *Utilization of Forest Areas* and further to MoF Regulation No. P.18/Menhut-II/2011 *Regarding Guidance in Respect of Rent Use Permits for Forest Areas*, utilization of Forest Areas for non-forestry activities may only be carried out in i) Production Forest Areas and ii) Protected Forest Areas, with an appropriate Forest Rent Use permit from the MoF, and only in respect of activities with a clear strategic purpose such as:

- Religious activities;
- Mining (i.e., oil and gas, coal, minerals and geothermal);

- Installation of generators, transmission and distribution of electricity;
- Promotion of new and renewable energy technology;
- Construction of telecommunication networks, radio transmitting stations,
- Television relay stations;
- Construction/operation/support of public roads, highways and railways;
- Construction/operation/support of transportation facilities, which are not
- Categorized as public transportation, for transporting production output;
- Construction/operation/support of facilities for water resources, water
- Installations and canals for clean water and/or waste water;
- Construction/operation/support of public facilities;
- Operation of forest related industries;
- Security and defense;
- Public safety supporting facilities; or
- Shelters for natural disaster victims.

48. The process to obtain a Rent Use Permit is summarized in Figure 2.1. The proponent must submit an application to MoF and accomplish a number of administrative and technical requirements (Table 2.6). If the applicant fulfills the subject administrative and technical requirements adequately the MoF will issue an Approval in Principal permit with a maximum validity period of 2 years, which is extendable subject to evaluation. The Approval in Principal permit will specify a number of obligations that need to be fulfilled by the Rent Use Permit applicant for the purpose of obtaining the Rent Use Permit. Once the Approval in Principal holder fulfills the obligations stated in the Approval in Principal permit, MoF will grant a Rent Use Permit.

49. A Rent Use Permit gives the holder the right to carry out land clearance and deforestation activities. However, a Rent Use Permit requires compensation for these impacts, depending on the forest area classification. Forest Areas affected by utilization are classified into 3 categories:

a) L1, being Forest Areas utilized for permanent facilities, excluding active mining concessions, which will be subject to 1 times the Forest Area Utilization Non Tax State Revenue rate;

b) L2, being Forest Areas utilized for temporary purposes and which can be restored by way of carrying out reclamation activities, which will be subject to 4 times the rate; and

c) L3, being Forest Areas utilized for long-term purposes and which cannot be restored by way of carrying out reclamation activities, which will be subject to 2 times the Forest Area Non Tax State Revenue rate.

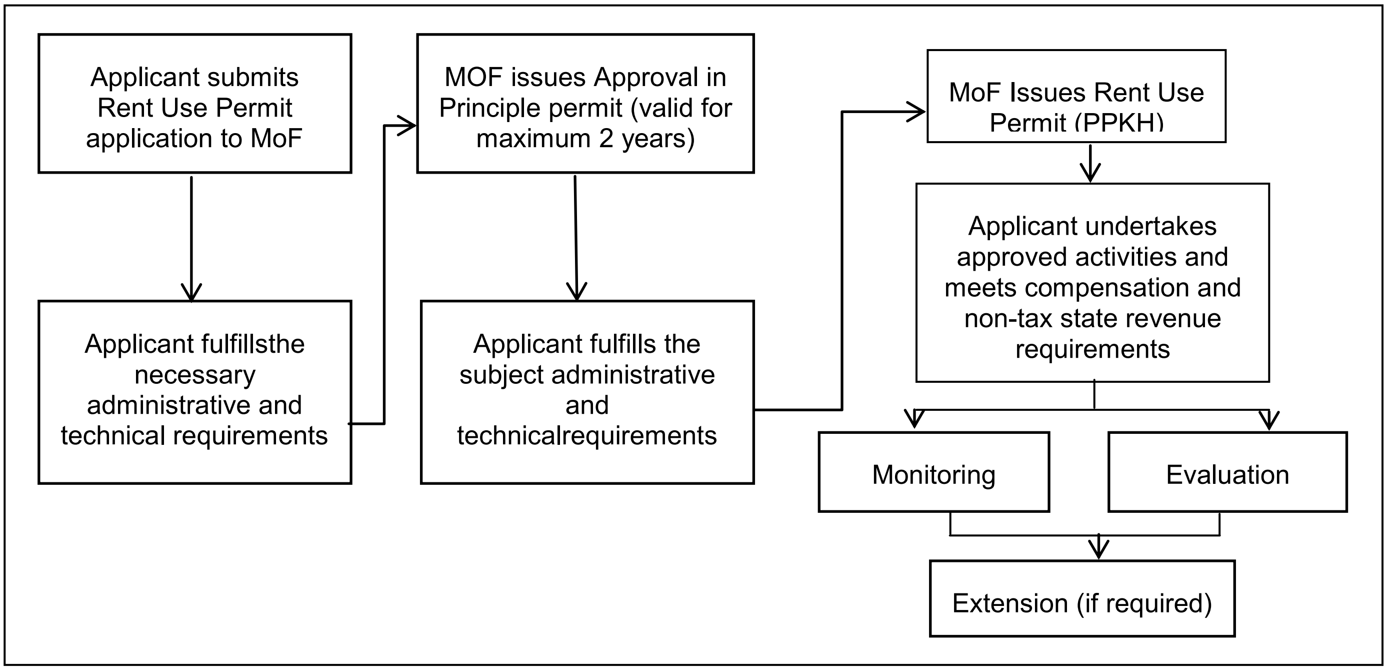

Figure 2.1:Forest Utilization Rent Use Permit process

(based on Government Regulation No 24, 2010 Regarding Utilization of Forest Areas and MoF Regulation No. P.18/Menhut-II/2011 Regarding Guidance in Respect of Rent Use Permits for Forest Areas).

50. The Rent Use Permit will require compensation as follows:

a) If the total Forest Area in the relevant Province where the target Forest Area is situated comprises less than 30% of the total Provincial land area (including islands and rivers), then the applicant must provide compensation land in the ratio of:
   i) *If the Forest Area is to be utilized for non-commercial purposes*: in the ratio of 1:1 plus the estimated total affected area in L3 category;
   ii) *If the Forest Area is to be utilized for commercial purposes*: in the ratio of 1:2 plus the estimated total affected area in L3 category; and,
   iii) If the actual realization of the L3 category area is larger than the estimated L3 category area, then the total compensation must reflect the difference between the L3 area estimation and the L3 area realization.

b) If the total Forest Area in the relevant Province where the target Forest Area is situated comprises more than 30% of the total Provincial land area (including islands and rivers), the applicant is obliged to pay Non Tax State Revenue in respect of Forest Area Utilization and carry out reforestation in the ratio of:
   i) *If the Forest Area is to be utilized for non-commercial purposes*: 1:1; and
   ii) *If the Forest Area is to be utilized for commercial purposes*: 1:1 plus the total area predicted to be affected by the relevant activities in the L3 area category.

ii. Status of Project Permitting

51. PLN is currently in the process of obtaining a Rent Use Approval in Principle Permit for Project activities in Production Forests in Java and Limited Production Forests in Bali.

Table 2.6: Administrative and technical requirements for obtaining a Forest Utilization Rent Use Permit

Administrative requirements for obtaining a Forest Utilization Rent Use Permit:

a) An application letter together with a location map showing the target Forest Area;
b) An Exploration/Production Operation Mining Business License ("IUP") or other license/agreement issued by the Central Government/Governor/ Regent/Mayor in accordance with their respective authority ("Relevant Authority"), except for activities which do not require any specific licenses/agreements;
c) A recommendation from the Relevant Authority as follows:
    a. The Governor for Rent Use Permits in respect of non-forestry licenses issued by the Regent/Mayor and Central Government;
    b. Regent/Mayor for Rent Use Permits in respect of non-forestry licenses issued by the Governor; or
    c. Regent/Mayor for Rent Use Permits in respect of activities which do not require any specific licenses; and
    d. Providing for, among other things, the approval of the utilization of the target Forest Area based on technical consideration by the relevant Head of Provincial Forestry Office and the Head of Forestry Area Development Bureau (Badan Pemantapan Kawasan Hutan or "BPKH").
d) A statement letter, affixed with sufficient stamp duty, confirming:
    a. The ability of the applicant to fulfill all of its obligations and to bear all its costs in connection with the application;
    b. The validity of all of the supporting documents attached to the application; and
    c. The applicant has not yet and will not carry out any activity in the target Forest Area prior to the issuance, by MoF, of the Rent Use Permit.

Technical requirements for obtaining a Forest Utilization Rent Use Permit:

a) Preparation of a work plan on the utilization of the target Forest Area together with a location map, in the scale of 1:50,000 or the biggest scale available for the relevant location, containing information on the target Forest Area;
b) Newest satellite imaging of the target Forest Area, with a resolution detail of 15 meters or more, in the form of digital and hard copies, signed by the applicant and stating the source of the satellite imagery; and,
c) Preparation of AMDAL (Analysis of Environmental Impact), which has been approved by the Relevant Authority, except for activities which do not require AMDAL or other environmental documents which have been approved by the Relevant Authority pursuant to the prevailing laws and regulations.

Source: MoF Regulation on Guidance Re Rent Use Permits for Forest Areas. Summary and Analysis of Key Articles. Christian Teo Purwono & Partners, May 2011.

52. With respect to the National Parks, PLN has applied for and received an Approval In Principle permit, also referred to as a Rent Use "Collaborative Permit" for TL construction activities inside Baluran and Bali Barat National Parks. Under the permit PLN has developed Collaborative Agreements with the two park authorities to compensate for Project impacts and to support conservation activities.

8. International Agreements

53. International agreements and conventions of relevance to the Project to which the Government is a party (or for which active discussions are taking place) are presented in Table 2.7.

Table 2.7: Relevant international environmental agreement and conventions

- International Convention on Civil Liability for Oil Pollution Damage, 1969;
- Protocol of 1976 to the International Convention on Civil Liability for Oil Pollution Damage, 1976;
- Protocol of 1978 related to the Convention for Prevention of Pollution from Ships, as amended, 1978;
- Convention on Long-range Trans boundary Air Pollution, 1979;
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987;
- Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal, 1989;
- International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990;
- Convention on Environmental Impact Assessments in a Trans boundary Context, 1991;
- United Nations Framework Convention on Climate Change, 1992;
- Convention on Biological Diversity, 1992;
- Convention on the Trans-boundary Effects of Industrial Accidents, 1992;
- Protocol of 1992 to amend the International Convention on Civil Liability for Oil Pollution Damage, 1992;
- United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994;
- Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, 1997;
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997;
- Protocol of 1997 to amend the International Convention for Prevention of Pollution from Ships, as modified by the Protocol of 1978 relating thereto, 1997;
- Protocol on Water and Health to the 1992 Convention on the Protection and Use of Trans boundary Watercourses and International Lakes, 1999; and
- The Stockholm Convention on Persistent Organic Pollutants, Stockholm, May 2001.

III. DESCRIPTION OF THE PROJECT

A. PROJECT OVERVIEW

54. The proposed Project will construct a 220km long extra high voltage (500 kV) transmission line (TL) and associated substations or substation extensions for transferring power from the Paiton Power Complex in East Java to the Bali power grid, thereby enhancing the availability and reliability of power supply to a province which is a major tourist destination and an important source of GDP of the country. The power transmission capacity of the TL will be 1,800 MW. The Project includes seven components:

Component 1: extension of the existing Paiton substation in East Java.

Component 2: construction of a 131.4 km 500 kV overhead TL from Paiton to Watudodol in East Java, including 18.60 km of TL passing through the Wilderness and Special Utilization zones of Baluran National Park.

Component 3: construction of a 2.68 km 500 kV overhead sea crossing TL from Watudodol in East Java to Segara Rupek in Bali.

Component 4: construction of a 10.50 km 500 kV overhead TL from Segara Rupek to Gilimanuk crossing through the Wilderness, Utilization, Marine Protection and Traditional Use zones of Bali Barat National Park.

Component 5: construction of a 75.32 km 500 kV overhead TL from Gilimanuk to New Kapal (Antosari), Bali.

Component 6: construction of a new 500/150kV distribution substation at New Kapal (Antosari) in Bali.
Component 7: upgrading or extension of twenty-six (26) substations in Java and Bali.

Components 1, 2, and 5 will be co-financed by ADB and PLN, Components 3 and 4 will be financed directly by PLN, Component 6 will be co-financed by ADB, PLN and the ASEAN Infrastructure Fund (AIF), and Component 7 will be co-financed by ADB and PLN. Components 3 and 4, and 7 though not financed by ADB, are assessed as part of the project due diligence.

B. PROJECT RATIONALE

55. Infrastructure development is a key component of Indonesia's Medium Term Development Plan (RPJMN) 2010-2014. With the goal of transforming Indonesia into a developed country by 2025, the Government, in May 2011 launched a 14-year master plan for accelerating economic development integrating three main elements: i) developing regional economic potential in six economic corridors; ii) strengthening national connectivity locally and internationally; and iii) strengthening human resource capacity, and national science and technology to support the development of key programs in every economic corridor.[10,11] Infrastructure development, especially electricity infrastructure, is essential to support connectivity required in the development activities of each sector identified in this master plan.

[10] Coordinating Ministry for Economic Affairs. 2011. *Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia (MP3EI) (*Acceleration and Expansion of Indonesia Economic Development) 2011-2025. Jakarta.
[11] The six corridors include Sumatra, Java, Kalimantan, Sulawesi, Bali-Nusa Tenggara and Papua-Kepuluan Maluku.

56. Power availability is a critical infrastructure constraint throughout Indonesia. The current peak demand of the country averages 27,000 megawatt (MW) and is expected to grow at an average rate of 9.4% up to 2019.[12] Current average electrification level is around 67% and the Government aims to increase the average electrification level to 90% by 2020.

57. Bali is a world-famous tourist and cultural destination, and given that tourism accounts for 6% of the national GDP, the Government has given priority to its infrastructure development. The tourism industry generates 67% of Bali's gross regional domestic product and about 70% of the island's residents are directly or indirectly dependent on this activity.

58. The electrical power generation capacity in Bali is not sufficient to meet existing or future demands. Bali is currently supplied by three major power plants (installed capacity of 388 MW) and a number of small diesel plants (installed capacity of 45 MW), as well as by two 150 kV submarines cables from Java with a combined capacity of 200 MW (2 x 100 MW), for a total aggregate capacity of 633 MW. The reserve margin is critically low, less than 15% and far below the 30% reserve margin considered to be safe. In addition, the capacity of the transmission network is limited due to lack of investments in the past. Low reserve margin coupled with transmission bottlenecks has meant that the Bali power system has suffered from power outages and blackouts that take an average of 2-3 hours to restore.

59. Household electrification in Bali is only 72% whereas the Government's target is 100% electrification by 2020. Electricity demand in Bali averaged around 550 MW in 2010 and is expected to grow to about 2,300 MW by 2025 based on PLN's load forecast. According to PLN-Distribution Bali, over 50,000 applicants have been waiting for new connections for over a year, forcing several commercial consumers such as hotels to adopt on-site generation using diesel fuel oil, adding to pollution in an environmentally sensitive island.

60. At present construction of new thermal power stations in Bali is restricted, as the provincial government has classified Bali as an environmentally protected area. The Bali Utara Power Plant, an Independent Power Producer (IPP) with a capacity of 250 MW was planned in 2010. However, it seems unlikely to materialize as planned. Power consumption in Bali is approximately 2.5% of the total consumption of Java and Bali, hence in the medium-term new generation in Bali is also not the most techno-economically feasible option compared to transmission of power from Java to Bali.TheBali. The current 150 kV submarine Java-Bali interconnections had an initial capacity of 6 x 100 MW; however only two cables remain operational and they do not have the capacity to bring any additional power from Java.[13]Based on these factors transmission of power from East Java to Bali at the 500 kV level has been identified as the preferred option by PLN.

61. The proposed Project will strengthen the power transmission system by connecting Bali at the 500 kV level to the Java transmission grid, allowing access to existing and planned efficient power plants in Java. This will enable transmitting comparatively cheaper power to Bali from the large power plants in East Java with lower technical losses.[14] It will contribute to the long-term energy security in Bali and ensures provision of adequate and reliable power supply, which is vital for economic development activities identified in Bali under the 14-year master plan for accelerating economic development in Indonesia.

62. The proposed Project is an outcome of the long-term transmission development plan and is included in the power development plan of PLN.[15] The Project has been endorsed by the

[12] PLN. *Power Development Plan (RUPTL) 2010-2019*. Jakarta.
[13] Of 11 submarine cables installed since 1987, only these two are still in service.
[14] Technical losses are less in 500 kV transmission compared to 150 kV and 275 kV which are the standard high voltage transmission voltages in Indonesia.
[15] PLN. *Power Development Plan (RUPTL) 2010-2019*. Jakarta.

Government and is included in the planning Ministry's (BAPPENAS) Bluebook for external funding.[16]

63. The Project is in line with ADB's Indonesia Country Partnership Strategy (CPS)[17]and Assessment, Strategy and Roadmap (ASR) for Indonesia that supports infrastructure development to address bottlenecks in the energy sector. ADB's strategy in the energy sector emphasizes the assistance in power transmission projects that will link different islands to reduce the overall reserve requirements, improve system reliability, remove transmission bottlenecks and transmit comparatively cheaper power from one area to the other or cross-border interconnections where both countries will benefit from power trading. The Project is listed in the Country Operations Business Plan (COBP) 2011-2015 with loan approval targeted for 2012.[18]

C. PROJECT PROPONENT

64. PT. PLN (Persero) will be the Project proponent. PLN (*Perusahaan Listrik Negara* or State Electricity Company) is a state owned corporation, which has a monopoly on electricity distribution in Indonesia. PLN was founded on 27 October 1945, and has its headquarters in Kebayoran Baru, Jakarta. See http://www.pln.co.id/ for additional information.

65. A Project Management Unit (PMU) headed by a full-time Project Director (a senior PLN staff member) and supported by technical and administrative staff has been established by PLN and will have direct responsibility for Project management and supervision.

D. PROJECT LOCATION AND AREA

66. The proposed TL alignment will originate in Paiton in East Java and terminate in New Kapal, Bali, with substations either being upgraded (Paiton) or established (New Kapal) at the alignment starting point and terminus, respectively. The TL route will span three regencies in East Java (Probolinggo, Situbondo and Banyuwangi) and two regencies in Bali (Jembrana and Tabanan).The alignment also passes through two national parks: Baluran National Park in East Java, and Bali Barat National Park in Bali. In addition, the Project will upgrade or extend 26 existing substations in Java and Bali. The project location map is presented in Figure 1.1. Detailed TL alignment strip maps are presented in Appendix 6.

67. The TL alignment will be 220km long and in accordance with Indonesia National Standard (SNI) Number 04-6918-2002 the Right of Way (RoW) will be 34 m wide, giving a total RoW area of 757.85 ha. Transmission towers have a total area of 40.01 ha, but as the majority of their footprints are within the RoW they only add a net total of 2.68 ha. The Component 1 and 6 substation extensions and creation will occupy 12 ha and a small amount or no land is required for Component 7, giving a total Project area of 772.53 ha (Table 3.1). The alignment includes 18.60km through Baluran National Park (63.30ha) and 11.80 km through Bali Barat National Parks (40.12ha), for a total of 30.40 km (99.52 ha).

[16] BAPPENAS is the National Planning & Development Agency of Indonesia.
[17] ADB. 2011. *Indonesia Country Partnership Strategy*. Manila.
[18] ADB. 2011. *Indonesia Country Operations Business Plan (2011-2015).* Manila.

Table 3.1: Project area

1. HVTL RoW	**Length km**	**Width m**	**Area m2**	**Area Ha**		
	222.897	34	7,578,498	757.85		
2. Transmission Towers						
Tower Type	**Dimensions m**	**Number of Towers**	**Area m2**	**RoW Correction**	**Area (in Addition**	**Area (in Addition**
	(maximum)		(includes RoW)		**to RoW) m2**	**to RoW) Ha**
Suspension	25x25	437	273,125	371,450	NA (within RoW)	NA (within RoW)
Tension	42x42	63	111,132	89,964	21,168	2.12
Bali Strait Crossing Towers						
Java	75x75	1	5,625	2,550	3,075	0.31
Bali	70x70	1	4,900	2,380	2,520	0.25
Bali Strait Anchor Towers						
Java	16x16	2	512	1,088	NA (within RoW)	NA (within RoW)
Bali	27x27	2	1,458	1,836	NA (within RoW)	NA (within RoW)
Manuk Bay Crossing Towers	34x34	2	2,312	2,312	NA (within RoW)	NA (within RoW)
Manuk Bay Suspension Towers	25x25	4	2,500	3,400	NA (within RoW)	NA (within RoW)
Subtotal			401,564		26,763.00	2.68
3. Substations	**Area m2**	**Area Ha**				
Paiton Substation Extension	NA (within existing site)	NA (within existing site)				
New Kapal Substation	120,000	12.00				
4. Summary	**Area m2**	**Area Ha**				
HVTL RoW	7,578,498	758				
Transmission Towers (over and ab	26,763	3				
Substations	120,000	12				
TOTAL (RoW, Substations, Tower I	7,725,261	773				

Notes:
1. Based on GIS analysis. 2. For Suspension and Tension towers there is a range of base sizes; the maximum design dimension has been used in all cases to be conservative.

E. PROJECT COMPONENTS

68. The Project is divided into seven components (Table 3.2).

Table 3.2: Details of the Project Components

Component	Details	Contract packages	Procurement modality	Source of funding
Component 1: Extension of existing substation at Paiton	500 kV GIS substation at Paiton, East Java	One	International Competitive Bidding, Turn-key	ADB and PLN co-financing
Component 2: Paiton - Watudodol TL	131.39 km of 500 kV double circuit, quadruple dove conductor overhead TL, East Java	One		ADB and PLN co-financing
Component 3: Watudodol - Segara Rupek Overhead Sea Crossing TL	2.68 km of 500 kV double circuit, quadruple dove conductor overhead sea crossing TL, East Java and Bali (tower to tower crossing width is 2.68 km)	One		PLN
Component 4: Segara Rupek - Gilimanuk TL	10.50 km of 500 kV double circuit, quadruple dove conductor, overhead TL through Bali Barat National Park, Bali	One	National Competitive Bidding, Turn-key	PLN
Component 5: Gilimanuk - New Kapal TL	75.32 km of 500 kV double circuit, quadruple dove conductor overhead TL, Bali	One	International Competitive Bidding, Turn-key	ADB and PLN co-financing
Component 6: New Kapal Substation	500/150/20 kV, 2 x 500 MVA GIS	One		ADB, PLN and AIF co-financing
Component 7: substation upgrading or extension	Upgrading or extension of 26 substations in Java and Bali.	To be Decided		ADB and PLN co-financing
Consulting Services	Engineering, Project Management and Construction Supervision, Environment Health and Safety	Multiple	International Competitive Bidding	ADB and PLN co-financing

1. Component 1: Extension of Paiton Substation

69. The Paiton Substation is a major 500 kV pooling substation located approximately 100 km southeast of Surabaya on the north coast of East Java. The substation currently receives power from the Paiton Power Complex (see Appendix 8 for additional information on the Power Complex). Figure 3.1 shows the existing Paiton Substation.

Figure 3.1: Paiton Substation (Component 1), East Java

70. The Paiton Substation utilizes an outdoor 500 kV GIS (Alsthom outdoor GIS of eight diameters with one and half breaker switching scheme for high reliability) along with two 500 MVA, 500/150 kV power transformers with associated 150 kV line bays, two of which are used for supplying power to Bali on the first interconnector via Situbondo, Banyuwangi and Gilimanuk. At present, two 500 kV double circuit TLs are connected to the substation and supply power to Kediri and Grati. An additional double circuit 500 kV TL to Grati is planned to be commissioned in 2012.

71. The substation will be expanded through the establishment of two new 500 kV TL circuits and two number 50 MVAR switching reactors in an existing empty bay. The new TLs will cross the existing TLs servicing Grati and Kediri. Three options are currently being evaluated to cross the existing circuits: i) using gas insulated cables to cross the existing four circuits; ii) using a gantry to go under the circuits; and iii) using towers to go over the existing circuits. Figure 3.2 shows the location and a layout plan of the proposed extension. The component will be co-funded by ADB and PLN.

2. Component 2: Paiton to Watudodol Transmission Line

72. The component will construct 130.60 km of 500 kV TL from Paiton to Watudodol, East Java Province, and will be co-funded by ADB and PLN. As with all TL components the TL will utilize double circuit on quadruple zebra (400 mm^2) conductors. The TL will start at the Paiton substation extension and terminate at Watudodol, the location for the Java side Bali Strait crossing tower, and will include an estimated 308 transmission towers. The RoW alignment runs roughly parallel to the existing 150 kV TL alignment and passes through a generally flat coastal plain predominantly used for agriculture and production forests (Figure 3.3).

73. Approximately 18.60 km length of the TL (49 towers) will pass through the Baluran National Park. The first four towers (T-212 and T-215) will be in the Wilderness Zone and the remaining 45 towers will be located in the Special Utilization Zone.

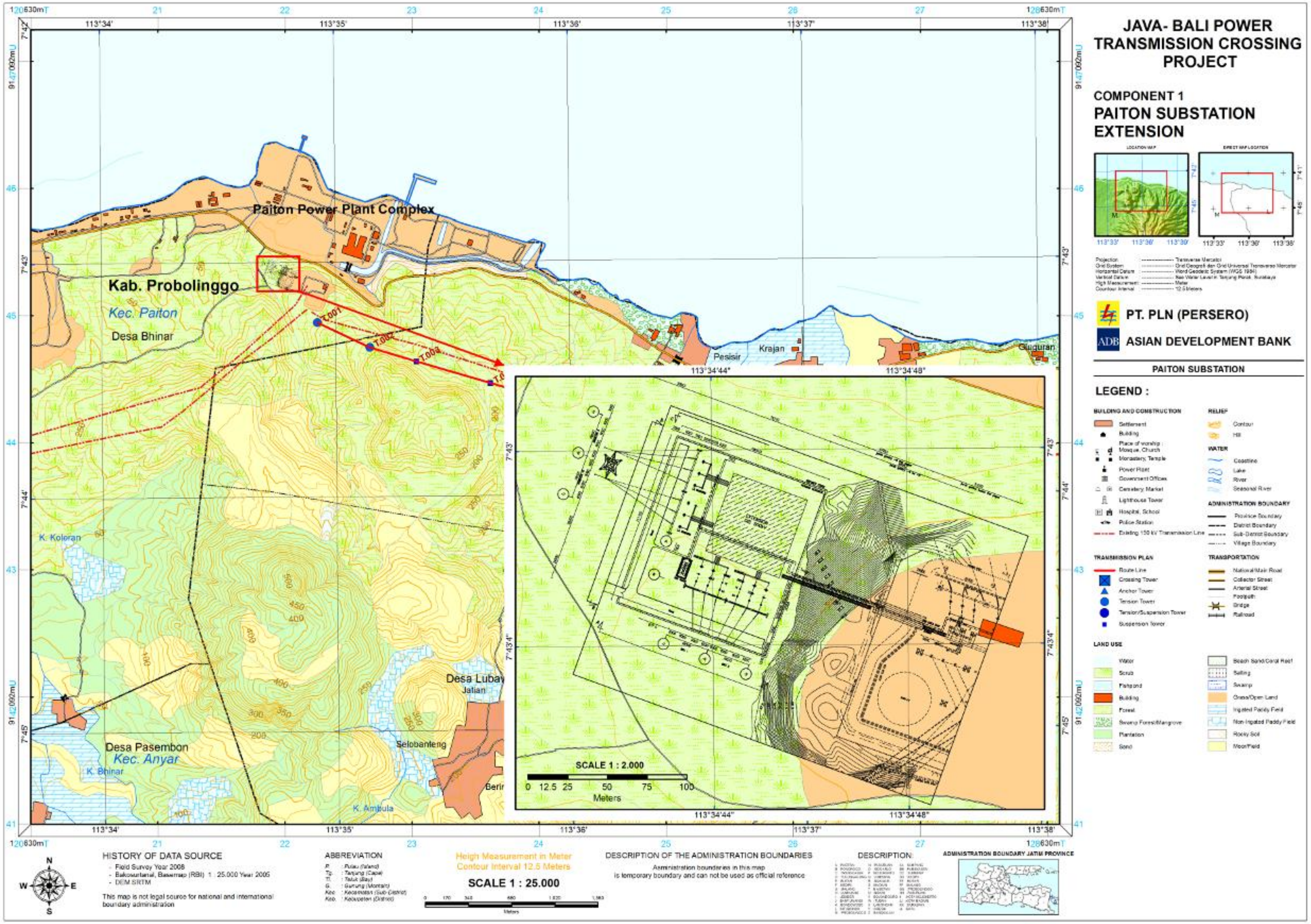

Figure 3.2: Proposed Paiton Substation expansion location and layout plan, Component 1

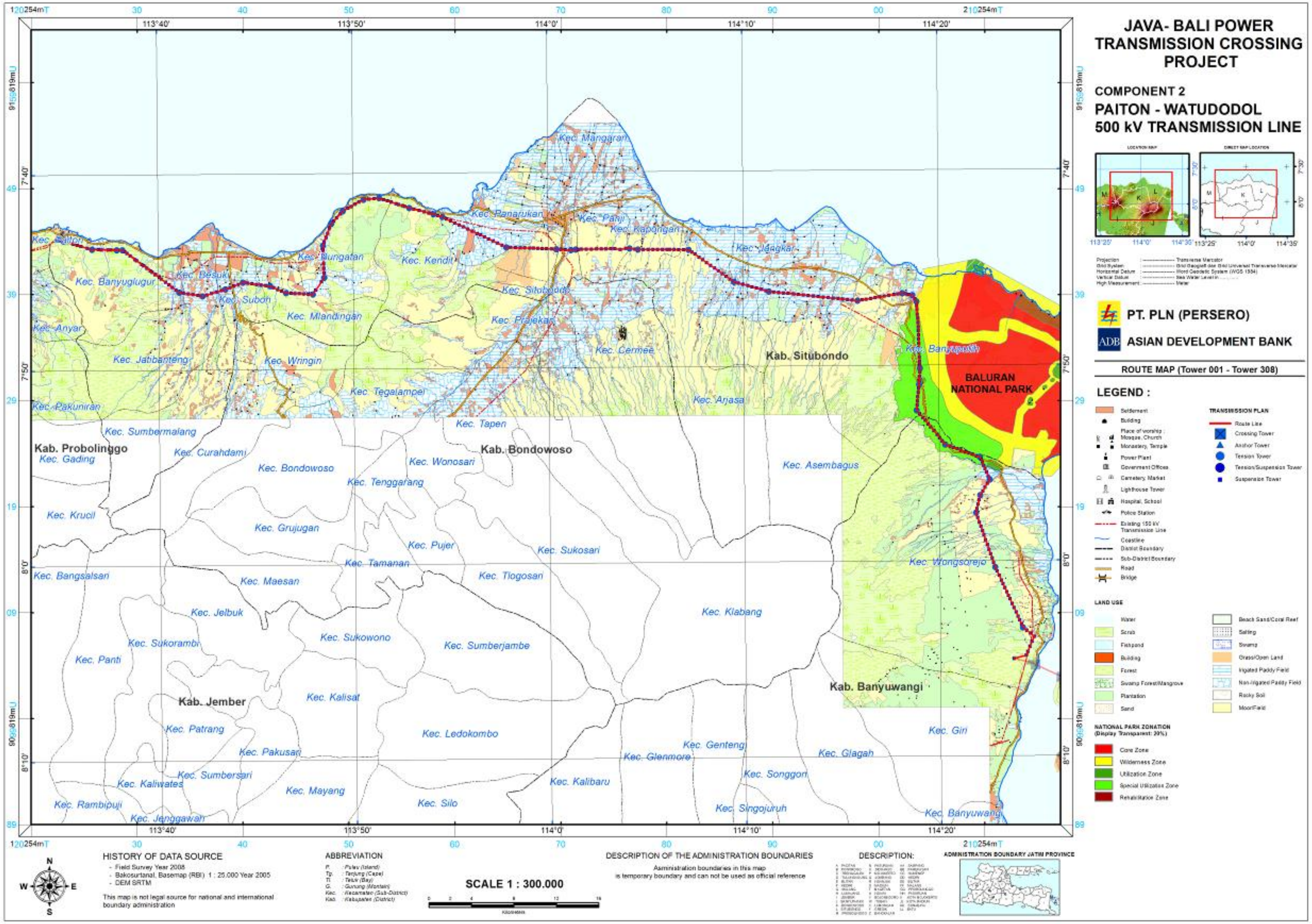

Figure 3.3: Paiton to Watudodol TL map, Component 2

3. Component 3: Watudodol to Segara Rupek Overhead Sea Crossing 500 kV TL

74. Component 3 will construct a 2.68 km 500 kV double circuit TL overhead crossing of the Bali Strait from Watudodol (Java side) to Segara Rupek (Bali Side), and will be funded by PLN.[19] The crossing and anchor towers on the Bali side will be located within the Wilderness Zone of Bali Barat National Park; works under the component will require a permit under Government Regulation No. 28/2011 on the Management of Nature and Conservation Areas.

75. At 363 m high on the Java side and 376 m high on the Bali side, these will be the tallest such towers in the world. However, there is a number of similar power crossing towers around the world and the technology is proven.[20] The above water minimum conductor clearance is 70 m, while the design clearance is 74.5 m.

76. Figure 3.4 show the location of the TL overhead sea crossing across the Bali Strait, Figure 3.5 shows a conceptual plan of the sea crossing, and Figure 3.6 shows the view from near the crossing tower site on Bali side looking towards East Java.

77. PLN has signed a contract with a six-company Chinese/Indonesian consortium to construct the sea crossing. The three Chinese companies will be primarily responsible for design, manufacture and erection; the three Indonesian companies will be primarily responsible for civil works and facilities.[21]

4. Component 4: Segara Rupek to Gilimanuk TL

78. Component 4 will construct 10.44 km of 500 kV double circuits TL through the Bali Barat National Park from Segara Rupek to Gilimanuk (24 transmission towers in total), and will be funded by PLN. The TL will pass through the national park's Wilderness, Marine, Traditional and Utilization zones, and will cross Gilimanuk Bay where it will pass through sensitive mangrove ecosystems, including the construction of a transmission tower on one mangrove island (Gadung). Works under the component will require a permit under Government Regulation No 28/2011 on the Management of Nature and Conservation Areas. Figures 3.7 to 3.9 show various site locations, while Figure 3.10 presents a Component 4 location map.

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[19] This refers to the distance from crossing tower mast to crossing tower mast.

[20] For example, similar projects include: Jiangyin Crossing - 346 m, PRC; Nanjing Crossing - 257m, PRC; Orinoco Crossing - 240m, Venezuela; Zhujiang Crossing - 235m, PRC; Wuhu Crossing - 229m, PRC; Elbe Crossing - 227m, Germany; Chusi Crossing -226m, Japan; Osaki Channel Crossing-223m, Japan; Suez Canal Crossing-221m, Egypt; and Lingbei Crossing - 214m, Japan.

[21] The Indonesian companies are: PT Tehate Putratunggal, PT Airlanggatama Nusantara Sakti, and PT Wijaya Karya (Persero) TBK; the Chinese companies are Changshu Fengfan Power Equipment Co Ltd, Guangdong Power Transmission and Transformation Engineering Co, North China Power Engineering Co Ltd,

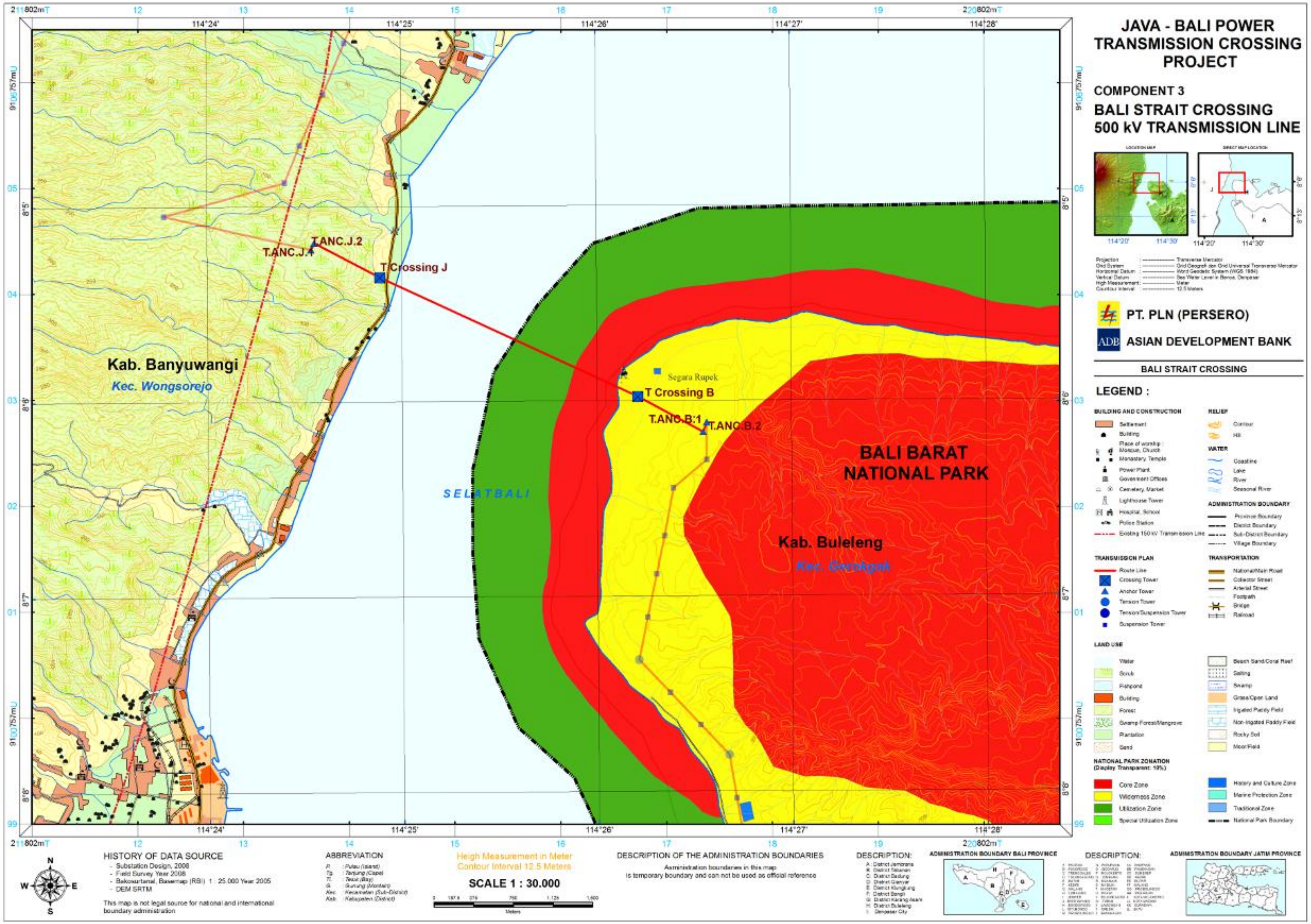


Figure 3.4: Watudodol to Segara Rupek TL Overhead Sea Crossing, Component 3

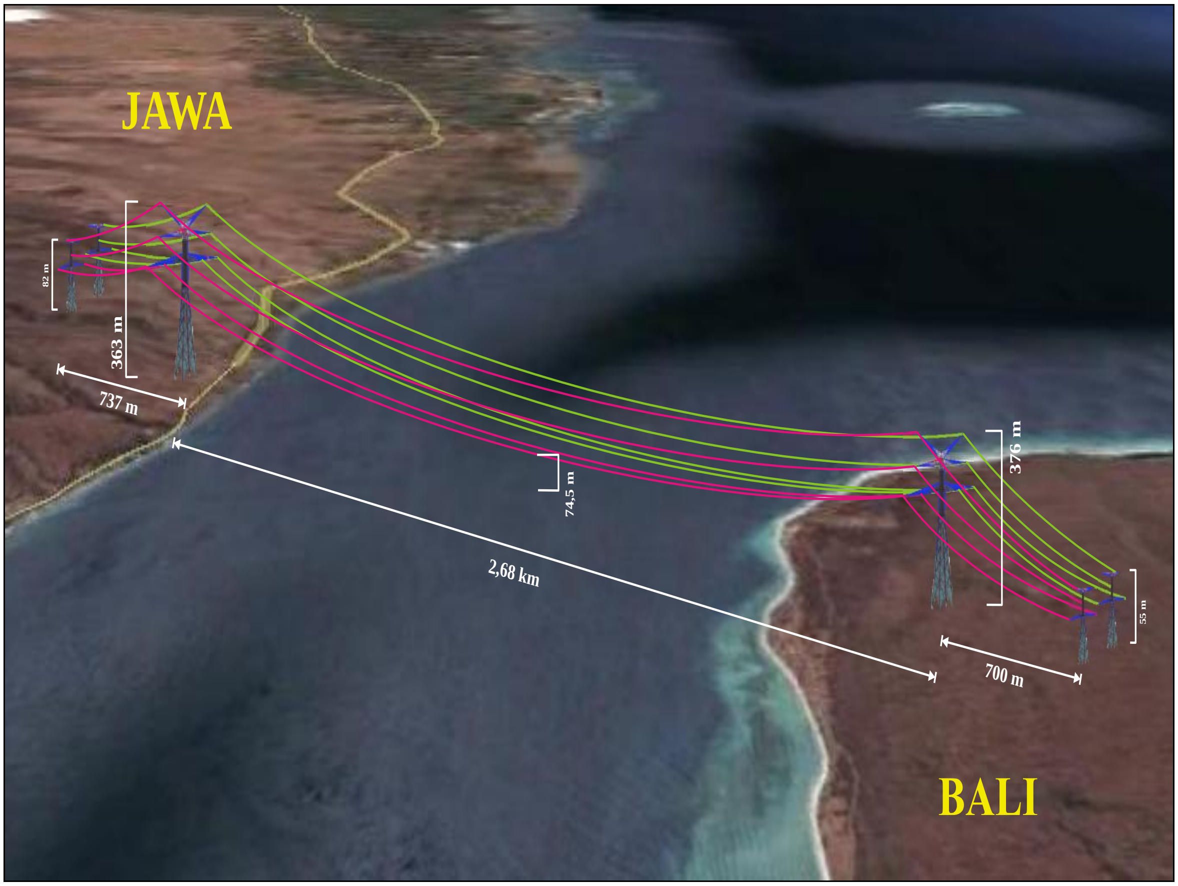


Figure 3.5: Conceptual Diagram of Bali Strait Overhead Sea Crossing, Component 3

Figure 3.6: Near Crossing Tower site on Bali side, looking towards East Java

Figure 3.7: Mangroves on south end of Gilimanuk Bay, near suspension tower site

Figure 3.8: Burung and Gadung Islands, Gilimanuk Bay

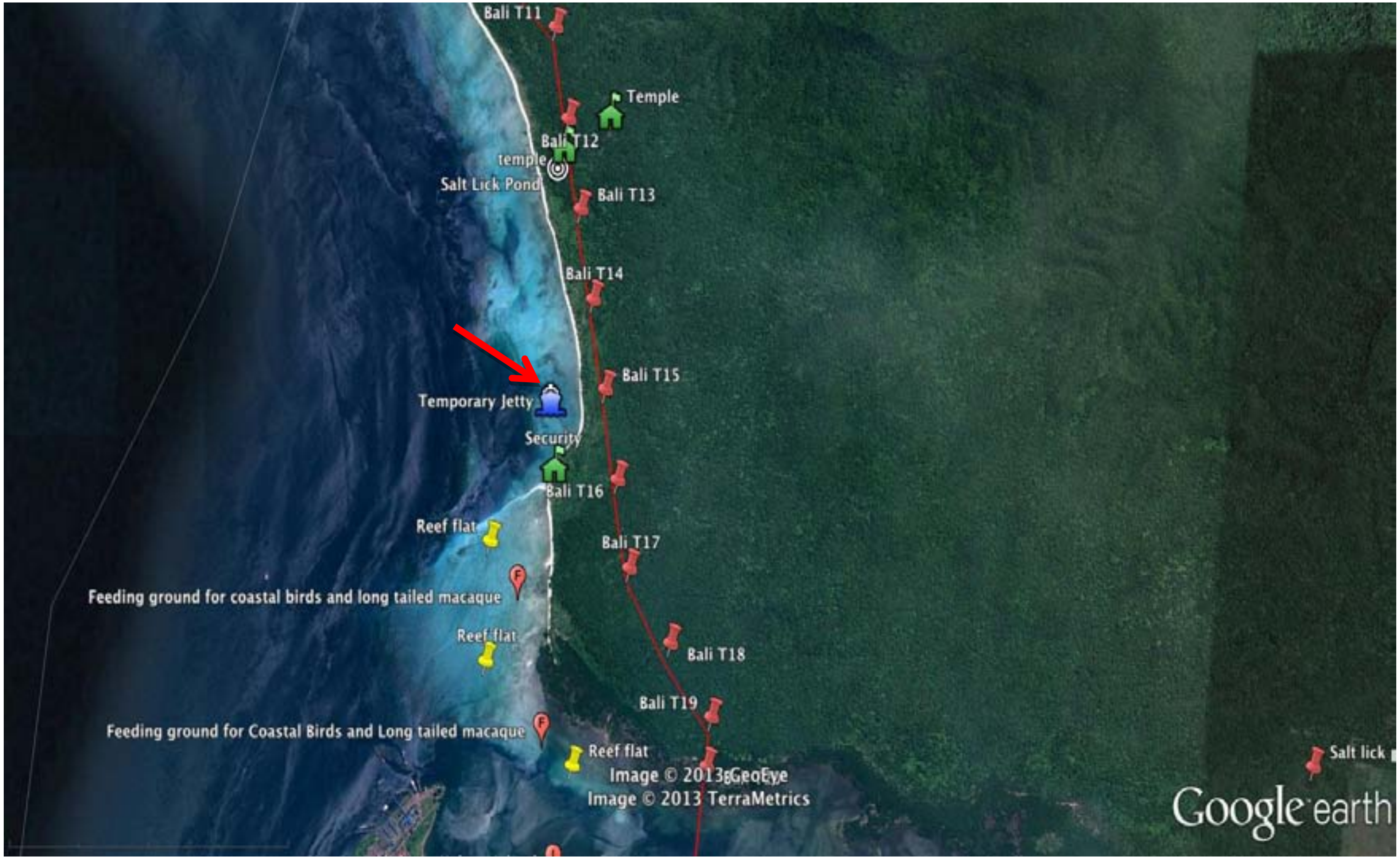


Figure 3.9: Site of the proposed jetty, near Component 4 Tower No.15

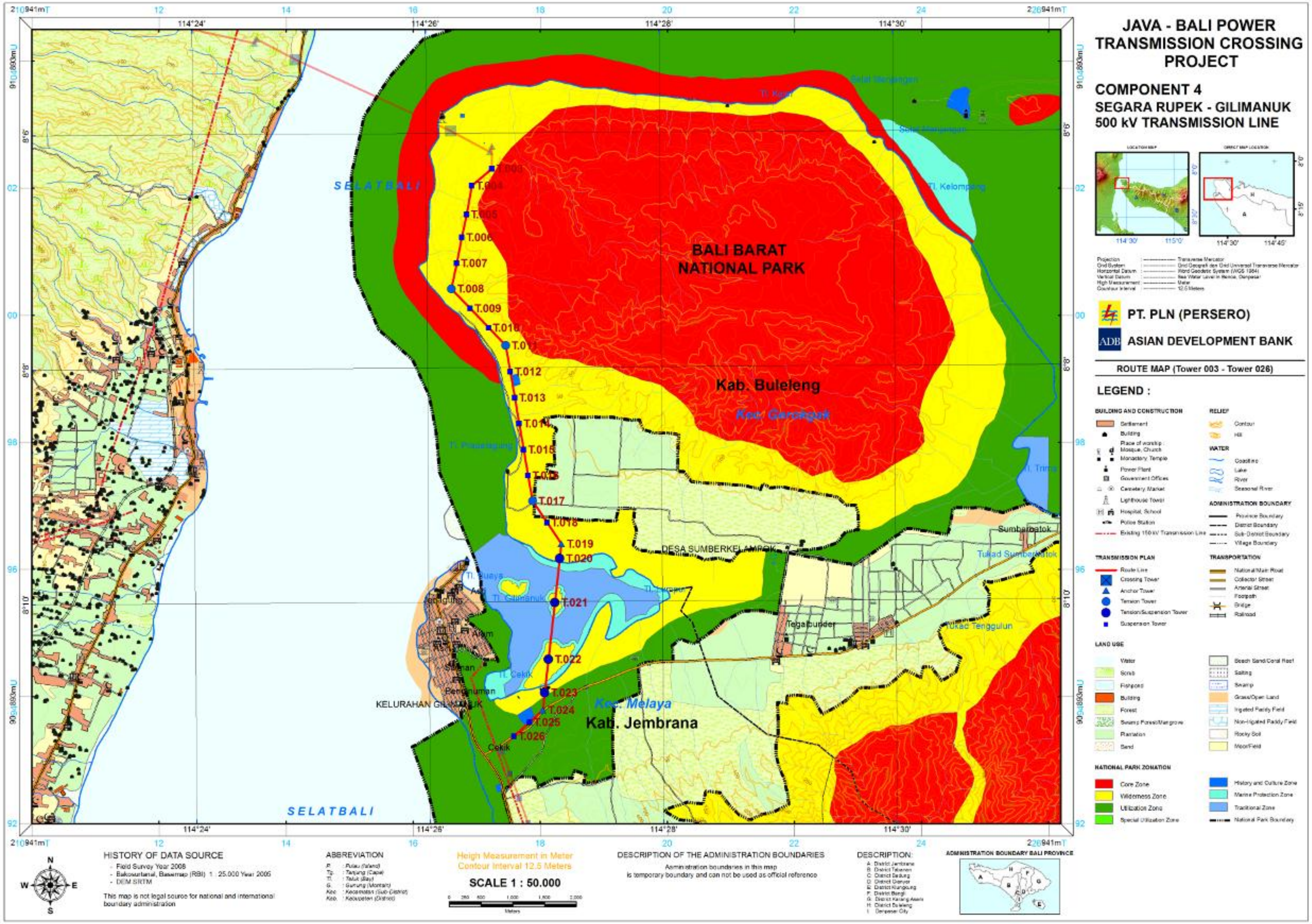


Figure 3.10: Segara Rupek to Gilimanuk TL, Bali Barat National Park, Component 4

5. Component 5: Gilimanuk to New Kapal Transmission Line

79. Component 5 will construct 75.44 km of 500 kV TL from Gilimanuk to New Kapal, and will be co-funded by ADB and PLN. The alignment runs generally parallel to the existing alignment of 150 kV TL and passes through generally flat terrain used primarily for agriculture. A total of 174 transmission towers will be required (Figure 3.11).

6. Component 6: New Kapal Substation

80. Component 6 will construct a new 500/150/20 kV capacity, 2 x 500 MVA + 2 x 60 MVA GIS substation at New Kapal (Bali) for reliable transformation of power transmitted from through the 500 kV TL from 500 kV to 150 kV. The substation will allow continuous transmittal of power to 150 kV substations throughout Bali. The component will be co-funded by ADB and PLN.

81. Key elements of the proposed substation include:

- Two 500 MVA (3 x 167 MVA, 1-Phase) 500/150 kV transformers (7 Units, 1-Phase) (designed according to the IEC 60076 Standard);
- Two 150/20 kV, 60 MVA (3-Phase) transformers (designed according to the IEC 60076 Standard);
- Three 500 kV, 100 MVAR switchable type shunt reactors;
- 500 kV side-2 diameters GIS for two line bays and two transformer bays; and,
- 150 kV side-6 diameters GIS for twelve line bays and two transformer bays.

82. Figures 3.12 and 3.14 show the substation site location, layout and site conditions. The substation will occupy 12 ha of high quality privately owned rice paddy.

7. Component 7: Substation Upgrading and Extension

83. Component 7 was added to the Project late in the design process (May 2012). Component 7 will upgrade 26 existing 150 kV substations (21 in Java and 5 in Bali) to improve the reliability, quality and efficiency of power supply in the Java-Bali grid and to ensure that the capacity of the substation in Bali will be able to distribute the power transmitted by the Project. The component will either extend substations through the provision of new 150/20kV 60 MVA transformers or upgrade substations through the replacement of existing lower capacity transformers with 150/20kV 60 MVA transformers (Table 3.3 and Figure 3.13). As existing transformers will be moved to other PLN substations, there will be no disposal of used transformers. The proposed substation expansions are in the PLN's power sector master plan, and will be co-funded by PLN and ADB.

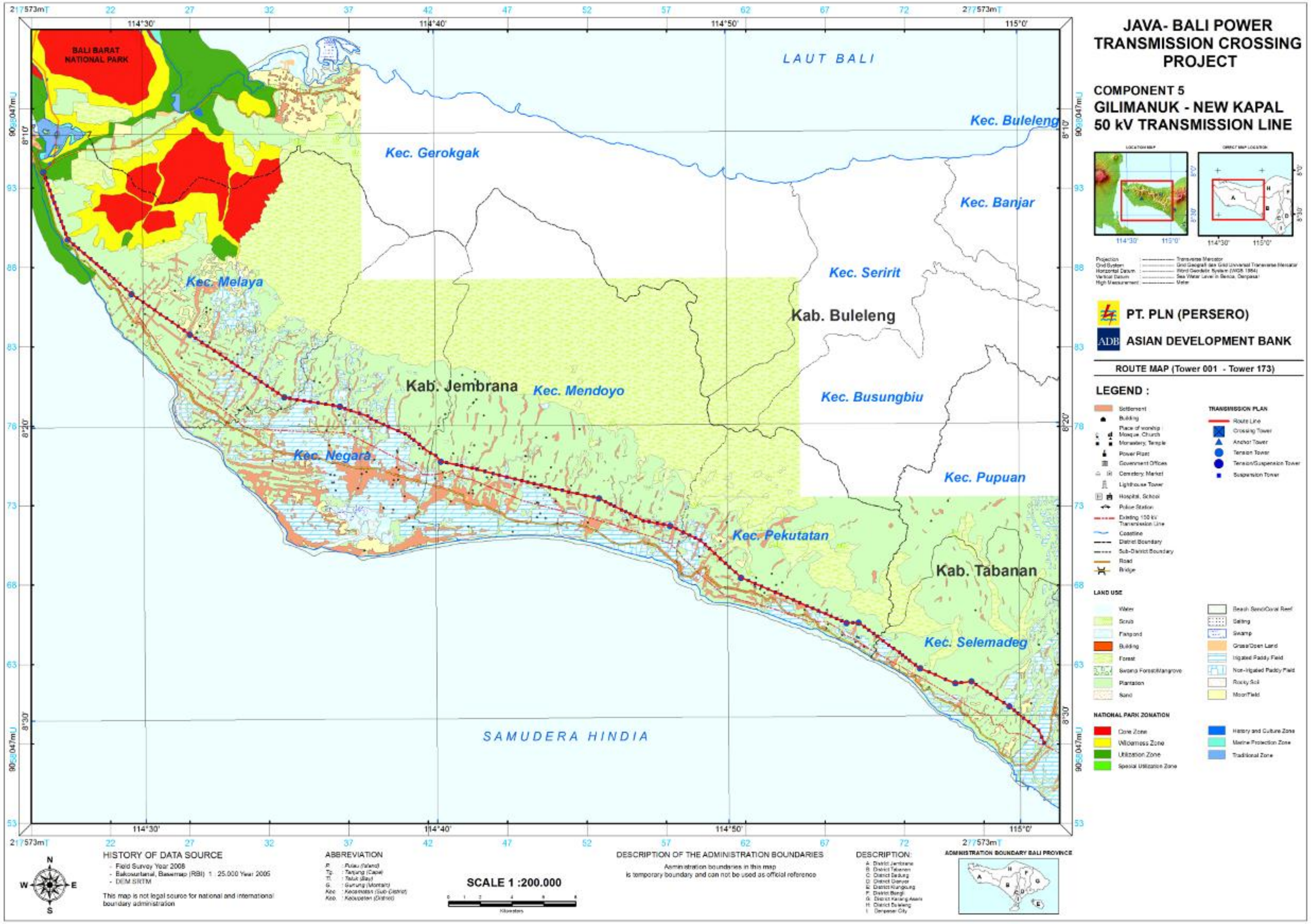


Figure 3.11: Gilimanuk to New Kapal TL, Component 5

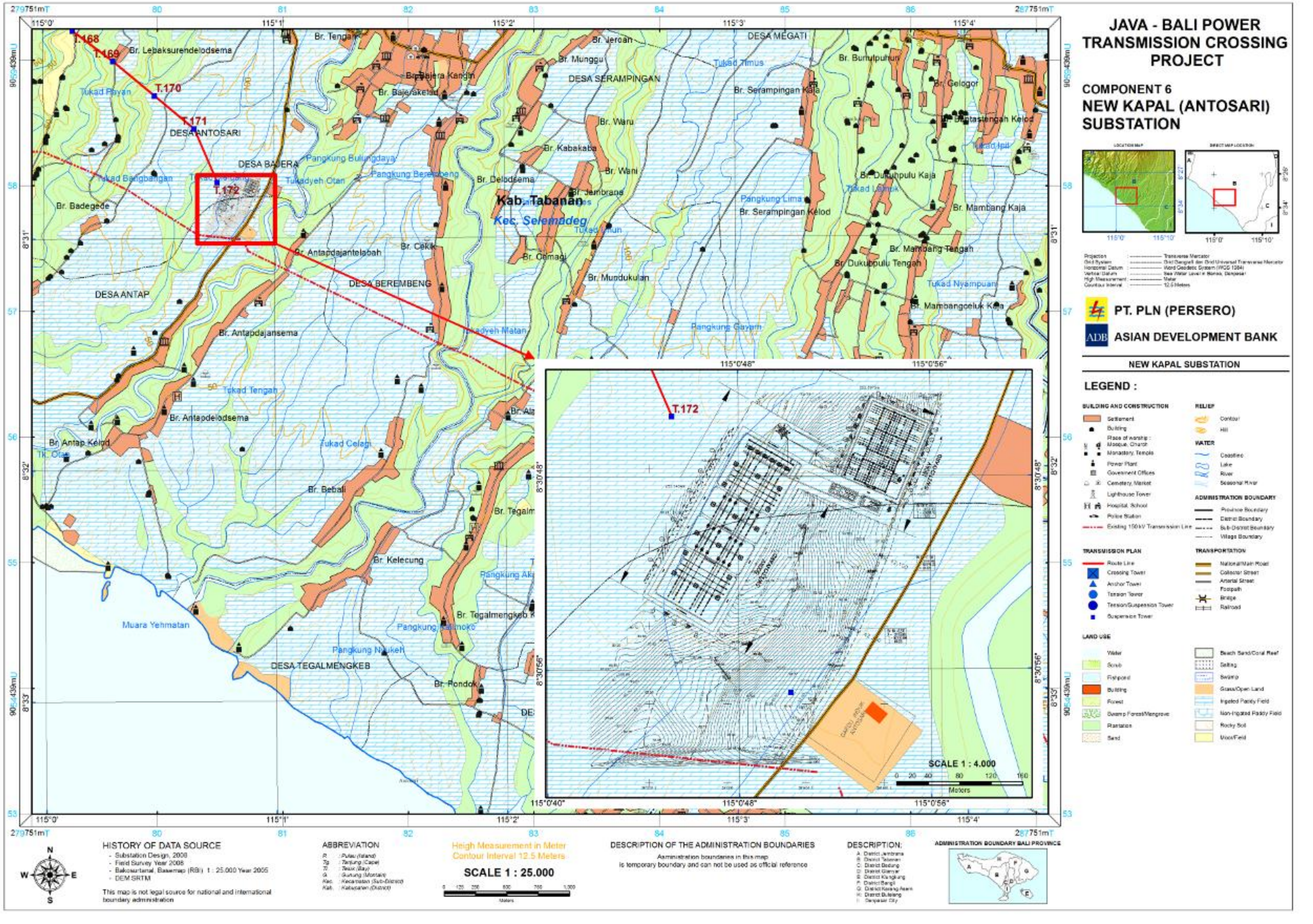


Figure 3.12: Location map of proposed 500 kV substations at New Kapal, Component 6

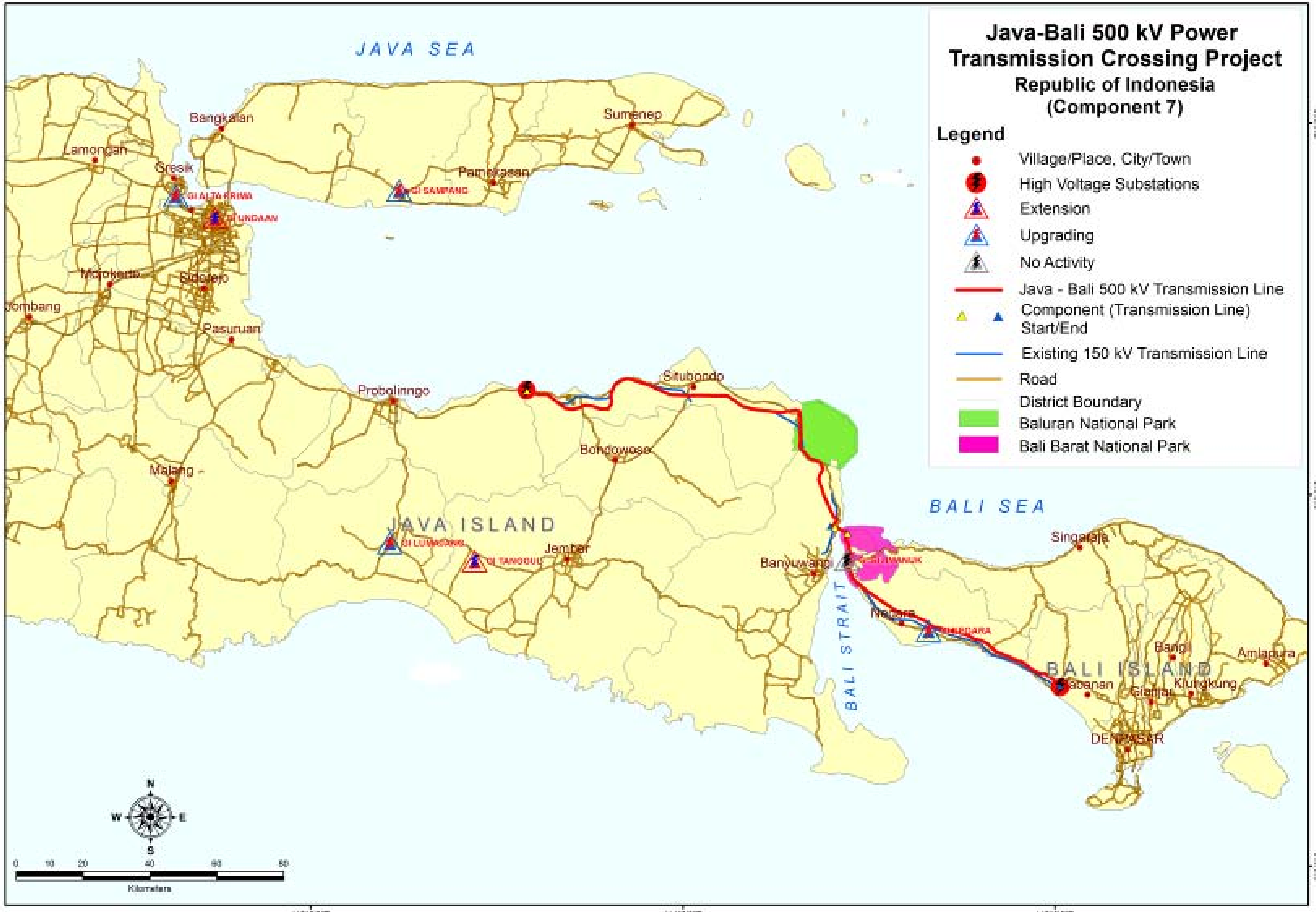


Figure 3.13: Substation Upgrading, East Java and Bali, Component 7

Table 3.3: Substations to be upgraded or extended, Component 7

No	Substation	Voltage	Scope of Work	Capacity MVA	Cost Million USD	COD	Status	District/ Regent
1	Payangan	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Bali Province
2	Gilimanuk	150/20 kV	Upr, 1 TB, 1 Trf	30	1.67	2017	Plan	Bali Province
3	Negara*	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Bali Province
4	New Sanur	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Bali Province
5	Undaan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Surabaya
6	Babadan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Sidoarjo
7	Sengkaling	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Malang
8	PLTA Tulungagung	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Tulungagung
9	Trenggalek	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Trenggalek
10	Sekarputih	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Mojokerto
11	Ngoro	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Jombang
12	Siman	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Jombang
13	Cerme	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Gresik
14	Sidoarjo	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Sidoarjo
15	Sby. Selatan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Surabaya
16	New Pacitan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Pacitan
17	Banaran	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Kediri
18	Tanggul	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2017	Plan	Jember
19	Lumajang	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Lumajang
20	Jaya Kertas	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Nganjuk
21	Sampang	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2017	Plan	Madura
22	Manyar	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Surabaya
23	Blimbing	70/20 kV	Upr, 1 TB, 1 Trf	30	1.26	2017	Plan	Malang
24	Alta Prima*	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2018	Plan	Gresik
25	Ngawi	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Ngawi
26	Gili Timur	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2018	Plan	Madura
	Total			**1500**	**49.48**			

Notes:

Source: PLN (2012) and field survey (2012). List is indicative and subject to change.

- Upr: Existing transformer to be upgraded. Will be done within the substation, does not require land acquisition.
- Ext: Substation to be extended with new transformer requires small extension of the substation.
- BT: Bay Transformer.
- Trf: Trafo Transformer.

Substation has been surveyed by the environmental team.

Substation may be replaced with another by PLN.

* Further to discussions during the site visits, the following changes may be made based on technical aspects and local electricity consumption: extension of Negara substation to be changed to upgrading, and upgrading of Alta Prima substation is to be changed to extension.

Figure 3.14: Site conditions, proposed 500 kV substation at New Kapal, Component 6

F. RIGHT-OF-WAY AND TRANSMISSION TOWERS

84. The total length of the TL is 220km and as per Indonesia National Standard (S) Number 04-6918-2002 on *Free Space and Minimum Free Distance of High-Voltage Transmission Lines and Extra High-Voltage Transmission Lines* (Table 3.4) the right-of-way (RoW) will be 34 m wide. The RoW, transmission tower bases and substations in total will require an estimated 773 ha. Tall vegetation will be trimmed in the RoW to obtain the necessary conductor clearance of 8.5 m as per SNI 04-6918-2002 (Table 3.5).

85. The TL (all components) will include an estimated 512 transmission towers:

- 437 suspension towers:
  - Straight alignment or up to 2^o change in direction;
  - From 50 to 75 m high;
  - Weight of approximately 38 t (including load transferred from the towers); and,
  - Base dimension from 15 x 15 m to 25 x 25 m (225 m^2 to 625 m^2).

- 63 tension (angle) towers:
  - Up to 15^o change in direction;
  - From 60 to 84 m high;
  - Weight of approximately 46 t (including load transferred from the towers); and,
  - Base dimension from 30 x 30 m to 42 x 42 m (600 m^2 to 1,764 m^2).

- 2 Bali Straight crossing towers:
  - 363 m high on East Java side, and 376 m high on Bali side;
  - Weight of approximately 450 t each (including load transferred from the towers); and,
  - Base dimension of 70 x 70 m on the Bali side (4,900 m^2) and 75 x 75 m on the Java side (5,625 m^2).

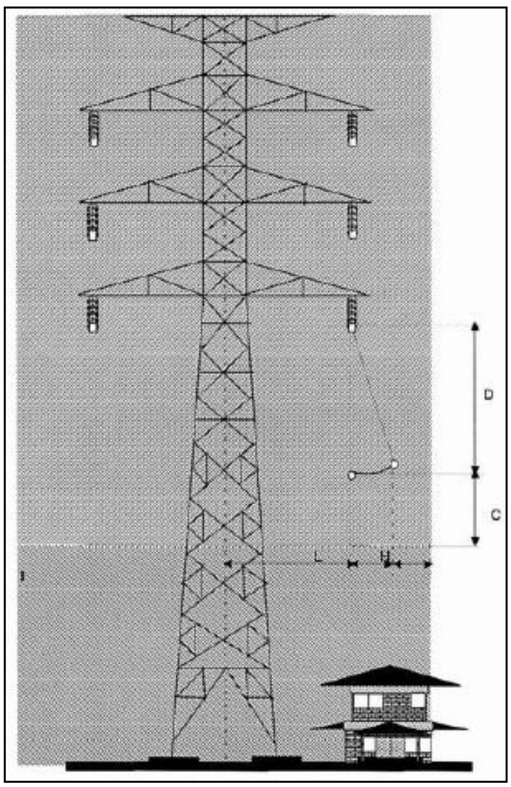
- 4 Bali Strait crossing anchor towers:
  - 2 x 55 m high on the East Java side
  - 2 x 82 m high on the Bali side;
  - Base dimension of 27 x 27 m on the Bali side (729 m^2); and,
  - Base dimension of 16 x 16 m on the Java side (256 m^2).

- 2 anchor towers and 4 tension/suspension towers for crossing Gilimanuk Bay:
  - 2 x 74 m high anchor towers, base dimension 34 x 34 m (1,156 m^2); and,
  - 4 x 50 to 75 m high suspension towers, up to 25 x 25 m (225 m^2 to 625 m^2).

Table 3.4: Transmission tower RoW minimum horizontal clearance (m)

No	Transmission Line	L	H	I	L + H + I	Rounded Value
1	66 kV Steel Pole	1.80	1.37	0.63	3.80	4
2	66 kV Concrete Pole	1.80	0.68	0.63	3.11	4
3	66 kV Tower	3.00	2.74	0.63	6.37	7
4	150 kV Steel Pole	2.25	2.05	1.50	5.80	6
5	150 kV Concrete Pole	2.25	0.86	1.50	4.61	5
6	150 kV Tower	4.20	3.76	1.50	9.46	10
7	275 kV Double Circuit	5.80	5.13	1.80	12.73	13
8	500 kV Single Circuit	12.00	6.16	3.10	21.26	22
9	500 kV Double Circuit	7.30	6.16	3.10	16.56	17

where:



Source: SNI 04-6918-2002.

Table 3.5: Minimum vertical conductor clearance (m)

No	Location	Medium Voltage		High Voltage	
		66 kV	*159 kV*	*275 kV*	*500 kV*
1	Open field or open area	7.5	8.5	10.5	12.5
2	Other				
2.1	Buildings, bridges	4.5	5.5	7.5	9.5
2.2	Plant/vegetation, forests, plantations	4.5	5.5	7.5	9.5
2.3	Road/Highway/Railway	8.0	9.0	11.0	15.0
2.4	Public field	12.5	13.5	15.0	18.0
2.5	Transmission Lines	3.0	4.0	5.0	8.5
2.6	Highest point of a Pole/Tower Mast	3.0	4.0	6.0	8.5

Source: SNI 04-6918-2002.

86. Towers will be steel lattice frame and the standard tower span will be 450 m. Four 500 kV DC aluminum conductors steel-reinforced (ACSR) 400 mm^2 Zebra conductors will be installed on each tower. Minimum conductor clearance will be as per (SNI) Number 04-6918-2002 (Table 3.5). Vegetation will be cleared in the base area of the towers.AS 95 mm^2 and OPGW 95 mm^2 ground wires will be utilized. Sag of ground-wires under every day conditions should be below 80% of the conductors' sag at the standard span length of 450 m to avoid reverse flashover from ground wires to the conductors and direct lightning strike to the conductors. The tensions of the ground wires will be set to satisfy the safe separation of conductors and ground wires in the mid-span.

87. Suspension and tension tower foundations will be pad and chimney type. The footing excavation depth is expected to vary from 5 to 10 m, with excavation carried out either manually or by mechanical excavator depending on site conditions. The Bali Strait crossing tower leg foundations will consist of 17 m x 13.5 m footing slabs and twenty 30-40 m long 1.2 m diameter piles, with coupling beams in sandy gravel. One tower leg of the west (Java) crossing tower will be anchored to bedrock using a 16.8 x 16.8 m footing slab. Each anchor tower leg foundation will consist of a 4.5 m x 4.5 m footing slab and four 26-30 long m 0.8 m diameter piles. Figure 3.15 shows a typical transmission tower, while Figure 3.16 shows the profile of the 500 kV overhead sea crossing towers.

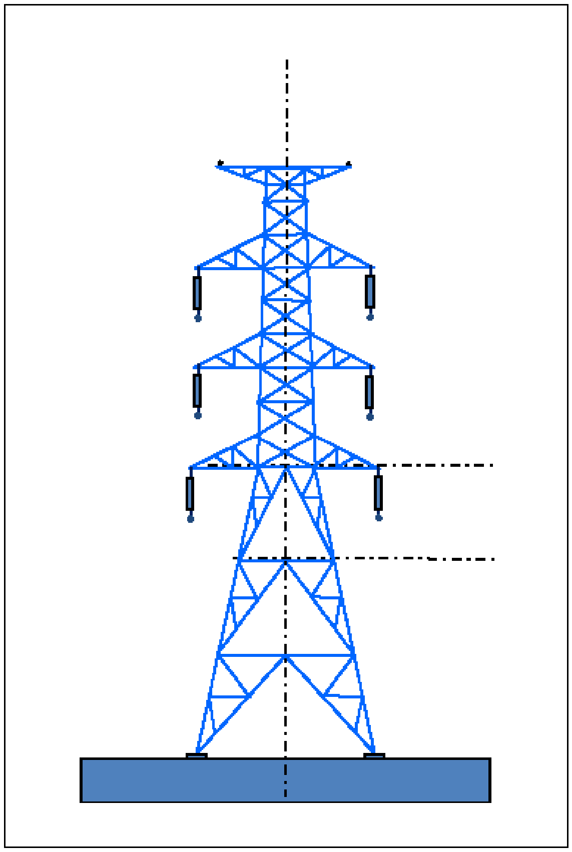


Figure 3.15: Generic 500 kV transmission tower design (height: 50 – 84 m; RoW: 34 m)

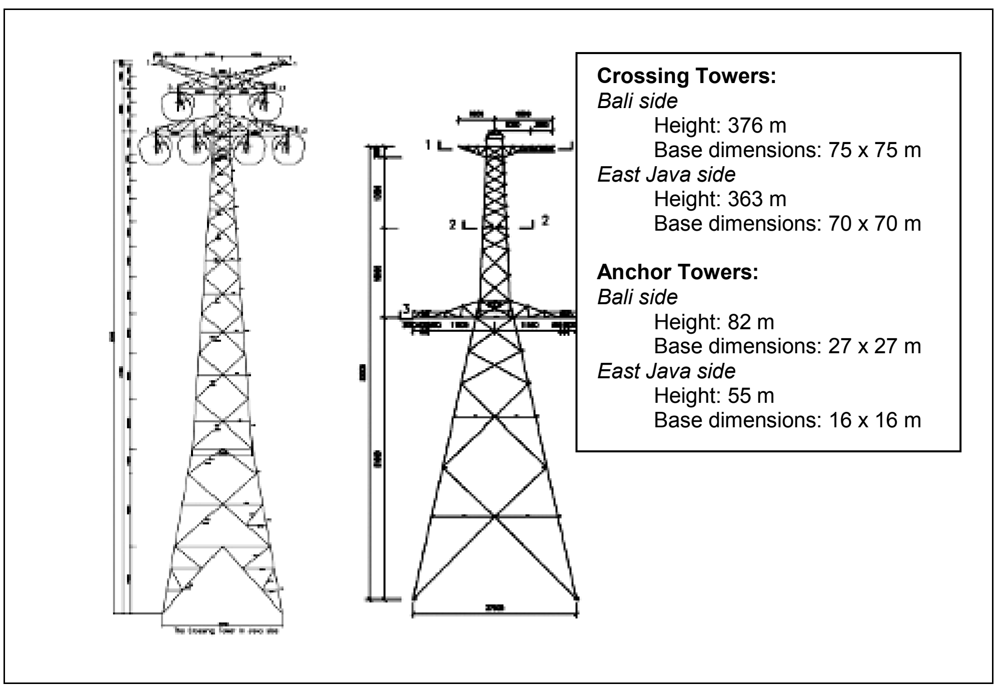


Figure 3.16: Profile of 500 kV Bali Strait Overhead Sea Crossing Towers, Component 3

G. ACCESS ROADS AND JETTIES

88. The proposed 500 kV TL alignment in general runs parallel to an existing 150 kV TL alignment from Paiton to New Kapal. Both alignments also run parallel to the existing Surabaya to Banyuwangi highway on East Java and the Gilimanuk to Denpasar Highway on Bali, and are well serviced by the current road network, which will be used for the transportation of equipment and materials. There is not much needed for additional access roads, though they may be required in some areas where the proposed alignment deviates from the existing roads. The exact requirements for additional access roads will be identified during the detailed engineering design.

89. As discussed from the previous section, for Component 4: Segara Rupek to Gilimanuk TL, the proposed jetty is near Component 4, Tower 15 as shown in Figure 3.9.

90. With respect to Baluran National Park, the proposed alignment through the National Park is very close to the existing highway, which also passes through the Park, and provides excellent access. The proposed temporary jetty that will be used during the construction of transmission towers within the Baluran National Park is dicussed in Tables 5.3, 9.1 and 9.3 as part of the impact assessment and mitigation measures for the Project.

91. With respect to Bali Barat National Park, the crossing and anchor towers (Towers T. Crossing B and T. Anc. B1 and B2, Component 3) and transmission towers 3 to 20 and 23 to 26 are within easy access of an existing park road. Towers 21 and 22 in Gilimanuk Bay will be accessed by small boat such as fishermen boat. The proposed temporary jetty that will be used during construction of the transmission towers within the Bali Barat National Park is discussed in Tables 5.4, 9.1, 9.2, and 9.5 as part of the impact assessment and mitigation measures for the Project. Refer to Figure 5.6 for the proposed temporary jetty during the construction of TL towers in Bali Barat National Park.

92. All substations (Paiton substation extension, Component 1; New Kapal substation, Component 6; and 150 kV substations for upgrading or extension, Component 7) are accessible by existing roads.

H. CONSTRUCTION MATERIALS

93. The civil works will require construction material such as soil, aggregates, cement and steel. The soil will be sourced from borrow pits and aggregates from existing licensed quarries. The locations of the borrow areas and quarries will be selected during detailed engineering design prior to commencement of civil works.

94. An estimated 62 m^3 of concrete will be required for each suspension tower and 99 m^3 for each tension tower for a total of approximately 40,000 m^3. The suppliers for cement, tower materials, conductors, etc., will be identified and procured through competitive bidding.

I. WORKFORCE

95. It is estimated that 100 to 150 workers will be required on a rolling basis during the construction phase. Local workers will be used to the extent possible, though outside skilled workers will also be required. TL construction will be gradual on a rolling section-by-section basis, and only temporary worker camps will be established along the route of the TL – no permanent camps will be established. The number and locations of the camps will be identified during detailed engineering and prior to commencement of civil work. No worker camps will be allowed in the National Parks.

J. BUDGET AND IMPLEMENTATION SCHEDULE

96. The total project cost is estimated at $414.5 million, including physical and price contingencies, financing charges during implementation, and taxes and duties. Total estimated loan amount by ADB and AIF is $251 million. PLN will finance $162 million including land acquisition and environmental mitigation, duties and taxes, and financing charges during implementation. The Project will be implemented over a period of approximately three (3) years.

97. The Project will be implemented over a period of approximately four years. Components 3 and 4 will be financed and constructed by PLN. These two components will be constructed to a 500 kV level and operated initially at 150 kV to connect the Watudodol substation in East Java and the Gilimanuk substation in Bali, delivering 540 MW to Bali.

98. Implementation of the rest of the Project components will commence in 2013 and will be completed by 2016. The entire TL will thereafter be operated at 500 kV level directly between Paiton and New Kapal (Antosari) substations.

IV. DESCRIPTION OF THE ENVIRONMENT

The proposed 500 kV TL alignment will originate in Paiton in East Java and terminate in New Kapal, Bali. The route will span three provinces in East Java (Probolinggo, Situbondo and Banyuwangi) and two provinces in Bali (Jembrana and Tabanan). The alignment includes a combination of barren land, plantations and forests, agricultural land, and bays and coastal areas. On East Java the alignment closely follows the main Surabaya to Banyuwangi highway as well as an existing 150 kV line running from Paiton to Watudodol, and on Bali the alignment closely follows the Gilimanuk to Denpasar highway as well as an existing 150 kV line running from Gilimanuk to the main road center in South Bali. The terrain along the alignment is predominantly flat or moderately undulating coastal plain, and crosses a number of rivers and streams as well as the Bali Strait. The RoW also passes through two national parks: Baluran National Parks in East Java, and Bali Barat National Park in Bali. The project location map is presented in Figure 1.1. Detailed TL strip maps are presented in Appendix 6.

A. PHYSICAL ENVIRONMENT

1. Topography

99. Indonesia is an archipelagic island country. Java lies on the Sunda Shelf, and along with Madura, Kalimantan and Sulawesi are considered to form the Greater Sunda Islands. On the other hand, Bali, along with West Nusa Tenggara and East Nusa Tenggara forms the Lesser Sunda Islands. Java Island extends from $6^0$23' to $8^0$48' S and $105^0$4' to $114^0$37' E, while Bali Island extends from $8^0$03' to $8^0$51'S and $114^0$25' to $115^0$42' E. The islands are separated by the Bali Strait.

100. Terrain in East Java and Bali provinces varies from flat low elevation plains to steep mountains, and is dominated by a series of volcanoes, which greatly limit TL route options (Figure 4.1).Java is almost entirely of a volcanic origin; it contains 38 mountains forming an east-west spine, all of which have at one time been active volcanoes, the highest of which is Mount Semeru (3,676masl). The central part of Bali Island is also covered with a range of hills and volcanic mountains, which form a rough dividing line between the northern and southern parts of the island. The hill slopes in the north are steep while the southern slopes tend to be gentler. Given topographical constraints, the TL alignment predominantly follows the flat coastal plains of the north and northeast coasts of Java and the southwest coast of Bali. On Java the alignment passes between Mt. Baluran volcano in Baluran National Park and the Raung Volcano chain in central eastern East Java.

101. The Bali Strait is approximately 4.5 km wide at the current 150 kV submarine cable crossing point. From the Java side the seabed gently slopes away to approximately 15 m depth at the 500 m mark, extending to 28 m depth at 1000 m. The gradient continues until 1500 m, where a more sudden drop off is experienced, increasing to a maximum of approximately 90 m at the midway point. Water depth then begins to decrease to 30 m at the 3000 m point, and from there shallows out to the beach on the Bali side.

102. Bordered by the Bali Sea to the north and the Indian Ocean to the south, the strait area experiences high surface currents in the region of 10 knots. The seabed is predominantly made up of rock and coral combined with areas of soft mud.

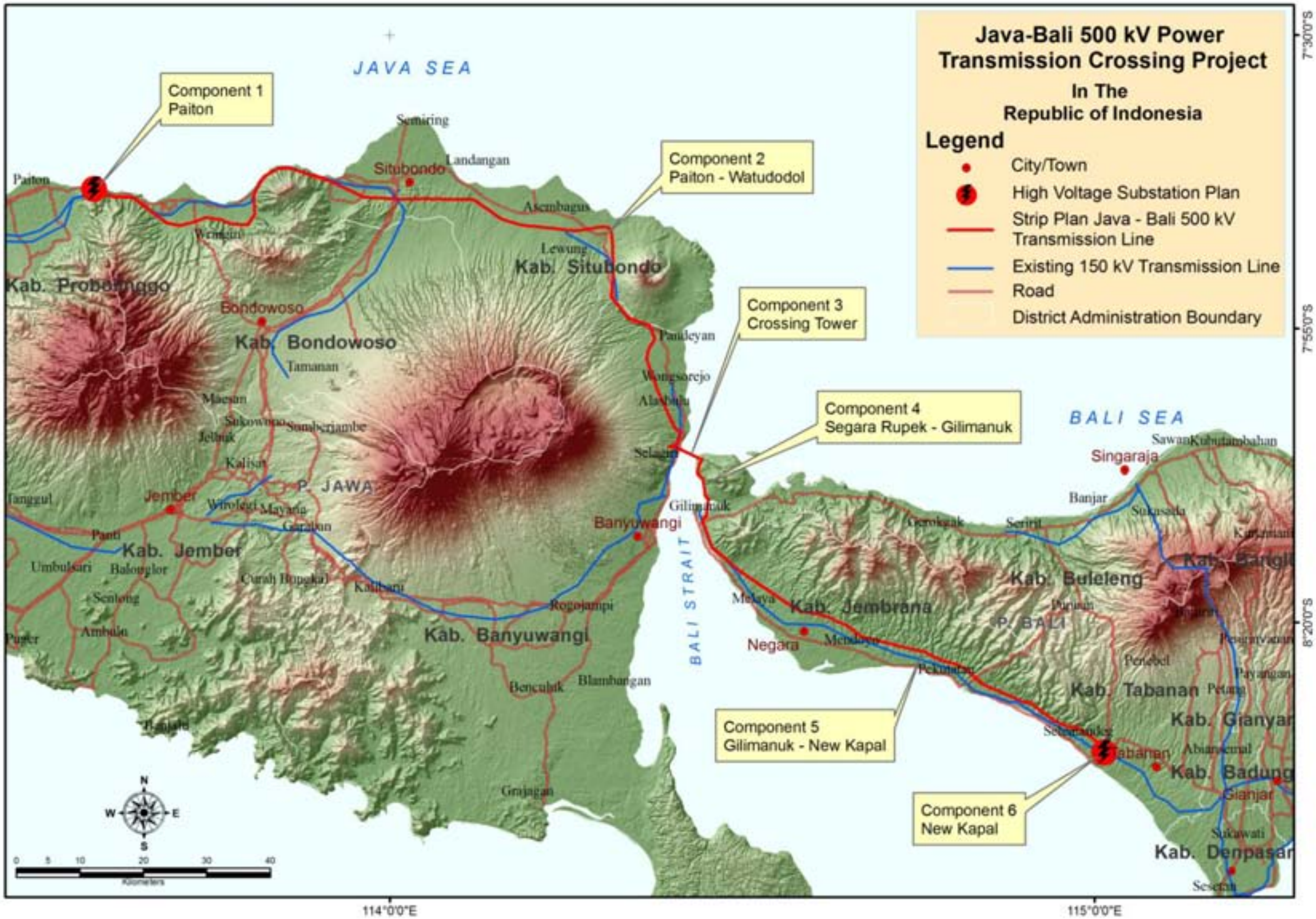


Figure 4.1: Java and Bali topography and TL alignment

2. Seismology

103. Tectonically, Indonesia is highly unstable. Both Java and Bali are within the Sunda Arc, a volcanic arc that has produced the islands of Sumatra and Java, the Sunda Strait and the Lesser Sunda Islands, and a chain of volcanoes forms the topographic spine of the islands. The Sunda Arc marks an active convergent boundary where the India and Australian plates are subducting beneath the Sunda and Burma plates. The tectonic deformation along this subduction zone caused the Indian Ocean earthquake on December 26, 2004

104. The Java segment of the Sunda Arc extends from the Sunda Strait in the west to the Bali Basin in the east, and the oceanic crust is converging in a direction essentially normal to the arc at a rate of about 6.0 cm per year in the west Java Trench and 4.9 cm per year in the east Java Trench.

105. There are 400 volcanoes in Indonesia of which approximately 150 are active; Java alone is home to 112 volcanoes, fifteen of which are still active. The two most violent volcanic eruptions in modern times occurred in Indonesia: in 1815 Mount Tambora in Sumbawa erupted killing 92,000, and in 1883 Krakatau erupted killing 36,000. The last major damaging earthquake in the region occurred on 30 September 2009 when a 7.6 magnitude earthquake in Padang, Sumatra, caused major loss of life and property.

106. Figure 4.2 shows the Indonesian seismic hazard map. The map was developed by averaging values from four seismic hazard maps developed by four different research groups in Indonesia using total probability theorem and by applying a 2-dimensionareasources model. The hazard map has been incorporated into the *Indonesian Earthquake Code* (SNI 03-1726-2002) for designing earthquake resistance structures.[22] The seismic hazard map shows the peak ground acceleration (PGA) measured in "g" contours at bedrock for a 10% probability of exceedance (PE) in a design time period of 50 years, corresponding to a return period of approximately 475 years.[23] The TL alignment up to the end of Baluran National Park lies in the 0.15 g PGA zone (the same as Jakarta, for example), while the Bali Strait Crossing lies in the 0.20 g zone. In Bali parts of the TL lie in the 0.25 g zone.[24] The transmission towers and foundations must be in compliance the *Indonesian Earthquake Code*, as well as other relevant national building codes which include earthquake resistance and loading requirements related to extreme winds that generally exceed even earthquake loads.

[22] Currently, Indonesia has three earthquake hazardmaps issued by the Department of Public Works.The first map is Peak Ground Acceleration (PGA)map at bedrock for 500 years return period in theIndonesian Earthquake Code, SNI 03-1726-2002.This hazard map is used for designing generalbuildings and is referred to in this report. The second is the hazard maps fordesigning waterworks, published by the ResearchCentre for Waterworks, Department of Public Works. The third map is used for designing bridge androad construction published by the Research Centrefor Roads and Bridgeworks.

[23] Peak ground acceleration can be expressed in g (the acceleration due to Earth's gravity, equivalent to g-force) as either a decimal or percentage; in m/s^2 (1 g = 9.81 m/s^2);[3] or in Gal, where 1 Gal is equal to 0.01 m/s^2 (1 g = 981 Gal).

[24] It is understood that the Indonesian seismic hazard is being updated in light of recent major earthquakes including the 2004 Aceh Earthquake (*Mw* 9.0–9.3) which was followed by a tsunami, the 2005 Nias Earthquake (*Mw* 8.7), and the 2006 Jogya Earthquake (*Mw* 6.3). These earthquake events must be considered while determining seismic hazard parameters especially maximum credible earthquake magnitude (MCE).

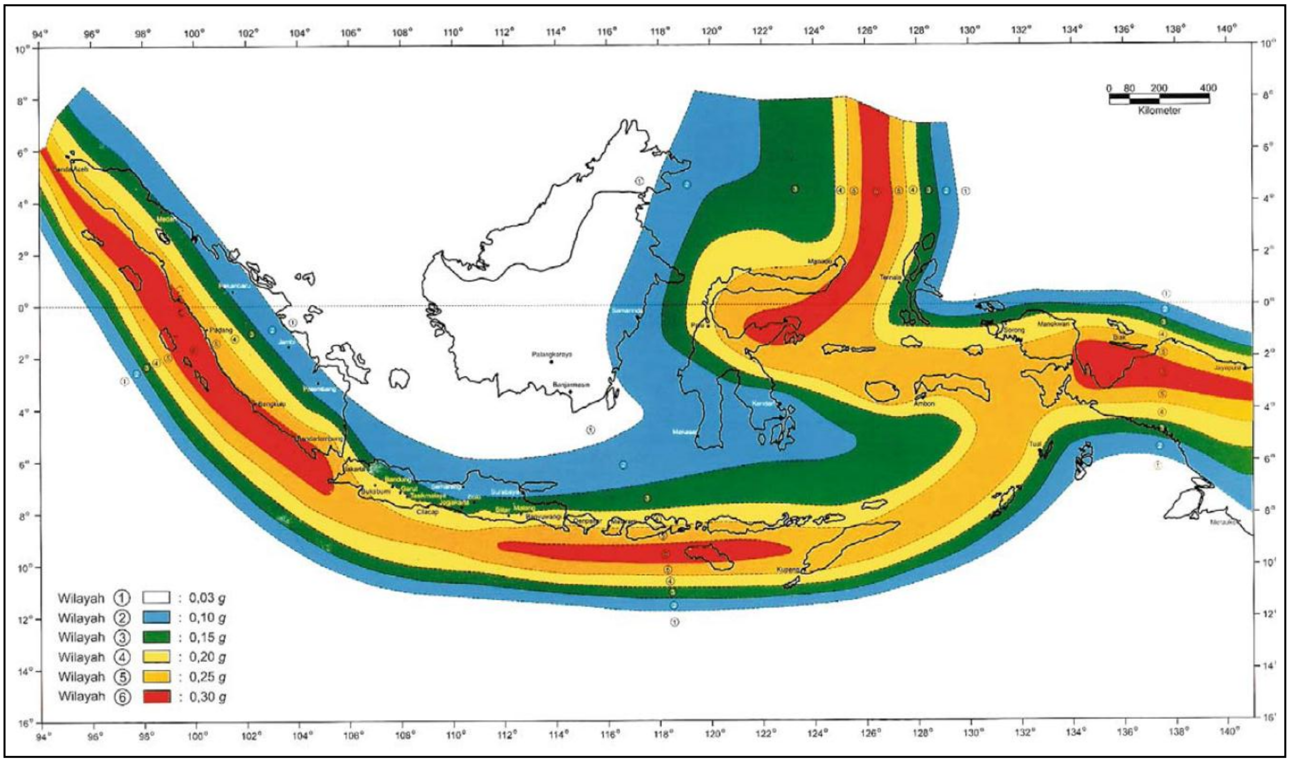


Figure 4.2: Indonesia Seismic Hazard Map in Indonesian Earthquake Code
(SNI 03-1726-2002)

3. Land Use

107. Land use within the TL RoW is a mixture of barren/open/shrub land, residential areas, agriculture and private plantations, public production forest and plantations, and the two National Parks (including a plantation within Baluran National Park). Table 4.1 presents a summary of land use along the TL alignment by component based on field observations; a detailed breakdown of features and land use along the TL alignment is presented in Appendix 7.

108. Table 4.1 also provides cross-references to corresponding detailed TL strip and land cover maps for each section presented in Appendix 6, based on Bakosurtanal base maps.[25]Table 4.2 provides detailed RoW length and area by land cover by component based on GIS analysis of Bakosurtanal base maps.

[25] Badan Koordinasi Survei dan Pemetaan Nasional (Bakosurtonal) is the national survey and mapping coordination agency.

Table 4.1: Distribution of land use along the Project RoW based on field surveys

Component	Section	Predominate Land use/land cover	Corresponding Detailed Strip/Land Cover Maps, Appendix 6
Component 1: Extension of Paiton Substation	Substation location	Open/Barren (including grass, bushes, and shrubs)	Sheet 1, Component 2
Component 2: 500 kV Overhead TL from Paiton to Watudodol	From Tower No. T-01 to T-212	Open/Barren, Agriculture, Private Plantation, Public Production Forest	Sheets 1 to 12, Component 2
	From Tower No. T-212 to T-260	Teak plantation forest within National Park managed by State Forestry Company	Sheets 12 to 15, Component 2
	From Tower No. T-260 to T-308	Open/Barren, Agriculture, Private/ Residential Land, Public Production Forest	Sheets 15 to 18, Component 2
Component 3: 500 kV Overhead Crossing of Bali Straight	Java side: Bali side:	Open/Barren Monsoon forest within National Park	Sheet 1, Component 3
Component 4: 500 kV Overhead TL from Segara Rupek to Gilimanuk	From Tower No. T-03 to T-19	Monsoon forest within National Park	Sheet 1 and 2, Component 4
	From Tower No. T-20 to T-23	Mangrove/Bay within National Park	Sheet 2, Component 4
	From Tower No. T-24 to T-26	Forest Land within National Park	Sheet 2, Component 4
Component 5: 500 kV Overhead TL from Gilimanuk to New Kapal	From Tower No. T-01 to T-20	Production Forest	Sheets 1 to 2, Component 5
	From Tower No. T-21 to T-173	Open/Barren, Agriculture, and Private/Residential Land	Sheets 2 to 9, Component 5
Component 6: 500/150 kV Sub-station at New Kapal (Antosari)	Substation location	Agriculture	Sheet 9, Component 5

Source: Field survey carried out by TA-7325 consultant team with PLN alignment survey, 2010.

109. In Component 1 the substation will be expanded using an existing bay, therefore, surrounding land use is not an issue. In Component 2 land use in the TL from Paiton up to the western boundary of Baluran National Park, and from the Parks' southern boundary to Watudodol is dominated by agriculture (irrigated, non-irrigated and other), followed by open and barren scrubland, and plantations. In Component 3 land use on the Java side is open barren scrub with some trees and agriculture, while on the Bali side the Crossing Towers are within Bali Barat National Park. Furthermore, this component is predominantly the open water of the Bali Strait. Component 4 is entirely with Bali Barat National Park. Land use for Component 5 from Gilimanuk to New Kapal is dominated by agriculture, predominantly rice, and plantation. Land use for Component 6 is privately owned rice paddy, and land use for Component 7 consists entirely of existing PLN substations.

Table 4.2: Distribution of land use along the TL RoW based on Bakosurtanal mapping

Component	RoW Land Use/land cover By Length (m)											
	Ocean	**Fresh Water**	**Scrub Land**	**Forest**	**Mangrove**	**Plantation**	**Beach**	**Settlement**	**Grass/Open land**	**Irrigated Paddy Field**	**Non-Irrigated Paddy Field**	**Other Fields**
Component 1												
Component 2	-	380	27,694	433	-	24,068	-	1,486	1,498	27,952	11,635	36,242
Component 3	2,201	-	1,921	1,111	-	92	101	-	259	-	-	-
Component 4	659	-	1,221	5,040	1,355	1,835	392	-	-	-	-	-
Component 5	-	204	84	1,167	-	57,014	-	4,071	82	7,009	3,644	2,047
Component 6												

Component	RoW Land Use/land cover by Area (ha)											
	Sea water	**Water**	**Scrub**	**Forest**	**Swamp Forest**	**Plantation**	**Beach sand**	**Settlement**	**Grass/Open land**	**Irrigated Paddy Field**	**Non-Irrigated Paddy Field**	**Other Fields**
Component 1												
Component 2	-	1	94	1	-	82	-	5	5	95	40	123
Component 3	7	-	7	4	-	-	-	-	`1	-	-	-
Component 4	2	-	4	17	5	6	1	-	-	-	-	-
Component 5	-	1	-	4	-	194	-	14	-	24	12	7
Component 6										12		

Source: Based on Bakosurtanal Base maps, 2005. Does not differentiate by forest type or classification.
Notes: Component 1 within existing PLN site.

4. Soils

110. Like many tropical areas, soils are predominantly infertile in Indonesia due to leaching as a result of high rainfalls. However, the soils of Java and adjacent islands such as Bali are more fertile than normal due to soil nutrient replenishment by frequent volcanic eruptions and the lava's alkalinity, which is conducive to plant.

5. Climate

111. The climate in the Project region is tropical monsoon. Temperatures are influenced by topography, with the coastal plains averaging 28°C, the inland and mountain areas averaging 26°C, and the higher mountain regions averaging 23°C. The region's relative humidity ranges between 70 to 90%. There are extreme variations in rainfall linked with the dry season (generally June to September) and the monsoon rainy season (generally December to March). Prevailing wind patterns interact with local topographic conditions to produce significant geographic variations in rainfall throughout the Indonesia archipelago with the western and northern parts generally experiencing the most precipitation. The islands closest to Australia and to the eastern tip of Java tend to be dryer.

112. **East Java.** The rainy season in East Java is from October to April while the dry season is from May to September. Meteorological data was obtained from the Meteorological Office of Juanda Surabaya for 2008. The highest temperature (36.7^{0}C) was recorded in October and the lowest (20^{0}C) in July and August, with humidity ranging from 31-100%. Winds were highest in February and lowest in March. The maximum number of rainy days was in December, while July and September had the highest daily hours of sunshine (Table 4.3).

Table 4.3: Monthly meteorological data, East Java, 2008

Month	Temperature (^{0}C)		Humidity		Atmospheric Pressure (Millibar)	Mean Duration of sunshine (%)	Wind Velocity (knot)
	Max	Min	Max	Min			
January	34.8	23.0	95.0	52.0	1009.3	57.5	7.8
February	34.1	23.5	97.0	55.0	1008.7	42.0	11.7
March	33.2	23.0	97.0	59.0	1 009.3	48.5	5.0
April	32.8	23.1	96.0	56.0	1 009.5	68.6	6.2
May	33.8	20.1	96.0	35.0	1 009.3	85.5	6.4
June	32.8	21.2	92.0	48.0	1 011.4	86.6	7.0
July	32.6	20.0	93.0	44.0	1 011.8	85.5	7.0
August	34.1	20.0	91.0	44.0	1 011.8	86.8	8.2
September	34.6	22.2	90.0	31.0	1 011.9	95.0	8.3
October	36.7	22.9	96.0	38.0	1 011.1	94.0	8.2
November	34.2	23.6	97.0	49.0	1 009.3	95.0	6.0
December	33.5	22.0	100.0	54.0	1 008.7	80.0	6.0

Source: Meteorological Office of Juanda Surabaya.

113. **Bali.** Bali also has a tropical marine monsoon climate with dry and wet seasons separated by a transition period. The dry season is from May to September and is influenced by the Australian continental wind movement, which does not contain much moisture. The rainy season occurs from October to April and is influenced by the Asia continental and Pacific Ocean wind movement, which contains much higher levels of moisture. Temperature levels are heavily influenced by altitude, with an average minimum temperature of 24^{0}C, an average maximum temperature of 31^{0}C, and an average humidity of 79%. The highest annual rainfall over the last five years was 2,082.6mm (or a monthly average of 173.55mm) and the average lowest annual rainfall for that same period was 1,455 mm (or a monthly average of 121.25mm).

114. In 2007, the highest temperature was recorded in Karangasem regency (28.6^{0}C) and the lowest (24^{0}C) in Bangli regency. Tabanan experienced a 3,314.6 mm rainfall in 2007, the highest rainfall as compared to other regencies/municipalities. This condition is favorable for the agricultural sector, and Tabanan regency has the most extensive area of paddy fields in Bali. Climate data for Bali is presented in Table 4.4.

Table 4.4: Meteorological data for Bali by District/Municipality, 2007

District/ Municipality	Temperature (^{0}C)	Relative Humidity (%)	Rain Fall (mm)	Wind Velocity (knot)
Jembrana	26.6	82	1 530.7	6
Tabanan	24.6	85	3 314.6	6
Badung	26.9	82	1 984.0	8
Gianyar	24.3	83	2 601.0	7
Klungkung	27.4	81	1 843.0	6
Bangli	24.0	90	2 443.0	6
Karangasem	28.6	81	1 398.3	9
Buleleng	26.4	81	2 483.0	8
Denpasar	27.3	79	1 564.1	8

Source: Meteorological and Geophysical Office - Region III of Denpasar

6. Water Resources

115. Indonesia's average rainfall is over 2,500 mm/yr, 80% of which occurs during the rainy season. However, there are large regional variations in the rainfall over the country, varying from over 5,000 mm in the West (Sumatera) to 1,000 mm in the East (Maluku, Nusa Tenggara and parts of Sulawesi).

116. Average annual surface water potential for Indonesia in 2000 was approximately 15,100 m^3 per capita, while for individual islands it varies from 1,580 m^3 per capita for Java and Bali to 418,800 m^3 per capita for Irian. A UNDP/FAO study reported that for Java and Bali (which together have 56% of Indonesia's population), nearly 60% of the natural basin discharge is required to meet the demand for water, while for Kalimantan (1.8% of Indonesia's population) only 1% of the natural basin discharge is needed. The surface water potential and the available low flow for some of important island groups are presented in Table 4.5.

Table 4.5: Surface water potential and available low flow for selected islands

Island	Area (1000 km^2)	Estimated Surface Water Potential (m^3/s)	Estimated low flow (m^3/sec)	Irrigation + DMI Demand *			Water Resources Utilization in 2015 %
				1990 (m^3/sec)	2000 (m^3/sec)	2015 (m^3/sec)	
Java/ Bali	139	6,199	786	1,074	1,777	1878	29.8
Sulawesi	187	2,488	561	126	365	529	21.3
Sumatera	470	23,660	4,704	297	497	693	2.9
Kalimantan	535	32,279	6,956	73	93	193	0.6

Source: UNDP/FAO Study 1992
* Irrigation demand is the range of 87% to 95% of the total demand.

117. Surface water is primarily used for irrigation. Currently more than 5.5 million ha is provided with technical irrigation and another 1.6 million ha as village irrigation. Water resources also support generation of 2,200 MW of hydropower mostly in Java and in some parts of Sumatra and Sulawesi.

118. The alignment of the TL crosses eight (8) rivers (1 on the Java side and 7 on Bali side), as well as several small streams and irrigation channels. Rivers in Indonesia are typically short and steep, and over 90% are less than 50 km long, and this is also true for Bali and East Java. Because of high rainfall intensities and watershed erosion, most rivers carry large quantities of sediment and are prone to flash floods.

119. Groundwater potential in Indonesia is limited. There are only a few extensive groundwater basins. In Java only the eastern part (East Java) has significant groundwater irrigation amounting to about 41,000 ha. In addition much of the eastern islands such as Nusa Tenggara, Timor and Maluku depend on groundwater because of limited surface waters. Estimated groundwater potential is $95m^3/s$ for Java, $44m^3/s$ for Sulawesi, $21m^3/s$ for East Nusa Tenggara, and $9m^3/s$ for Maluku.

7. Air Quality

120. The National Air Quality Monitoring Network System (AQMS) was established by the Ministry of Environment (MoE). The AQMS consists of 33 ambient air quality monitoring stations located in Jakarta (5), Medan (4), Bandung (5), Surabaya (5), Semarang (3), Pekanbaru (3), Palangkaraya (3), Denpasar (3), Jambi (1) and Pontianak (1). The system monitors CO, SO_2, NOx, O_3 and PM_{10}. Air quality monitoring data collected from the AQMS is summarized in Table 4.6.

121. PM_{10} is a significant pollutant in Indonesia, though the average annual PM_{10} in Jakarta, Surabaya and Bandung tends to be decreasing. In 2008, data from 12 stations in six cities showed that annual average PM_{10} levels of four of the six cities exceeded the WHO annual average guideline value of 20μg/m^3. Air quality monitoring conducted under the Clean Air Initiative for Asian Cities (CAI-AC) for Jakarta, Surabaya, and Bandung also indicates that PM_{10}

in these cities and O_3 levels in Jakarta exceed the national or provincial ambient air quality standards and/or WHO air quality guidelines.[26]

122. AQMS data also shows that the trend of the average annual SO_2 in three cities (Jakarta, Surabaya and Bandung) is increasing. Among these cities, Surabaya had the highest SO_2 average concentration, which corresponds to Surabaya being one of the major industrial areas in the country.

Table 4.6: Ambient air quality in major cities

a. SO_2 Emissions

Year	Cities and Annual Mean Concentration (µg/m^3)						
	Jakarta	**Surabaya**	**Bandung**	**Palangkaraya**	**Pekanbaru**	**Medan**	**Semarang**
2000	-	-	-	4.09	11.42	-	-
2001	34.95	26.61	24.89	2.6	6.04	15.63	20.67
2002	49.76	27.29	20.17	4.51	7.68	19.78	21.84
2003	35.63	26.22	16.94	4.18	2.79	-	22.34
2004	36.97	21.35	22.25	-	-	4.82	23.36
2005	48.9	16.67	25.13	-	0.97	-	-
2006	34.53	13.99	35.7	-	4.5	-	-
2007	25.64	9.05	23.2	1.78	6.02	10.11	-
2008	18.47	4.63	-	1.88	2.93	-	-

b. PM_{10} Emissions

Year	Cities and Annual Mean Concentration (µg/m^3)						
	Jakarta	**Surabaya**	**Bandung**	**Palangkaraya**	**Pekanbaru**	**Medan**	**Semarang**
2000	-	-	-	21.14	63.67	-	-
2001	64.33	62.73	59.98	36.64	29.28	40.92	52.57
2002	80.31	64.62	46.57	138.83	68.41	71.22	55.63
2003	72.81	57.72	45.24	40.51	46.86	-	57.00
2004	77.15	41.58	53.68	-	-	84.08	58.86
2005	70.23	52.52	55.98	-	14.19	-	-
2006	73.93	53.12	50.14	169.41	24.32	-	-
2007	60.08	51.73	59.41	17.06	5.75	61.3	-
2008	42.56	68.67	50.61	14.99	11.34	111.09	-

[26]Air quality monitoring has been carried out under the Clear Air Initiative for Asian Cities (CIA-Asia) Center by the Ministry of Environment in 2010. This program is supported by Asian Development Bank.

c. NO_2 Emissions

Year	Cities and Annual Mean Concentration (µg/m^3)						
	Jakarta	Surabaya	Bandung	Palangkaraya	Pekanbaru	Medan	Semarang
2000	-	-	-	3.22	7.66	-	-
2001	15.17	16.99	25.99	13.93	3.77	1.84	8.04
2002	22.91	30.44	16.38	13.03	2.92	5.05	9.45
2003	53.58	44.54	17.81	27.08	11.25	-	11.65
2004	53.24	56.19	26.96	-	-	33.12	-
2005	33.96	94.17	20.16	-	-	-	-
2006	27.59	128.21	13.71	-	9.31	-	-
2007	27.93	128.01	25.65	5.21	1.46	59.51	-
2008	52.65	79.69	-	5.58	7.12	92.48	-

Source: Indonesia- Air Quality Profile, 2010 Edition.

B. ECOLOGICAL ENVIRONMENT

1. Terrestrial Ecology

a. Vegetation cover

123. Vegetation covering Indonesia can be broadly categorized as:

- broadleaf evergreen forest;
- broadleaf deciduous forest;
- swamp forest;
- mangrove and nipa palms;
- alpine vegetation;
- grassland; and
- cultivated area.

124. Non-agricultural vegetation cover in the overall Project area outside of the two national parks includes mixed forests, mixed plantation and shrub/barren areas.

Mixed Forest

125. Mixed forests in the Project area refers to exploited and secondary broadleaf deciduous forest areas, often revegetated with horticultural plants, including teak (*Tectona grandis*), rubber (*Havea brasiliensis*), kemenyan (*Styrax benjoin*), Arenga palm species and fruit trees. It includes both private and production forests. Vegetation composition tends to be fairly homogeneous (Figure 4.3).

Figure 4.3: Mixed forest vegetation in the overall Project area

Mixed Plantation

126. Mixed plantation areas are cultivated with crop species including rubber, coconut, cacao, coffee, fruit trees and non-timber products. Typical mixed plantation areas are presented in Figure 4.4.

Shrub and Barren Lands

127. Low layer vegetation dominates typical barren/open land and shrub areas (i.e. vegetation < 70 cm in height). These areas are in the process of secondary succession, and are dominated by fast growing pioneer species including Congo grass (*Imperata cylindrical*), Kans grass (*Saccharum spontaneum*) and *Pteridophyta* species (Figure 4.5).

Figure 4.4: Mixed plantations in the overall Project area

Figure 4.5: Shrub areas in the overall Project area

b. Flora

Flora species within these vegetation cover in the Project area are presented in Table 4.7.

Table 4.7: Flora in the overall Project area

Sl. No.	Scientific Name	Local Name
Mixed Plantation Species		
1	*Aleuritas moluccana*	*Kemiri*
2	*Areca calechu*	*Pinang*
3	*Arenga pinnata*	*Aren*
4	*Arthocarpus heterophylla*	*Nangka*
5	*Baccaurea racemosa*	*Menteng*
6	*Calamus sp.*	*Rotan*
7	*Carica papaya*	*Pepaya*
8	*Cocos nucifera*	*Kelapa*
9	*Coffea sp*	*Kopi*
10.	*Durio zibethinus*	*Duren*
11	*Gigantochloa apus*	*Bambu tali*
12	*Havea brasiliensis*	*Karet*
13	*Lansium domesticum*	*Pisilan*
14	*Mangifera foetida*	*Limus/Kemang*
15	*Musa paradisiacal*	*Pisang*
16	*Nephelium lappaceum*	*Rambutan*
17	*Parkia speciosa*	*Petai*
18	*Persea Americana*	*Alpukat*
19	*Syzigium aqueum Jambu*	*air*
20	*Theobroma cacao*	*Coklat*
21	*Acalypha wilkesiana*	*Dawolang*
22	*Alimenthera ficoides*	*Kriminil*
23	*Ananas comosus*	*Nenas*
24	*Anona muricata*	*Sirsak*
25	*Arthocarpus heterophylla*	*Nangka*
26	*Caladium sp.*	*Keladi hias*
27	*Canna hybrid*	*Bunga tasbih*
28	*Capsicum frutescens*	*Cabe rawit*
29	*Carica papaya*	*Pepaya*
30	*Ceiba petandra*	*Kapuk*
31	*Citrus aurantifolia*	*Jeruk*
31	*Collocasia esculenta*	*Talas*
32	*Cordyline fruticosa*	*Hanjuang*
33	*Cymbophogon nardus*	*Serai*
34	*Dieffenbachia fourneri*	*Kasinlu*
35	*Duranta erecta*	*Anak nakal*
36	*Glyciridia sepium*	*Gamal*
37	*Hippeastrum puniceum*	*Bakung*
38	*Impatiens balsamina*	*Pacar air*
39	*Coleus sp.*	*Jengger ayam*
40	*Langus galangal*	*Laos*

Sl. No.	Scientific Name	Local Name
41	*Mangifera indica*	*Mangga*
42	*Manihot utilisima*	*Singkong*
43	*Marantha sp.*	*Sagu*
44	*Musa parasidiaca*	*Pisang*
45	*Nephelium lappaceum*	*Rambutan*
46	*Occimum basilium*	*Kemangi*
47	*Ophiopogon sp.*	*Petai*
48	*Parkia speciosa*	*Bunga es lilin*
49	*Psidium guajava*	*Jambu bali*
50	*Rosa sp.*	*Bunga rosa*
51	*Saccharium ollicianium*	*Tabe*
52	*Sechium edule*	*Labu siam*
53	*Solanum melongena*	*Terung*
54	*Syzigium malacensis*	*Jambu bol*
55	*Tagetes erecta*	*Bunga tahi ayam*
56	*Zinna legens*	*Bunga kertas*

Mixed Forest Vegetation		
1	*Havea brasiliensis*	*Karet*
2	*Styrax benjoin*	*Kemenyan*
3	*Arthocarpus sp*	*Nangka hutan*
4	*Arenga sp*	*Aren*
Shrub Vegetation		
1	*Imperata cylindrical*	*Alang-alang*
2	*Melastoma sp*	*Harendong*
3	*Pteridhopyta*	*Paku-pakuan*
4	*Cyperus sp*	*Teki-tekian*
5	*Oriza sp*	*Padi-padian*

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report*: Appendix 5: Draft Environmental Impact Assessment Report.* 2011

c. Fauna

128. Areas outside of the national parks have been heavily developed and have relatively low importance from a faunal biodiversity perspective. Table 4.8 presents summary information from the MoF on fauna in the Project area, the majority of which is understood to be found within the national parks.

Table 4.8: Fauna in the Project area

No.	Scientific Name	Local Name	Conservation Status		
			GR No. 7 of 1999	IUCN	CITES
Aves					
1	*Egretta intermedia*	Kuntul Perak	P	-	-
2	*Egretta garzetta*	Kuntul perak kecil	P	Least Concern	Appendix III
3	*Bubulcus ibis*	Kuntul kerbau/Bangau putih	P	Least Concern	Appendix III
4	*Spilornis cheela*	Elang Ular Bido	P	Least Concern	Appendix II
5	*Spizaetus cirrhatus*	Elang Brontok	P	Least Concern	-
6	*Alcedo meninting*	Raja udang meninting	P	Least Concern	-
7	*Lacedo pulchella*	Cekakak btu	P	Least Concern	-
8	*Buceros rhinoceros*	Rangkong badak	P	Near threatened	Appendix II
9	*Megalaima oorti*	Takur bukit	P	Least Concern	-
10.	*Megalaima Haemacephala*	Takur ungkut-ungkut	P	Least Concern	-
11	*Nectarinia jugularis*	Burung madu sriganti	P	-	-
12	*Aethopyga siparaja*	Burung madu sepah raja	P	Least Concern	-
13	*Aethopyga mystacalis*	Burung madu jawa	P	Least Concern	-
14	*Arachnothera longirostra*	Pijantung kecil	P	Least Concern	-
Mammals					
1	*Arctitis binturong*	Binturung	P	Vulnerable	
2	*Lutra sumatrana*	Lutra Sumatra/ berangberang	P	Endangered	Appendix II
3	*Cynogale bennetti*	Musang air	P		Appendix II
4	*Hystrix brachyura*	Landak	P	Least Concern	Appendix III
5	*Macaca fasicularis*	Monyet ekor panjang	P	Least Concern	-
6	*Manis javanica*	Trengiling	P	Endangered	Appendix II
7	*Tragulus javanicus*	Pelanduk	P	Data Deficient	-
8	*Tragulus napu*	Napu	P	-	-
9	*Muntiacus muntjak*	Kijang	P	Least Concern	-
10	*Felis bengalensis*	Kucing hutan,	P	-	Appendix II
11	*Felis marmorata Kuwuk*	Kucing bulu Pardofelis marmorata	P	-	Appendix II
12	*Lariscus insignis*	Bajing tanah	P	Least Concern	-
Reptile					
1	*Phyton sp.*	Sanca	P	-	Appendix II

Source: Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, *Appendix 5: Draft Environmental Impact Assessment Report.* 2011.
Note: P = Protected, IUCN= International Union for Conservation of Nature, CITES= Convention on International Trade in Endangered Species of Wild Fauna and Flora, Appendix I=List of all wild animal and plant species which are restricted in all forms of international trade, Appendix II=List of species which are not threatened by extinction, nevertheless they may be threatened if they are still traded without any control, Appendix III=List of wild animal and plant species which are protected in certain country in their habitat boundary, and they can be upgraded into Appendix II or Appendix I Status.

2. Project RoW Encroachment

129. Forests within the East Java and Bali as classified by MoF include Permanent Production Forest, Limited Production Forest, Protection Forest, Conservation Forest, and Protected Forests within national parks.[27]

130. Based on GIS analysis and information provided by PLN, the proposed RoW will encroach upon Permanent Production Forest, Limited Production Forest, and protected forests within national parks:

Production Forest

A total of 26.95 km of the RoW will pass through five areas of Production Forest in East Java, with a combined area of 94.36 ha and an estimated 57,162 trees (Figure 4.6).

Limited Production Forest

A total of 9.00 km of the RoW will pass through two areas of Limited Production Forest in Bali, with a combined area of 33.49 ha and an estimated 19,125 trees (Figure 4.7).

National Parks

Baluran National Park

A total of 18.60 km of the RoW will pass through the Special Utilization Zones of the park, with a combined area of 63.30 ha and an estimated 39,525 trees.

Bali Barat National Park

A total of 11.80 km of the RoW will pass through the various zones of the park, with a combined area of 40.12 ha and an estimated 25,075 trees.

Table 4.9 summarizes the length and area of RoW encroachment on Permanent and Limited Production Forests. A detailed inventory of the trees and vegetation cover along the proposed RoW is presented in Appendix 7. Impacts on private plantation land are dealt with separately in the LARP.

[27] This refers to forest on public land under the responsibility of the MoF, and not private plantations.

Table 4.9: Project RoW encroachment on Production and Limited Production Forests

Component	**Production Forest**			**Limited Production Forest**		
	Length of RoW (km)	Area of RoW (ha)	Trees Affected	Length of RoW (km)	Area of RoW (ha)	Trees Affected
Component 1 (East Java)	-	-		-	-	
Component 2 (East Java)	26.95	94.36	57,162	-	-	
Component 3 (East Java and Bali)	-	-		-	-	
Component 4 (Bali)	-	-				
Component 5 (Bali)	-	-		9.00	33.49	19,125
Component 6 (Bali)	-	-		-	-	
Total	**26.95**	**94.36**	**57,162**	**9.00**	**33.49**	**19,125**

Notes:
1. Based on GIS analysis of Bakosurtanal base map. Production Forest area data provided by MoF 2012. Affected trees and RoW data provided by PLN 2012.

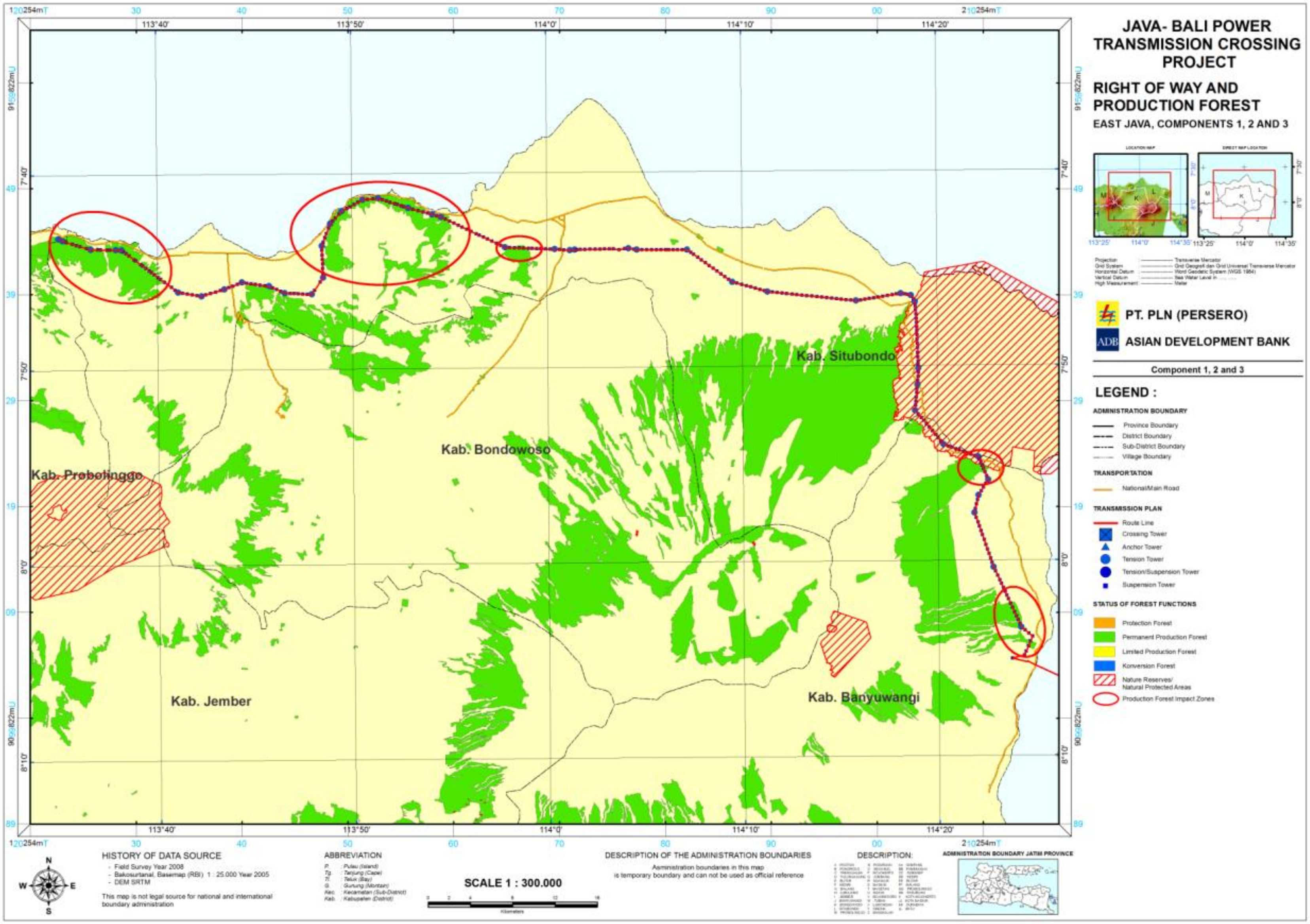


Figure 4.6: Production Forest and Project RoW, East Java

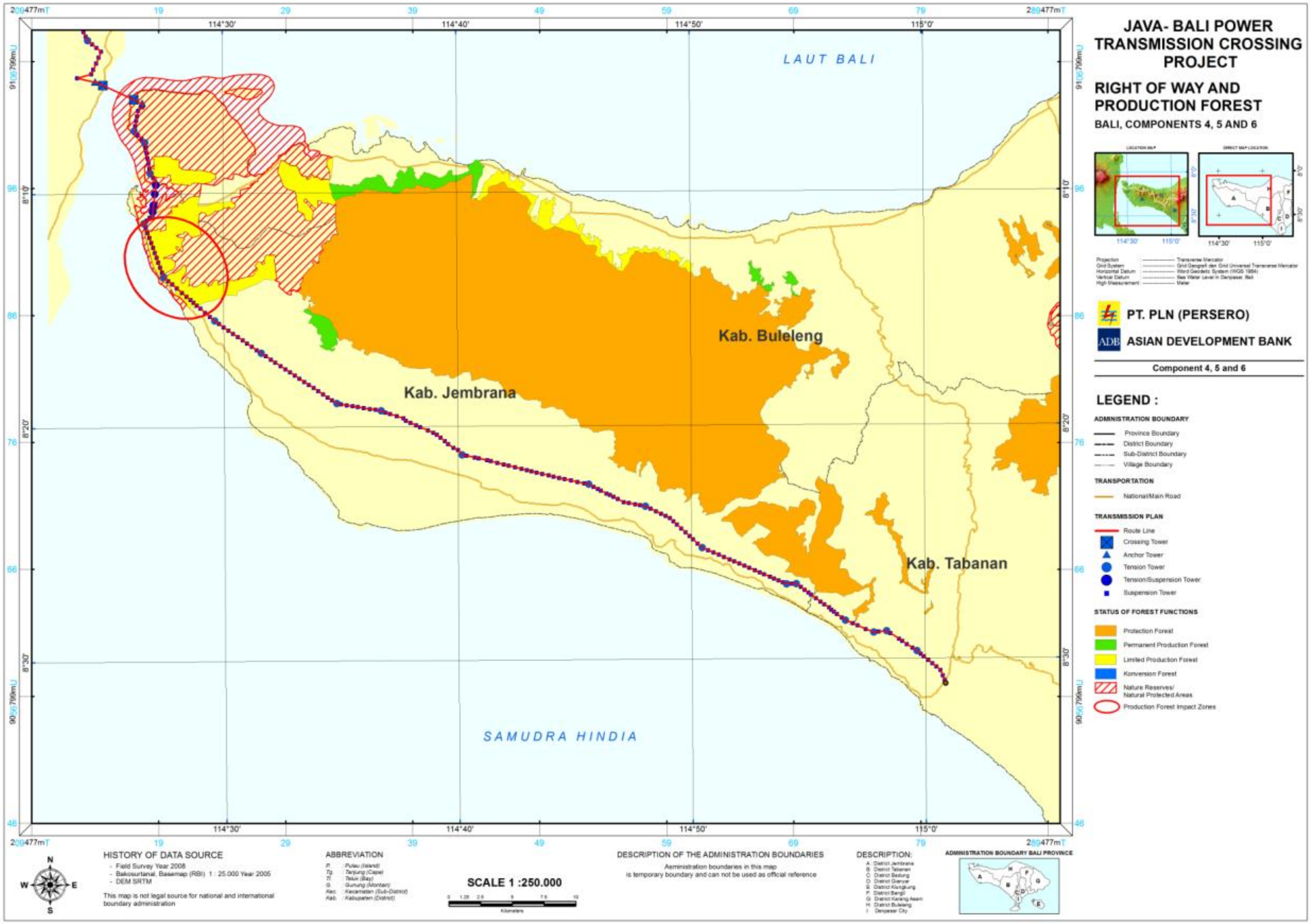


Figure 4.7: Limited Production Forest and Project RoW, Bali

3. Protected Areas: National Parks

131. The TL alignment will pass through the periphery of two protected areas, Baluran National Park in East Java and Bali Barat National Park in Bali. Though these parks have rich flora and fauna including endangered and protected species, the transmission corridor will be located within the Special Utilization Zone to achieve minimal impacts especially during construction.

a. Baluran National Park in East Java

132. The discussions below provide an overview of Baluran National Park. The informations in the succeeding sections on the impacts of the Project and the mitigation measures in Baluran National Park are from the supplementary biodiversity study conducted for the Project.

i. Location and Management

133. Baluran National Park is located in Situbondo Kabupaten in East Java Province (Figure 4.8). It is situated at the northeastern extremity of Java, close to the islands of Bali and Madura, and lies between 114°17'-114°28'E and 7°29'-7°55'S. The park is bordered by the Madura Strait to the north, the Bali Strait to the east, the Bajulmati River (Wonorejo village) to the west and the Klokoran River (Sumberanyar village) to the south. The park is a rough circle in shape, with the extinct Baluran volcano at its center. It has a relatively dry climate and consists of lowland forests, plantation forests, savanna, mangrove forests and hills.

134. Baluran is one of Indonesia's first five national parks, having been declared a national park in 1980 by the Minister of Agriculture, and further designated in 1997 by MoF Decree SK.No.279/Kpts-II/97. Previously it was a wildlife reserve during the Dutch colonial period. It is managed by the Directorate General of Forest Protection and Nature Conservation (*Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam - PHKA*) of the MoF.

ii. Zoning

135. Baluran National Park has an area of 25,000 ha consisting of five zones: the Core Zone (12,000ha), the Wilderness Zone (5,637 ha), the Intensive Utilization Zone (800ha), the Special Utilization Zone (5,780ha) and the Rehabilitation Zone (783ha).

Core Zone

136. Area and Location: 12,000 ha. Located in the center, north and southeast of the park, and includes Mount Baluran, Mount Klosot, Mount Glengseran, Mount Montor, and Mount Kakapa upto Karangtekok

Objectives:

- Protection of flora and fauna. Human activities not allowed other than related to science, education, and research.
- Protection of the Banteng (*Bos javanicus javanicus*), the Park flagship species; large mammals such as the Vulnerable Javan Rusa Deer (*Rusa timorensis*), Leopard (*Panthera pardus*), Muncak (Barking) Deer (*Muntiacus muntjak muntjak*), the Endangered Dhole (*Cuon alpinus*), and the Endangered Pangolin (*Manis javanica*); and aves such as the endemic and Endangered Javan Hawk-eagle (*Nisaetus bartelsi*), the Endangered Green Peafowl (*Pavo muticus*), and the Red Jungle Fowl (*Gallus gallus*).

- Protection of rare flora including Trenggulun (*Protium javanicum*), *Pterospermum diveripolium*, Bayur (*Pterospermum javanicum*), Candlenut (*Aleurites molluccana*), Mimba (*Azadiracha indica*), and Sugar Palm (*Arenga pinnata*).
- Protection of lowland rain forest ecosystems, lowland monsoon forest, lowland and upland savanna.
- Preservation and protection of hydrological systems.

Wilderness Zone

Area and location: 5,637 ha including 4,574 ha terrestrial and 1,063 ha marine.

Objectives:
- Utilization of the potential for environmental services in the form of limited nature tourism activities, marine tourism and research activities, research and cultivation of medicinal plants.
- Conservation training activities.

Intensive Utilization Zone

Area and location: 800 ha in locations scattered predominantly in the northern, eastern and southern areas of the Park.

Objective:
- Development center facilities and infrastructure for the development of nature tourism and recreation, or other uses that support the function of conservation of natural resources and ecosystems.

Special Utilization Zone

Area and location: 5,780 ha located on the western and southwestern portion of the Park.

Objectives:
- Use of natural resources and ecosystems in the form of environmental services (eco-tourism, nature conservation education/environment); research and development to support the interests of science and culture.
- As per Decree p.56, a special use zone accommodates “local communities that have been residing in the area since before it was designated a national park, or to accommodate public facilities and infrastructure such as telecommunication towers, roads and electricity installations.”

Rehabilitation Zone

Area and location: 793 ha located in the northeast region.
Objectives:
- Restore original ecosystems damaged by human activities.
- Includes reforestation, land rehabilitation, habitat development, etc.

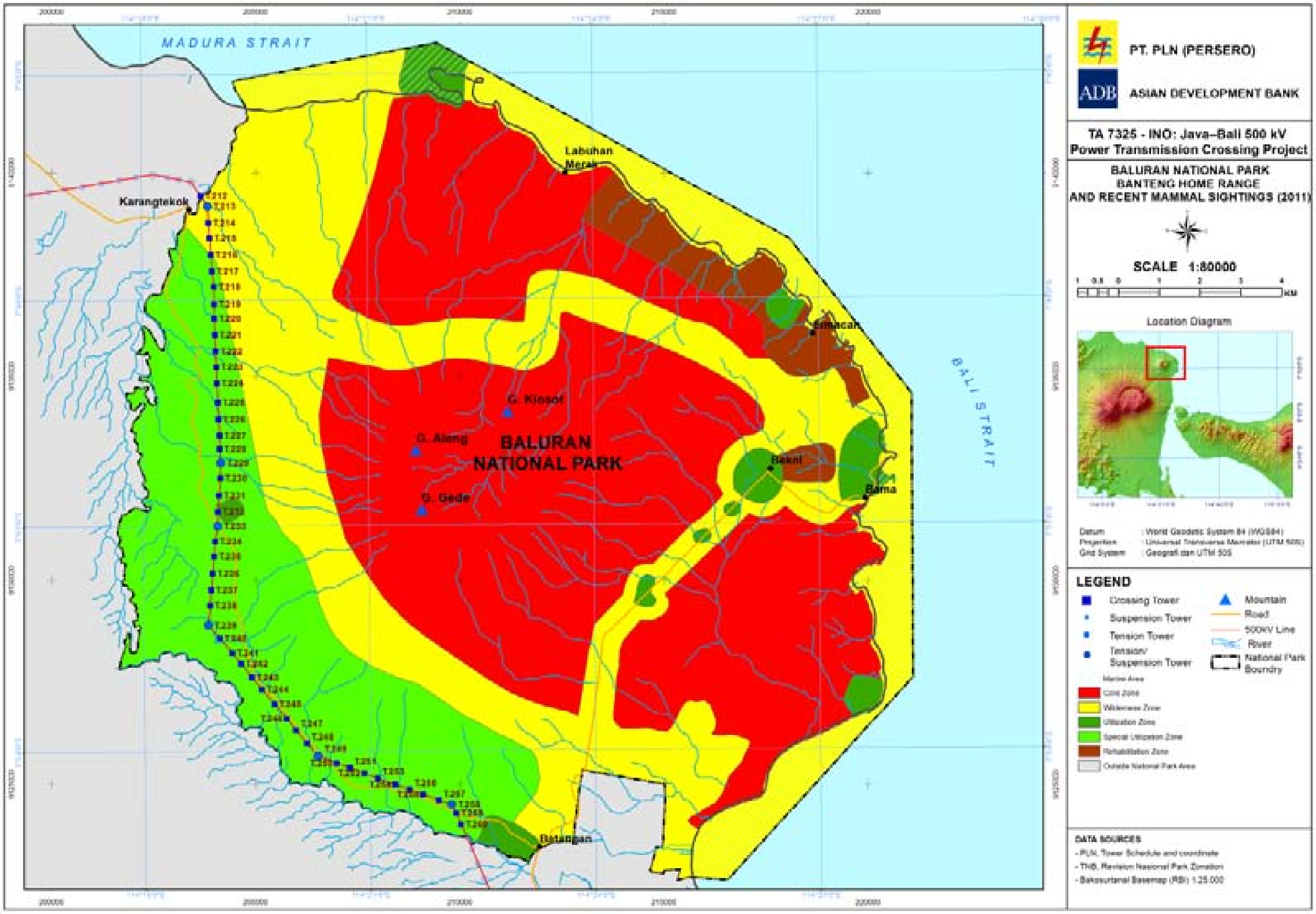


Figure 4.8: Baluran National Park and Project RoW

iii. Ecosystems

137. Baluran National Park (Figure 4.8) is often referred to as a microcosm of Indonesian vegetation types because there are many kinds of Indonesian vegetation that can be found here, including savanna, mountainous rain forest on Mount Baluran, lowland monsoon forest, plantation forest, coastal forest, sea grass, and coral reefs. The coastline is formed by irregular peninsulas and bays, including areas of living corals, sandbanks, and mudflats. The peninsulas are covered with mangroves, while other parts of the coastline are covered with swamp forest. The volcano is covered with savanna, lowland and upland monsoon forest.

138. **Plantation Forest.** The western portion of the Park where the TL RoW will pass is predominantly a teak plantation (*Tectona grandis)* managed by the East Java Perhutani (State Forestry Company). Trees are estimated to be 20 years old on average. The teak plantation covers both the Special Utilization Zone and the Wilderness Zone portions of the TL RoW.

139. **Savanna.** Savanna covers about 40% of the park, the largest savanna area on Java. Savannas are subject to regular wildfires and the ecosystem appears to be the result of human use of fire. There are two types of savanna in the park: flat and surging. Flat savanna grows on young stony alluvial terrain over an area of around 1,500–2,000ha in the southeast, around Plalangan and Beko. Dominant grasses in this area are *Dichantium caricasum*, *Heteropogon contortus* and *Sorghum nitidum*. Trees include *Acacia leucophloea* and *Schleichera oleosa*.

140. Surging savanna grows on rocky land over an area of 6,000 ha in the north and northeast. Grazing animals such as endangered Banteng (*Bos javanicus javanicus*), the Park mascot, Water buffalo and Javan rusa are found in this area. Dominant grasses are *Dichantium caricasum*, *Sclerachne punctata* and *Sorghum nitidum*. Trees are *Schleichera oleosa, Acacia leucophloea*, and *Zizyphus rotundifolia*.

141. The savanna areas are undergoing constant change as result of fires, illegal logging and animal herding by local peoples. Significant change has also been caused by the invasive thorny Acacia tree (*Acacia nilotica)*, originally introduced as a fire breaker. Acacia has spread over most of the Bekol savanna, the Curah Udang savanna and a small part of the Kramat savanna and Balanan.

142. **Coastal forest**.The coastal forest vegetation is formed of *Barringtonia*, which grows between Pandean and Tanjung Candi bang and in Labuhan Merak, *Pandanus tectorius* in Tanjung Bendi, and *Pemphis acidula* in Air Karang.

143. **Mangrove forest.** Mangrove forests are present on the north coast and eastern parts of the national park, in Bilik, Lambuyan, Mesigit, Tanjung Sedano and in Kelor. Shorter mangrove species, which grows best on mud substrate, are found in Kelor and Bilik, including *Avicennia*, *Sonneratia*, *Rhizophora* species including *Ceriops tagal* and *Rhizophora apiculata*. Saline bogs are found in North Pandean, Mesigit and some other places. Trees that grow here are *Avicennia* species and *Lumnitzera racemosa*, with few smaller plants.

144. **Brackish water forest**. The biggest brackish forest is on the south-eastern side of Sungai Kepuh; there are smaller areas in Popongan, Kelor, east Bama and north-west Gatal. Vegetation includes *Excoecaria agallocha*, *Syzygium polyanthum*, and *Buchanania arborescens*. Brackish water forests attract few wild animals because of the lack of fresh water.

145. **Mountainous rain forest**. Located around Mount Baluran up to 1200 masl, the mountain rain forest is the most virgin forest in Baluran. Abundant spring water is available there for wildlife, which is much needed during long dry seasons.

146. **Monsoon forest**. There are two types of monsoon forest in Baluran: lowland monsoon forest and mountainous monsoon forest. Lowland monsoon forest covers around 1500ha of the Baluran area, bordered by plantation forest, evergreen forest, and savanna at Bekol Kramat. Its trees include *Zizyphus rotundifolia, Emblica officinalis, Tamarindus indica, Schoutenia ovata, Azadirachta indica, Acacia tomentosa, Grewia eriocarpa* and *Schleichera oleosa.*

147. Mountainous monsoon forests occur on Mount Baluran, Mount Klosot and Pot Mount. Its trees include Candlenut (*Aleurites moluccana*), *Emblica officinalis, Homalium foetidum, Vitex pubescens, Dryopetes ovalis*, and *Casia fistula*.

148. **Sea grasses**. Sea grasses occur on low wave energy beaches including Bama, Kajang, Balanan, and Lempuyang beaches, and westward to Bilik-Sijile and Air Tawar beaches. Sea grasses provide habitat for Milkfish, squid and other marine species. Fishing often takes place in these areas.

149. **Coral reefs**. Coral reefs are found along Bama, Lempuyang, Bilik-Sijile, Air Karang, Kajang, Balanan and Kalitopo beaches. Baluran's coral reefs occur at depths ranging from 0.5 m to 40 m, with species including*Acropora*, *Porites lutea* and *Stylophora*.

iv. Flora and Fauna

<u>Flora</u>

150. There are a reported 444 species of plants growing in the Park, including widoro bukol (*Ziziphus rotundifolia*), mimba (*Azadirachta indica*), and pilang (*Acacia leucophloea*). These three species are able to adapt to very arid conditions, remaining green while the plants around them wither. Other important species in the Park include tamarind (*Tamarindus indica*), gadung (*Dioscorea hispida*), kemiri (*Aleurites moluccana*), gebang (*Corypha utan*), api-api (*Avicennia* sp.), kendal (*Cordia obliqua*), manting (*Syzygium polyanthum*),and kepuh (*Sterculia foetida*).

<u>Fauna</u>

153. There are 26 species of mammal in the Park, including the Banteng (*Bos javanicus javanicus*), Asiatic wild dog (*Cuon alpinus javanicus*), Barking deer (*Muntiacus muntjak muntjak*), Rusa Deer (*Cervus timorensis russa*), Panther (*Panthera pardus*), Lesser Malay mouse deer (*Tragulus javanicus pelandoc*), fishing cat (*Prionailurus viverrinus*); and Ebony leaf monkey (*Trachypithecus auratus auratus*).

154. The endangered Banteng is the mascot of Baluran National Park. There are only an estimated 20 Banteng remaining in the Park from an estimated population of 206 in 2002. The main threats to Banteng's existence include hunting and illegal poaching, particularly during the

dry season when animals may leave the Park in search of water; and loss of savanna, which forms its major feeding habitat, as a result of fire, invasive species and in particular Acacia, and predation.[28]Table 4.10 summarizes IUCN Red List species in the Park.

Table 4.10: Endangered fauna in Baluran National Park

LOCAL NAME	LATIN NAME	IUCN Status
Ajag	***Cuon alpinus javanicus***	Endangered
Banteng	***Bos javanicus javanicus***	Endangered
Rusa	***Cervus timorensis russa***	Vulnerable
Macan tutul	***Panthera pardus melas***	Critically Endangered
Kucing bakau	***Prionailurus viverrinus***	Endangered
Lutung budeng	*Trachypithecus auratus auratus*	Vulnerable

Source: Baluran National Park website, 2011.

155. Based on the latest Baluran birds survey, at least 189 species of avian-fauna have been recorded in the Park. While the Banteng is the mammalian icon of Baluran National Park, the endangered Green Peafowl (*Pavo muticus*) is its avian equivalent. Other notable species include the Red Jungle Fowl (*Gallus gallus*), Malabar Hornbill (*Anthracoceros coronatus conversus*), Rhinoceros Hornbill (*Buceros rhinoceros silvestris*), Koel (*Eudynamys scolopacea*), and Lesser Adjutant Stork (*Leptoptilos javanicus*). Table 4.11 summaries IUCN red-listed avifauna in the Park.

Table 4.11: Endangered Avian-fauna in Baluran National Park

LOCAL NAME	LATIN NAME	IUCN Status
Jalak abu	*Sturnus melanopterus*	Critically Endangered
Cikalang Kecil	*Freagata aireal*	Critical Endangered, IUCN
burung merak	***Pavo muticus***	Endangered
bangau tong-tong	***Leptoptilos javanicus***	Vulnerable
Bangau Sandang-lawe	***Mycteria cinerea***	Vulnerable
Kuntul Kecil	*Egretta intermedia*	Vulnerable
Kangkareng	***Anthracoceros convecus***	Near Threatened
Rangkong	***Buceros rhinoceros***	Near Threatened

Source: Birds of Baluran National Parks. 2011.

v. Climate

156. Baluran National Park has a monsoon climate with a long dry season. Temperatures vary between 27.2°C and 30.9°C, humidity averages 77%, wind velocity averages 7 knots and wind direction is predominantly south-east. The rainy season lasts from October to April and the dry season from May to September. The highest rainfall is typically in December and January. Baluran is the driest national Park in East Java, receiving on average less than 1,500 mm per year (by way of comparison, many mountainous areas of Central and West Java can received over 6,000 mm per year).

[28] Prior to 2000 the main strategy for managing Banteng was to reduce the number of feral Buffalo (*Babalus bubalis)* which was more abundant than the Banteng and thought to be competing with it for fodder. Under this program 300 Buffalo were caught and removed from the Park in 1985, and another 400 between 1989 and 1994. The program ceased soon after, and despite accurate population estimates for either Buffalo or Banteng before or after the removals, has been deemed a failure by subsequent managers.

vi. Soils and Topography

157. Most of the soils in the national park are volcanic, derived from weathered basalt, volcanic ash, and intermediary volcanic rock. These soils are rich in minerals but poor in organic material, and have high chemical content but low physical fertility. Most of these soils are very porous and do not retain water well. Black soils, on which most of the savannas are found, are highly erodible and very muddy in wet seasons, and form deep cracks (a few centimeters wide and sometimes more than 80 cm deep) in dry seasons. Many stream beds contain water only during the wet season as much of the water seeps through the porous volcanic soils until it reaches the hardened underground lava. Marine soils are limited to some areas near the coast on the salt flats and in the mangrove swamps.

158. The topography of the park is dominated by the central Baluran volcano (Mount Baluran). Altitude ranges from sea level to 1,247 masl at Mount Baluran (Figure 4.9).

vii. Hydrology

159. Baluran National Park has a radial water system (Figure 4.9). The Kacip River flows from the caldera to Labuhan Merak beach. The Klokoran and Bajulmati rivers form the western and southern borders of the park. Many stream beds form in the short wet season, but the water is absorbed in great quantity by the very porous volcanic ash, and after it reaches the hardened underground lava it comes to the surface in the form of springs in coastal areas (Popongan, Kelor, Bama, Mesigit, Bilik, Gatel, Semiang and Kepuh), in downhill areas (Talpat spring), in Air Tawar Bay and on the Sedano peninsula. In wet seasons, the black soils are least permeable, and water then flows on the surface, forming many pools, particularly in the southern area from Talpat to Bama. In the long dry periods, these pools are often dry.

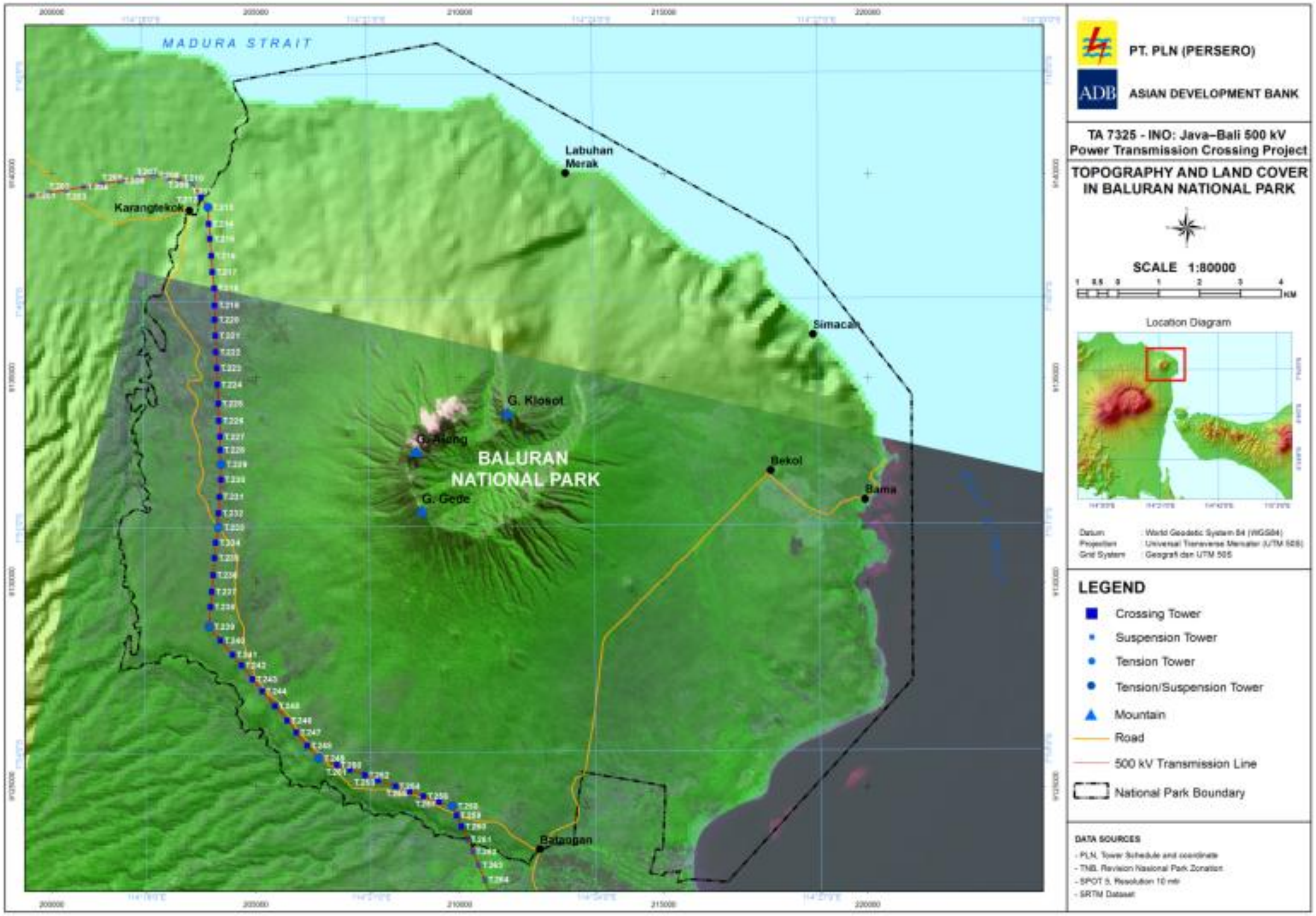


Figure 4.9: Baluran National Park topography

b. Biodiversity Study for the TL Alignment through Baluran National Park

160. The project TL will encroach a total area of 63.3 ha within the Baluran National Park (Figure 4.8). The details of the project encroachment within the Baluran National Park is shown in Table 4.12.

161. This section on the detailed biodiversity study for the TL alignment to the Baluran National Park is an additional information added to the first draft of the EIA (August 2012) to investigate the status of biodiversity and the potential impacts of the Project in Baluran National Park.

Table 4.12: Project TL area within Baluran National Park

Baluran National Park Zone	RoWLength m	RoW Width m	RoW Area ha
Core Zone	-	34	-
Wilderness Zone	1,435	34	4.9
Intensive Utilization Zone		34	
Special Utilization Zone	17,165	34	58.4
Rehabilitation Zone	-	34	-
Total	**18,600**		**63.3**

Note: Based on GIS Analysis and based on data provided by PLN (2012). Some numbers subject to revision based

162. This survey was conducted by the biodiversity consultant, with the assistance from the National Park authorities. The data and information in the discussion are from interviews of the National park staff, collecting secondary data from the National Park and field survey along the transmission line. Continuous communication and consultations were conducted with biodiversity experts, conservation groups, national park staff and NGO's to complete the data or address information gap on the biodiversity component of the Project. NGOs consulted during the study are Bird Indonesia, Wetland Indonesia and Raptor Indonesia. Banteng and big mammal experts consulted are Dr. Ali Kodra, Dr. Setyawan Pudyatmoko, Dr. Ahmad Sarmidi, and Dr. Eric Meijaard. The complete list and contact details of the experts consulted are listed in Appendix 3b (References for the Biodiversity study).

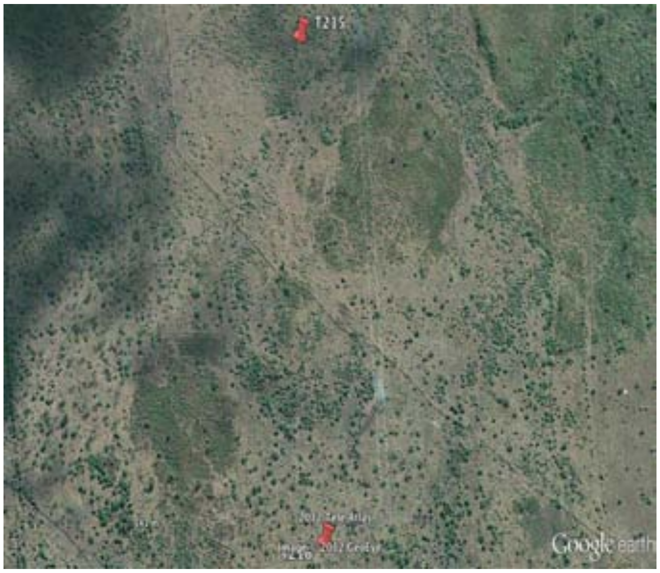
(i) Vegetation in Baluran National Park

163. **Transmission Line RoW tower T212 and T215,** transmission tower located at the savanna vegetation type, which is characterized by grasses and shrubs and a few trees. Plant species in this area include trees like Pilang (*Acacia tomentosa*), Akasia (*Acacia nelotica*) Secang (*Caesalpinia sappan*), jarak china (*Jatropha sp*), nimba tree (*Azadirachta indica*), and grass (*Andropogon sp*).

164. **Transmission Line RoW tower T216-T219, T229, T237, T238, T242,** located at production forest of monoculture gmelina (*Gmelina asiatica*). In this forest, an under forest stands can be found such as kesambi (*Schleicheria oleosa*), Pilang (*Acacia tomentosa*), secang (*Caesalpinia sappan*), trengguli (*Cassia fistula*), Talok (*Grewia koordersiana*), Nimba (*Azadirachta indica*) and Akasia (*Acacia nelotica*).

165. **Transmission Line RoW tower T220, T228, T230-T236, T239-T241, T243-T245, T247-T260** located at monoculture teak forest. Teak plants have broad and thick leaves, and as a deciduous plant, during rainy season, the trees became lush forest. Thick leaves make the

forest floor dark since only little sunlight is able to reach the forest floor. On the other hand, in the dry season normally teak will shed leaves, and dried teak leaves will fill the forest floor. The dried leaves are piled on the teak forest floor and may cause forest fire. Forest fire caused by dry teak leaves has reduced the vegetation to only few plants that can grow on teak forest stands. Example of these plants are *Lantana camara* or *Chromolaena odorata*.



(a) Savanna at the Wilderness Zone

(b) Gmelina Forest

(c) Teak forest

Figure 4.10: Vegetation in Baluran National Park
(a)Savanna at the Wilderness Zone; (b) Gmelina Forest; and (c) Teak forest

166. Teak and Gmelina forest are monoculture forests. Other forest in the national park are not too dense and allow other species of plants to grow in the forest floor, such as kesambi (*Schleicheria oleosa*), kepuh (*Sterculia foetida*), petai (*Parkia speciosa*), talok (*Grewia*

koordersiana) and akasia (*Acacia nilotica*). Plant species found in the Teak and Gmelina forests along the proposed transmission lines are listed in Table 4.13:

Table 4.13: Plants species found at Teak and Gmelina Forests, TNB

No	Scientific name	Local Name	IUCN Status	Remark
1	*Schleichera oleosa*	Kesambi	-	Locally considered as Rare species
2	*Breynia microphylla*	Katuk hutan	-	-
3	*Erythrina sp.*	Ploso	-	-
4	*Tespesia populnea*	Waru lot	-	-
5	*Cassia multijuga*	Johar	-	-
6	*Ceiba pentandra*	Randu	-	-
7	*Acacia tomentosa*	Pilang	-	-
8	*Acacia nilotica*	Akasia	-	Invasive species
9	*Sterculia foetida*	Kepuh	-	-
10	*Lannea pinnata*	Kayu jaran	-	-
11	*Delonix regia*	Flamboyan	-	-
12	*Parkia speciosa*	Petai	-	-
13	*Zizphus mauritiana*	Bekol	-	Invasive species
14	*Adenanthera tetrasperma*	Saga pohon	-	-
15	*Grewia koordersiana*	Talok	-	-
16	*Cassia fistula*	Trengguli	-	Locally considered as Rare species
17	*Ficus hispida*		-	-
18	*Ficus septica*	Awar-awar	-	-
19	*Ficus indica*	Bunut	-	-
20	*Lantana camara*	Tembelekan	-	Invasive species
21	*Chromolaena odorata*	Kirinyuh	-	-
22	*Digitaria ciliaris*	Rumput	-	-
23	*Caesalpinia sappan*	Secang	-	-
24	*Swietenia macrophylla*	Mahoni	Vulnerable	-
25	*Melia azedarach*	Mindi	-	-
26	*Azdirachta indica*	Nimba	-	-

Source: Field survey 2012

167. **Transmission Line RoW Tower T245-T246**, the towers footprint are in teak forest, but part of the RoW alignment is across an area known as Bajulmati corridor (Figure 4.11) at the Panjaitan river, which is a water source for big mammals during dry season. Vegetation type on this area are mostly wild plants such as Kepuh (*Sterculia foetida*), Kayu Jaran (*Lannea pinnata*), Kayu Ara (*Ficus hispida*), *Lantana camara*, Saga Pohon (*Adenanthera tetrasperma*), kesambi (*Schleicheria oleosa*), Waru lot (*Tespesia poipulnea*), Talok (*Grewia koordersiana*) and Bunut (*Ficus indica*).

Some species of plants which serve as a food source for mammals were also observed during the field survey such as grass (*Digitaria ciliaris*), leaves of *Acacia tomentosa* and *Acacia nilotica* and some *Ficus* species.

168. It should also be noted that it was observed from the field survey that the vegetation growth between Towers T212 to T232 is not growing very well since the area is full of dark basaltic andesite rock out crop, while other references described it as a lava field (Figure 4.12).

Figure 4.11: Bajulmati corridor (water source)

Figure 4.12: Dark basaltic andesite rock (Lava flow)

(ii) Birds' species

169. Base on the latest Baluran birds' survey, at least 189 species are known and documented to live in the Park. There was an estimated 46 species of bird at the TL RoW out of 171 bird species at Baluran NP as shown at Appendix 15. There are 13 species protected by law of GOI and one species endangered (IUCN status). The only endangered bird species is Green Peafowl (*Pavo munticus)*. Its habitat is like an open area and distributed all over the National park area. Mating season is during August to October, nesting on the ground of open areas overgrown with shrubs. Local people used to collect the eggs and wait for them to hatch and sell the juvenile as a pet.

170. Number of birds' species recorded during the survey was 10 species. Only a small number of bird species were observed during the survey. Birds observed during field survey are listed at Table 4.14 and Figure 4.13 shows the observed crested serpent eagle nest in a 150-kV transmission tower.

Table 4.14: List of birds observed during fieldwork

Location	Common names	Scientific name	IUCN status
T212	Crested Serpent Eagle	*Spilornis cheela*	LC
	Golden belied geryone	*Gerygone sulphurea,*	LC
	Spotted dove	*Streptopelia chinensis*	LC
	Yellow-ventet Bulbul	*Pycnonotus goiavier,*	LC
	Scarlet-headed Flower pecker	*Dacaeum trochialeum*	LC
T240	Ashy Drongo	*Dicrurus leucophaeus,*	LC
	Scarlet headed flower pecker	*Dicaeum trochialeum,*	LC
	Hill blue flycatcher	*Cyornis banyumas.*	LC
	Oriental Pied Hornbill	*Anthracoceros albirostris*	LC
T241	Collared Kingfisher	*Todirhampus chloris*	LC
T259	Crested Serpent Eagle	*Spilornis cheela*	LC
T260	Yellow-vented Bulbul	*Pycnonotus goiavier*	LC

Source: Field survey 2012
LC: Least Concern, IUCN

Figure 4.13: Crested Serpent Eagle nest observed during the field survey at 150 KV TL tower

(iii). Mammals' species

171. During the field survey, five mammal species are observed at RoW between Tower T228, T235 to T250 and between tower T257 toT260.

172. ***Macaca fasicularis* IUCN Least concern**, Long tailed macaque during the dry season are observed along the highway Situbondo Surabaya between Tower T257 to T260 begging food from car passenger. During wet season, most of the long tailed macaque lives in the forest, only a few were observed at the side of the road and one group was observed at an area in the Bitakol security guards checkpoint which is located close to tower T239-T240.

173. ***Trachypithecus auratus auratus, IUCN vulnerable***, a group of Ebony Leaf Monkey arboreal animal were observed near the area between transmission tower T245 and T246. The vegetation at this area are wild plant such as Kepuh (*Sterculia foetida*), Kayu Jaran (*Lannea pinnata*), Kayu Ara (*Ficus hispida*), *Lantana camara*, Saga Pohon (*Adenanthera tetrasperma*), kesambi (*Schleicheria oleosa*), Waru lot (*Tespesia poipulnea*), Talok (*Grewia koordersiana*) and bunut (*Ficus indica*).

174. Based on the interviews from Park rangers, ebony leaf monkey are usually found at mixed forest and Gmelina forest and were never observed at Teak forest. Distribution of ebony leaf monkey in the eastern area of tower T235, between towers T238-T239 and T245-246 and western area of tower T243 is shown in Figure 4.14.

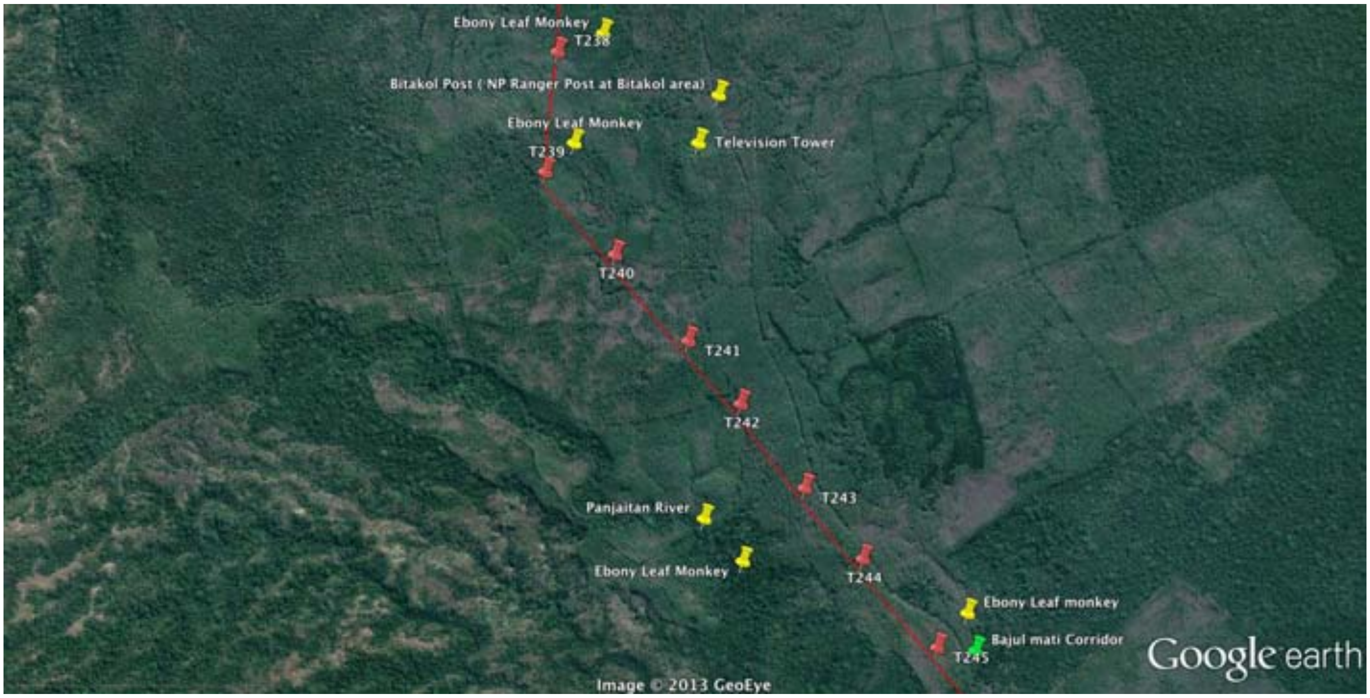


Figure 4.14: Distribution of ebony leaf monkey

175. ***Muntiacus muntjak*, IUCN Least concern**, Barking Deer was observed on the road side the area between transmission tower T245 and T246. The vegetation at this area are wild plant such as Kepuh (*Sterculia foetida*), Kayu Jaran (*Lannea pinnata*), Kayu Ara (*Ficus hispida*), *Lantana camara*, Saga Pohon (*Adenanthera tetrasperma*), kesambi (*Schleicheria oleosa*), Waru lot (*Tespesia poipulnea*), Talok (*Grewia koordersiana*) and bunut (*Ficus indica*).

176. Based on the gathered information from local people, who are herding their cattle in the National Park, they never found Banteng or Rusa in the area close to tower T212-T218, but they often see barking deer in this area.

177. ***Sus Scrofa,* IUCN Least concern**, wild boars were observed in the area between tower T248-T249, and the spoor was observed in the area between T245-T260.

178. ***Bos javanicus,* IUCN Endangered**. Baluran National Park is an important habitat of Banteng (Figure 4.15a). However, it should be noted that this is not the only habitat of Bantengs in Java. Other habitats of Banteng in Java are in Meru Betiri National Park, in Alas Purwo National Park and in Ujung Kulon National Park (Pudyatmoko, 2012).

179. Banteng excrement and spoor were observed at Bitakol area between T236-T249 (Figure 4.15b). Based on the gathered informations from the Park Rangers, about 7- 8 banteng (latest finding 7 Bantengs) live in this region. This banteng herd is predicted to be a different group with banteng herds that live in the Bekol Savana (at least 12 km Northeast). Based on the latest data from the National Park, the area between Tower T236-T245 and T250 are known to be home range of these Banteng herd.

Figure 4.15a: Banteng (*Bos javanicus*)[29]

Figure 4.15b: Banteng excrement observed in Bitakol area

Figure 4.15: (a) Banteng (Bos javanicus); (b) Banteng excrement in Bitakol area

180. Distribution of Banteng within the project area based on field data is between towers T238-T239 and T245-246 and western area of tower T245 (Figure 4.16 and 4.17).

[29] http://ds-lands.com/animals/banteng.html Copyright Terry Whitaker www.flpa-images.co.uk

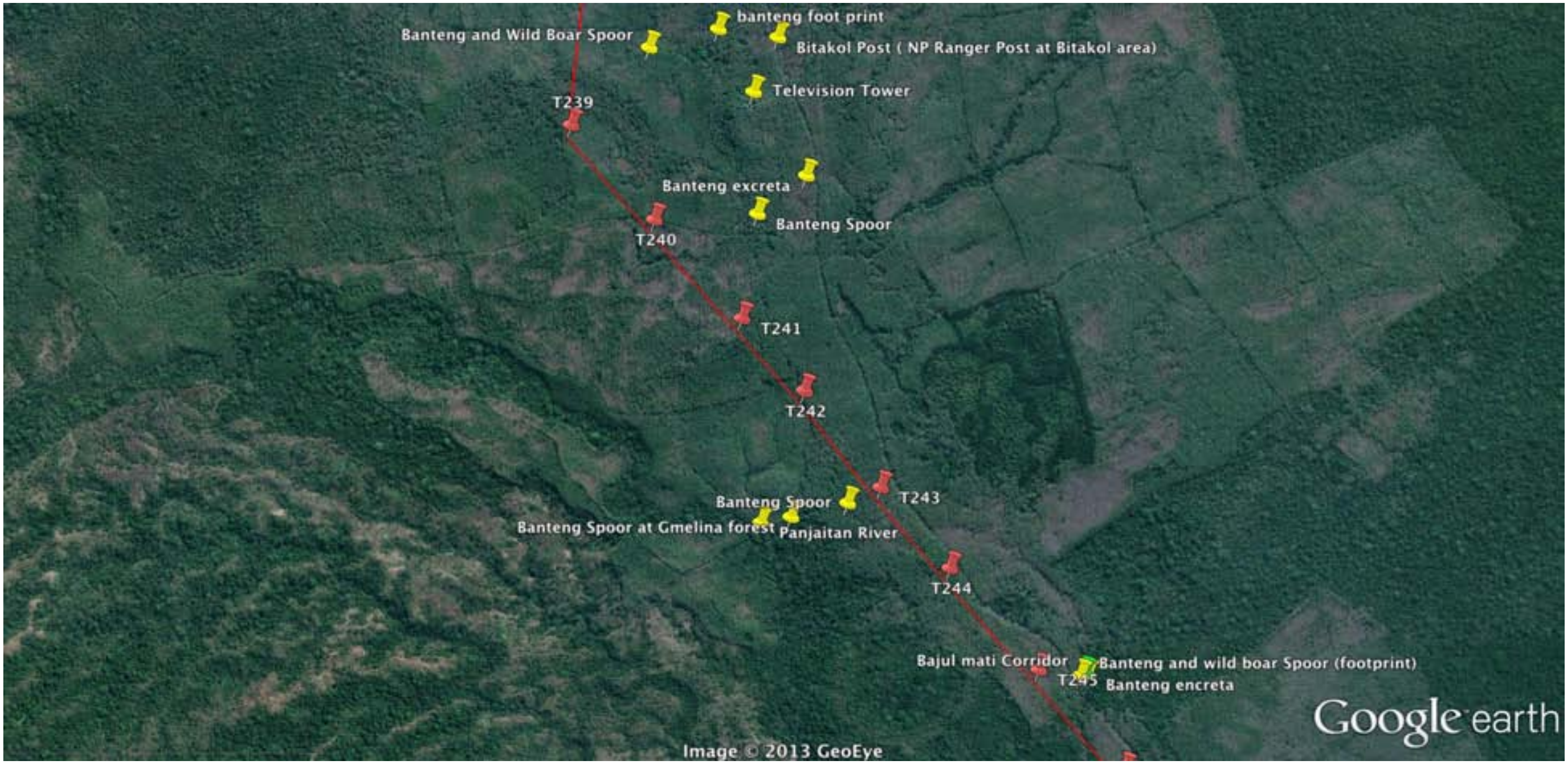


Figure 4.16: Distribution of Banteng (field work data)

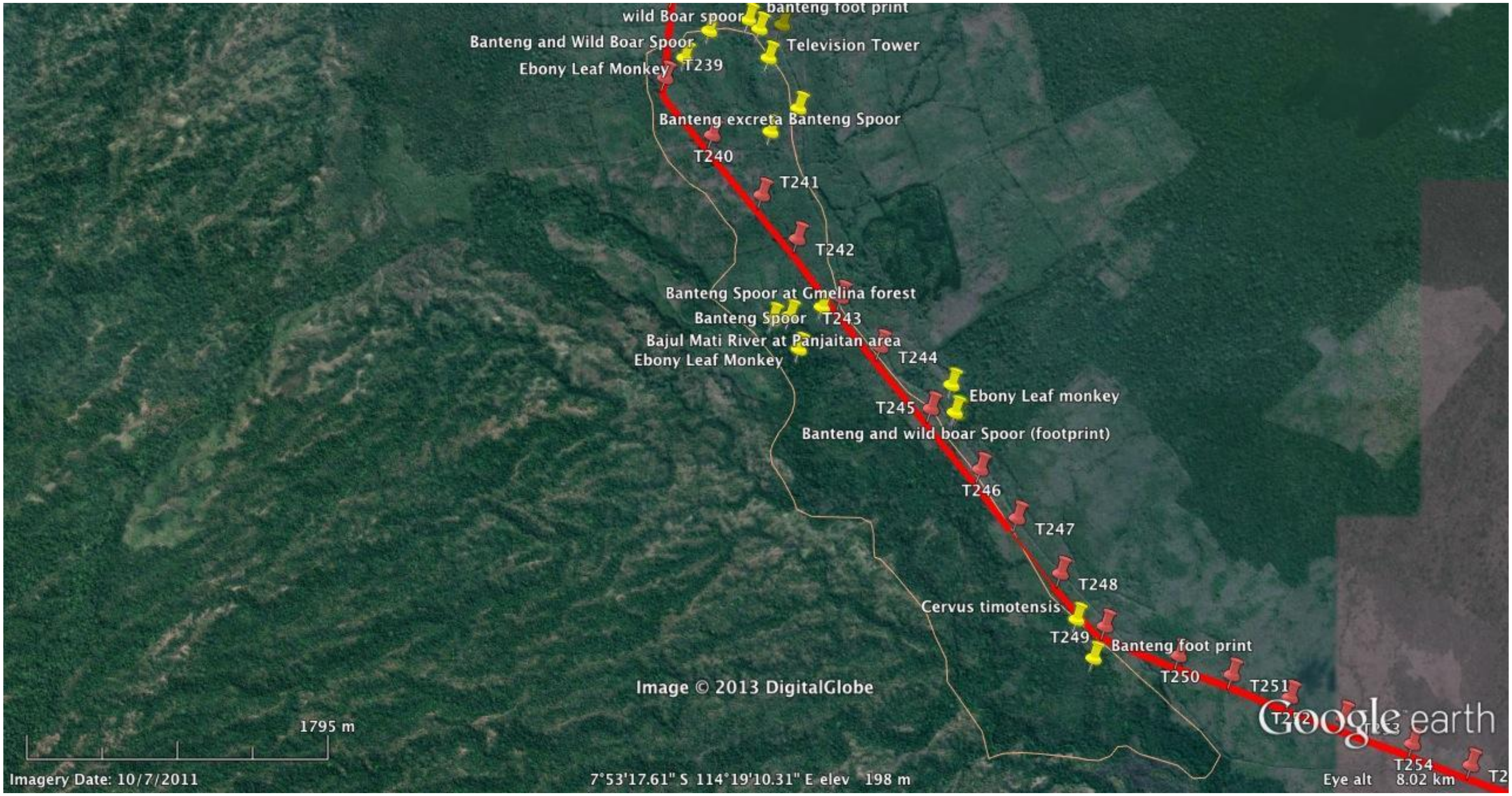


Figure 4.17: Banteng Home Range at Bitakol

(iv) Banteng Home Range at Bitakol

181. According to Pudyatmoko (Personal communication 2013), Bitakol area provides a better fodder than Bekol savanna, because fewer predator (dhole/*Cuon alpinus javanicus*) thrive in the area and Bajulmati River provides continuous water supply. But according to staff of Baluran National Park, Banteng herd at Bitakol is more at risk from poaching activities.

182. Teak forest at Bitakol area serve as fodder during wet season such as grass and shrubs at the forest floor, but during dry season most of fodder at teak forest are dried and burned. During dry periods Banteng herd moves south from teak forest to mixed forest, which provide fodder for Banteng.

183. Bajulmati river, located at the border between Baluran National Park and Perhutani Forest, and is an important water source for Banteng at Bitakol area. Most of the areas of Bajulmati river is not accessible by Banteng because it has a steep slope. Bajulmati river bank at Panjaitan is a more accessible water source for Banteng.

Bajulmati Corridor

184. Bajulmati corridor is a wildlife corridor connecting Bitakol and Bekol area. This corridor followed Pangang river passes under the bridge in Surabaya Situbondo national highway. This corridor is important for wildlife that lives in the Bekol area to undertake seasonal migration to Bitakol area. Seasonal migration takes place during the dry season when water sources at Bekol area dry up and most of the animals look for water source to Bitakol area toward Pangang river to utilize pools of water that were collected in riverbeds (Figure 4.18) and then move toward Bajulmati river at Panjaitan through the Bajulmati corridor (Figure 4.19).

Figure 4.18: Puddle at Panggang river bed

Water pool

185. Based on the information from park rangers, the area located less than 100 m from western of tower T228 is a water pool known as Tlogo, a small natural retention pond providing water to mammals during dry season. This area is considered to be an important water source for big mammals (including Banteng) during dry season. There were observations that banteng herds visit this area for water (Figure 4.20).

Figure 4.19: Water source Bajulmati river (Panjaitan area) at Bajulmati corridor

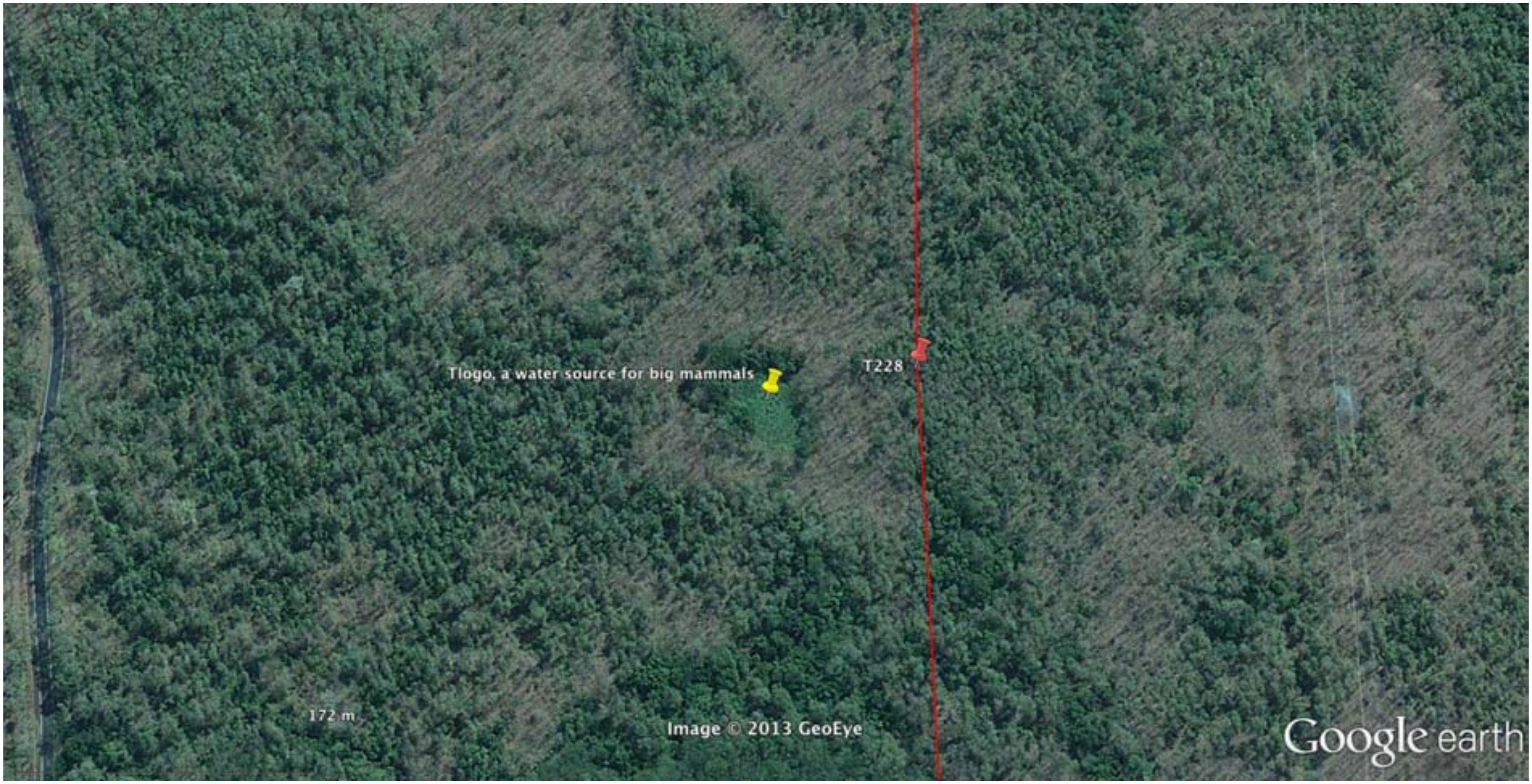


Figure 4.20: Tlogo, water source for big mammals

c. Bali Barat National Park in Bali

(i) Location and Geography

186. Bali Barat National Park is located on the north western portion of Bali island about 60 km west of Denpasar, between 114°25' - 114°34' E and 8°05' - 8°15' S (Figure 4.21). It lies within Buleleng and Jembrana Kabupatens, and has an area of approximately 19,080 ha (about 5% of Bali's total land area). The Park was founded in 1941 with the aim of protecting the endemic Bali Starling or Rothschild's Myna *(Leucopsar rothschildi),* the Park's mascot, and the last of the wild Banteng from which most Balinese cattle descended. The original park was approximately 77,000 ha in area and extended much further to the east than it does today; the modern boundaries of the park were established under MoF Decree SK.No.493/Kpts-II/95. The Park is surrounded by six villages with varied ethnic populations (Balinese, Javanese, Madurese and Bugis). Administratively these villages are either governed by the districts of Buleleng or by Jembrana.

(ii) Zoning

According to the Director General of PHKA Decision No.SK.143/IV-KK/2010, Bali Barat is divided into seven zones;

Core Zone

Area: 8,023 ha consisting of 7,568 ha of land area and 455 ha of marine waters.

- Protection of biodiversity.
- Only research and science activities allowed.

Wilderness Zone

Area: 6,174 ha.

- Buffer zone for core zone.
- Research and science activities and limited tourism allowed.

Utilization Zone

Area: 4,294 ha consisting of 1,645 ha of land area and 2,746 ha of marine waters.

- Research and science activities and limited tourism allowed, as well as construction of tourism facilities, some infrastructure, natural resource utilization, and other uses that support the conservation of natural resources and ecosystems.

Maritime Zone

Area: 222 ha

- Protection of marine biodiversity.
- Research and science activities and limited tourism allowed.

Cultural Utilization Zone

Area: 51 ha

- This zone can be developed and utilized for cultural or religious purposes.

Traditional Zone

Area: 311 ha

- Traditional use by the communities, which have a historical dependence on natural resources.

Special Utilization Zone

Area: 4 ha

Provides for land uses that were pre-existing before the Park was established, including community activities, telecommunications, transportation and power facilities.

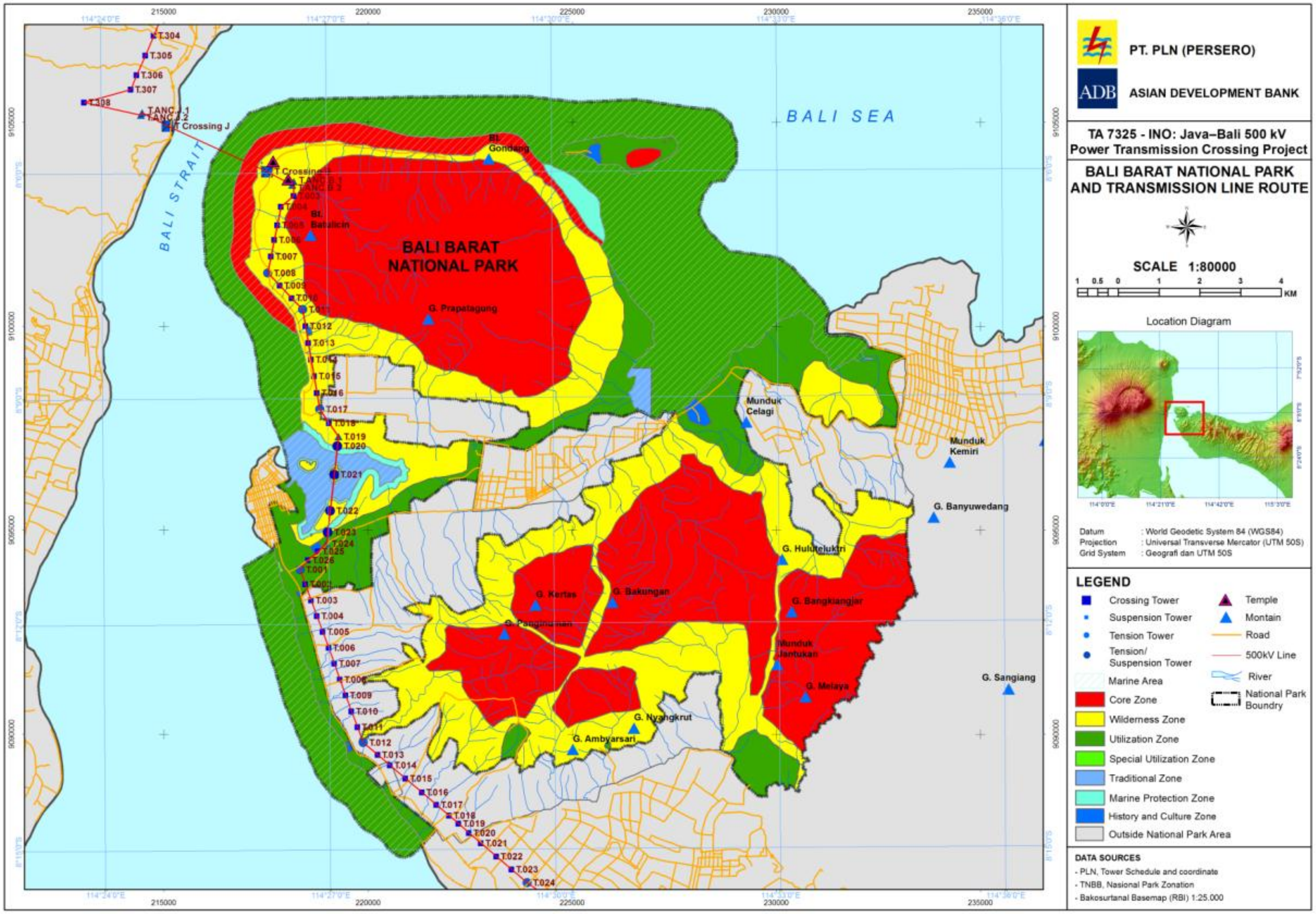


Figure 4.21: Bali Barat National Park Location and Project RoW

(iii) Topography

187. Bali Barat Park is mountainous and has steep and undulating topography, though the RoW makes uses of the flatter near shore area (Figure 4.22). Altitude ranges from sea level to 1,414 masl. The peninsular Prapat Agung, with its extensive web of footpaths, is the most accessible part of the park.

(iv) Climate

188. Bali Barat National Park has a tropical monsoon climate. The rainy season lasts from October to April and the dry season from May to September. Average temperature is 33°C, and rainfall varies between about 950 to 1550 mm/year.

(v) Ecosystems

189. The Bali Barat National Park includes savanna, monsoon forest, mangrove forest, montane and mixed-monsoon forests, sea grasses, coral reefs, sandy beaches, and both shallow and deep-sea waters. Given its relatively small area, the Park is rich in biodiversity.

Flora

190. The Park has 175 species of plants, 14 of which are endangered or protected species (Table 4.15) such as Bayur *(Pterospermum javanicum),* Ketangi *(Lagerstroemia speciosa),* Burahol *(Stelechocarpus burahol), S*andalwood *(Santalum album), and* Rosewood *(Dalbergia latifolia)*.

Table 4.15: Protected Vegetation in Bali Barat National Park

No.	Scientific Name	Local Name	Conservation Status
1.	*Pterospermum javanicum*	Bayur	Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
2	*Antidesma bunius*	Buni	rare
3	*Langerstroemia speciosa*	Bungur	Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
4	*Steleochocarpus burahol*	Burahol	Rare
5	*Santalum album*	Cendana	Vulnerable (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
6	*Aleuritas moluccana*	Kemiri	Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
7	*Sterculia foetida*	Kepah, Kepuh (Bali)	Rare
8	*Schleichera oleosa*	Kesambi	Rare
9	*Diptercocaus Hasseltii*	Kruing bunga	Rare BTNBB
10	*Garcinia dulcis*	Mundu	Rare
11	*Alstonia scolaris*	Pulai	Rare
12	*Manilkara kauki*	Sawo kecik	Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972)
13	*Dalbergia latifolia*	Sono keling	vulnerable (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972)
14	*Cassia fistula*	Trengguli	Rare

Source: Bali Barat National Park.

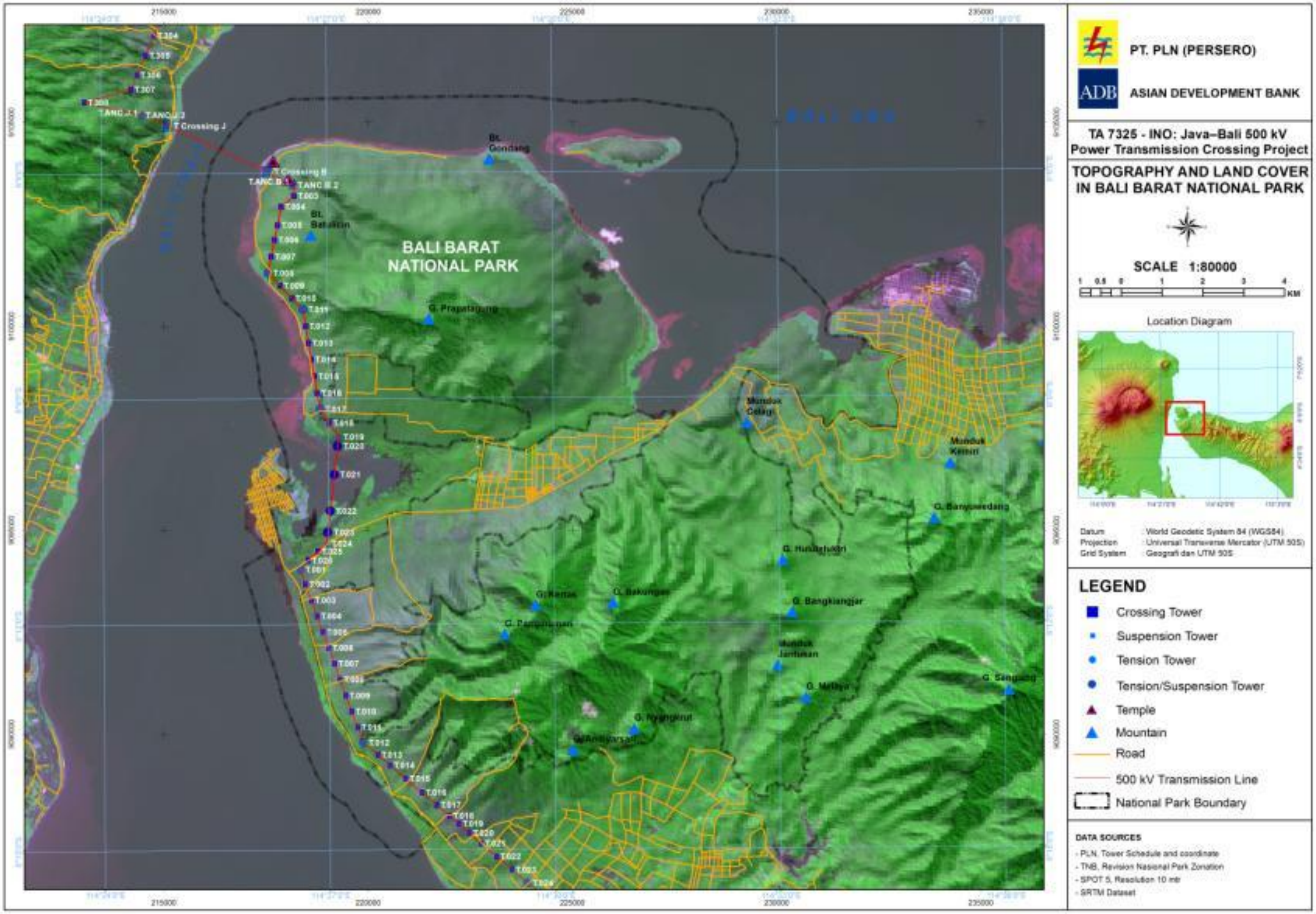


Figure 4.22: Bali Barat National Park Topography

Fauna

Birds' species

191. Bali Barat National Park has approximately 160 species of avifauna and is an important bird-watching site. The endemic Bali Starling (Figure 4.23) is the Park mascot. According to Birdlife International (2012) it has likely long been uncommon (numbers in the early 1900s, the period of discovery, have been retrospectively guessed at 300-900), and has since declined drastically in population and range. The species has been protected under Indonesian law since 1970, and since 1983 the Bali Starling Project has helped to improve the guarding of the park, bolstered the wild population through release of captive-bred birds, and provided the foundation for the development of the Bali Starling Recovery Plan. A population was introduced to Nusa Penida Island (apparently not part of its native range), derived from captive individuals. Nonetheless, unsustainable, illegal trapping in response to the worldwide demand for the cage-bird trade reduced numbers to a critically low level in 1990 when the wild population was estimated at approximately 15 birds. Conservation intervention coupled with the release of captive-bred birds raised this to between 35 and 55. However, despite excellent breeding success and continuing conservation efforts, the population continues to fluctuate (i.e. the population fell to as low as six birds in 2001).

192. According to Park officials there are currently an estimated 14 individuals in the wild, and the Bali Starling is designated as Critically Endangered by IUCN and is listed in Appendix I of CITES. Trade in captive-bred specimens is strictly regulated though illegal poaching and trade continue to be a major threat.

193. There are currently two rehabilitation centers in the Park attempting to establish viable populations in the wild through the Bali Starling Recovery Project. After rehabilitation, the Bali Starling will be released at Teluk Berumbun. This area is the primary wild Bali Starling habitat within the Park, and is located on the opposite side of the Park from the TL. Through captive breeding efforts by Indonesian NGOs, a second and larger population of Bali Starlings now also exists on the islands of Nusa Penida, Nusa Ceningan and Nusa Lembongan, which are 14 km off the south east coast of Bali.

Figure 4.23: Bali Starling of the Bali Barat National Park[30]

[30] Picture is from North Bali Information. www.northbali.info.

194. Other avian-fauna mostly consists of sea and shore birds, the most conspicuous being the Brown Boobies and Lesser Frigate birds. There are two colonies of Terns that nest on a sandy cay at the entrance to TelukLumpur (also known as Mud Bay) whilst the Frigates and Boobies roost on Pulau Burung. The number of White Starlings left in the wild is unknown.

195. Other birds reported in the National Park include: Yellow-vented Bulbul *(Pycnonotus goiavier),* Black-naped Oriole *(Oriolus chinensis),* Pied Fantail *(Rhipidura javanica),* Edible-nest Swiftlet *(Collocalia fuciphaga),* White-bellied Swiftlet *(Collocalia esculenta),* Pacific Swallow *(Hirundo tahitica),* Crested Treeswift *(Hemiprocne coronata),* White-breasted Wood-Swallow *(Artamus leucorhynchus),* Barn Swallow *(Hirundo rustica),* Red-rumped Swallow *(Hirundo daurica),* Long-tailed Shrike *(Lanius schach),* Striated Warbler *(Megalurus palustris),* Collared Kingfisher *(Halycon chloris),* Sacred Kingfisher *(Halycon sancta),* Javan Kingfisher *(Halycon cyaniventris),* Small Kingfisher *(Alcedo caerulescens),* Rufous-backed Kingfisher *(Ceyx rufidorsus),* Stork-billed Kingfisher *(Pelargopsis capensis),* Racket-tailed Treepie *(Crypsirina temia),* Dollarbird *(Eurystomus orientalis),* Savanna Nightjar *(Caprimulgus affinis*), Collared Scops-Owl *(Otus bakkamoena),* Crested Serpent-Eagle *(Spilornis cheela),* Javan Turtle-Dove *(Streptopelia bitorquata),* Banded Pitta *(Pitta guajana),* Mangrove White-eye *(Zosterops chloris),* Lesser Adjutant *(Leptopilus javanicus), and* Great Thick-Knee *(Esacus magnirostris).*

Wildlife

196. A variety of animals can be found in the National Park, including Banteng *(Bos javanicus),* Wild Boar *(Sus scrofa),* Rusa Deer *(Cervus timorensis),* Long-tailed Macaque *(Macaca fascicularis),* Ebony Leaf Monkey *(Trachypithecus auratus),* Barking Deer or Muntjac *(Muntiacus muntjak),* Hawksbill Turtle *(Eretmochelys imbricata),* Leopard Cat *(Prionailurus bengalensis),* Pangolin or Trenggiling *(Manis javanicus),* Large Flying Fox or Kalong *(Pteropus vampyrus),* Black Giant Squirrel *(Ratufa bicolor),* and Water Monitor *(Varanus salvator).*The Critically Endangered Hawksbills Turtle (*Eretmochelys imbricata*) are frequently sighted along the north coast. Based on the information from the staff of Bali Barat National Park and from the observation during the field survey, Bantengs are no longer found in the national park. Table 4.16 shows the list of protected fauna in the Park.

Table 4.16: Protected Fauna in Bali Barat National Park

Sl. No.	Scientific Name	Local Name	Conservation Status
1	*Leucopsar rothschildi*	Jalak Bali	Critically Endangered Rare; Protected
2	*Manis javanicus*	Trenggiling, Kesih (Bali)	Endangered Rare; Protected , Category II (CITES)
3.	*Ratufa bicolor*	Jelarang, Kapan-kapan (Bali)	Near Threatened Rare; Protected , Category II (CITES)
4	*Porcupine*	Landak	Locally considered Rare
5	*Felis marmorata*	Kueuk	Locally considered Rare; Protected by the population descended
6	*Cervus timorensis*	Menjangan	Protected; Category II (CITES)
7	*Bos javanicus*	Banteng	Rate; Endangered, Category III Vulnerable
8	*Trangulus javanicus*	Pelanduk, Kancil (Bali)	Rare; Protected by the population descended
9	*Varanus salvator*	Biawak	Rare
10	*Lepidochelys olivceae*	Penyu rider	Rare; Protected

Source: Bali Barat National Park.

Corals

197. About 110 species of corals belonging to 18 families were recorded in 1988, including 22 species of the mushroom coral family (*Fungiidae*), and at least 27 species of *Acropora* coral found in the 3,415 hectares of marine protected area includine a mangrove forest and coral reefs located in the Core Zone of the Marine Protected Area.

c. Biodiversity Study for the TL alignment through Bali Barat National Park

(i) Vegetation type

Mixed Monsoon forest

198. Transmission Line Tower T crossing B, T Anc B1,T Anc B2, and tower T03 to T019 located at mixed monsoon forest. Vegetation type at tower T Crossing, T Anc B1 and T anc B2 originally was savanna vegetation type and now more to a forest structure (Figure 4.24).

199. The vegetation at Transmision lines RoW consist of Intaran (*Azadirachta indica*), Jerukan (*Xanthopyllum excelsum*), Talok (*Grewia koordersiana*), Bekul (*Zizypus mauritiana*), Pilang (*Acacia leucoplea*), Suli (*Bridelia monoica*), Kitejo (*Cinnamomum iners*), trenggulun (*Protium javanicum*), Sawo kecik (*Manilkara kauki*). Walikukun (*Shoutenia ovata*), Serut (*Streblus asper*), Kapasan (*Croton argyratus*) and Laban (*Vitex pubescens*). Kayu pait (*Strychnos lucida*).

Figure 4.24: Mixed monsoon forest

200. A complete list of vegetation with in the Transmission line RoW from tower T crossing to T19 is listed in Table 4.17.

Table 4.17: List of Plant Species within the Transmission Line RoW

No	Local name	Scientific name	IUCN Status	Remark
1	Bekul	*Zizipus mauritiana*	-	Invasive species
2	Bentawas	*Wrightia calycina A.DC.*	-	-
3	Buta-buta	*Excoecaria agallocha L.*	-	-
4	Ilalang	*Imperata cylindrica*	-	Invasive species
5	Intaran	*Azadirachta indica A.Juss.*	-	-
6	Jerukan	*Xanthophyllum excelsum Blume*	-	-
7	Kapasan	*Croton argyratus Blume.*	-	-
8	Kayu pait	*Strychnos lucida*	-	-
9	Kerasi	*Lantana camara*	-	Invasive species
10	Kesambi	*Schleichera oleosa Merr.*	-	Protected by Minister for Agriculture SK No54/Kpts/Um/2/1972
11	Kitejo	*Cinnamomum iners*	-	-
12	Laban	*Vitex pubescens Vahl.*	-	-

13	Pakis haji	*Cycas rumphii*	IUCN Near Threatened	-
14	Panggal buaya	*Zanthoxyllum rhetza (Roxb.) DC*	-	-
15	Pilang	*Acacia leuchoplea*	-	-
16	Kipait	*Chromolaena odonata*	-	Invasive species
17	Rukem	*Flacourtia rukam*	-	-
18	Rumput jampang	*Themeda villosa*	-	-
19	Rumput jarum	*Digitaria ciliaris*	-	-
20	Sawo kecik	*Manilkara kauki (L.) Dubard.*	-	Protected by Minister for Agriculture SK No54/Kpts/Um/2/1972
21	Serut	*Streblus asper*	-	-
22	Sono keling	*Dalbergia latifolia*	IUCN Vulnerable	Protected by Minister for Agriculture SK No54/Kpts/Um/2/1972
23	Suli	*Bridelia monoica*	-	-
24	Talok	*Grewia koordersiana*	-	-
25	Tekik	*Albizia lebeckoides*	-	-
26	Trengguli	*Cassia fistula*	-	Locally considered as Rare species
27	Trenggulun	*Protium javanicum Burm.f.*	-	-
28	Walikukun	*Shoutenia ovate*	-	-
29		*Pongamia pinnata*	-	-

Source: Field survey 2012

201. The following species were also observed during the field survey:

- Pilang tree (*Acacia leucoplea*), known for harbouring insects, is often visited by birds including Bali starling for insect, Needle grass *(Digitaria ciliaris*) and Jampang grass (*Themeda villosa*) are type of grass that grows in several locations within the Bali Barat National Park, which serves as a food source for Barking deer and Rusa deer.
- Kerasi (*Lantana camara*) and Ki Pahit (*Chromolaena odonata*) are dominating shrubs in the area especially at the savanna. *Lantana camara,* known as invasive species are transferred in the park by animals that eat *Lantana camara* fruit.

202. **Salt lick pond,** a patch of evergreen vegetation found in the monsoon forest at Prapat Agung temple about 60 m west of Transmission line tower T012 – T013 (Figure 4.25) is dominated by a salt tolerant tree known as Buta buta tree (*Excoecaria agallocha*). The Buta buta tree grows in the surrounding puddles of brackish water (S: 218,419; E: 9099845). Mammals such as barking deer, rusa deer, long-tailed macaque, and Ebony Leaf Monkey visit the puddles for salt licking. It was observed that these mammals are not afraid of humans since the area is near a tourist site for people visiting temples.

Figure 4.25: Salt Lick Pond at Prapat Agung

Mangrove

203. **Tower T020 -T024**, The RoW will pass across Gilimanuk Bay (Figure 4.26), where Tower 022 will be located at Gadung Island, which is covered by undisturbed mangrove vegetation. Mangrove vegetation in the area are; Bakau kurap (*Rhizophora stylosa*), bakau tinjang (R.apiculata), api api (*Avicenia marina*), prepat (*Sonneratia alba*), truntun (*Lumnitzera racemosa*), Cantigi (*Pemphis acidula*). A complete list of mangrove vegetation is in Table 4.18.

Table 4.18: Mangroves species in Gilimanuk Bay

No	Scientific Name	Local Name
1	*Acrosticum aureum*	Pakis rawa
2	*Avicenia marina*	Api-api
3	*Aegiceras floridum*	Gigi gajah
4	*Bruguiera cylindrical*	Tanjang putih
5	*B.gymnorrhiza*	Tanjang
6	*Ceriops tagal*	Tingi
7	*Excoecaria agallocha*	Buta-buta
8	*Lumnitzera racemosa*	Truntun
9	*Nypha fruticans*	Nipah
10	*Rhizophora apiculata*	Bakau tinjang
11	*R. mucronata*	Bakau
12	*R. stylosa*	Bakau kurap
13	*Sonneratia alba*	Perpat
14	*Osbornia octodonta*	Osbornia
15	*Pemphis acidula*	Cantigi
16	*Xylocarpus granatum*	Nyiri
17	*X. mollucensis*	Pohon kira kira

Source: Field survey 2012

204. Vegetation at Burung island is classified as mangrove. On the other hand, vegetation at Gadung Island consists of two types - mangrove vegetation type at area influence by tidal, and coastal vegetation type in the middle of the island which is a dry land. Coastal vegetation type consist of *Schleichera oleosa Merr*, *Diospyros maritime*, *Hibiscus tiliacus* , *Eugenia javanica*, *Acrosticum aureum*, *Eupatorium inulifolium* and some grasses (Arinal and Utami, 2011).

Sea grass

205. Sea grass patches grow almost all over Gilimanuk bay but the most dense sea grass beds at Gilimanuk bay lies at five meter (5m) offshore between Burung and Kalong Islands and Buaya bay extending about 200m and about 500m in width along the sandy beach (1.37% gravel, 94.98 % sand and 3.04% silt). The sea grass consists of 6 species, namely: (1) *Enhalus acoroides*; (2) *Halophila ovalis*; (3) *Halodule uninervis*; (4) *H pinifolia*: (5) *Thalassia hemprichii;* and (6) *Cymodocea rotundata* (Al Hakim and Wahyuni, 2009).

Figure 4.26: Gilimanuk Bay, part of the Bali Barat National Park

206. Important facts about the Gilimanuk Bay based on field observations:

- Gilimanuk bay is a small bay with the tides two times a day (diurnal). At the lowest tide sandbar and some seaweed around the island Kalong, Birds and Gadung were exposed.
- The beach outside of Gilimanuk bay is dirty but beach inside the bay is considerably clean.
- During low tide, local people take the opportunity to collect bivalves mollusk such as *Anadara maculosa*, *Pinna muricata* , *Modiolus sp* (Figure 4.27) at the sand bank and reef flat. Based on LIPI (Indonesian institute for Science) report on Mollusca research in 2005, economically value bivalves in the area seem decreasing due to over harvesting. In the past years, oyster such as *Pinctada margitifera* and *Pteria penguin* can be found in the area.

Figure 4.27: Bivalves collected by local people

(ii) Bird species

207. Base on latest Bali Barat NP birds survey, at least 160 species can be found in the Park. Of these species, about 31 species use Gilimanuk Bay as habitat (see Appendix 15). There were 17 species observed during the field survey. Only a few birds were observed during the survey (Table 4.19).

Table 4.19: Birds observed during fieldwork between Crossing Tower to T022

No	Location	Common names	Scientific name	Status
1	T Cross B T Anc B1 TAnc B2	Asian Glossy Starling	*Aplonis panayensis*	LC
		Collared Kingfisher	*Todirhampus chloris*	LC
		Yellow-ventet Bulbul	*Pycnonotus goiavier*	LC
		Blue-tailed Bee-eater	*Merops philippinus Linnaeus, 1766*	LC
		Green Jungle fowl	*Gallus varius (Shaw, 1798)*	LC
2	T012-T013	Asian Glossy Starling	*Aplonis panayensis,*	LC
		Green Jungle fowl	*Gallus varius (Shaw, 1798)*	LC
		Asian Common Dollar bird	*Eurystomus orientalis (Linnaeus, 1766)*	LC
		White Collared Kingfisher	*Halcyon chloris*	LC
		Yellow-vented Bulbul	*Pycnonotus goivaier*	LC
3	T20-T22	Little Egret	*Egretta garzetta*	LC
		Blue-tailed Bee-eater	*Merops philippinus*	LC
		Chesnut headed Bee eater	*Merops leschenault*	LC
		Collared kingfisher	*Todirhampus chloris*	LC
		Little tern	*Sterna albifrons*	LC
	Gilimanuk Bay	Grey-tailed Tattler	*Heteroscelus brevipes*	LC
		Whimbrel	*Nemenius phaeopus*	LC
		Little Whimbrel	*Nemenius minutus*	LC
		Lesser Adjutant Stork	*Leptoptilos javanicus*	VU
	Prapat Agung	Beach Stone-curlew	*Esacus magnirostris*	NT
		Lesser Adjutant Stork	*Leptoptilos javanicus*	VU
		Little tern bird	*Sterna albifrons*	LC

Source: Field survey 2012
LC: Least Concern, IUCN

Birds observed at Gilimanuk bay and Prapat Agung (inter tidal ecosystem)

208. Gilimanuk Bay (Figure 4.26), is about 2 km wide, very shallow (3-12m), contains three small islands, and has some areas of mangrove with coral reef lying just outside the mouth of the bay. Gilimanuk bay and Prapat Agung are known as a feeding ground for resident and migrant birds. During low spring tide (Figure 4.28), exposed sand bank around Kalong, Burung and western part of Gadung island, mud flat at the eastern part of Gadung island, reef flat at Prapat Agung and Buaya bay will provide food for birds such as small fish, various kinds of shellfish, crab, worms. Based on information from the local people, low spring tides occur twice a month and lasts for about three days.

Figure 4.28: Sand bank at Gilimanuk Bay during low spring tide

209. Based on information from the National Park officers, Gilimanuk Bay is often visited by migratory bird flown from Asia and Europe towards Australia or New Zealand. Migratory birds start arriving in February and the peak of their migration is in April. The birds continue their migration and usually come back in September to October at Gilimanuk Bay before they continue their migration. The migratory birds used the sand bank, mud flats and reef flats as feeding ground (Kusumanegara, personal communication 2013).

210. Field survey conducted on January and March 2013 during low tide did not find any migratory birds. The result of the survey is also supported by Dr Noerjito (personal communication 2013) an ornithologist who did some research on bird at Bali Barat National Park. According to him, it is not evident that Gilimanuk bay is used as a stopover by migratory bird.

211. Bali Island is known as an important raptor diurnal Autumn migratory path (Germi, 2005). Bali Barat also known as migratory path (Ash.J.S, 1993, Nijman, et.al., 2006). Raptor migratory path on Bali Barat at Trima bay (Ash,1993; Germi.F., 2005 and 2006) and there were also observations on raptor migration crossing Gilimanuk Bay (Personal communication, Sugiarto 2013). The bird species found during January and March 2013 survey are:

- Great thick knee (*Esacus magnirostris)* an IUCN NT birds found at the beach of Prapat Agung close to the national park guard house near the proposed jetty location and transmission tower Bali T15 and T16 (Figure 4.29).
- Lesser Adjutant Stork (*Leptoptilos javanicus*, Horsfield, 1821) an IUCN Vulnerable Bird was found feeding at reef flat of Prapat Agung and Buaya bay and roosting at mangrove tree at Burung Island (Figure 4.30a). Based from the information and record of the National park, Lesser adjutant is permanent resident of Gilimanuk bay. The Bird feeding ground during low tide are at reef flat of Prapat Agung and Buaya Bay and the mud flat area close to Gadung island (Figure 4.31 and Figure 4.32), feeding ground during high tide are at Tegal Bunder area and some swampy area at the eastern of Gilimanuk bay.

- Several small groups birds like Grey-tailed Tattler (*Heteroscelus brevipes*), Whimbrel (*Nemenius phaeopus*), Little Whimbrel (*Nemenius minutus*), were observed resting on braches mangrove or mangrove roots at Gadung island, Buaya Bay and Batu Payung (Figure 4.30b, 4.30c, 4.30d),
- Little Stern bird (*Sterna albifrons*), an IUCN LC was observed resting at a sand bank located at the southern of Prapat agung. This bird probably a migrant bird since Little Stern is known to have two sub species: one is a migrant and the other is resident bird (Figure 4.30e).
- Proposed Crossing Tower (T cross B) at Lampu Merah located at the area used by Merops philippinus Linnaeus, 1766 (Blue-tailed Bee-eater) IUCN status LC for nesting on January.

Figure 4.29: Great thick knee at Prapat Agung beach

(a) Lesser Adjutant Stork at reef flat and on mangrove tree

(b) Grey tailed tattler (Heteroscelus brevipes) (c) Little Wimbrel (Nemenius minutus)

(d) Wimbrel (*Nemenius phaeopus*) (e) Little Stern (*S.albifrons pusssila*)

Figure 4.30: Birds observed during the field survey in January and March 2013
(a) Lesser adjutant stork; (b) Grey tailed tattler; (c) Little Wimbrel; (d) Wimbrel; and (e) Little Stern

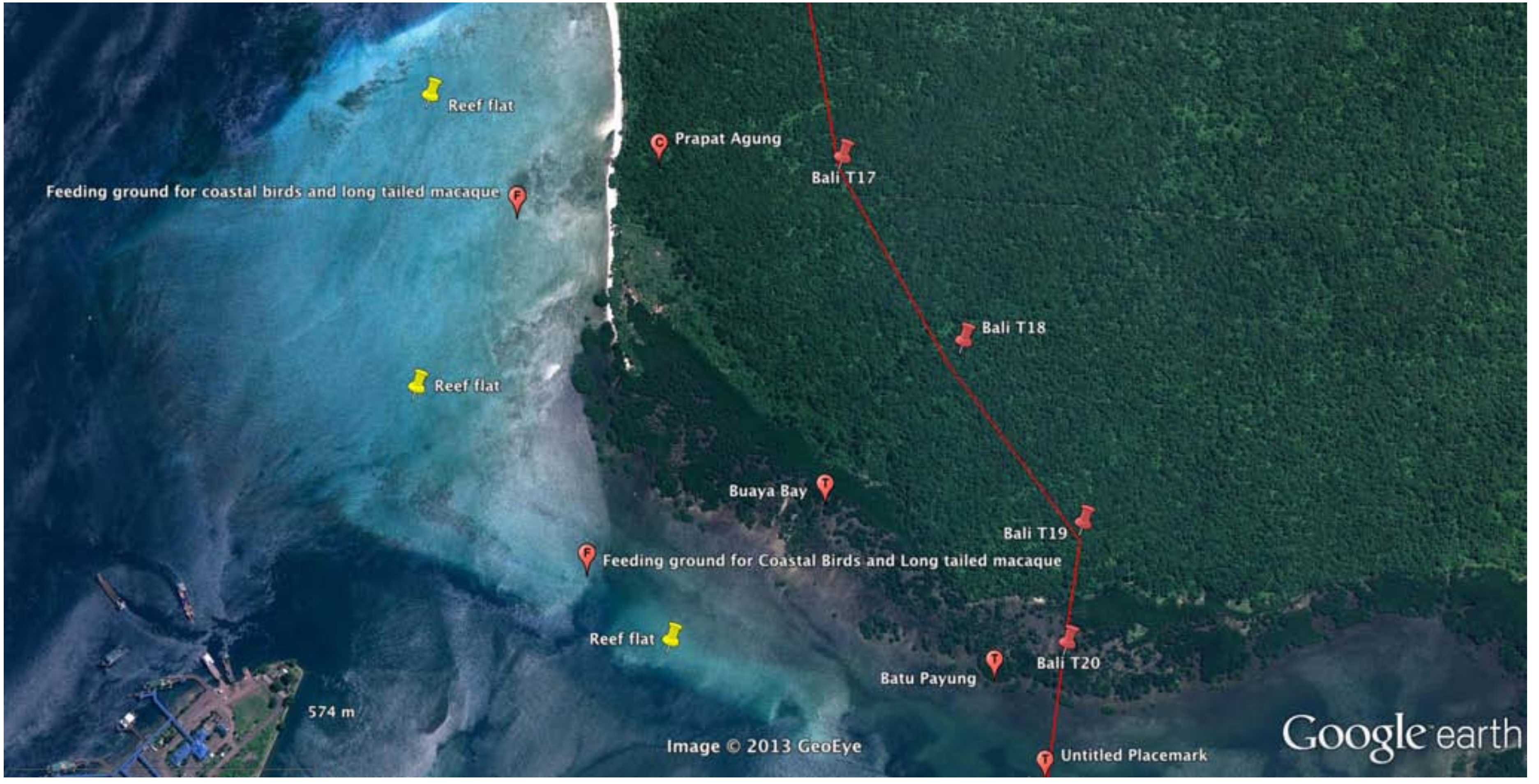


Figure 4.31: Reef flat, a feeding ground for coastal bird and long tailed Macaque at Prapat Agung

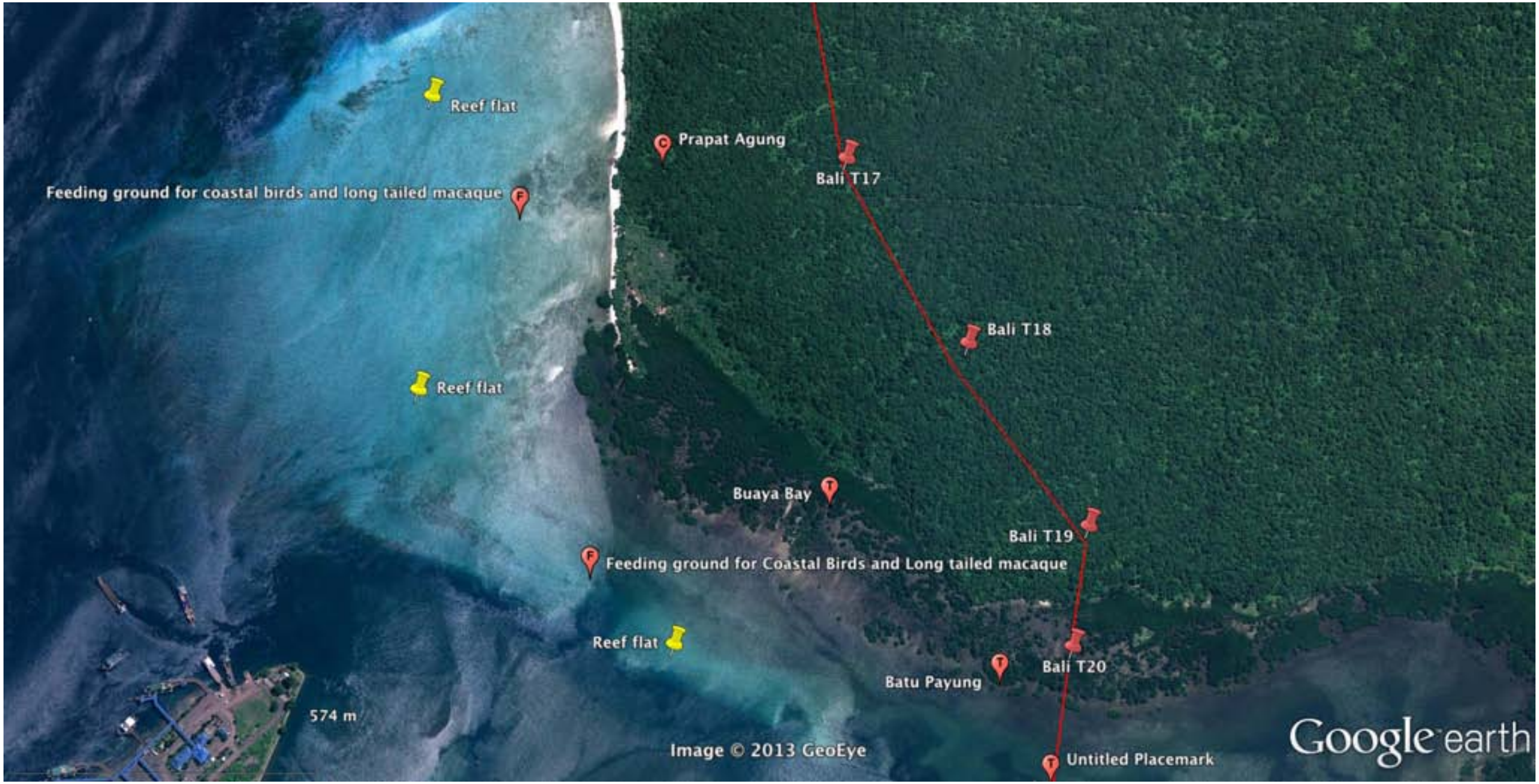


Figure 4.32: Mud flat, a feeding ground during low tide for coastal birds and long tailed Macaque at Gadung island

(iii) Mammals' species

212. During the survey between Tower T Crossing B to T018, the following four mammal species were observed:

213. **Long tail Macaque (Macaca fasicularis) IUCN LC**, was observed along the road from the national park entrance to Prapat Agung (TL Tower T012) soliciting food from car passengers or Park visitors.

214. **Ebony Leaf Monkey (*Trachypithecus auratus)* IUCN Vulnerable,** during dry season was observed at the Buta Buta forest **(**Excoecaria agallocha). During wet season ebony leaf monkey was observed at the Lampu Merah area close to Bali Crossing tower and also in some areas along the road side parallel to the alignment TL RoW between tower T03 to T012 (Prapat Agung).

215. **Barking deer (*Muntiacus muntjak*) IUCN LC and Rusa deer (*Cervus timorensis*) IUCN Vulnerable,** during dry season Barking Deer and Rusa Deer, were found in some places along the road parallel to the alignment TL RoW between tower T05 to T018. It was observed that Barking deer has higher population than Rusa deer. Based on information from Park ranger, some animals such as long tailed macaque, Barking deer and Rusa deer use to come to the beach area. During wet season, Barking deer and Rusa deer are in the forest, far from roadside.

216. **Salt Licking,** is an area about 60 m west of Transmission line tower T012 toT013, (Figure 4.33) in the vicinity of the temple Prapat Agung, where the vegetation around the temple is dominated by plants buta buta (Excoecaria agallocha). The buta buta trees grow around puddles of brackish water (S: 218,419; E: 9099845). Mammals visit this brackish water puddle for salt licking (Figure 4.34).

217. It was also observed during the field survey that excreta of Asian palm civet (*Paradoxurus hermaphrodites)* IUCN Least concern, an arboreal animal was found around Tower Anc B1 and B2.

Figure 4.33: Salt Licking Area (in the vicinity of Prapat Agung, Bali Barat National Park)

Figure 4.34: Big Mammal around the brackish water puddles at Prapat Agung

C. SOCIO-ECONOMIC ENVIRONMENT

1. East Java and Bali Population

218. The Project TL will pass through five districts of East Java and Bali provinces with a total population of 4.1 million (Table 4.20). In East Java the TL will pass through a total of 15 subdistricts with a population of 660,000; in Bali the TL will pass through a total of nine subdistricts with a population of 719,000 (Table 4.21).

Table 4.20: Population, Project area Provinces and Districts

Province / Districts	Population
East Java Province	**3,387,017**
Probolinggo	1,162,217
Situbondo	640,882
Banyuwangi	1,583,918
Bali Province	**719,176**
Jembrana	304,956
Tabanan	414,220
Total	**4,106,193**

Source: East Java and Bali Digest of Districts in Figures, 2009.

Table 4.21: Project area demographics

District	Land Area (km^2)	Population Density (nos./km^2)	Affected Sub-districts (nos.)	Total population of affected subdistricts	Population below poverty line	Electricity Consumers (households)
East Java Province						
Probolinggo	1,696	685	1	72,566	8,680	6,797
Situbondo	1,639	391	11	417,415	168,506	138,135
Banyuwangi	57,825	274	3	170,153	70,656	25,681
			Sub-Total	**660,134**	**247,842**	**170,613**
Bali Province						
Jembrana	841	261	5	304,956	6,444	38,253
Tabanan	893	460	4	414,220	11,624	78,905
			Sub-Total	**719,176**	**18,068**	**117,158**

Source: Digest of Districts in Figures, 2009.

219. The population growth rate of Indonesia was 1.49% from 2000-2010. During the same period East Java's growth rate was 0.78% and Bali's was 2.15% (Table 4.22).

Table 4.22: Population growth by province

Province	Average Annual Population Growth Rate (%)			
	1971-1980	**1980-1990**	**1990-2000**	**2000-2010**
East Java	1.49	1.08	0.7	0.78
Bali	1.69	1.18	1.31	2.15
Indonesia	2.31	1.98	1.49	1.49

Source: BPS.

2. Socio-economic conditions in Java and Bali

GDP

220. Java, Bali and Sumatra are the largest contributors to Indonesia's economic growth, and the eastern islands share of the national gross domestic product (GDP) has been growing in recent years. Data for 2009 indicate that Java and Bali contributed 59% of the national GDP, followed by Sumatra with 23%.

Poverty

221. Indonesia's food poverty line is defined as the expenditure on a 52-item food bundle that provides 2,100 kilocalories per person per day (BPS, 2008). Indonesia's national poverty line is defined as the food poverty line plus the "minimum required" expenditure on a 46-item non-food bundle (BPS, 2008), which is equivalent to 200,262 Rp per month ($22 as of March 2010). Households with a monthly income at or below national poverty line are considered poor.

222. Of the two provinces the highest numbers of poor people are in East Java, with 6.651 million or 18.51% of the total provincial population, consisting of 2.311 million from urban areas and 4.341 million from rural areas. In Bali 0.216 million are poor or 6.17% of the total population of the province, with 0.115 million from urban areas and 0.101 million from rural areas.[31]

Electrification Rate

223. The electrification rate in Indonesia is about 68.9%, the lowest in Southeast Asia, meaning that as many as 90 million people still do not have access to electricity, often in the rural areas of remote islands. Electrification is higher in the rural areas of Java and Bali provinces. Nonetheless, household electrification in Bali is only 72% whereas the Government's target is 100% electrification by 2020.

224. According to PLN electricity distribution data from PLN, in 2009 the total number of consumers in Bali was 750,994, the majority of which were residential (Table 4.23).

Table 4.23: Number of electricity consumers and annual growth in Bali Province

Consumer Type	Number	Annual Growth (percent)
Residential	656,299	6.07
Commercial	67,169	7.72
Public	26,861	4.54
Industrial	665	1.61

Source: PLN data on electricity distribution

3. Affected Persons

Demographics and Assets

225. The total number of project affected households (PAHs) is 1,210, consisting of 815 PAHs (2,227 people) in East Java Province and 395 PAHs (1,585 people) in Bali. Information on the general characteristics of PAHs and affected persons (APs) was collected through a household

[31] Data and Information Poverty, 2008, BPS.

questionnaire distributed to a total of 344 PAHs, equivalent to 28% of the households which will be impacted by the Project through land acquisition and impacts on assets.

226. The average family size is 3.48 persons. The dependency ratio between productive age household members to nonproductive age members is 34%.The majority of PAHs (over 80%) live in rural settlements (Table 4.24).

Table 4.24:Type of PAH settlements

Type of Settlement	Number of respondents	Percentage of total respondents (percent)
Rural	287	83.43
Rural Urban	15	4.36
No Answer	42	12.21

Source: TA 7325 Consultant Survey

227. The majority of respondents indicated that they are traditional single “nuclear” families (approximately 47%), 31.4 % are joint families, while the remainder are extended or other family types. (Table 4.25). Only 5% of the APs live in households headed by women; these are considered as being vulnerable families.

Table 4.25: Distribution of PAHs by family type

Family Type	Number of respondents	Percentage of total respondents (percent)
Joint	108	31.40
Nuclear	160	46.51
Extended	2	0.58
Others	3	0.87
No Answer	71	20.64

Source: 7325 Consultant Survey

228. Table 4.26 shows gender and the age composition of APs. About 18% of household members are below 14 years of age, while 75% of households members are in the productive age group of 15-64.The female to male ratio is 100:97.

Table 4.26: Affected Persons (AP) age groups

Age group	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
0-14 year	106	17.40	105	17.85	211	17.62
15-44 year	278	45.64	271	46.08	549	45.86
45-64 year	178	29.22	166	28.23	344	28.72
65+ year	47	7.71	46	7.82	93	7.76
Total	**609**		**588**		**1197**	

Source: TA 7325 Consultant Survey

229. In terms of religion, 45% of PAHs are Muslim (primarily in Java) and 41% are Hindu (primarily in Bali) (Table 4.27).

Table 4.27: Religious affiliations of PAHs

Religion	Number of respondents	Percentage of total respondents
Muslim	153	44.48
Catholic/Christian	4	1.16
Buddhism	2	0.58
Hinduism	140	40.70
Other (traditional belief)	2	0.58
No Answer	43	12.50

Source: TA 7325 Consultant Survey

230. In addition to its impacts on local communities, the Project also impacts surrounding buildings and environment. Residents' assets affected by the Project include land, houses/buildings, plants and trees. The number of PAHs whose land will be affected is 450 in East Java and 392 in Bali.

231. The land area affected by the Project in East Java province is 397,554m^2 while in Bali it is 22,622,744m^2. As much as 93.35% of the affected land is private property in Bali; while in East Java, 73.26% is private property and the rest belongs to the Government. In Bali the number of affected buildings is 209 units and in East Java it is 126 units. Based on survey results, in Bali Province there are 250 severely affected households (more than 30%of land affected), while East Java province has the greater number with 532 households.

Education

232. Survey results indicate that less than 54% of adult members of PAHs have a primary school education; 18% have completed junior high school; 22% have completed high school; and 6 % have a graduate or post graduate education. There is a significant gap in the education levels of females and males, with women having a higher rate of illiteracy and lower rates of higher education (senior high school and graduate/post-graduate degree)(Table 4.28).

Table 4.28: Education levels of adult members of PAHs

Group	Illiterate	Not attained primary	Primary school	Junior HS	Senior HS	University	Post-Graduate	Total
Males adult	21 (3.9 %)	78	164	100	139	39	4	545
Females adult	67 (13.0 %)	87	153	92	93	23	1	516

Source: TA 7325 Consultant Survey

Employment

233. Agriculture and livestock rearing are the main occupation of PAHs workers in the project affected area, as more than 52% are farmers. Approximately 9% are engaged in daily wages laborer/driver work, 7% are employed in private and government sector, 3% run their own businesses, and the remainder work in other sectors (Table 4.29).

Table 4.29: Occupations of PAH workers

Occupation	No.	Percentage (percent)
Farmer/Livestock	632	52.23
Business/Trade/Shop Owner	39	3.22
Driver/Laborer	103	8.51
Employee (Private/Govt.)	86	7.11
Retired	10	0.83
Unemployed	7	0.58
Other	333	27.52

Source: TA 7325 Consultant Survey

234. A total area of 2,435 ha is cultivated by APs in the two provinces, dominated by rice production (Table 4.30).

Table 4.30: Crop types, land used and crop yields

S. No.	Type of Crops	Total of Land (m^2/ha)	Total of Yield (Thousand Rp)
1	Paddy/Rice field	4,143,108	779,854
2	Seasonal crops (palawija)	652,781	333,325
3	Other	19,563,994	1,301,130
Total		**24,359,884**	**2,414,309**

Source: TA 7325 Consultant Survey
Note: Other crops consist of plants excluding paddy/cereal and seasonal crops (palawija), e.g.: coconut, teak wood, bayur wood, clove, other trees/woods, sengon/jeunjing (albazia), rubber, banyan tree, coffee, tobacco, pepper, sugarcane, peanut, corn, cassava, green bean, fruit plants (mango, sawo, durian, banana), and cacao.

House Ownership and Indebtedness

235. Approximately 77% of affected families own a house and only small proportion (less than 1%) of households live in rented houses (Table 4.31).

Table 4.31:House ownership

House Ownership	Number of respondents	Percentage of total respondents (percent)
Owned	265	77.03
Rental	3	0.87
Other (using right, permit to use, land cultivator, etc.)	16	4.65
No Answer	60	17.44

Source: TA 7325 Consultant Survey

236. In terms of indebtedness, loans from banks are the most common form, followed by private sources (Table 4.32).

Table 4.32: Indebtedness (thousand Rp)

No.	Source	Total Debt	Total Paid	Balance
1	Bank	2406570	156051	2250519
2	Personnel/Private of non-Bank	261487	76143	185344
3	Other	40985	15673	25312
	Total	**2709042**	**247867**	**2461175**

Source: TA 7325 Consultant Survey

Social Infrastructure

237. Only 33.1% of the PAHs have access to piped water, below the national average of 42% in rural areas.Approximately 77% fulfill their water needs through other sources such as hand pumps, wells, and rivers and other surface water sources (Table 4.33). In terms of sanitation, almost 12% of PAHs do not have access to toilets (Table 4.34).

Table 4.33: Source of drinking water, PAHs

Drinking water source	Number of Respondents	Percentage of respondents (percent)
Piped	114	33.14
Hand pumps	17	4.94
Wells	111	32.27
River	10	2.91
Other (spring water, water from forest, public hydrant, mineral water, swadaya)	61	17.73
No Answer	31	9.01

Source: TA 7325 Consultant Survey

Table 4.34: Sanitation access, PAHs

Toilet Type	Number of Respondents	Percentage of respondents (percent)
No toilet	41	11.92
Pour flush toilet	224	65.12
Water closet, no septic tank	50	14.53
No answer	29	8.43

Source: TA 7325 Consultant Survey

238. Fifty percent of PAHs use wood as cooking fuel due to limited access to LPG; 33% of households use LPG, and less than 10% use kerosene and electricity for cooking purposes (Table 4.35).

Table 4.35: Cooking fuel sources

Cooking Fuel	Number of Respondents	Percentage of respondents (percent)
Electricity	10	2.91
Wood	172	50.00
Kerosene	15	4.36
Other (LPG/Gas)	114	33.14
No Answer	33	9.59

Source: TA 7325 Consultant Survey

239. Table 4.36 shows a summary on the use of electricity by PAHs; electricity is mainly utilized for lighting purposes.APs were also asked about alternatives in case of no or limited access to electricity. More than half of respondents use kerosene as an electricity alternative, while 27% use other alternatives like candles, generators, hand lamps, flashlights and gas lamps (Table 4.37).

Table 4.36: Electricity use by PAHs

Electricity Using	Number of Respondents	%
Lighting	289	84.01
Cooking	11	3.20
Business	3	0.87
Other (computer, TV, ironing, radio, machine)	3	0.87
No Answer	38	11.05

Source: TA 7325 Consultant Survey

Table 4.37: Use of electricity alternatives

Alternative	Number of Respondents	Percentage of respondents (percent)
Kerosene	194	56.40
Battery	18	5.23
Wood	3	0.87
None	1	0.29
Other (candle, generator, hand lamp, flashlight, gas lamp)	93	27.03
No Answer	35	10.17

Source: TA 7325 Consultant Survey

4. Settlements, Physical and Cultural Resources in Transmission Lines Right-of-Way (RoW)

240. The 229 km TL RoW was selected so as to minimize encroachment on settlements, physical and cultural resources (PCRs) and commercial establishments.[32]The alignment passes though the residential areas of two villages in Component 2 (Paiton – Watudodol section) and six villages in Component 5 (Gilimanuk to New Kapal); however the alignment has avoided housing and commercial areas to the maximum extent possible.Neither substations (Components 1 and 6) are in settlement areas.

241. The TL RoW also crosses a number of public utilities such as roads at 8 locations, existing power TLs at 16 locations, railway tracks at two locations, etc. Based on site surveys there are no well-known sites of archaeological, historical or national importance, nor any famous places/sites of cultural, religious and tourist interests, defense installations, etc. However, on Bali the RoW is within 350 m of the Segara Rupek Hindu Temple in Bali Barat National Park.

242. The detailed inventory of public properties and utilities along the TL line alignment is shown in Appendix 6 (Project TL Detailed Strip Maps) and Appendix 7 (Detailed Features and Land Use along TL alignment).

[32] Physical cultural resources are movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings and may be above or below ground or under water. Their cultural interest may be at the local, provincial, national, or international level.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

243. This chapter identifies potential Project environmental impacts and presents appropriate mitigation measures. The analysis covers all Project components including Components 3 and 4 (see Appendix 8 for the due diligence review). Component 7, is also assessed through a due diligence review (Appendix 9). The due diligence results are fully incorporated into the main report.

244. Potential Project impacts have been identified related to the preconstruction, construction and operation phases. Impact predictions are based on the TA 7325 consultants' previous experiences on similar projects; professional judgment; data collected in the field; international good practice guidelines such as the World Bank *EHS Guidelines*; the due diligence review of the AFs and Component 7; and discussions with local communities, relevant and knowledgeable governments officials and relevant technical specialists. Predicted impacts relate to all aspects of the proposed TL and substations, with particular focus on environmentally sensitive areas. Many of the mitigation measures are related to good design practices, others with good construction and housekeeping practices.

245. This chapter includes additional information and site-specific mitigation measures for the construction activities in national parks from the study conducted by the biodiversity expert on the environmental impacts and mitigating measures in Bali Barat and Baluran National Parks.

A. GENERAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

1. Preconstruction

246. Preconstruction phase impacts are primarily related to Project siting including i) land acquisition and resettlement; ii) potential impacts on sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, TLs); iii) potential impacts on physical cultural resources (PCRs); iv) potential impacts on national parks; and iv) potential impacts related to the siting of temporary borrow and disposal pits, quarries and temporary worker camps. Mitigations are primarily related to careful selection of the RoW alignment so as to avoid or minimize impacts. There are also preconstruction phase environmental assessments and other clearances required from ADB, the Ministry of Environment (MoE) and the Ministry of Forestry (MoF).

a. Land Acquisition and Resettlement

247. The siting of substations and the TL RoW will result in land acquisition and resettlement, though based on the Component 7 review (Appendix 9), there are no resettlement impacts expected associated with the substation upgrading and extension.

248. To mitigate these impacts:

- During the selection of the RoW alignment significant effort was directed to avoiding or minimizing impacts on land acquisition and structures (see Appendix 6 for detailed TL alignment strip maps). This effort will continue during the finalization of the alignment in detailed design.

- A Land Acquisition and Resettlement Plan (LARP) has been developed and uploaded in the ADB website in accordance with Government and ADB requirements.

b. Sensitive Receptors and Existing Infrastructure

249. The siting of substations and the TL RoW has the potential to negatively impact sensitive receptor**s** (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, TLs). To mitigate these impacts:

- During the selection of the RoW alignment significant effort was directed to avoiding or minimizing impacts on sensitive receptors and existing infrastructure (see Appendix 6 for detailed TL alignment strip maps).

250. Nonetheless, it has been impossible to completely avoid all infrastructure and sensitive areas, and the TL will pass within the vicinity of several settlements. It will also cross eight major rivers and numerous small streams, major roads at eight locations, railway tracks at two locations, and existing power TLs at 16 locations. It will also cross two National Parks. To further mitigate potential impacts:

- Where the TL does pass in the vicinity of sensitive receptors a buffer of 500 m from the edge of the RoW will be maintained such that no significant impacts are expected.

- Impacts on public utilities have been minimized by incorporating environment- friendly construction methods in the engineering design.

- Works around public utilities will be carried out in consultation with relevant authorities.

- Additional public consultation will be undertaken prior to and during the construction phase to ensure that the public is aware of planned construction activities and understands the Grievance Redress Mechanism (Public Consultation, see Chapter VII; GRM, see Chapter VIII).

c. Physical Cultural Resources

251. The siting of substations and the TL RoW alignment has the potential to negatively impact physical cultural resources (PCRs). To mitigate these impacts:

- During the selection of the RoW alignment significant effort was directed to avoiding any identified PCRs (see Appendix 6 for detailed TL alignment strip maps).

252. Based on site surveys, the current TL alignment and substation siting does not encroach on any known PCR sites. Nonetheless,

- A chance find procedure will be put in place.

d. National Parks

253. TLs can have significant impacts when routed through conservation areas such as National Parks, including loss of trees and vegetation, impacts on floral and faunal biodiversity, disturbances to wildlife, habitat fragmentation, and the potential for increasing park encroachment. To mitigate these impacts:

- During the selection of the RoW alignment significant effort was directed to minimizing the impacts on National Parks. However, the volcanic topography of Java and the juxtaposition of Java and Bali islands provide limited options. These limitations have also been faced by previous infrastructure projects, and as noted above on Java the proposed RoW closely follows the main Surabaya to Banyuwangi highway as well as an existing 150 kV line running from Paiton to Watudodol. 18.60 km of the Component 2 TL will pass through a teak plantation in the Wilderness and Utilization zones of Baluran National Park, affecting an area of 63.30 ha. On Bali the RoW closely follows the Gilimanuk to Denpasar highway, as well as an existing 150 kV TL running from Gilimanuk to the main load center in southern Bali. 11.80 kms of the proposed alignment of components 3 and 4 will pass through the Wilderness and Utilization zones of Bali Barat National Park, affecting an area of approximately 40.12 ha.

- In Baluran the alignment area is dominated by monoculture Teak and Gmelina plantations; no incursion of the alignment into the Core Zone will occur. This significantly reduces impacts compared to an alignment passing through non-plantation forest.

- Additional mitigation measures for Baluran and Bali Barat National Parks related to impacts on flora, fauna are presented in sections on Collaborative Agreement between PLN and the Bali Barat and Baluran National Parks.

- Under PLN's Forest Rent Use Approval in Principal Permit, Collaborative Agreements were drafted between PLN and Baluran and Bali Barat National Parks, which will provide support to the Parks so as to offset potential construction impacts on biodiversity and ensure no net loss of biodiversity.

e. Temporary Borrow and Disposal Pits, Quarries and Temporary Construction Camps

254. There will be a requirement to establish temporary borrow and spoil disposal pits to source materials from quarries, and to establish temporary workers' camps and other contractor's facilities. If not sited or undertaken carefully these activities can result in reductions to air, water, and biodiversity quality; landscape impacts; and social impacts including social unrest and disease transmission. To mitigate these impacts:

- The locations of temporary borrow and spoil pits, temporary workers' camps and contractor's facilities will be determined during detailed design in accordance with applicable laws and regulations in Java and Bali Provinces and good international practices.

Temporary Borrow and Disposal Pits

- Borrowand disposal pits will not be located in environmentally sensitive areas, including within 100 m of the National Parks other than within the RoW, or within 100 m of wetlands, mangroves and other high ecological value areas.

- The National Park authorities will be consulted as to any proposed temporary borrow or spoil pits within the RoW in the Park or adjacent to the Park.

- Local community leaders will be consulted regarding the design and location of all borrow and disposal pits so as to ensure the safety of local communities.

- Borrow and disposal pits are to be located away from settlements and hill slopes facing settlements so as to minimize visual impacts.

- Spoil disposal pits should be in suitable depressions not adjacent to waterways.

- For rehabilitation of temporary borrow and disposal pits, see the subsection in Construction Impacts and Mitigation Measures for Erosion, Borrow and Spoil Pits, and Sourcing of Aggregates (Section 2a).

Quarries

- Construction materials for tower foundations and access road works will be sourced only from established quarries approved by relevant local authorities and which comply with environmental, health and safety and other applicable regulations.

Temporary Construction Camps and Facilities including Hot Mix and Batching Plants

- Should be located at least 500m away from settlements.

- Should not be located in environmentally sensitive areas, including within 500 m of the Baluran National Park, wetlands, mangroves and other high value ecological areas.

- Should have adequate drainage and not be subject to flooding.

- Should not be within 100 m of any domestic or public water sources.

- The Baluran National Park authority should be consulted as to any proposed temporary workers' camps or other facilities in the Park vicinity.

- Local MoF departments should be consulted as to any proposed temporary construction camps or other facilities in Production or Limited Production Forests.

- Local community leaders should be consulted regarding the design and location of temporary construction camps and other facilities to minimize impacts on local communities.

f. Ministry of Environment and Ministry of Forestry Clearances Prior to Commencement of Physical Works

255. As described in Chapter II, there are several mandatory environmental clearances required before the Project can proceed to the construction stage.

AMDAL

256. MoE Regulation No. 5/2012 requires that TL projects greater than 150 kV or which cross provincial boundaries require an AMDAL approved by the MoE before works can proceed.

257. PLN has recruited the Environmental Research Center (*Pusat Penelitian Lingkungan Hidup* or PPLH) of the University of Udayana in Denpasar Bali to undertake the Project AMDAL process. A draft AMDAL ToR was prepared by PPLH which underwent extensive review and revision and was approved by MoE in July 2012 (Appendix 4). The ToR for the AMDAL is comprehensive and covers impacts to be assessed including biodiversity, alternatives assessment, public participation, and detailed methodologies for data collection and analysis. No physical works will be undertaken prior to the ANDAL approval.

258. The AMDAL or Environment Permit for the Project was issued in April 2013 (see Appendix 5a and 5b)

Production and Protection Forests Rent Use Permit

259. Construction of the TL will lead to loss of vegetation at the tower bases and at any access roads (though few will be required). In addition vegetation within the RoW will be trimmed to obtain the necessary clearance from the tops of trees to the conductors as per SNI 04-6918-2002. This will reduce the chances of forest fires due to arcing.

260. During the selection of the RoW alignment significant effort was directed to minimizing the impacts on Production and Protection Forests. However, due to limitations imposed by topography, not all forest areas could be avoided.

261. As per *Government Regulation No. 24 Year 2010 on the Utilization of Forest Areas* and *Ministry of Forestry Regulation No. P/18/Menhut-II/2011 on Guidance in Respect of Forest Rent Permits,* PLN has obtained a Forest Rent Use Permit from the MoF to utilize Production/Limited Production Forest areas and Protected Forest areas for non-forestry activities.

2. Construction

262. Construction phase impacts include site erosion and landslides; impacts on surface and groundwater; solid waste management; air quality issues, primarily related to dust generation; noise; vegetation removal or cutting and other impacts on flora and fauna; destruction of PCRs; aesthetic impacts; and occupational and community health risks. PLN will also implement their Standard Operating Procedures (SOP) for Environmental Management, Emergency Preparedness and Response and Health and Safety (Appendix 16) as part of the mitigation measures. Of these potential impacts, perhaps the most important are flora and fauna issues associated with construction inside the National Parks. Mitigation measures include good construction and housekeeping practices, Collaborative Agreements between PLN and the Baluran and Bali Barat Park Authorities to offset negative impacts and support conservation activities in the Park, TL site ecological rehabilitation to be undertaken in the teak plantation area by the Baluran National Park Authority and in Bali Barat through the Collaborative Agreement, and compensation planting for the loss of trees in the RoW.

a. Erosion, Borrow and Spoil Pits, and Sourcing of Aggregates

263. Construction activities for the TL and substation expansion/establishment,including installation of towers, construction of new access roads and clearing of tower bases,have the potential to lead to site erosion and landslides and associated impacts on water quality and aquatic life. In addition, the sourcing of soil and aggregates has become a major issue in Java and Bali; they are often obtained illegally from river deposits which can cause significant environmental impacts.

264. To mitigate these impacts:

- During detailed design of final tower, locations should avoid steep erosion prone slopes as much as possible.
- Materials used for tower foundations and surface dressing will consist mainly of aggregates and gravel, which do not contain silt.
- Excavation and earthworks should be undertaken during the dry season to the maximum practical extent when the risks from erosion and silt run-off are lowest.

- Streams, river and drains within and adjacent to construction sites should be kept free from any debris.

- Cut and fill should be balanced to the extent practical at each site in order to minimize the need for fill and for spoil disposal. Cut material should be used to level the site area or be disposed at designated spoil disposal sites.

- Cut slopes should be re-vegetated immediately after construction activities.

- Aggregates should be sourced from existing licensed quarries that comply with environmental and other applicable regulations, if available. If not available and new quarries are to be developed, the following measures should be observed:
    - site environmental investigations should be undertaken to ensure quarries are not in environmentally sensitive locations;
    - appropriate approvals should be obtained from relevant authorities;
    - relevant Indonesian health and safety regulations should be adhered to;
    - EMP dust control, noise control and health and safety requirements will apply to temporary quarries, as will environmental monitoring as presented in the Environmental Monitoring Plan (EMoP).
    - rehabilitation should include covering the quarry area with good quality soil and planting native vegetation. Surfaces should be provided with a low angle slope sufficient to avoid pooling of water which may be a breeding area for insects.

  - Temporary sites for borrowing and disposal of spoils should to be selected in compliance mitigation measures presented in the table of impacts and mitigating measures (Table 9.1).

  - The extent of area to be excavated at borrow pits should be demarcated with signs and access to the operational area controlled.

  - Excess spoil should only be directed to designated disposal areas and temporary quarries; no disposal in waterways is allowed.

  - Disposal pits are only to be used for spoil disposal and not for construction or other solid wastes.

  - Topsoil from borrow pits should preserved; borrow and disposal pits should be rehabilitated when no longer required. This includes ensuring rehabilitated sites are:
      - compatible with local land uses;
      - stable and safe;
      - covered with good quality soil and revegetated with appropriate native species; and,
      - provided with a low angle slope sufficient to avoid pooling of water which may be a breeding area for insects.

  - Construction sites within 50 m of waterways and mangrove area should be protected by silt fences.

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b. River Crossings, Streams, Irrigation Channels

265. The TL alignment crosses eight major rivers and small streams; however, as these are overhead crossings the impacts associated with construction of the TL will be minimal, though there may be some temporary impacts due to construction of access roads and foundations at locations near the water bodies.In addition construction of the New Kapal substation will impact an existing irrigation channel. To address these impacts, in addition to the erosion mitigation measures noted above:

- Natural watercourses should be maintained to the maximum extent possible.
- Work on access roads culverts and bridges should be limited to the dry season if possible, when many of the smaller streams will have low water flows. Water diversion works can thus be minimized or eliminated, and if diversion is required the original course can be restored immediately after the work is completed.
- Affected irrigation ditches and canals should be engineered so as to maintain their original function. This is particularly important at the New Kapal substation, where an underground conduit or diversion channel will be required to maintain the functioning of the affected irrigation channel.
- Drainage structures on access roads should be properly designed to accommodate forecast discharges.
- Debris and vegetation clogging culverts should be regularly cleared.

c. Fuels, Oils and Chemicals

266. Inappropriate storage of fuels, oils and chemicals at construction sites may lead to the contamination of surface and groundwater. To mitigate these impacts:

- Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course or drinking water source. For construction sites at the National park, no chemical and oil allowed to be strored inside the National Park.
- Refueling, oil changing and engine maintenance of machinery, equipment and vehicles should be undertaken in designated areas with containment to prevent any oil spills washing away, at distance of at least 100 m from any water course.
- Waste oil shall be collected and taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available.
- Oil contaminated material shall be disposed at designated waste disposal facilities.

d. Solid Waste Management

267. The construction of TLs, substations and access road will result in the generation of solid wastes including construction wastes, domestic wastes and waste spoil which can cause impacts on water quality, public health and aesthetics if not managed appropriately. To mitigate impacts from construction waste contractors will be required to adopt good construction site housekeeping practices:

- Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site (e.g. tower site, substation or substation access roads).
- Designated waste storage areas should not be within 50 m of water ways.
- Wastes should be routinely collected from the designated area and disposed at licensed waste disposal facilities approved by local environmental authorities.
- Upon completion of activities at a construction site all solid wastes should be completely removed, and the site should be revegetated or prepared for natural revegetation.

e. Air Quality

268. Construction activities that may lead to dust generation include cutting and excavation; transportation and tipping of cut materials; blasting operations; transportation of raw materials from quarries and borrow sites; transportation of tower materials, conductors and equipment; stone crushing; handling and storage of aggregates in concrete plants; concrete batching; site leveling and clearing of trees; laying of asphalt and construction of bridges on access roads; and construction of structures and associated activities.

269. Given the scale and dispersed nature of the Project construction these impacts will be localized to each construction site and small scale in nature. Nonetheless, to mitigate potential impacts:

- Substation construction sites and access roads should be sprayed with water as necessary to suppress dust.
- Accumulated soil and debris should be cleaned from adjacent tarmac roads as required.
- Truckloads should be covered, with the exception of on-site or local trips.
- Soil and temporary spoil piles should be covered or sprayed if generating dust. Piles that are not going to be used in the short-term should be allowed to develop vegetation cover.
- Hot mix and batching plants should be sited according to the mitigations presented in the table of environmental impacts and mitigating measures (Table 9.1), and should be operated in accordance with applicable World Bank *EHS Guidelines.*[33]
- Only controlled blasting should be carried out.

33 Environmental, Health, and Safety Guidelines for Construction Materials Extraction, World Bank, 2007. Available at: www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines.

270. During construction localized and relatively minor air quality impacts will also occur from vehicle emissions. To mitigate these impacts:

- All vehicles and machinery should be routinely checked and maintained and in good working order, and should be in compliance with relevant Government transport regulations.
- Excessive engine idling should be discouraged and machinery causing excessive pollution (i.e. visible clouds of smoke) should be banned from sites.

f. Electromagnetic Fields

271. Impacts of the electromagnetic fields (EMFs) on public health or fauna are not anticipated during the construction phase as conductor lines will not be energized.[34] When the TLs lines are energized there will be an increase EMF levels; potential impacts associated with the EMF increase are discussed in operational phase impacts.

g. Climate

272. The Project works will be localized activities and should not have any significant adverse impact on rainfall, temperature or humidity in the Project areas.

h. Noise

273. During the construction phase noise will be generated from the operation of heavy machinery, haulage of construction materials and tower materials to and around construction sites, and site construction activities including concrete mixing, excavation and blasting. These construction activities are expected to produce noise levels in the range of 80 – 95 dB (A) (Table 5.1), and may cause discomfort to local residents and fauna. To mitigate these impacts:

- Machinery operation and high noise activities should be carefully planned and scheduled.
- To the extent practical batching plants and construction areas should not be located with 500 meters of a settlement.
- Where that is not possible, high noise activities should cease between 22:00 and 06:00 hrs at any construction site within 500 meters of a settlement, or if noise complaints are received from settlement residents.
- Vehicles and machinery should be equipped with exhaust mufflers in accordance with relevant Government transportation regulations. Contractors should be required to fit noise shields on high noise construction machinery.
- Appropriate native trees (estimated at 375) will be planted along the boundary of the New Kapal and Paiton substations, which will help minimize noise.

[34] Electric and magnetic fields (EMF) are invisible lines of force emitted by and surrounding any electrical device (e.g. power lines and electrical equipment). Electric fields are produced by voltage and increase in strength as the voltage increases. Electric field strength is measured in volts per meter (V/m).Magnetic fields result from the flow of electric current and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T), where 1T equals 10,000 G.

i. Temporary Construction Camps

274. A number of temporary construction camps will be required over the 30 month construction period, housing an estimated 100 to 150 workers. Solid and liquid wastes generated from temporary construction camps have the potential to pollute water sources. There is also the potential for poor sanitation and housing conditions to lead to illness among workers, and for communicable diseases to be transmitted among workers and to local communities. In addition, workers can cause ecological impacts, especially in the national parks, through firewood collection, collection of forest products, and hunting, trapping and sale of wildlife. To mitigate these impacts:

- Temporary construction camps should be sited as discussed in the previous section on siting of temporary construction camps and facilities including hot mix and batching plants.

- Temporary housing structures should provide adequate protection against the weather, should have adequate lighting and ventilation, and should comply with local building codes (with the exception of tent camps).

Table 5.1: Typical noise levels of construction equipment (noise level in dB (A) at 15 m)

Clearing		**Structure Construction**	
Bulldozer	80	Crane	75-77
Front end loader	72-84	Welding generator	71-82
Jack hammer	81-98	Concrete mixer	74-88
Crane with ball	75-87	Concrete pump	81-84
		Concrete vibrator	76
Excavation and Earth Moving		Air compressor	74-87
Bulldozer	80	Pneumatic tools	81-98
Backhoe	72-93	Bulldozer	80
Front end loader	72-84	Cement and dump trucks	83-94
Dump truck	83-94	Front end loader	72-84
Jack hammer	81-98	Dump truck	83-94
Scraper	80-93	Paver	86-88
Grading and Compaction		*Landscaping and clean-up*	
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
		Truck	83-94
Paving		Front and end loader	72-84
Paver	86-88	Dump truck	83-94
Truck	83-94	Paver	86-88
Tamper	74-77	Dump truck	83-94

Source: U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations. Building Equipment and Home Appliance. NJID. December 31, 1971.

- Camps should be provided with appropriate sanitation facilities, including:
  - A potable water supply approved by the local health authority and in compliance with WHO drinking water quality standards.
  - Appropriate washing facilities, temporary toilets, and waste containers.
  - Sanitary latrines that do not pollute surface waters. Latrines should either be of a pit type that are at least 100 m from any water source, or porta-potty type. If the latter, they should be emptied on a regular or as needed basis, and the effluent disposed of at an approved waste disposal facility.

  - Camps should also be provided with health care clinics and appropriate places of worship.
  - Firewood collection will not be permitted. A supply of cooking gas should be provided by the contractor to eliminate the need for fire wood.
  - Hunting and poaching will not be allowed, and other than for work purposes, the Parks will be no entry zones. Workers' identification card with photo should be issued and worn at all times. IDs will specifiy the areas of the park that they are allowed to enter and the period of entry. Construction vehicles and equipments should also be registered.
  - All worker camps should be decommissioned when no longer required and restored to their natural condition. Temporary structures should be removed, solid wastes collected and disposed, and toilet pits sealed.
- The PIC EHS Specialist will provide a public health education program for workers and villagers covering safety, malaria, hygiene, and sexually transmitted diseases. The district health departments should be invited to participate in monitoring and education of communities and workers affected by the project.

j. Physical Cultural Resources

Chance Find Procedure

275. Based on site surveys, the current TL alignment and substation siting do not encroach on any known PCR sites. Nonetheless, to mitigate against impacts on any unknown PCRs, a chance find procedure will be put in place:

i) If physical cultural resources are encountered during the construction phase, all works at the find site should be immediately halted.

ii) The find should be assessed by a competent expert, and procedures to avoid, minimize or mitigate impacts to the physical cultural resources should be developed by the expert in cooperation with the relevant local heritage authority, proportionate to the value of the resource in question and the nature and scale of the Project's potential adverse impacts on it.

iii) Work should not begin until the procedures to avoid, minimize or mitigate impacts to the physical cultural resources have been implemented.

iv) Where avoidance is not feasible, no alternatives to removal exist, and the Project benefits outweigh the anticipated cultural heritage loss from removal, the physical cultural resource should be removed and preserved according to the best available technique.

v) Any removal should be conducted in accordance with relevant provisions of national and/or local laws.

vi) Records should be maintained of all finds, including chain of custody instructions for movable finds.

vii) All Project workers and staff should be made aware of the chance-find procedure.

276. In addition, if trees with religious significance are to be removed, written permission should be obtained from the relevant forest authority and the owner after written justification by PLN.

k. Religious Sensitivities

273. The Bali side-crossing tower will have a distance of 350 m from the Segara Rupek Temple (Figure 5.1). The Governor visits the temple annually and by the Hindu community on a monthly basis during full and new moons. The temple can be reached by a paved rough road along the coastline of the National Park. After proper consultation, the Governor of Bali has issued a permit for construction of the Bali side-crossing tower.

274. To avoid potential public concern, public consultation has been undertaken including with the Hindu Dharna Sabha in March 2011 and June 2012 to ensure the public is aware of the Project benefits and the measures taken to minimize impacts (see Section VII).

Figure 5.1: Segara Rupek Temple, Bali Barat National Park

l. Aesthetic Impacts

275. During the construction stage there will be short-term and localized visual impacts from earthworks. To mitigate these impacts:

- Proper revegetation activities will be discussed in the succeding sections and should be strictly implemented for temporary construction sites.
- TL and substation construction activities will result in permanent changes in the appearance of the project sites. Public consultation has indicated that this is not considered a significant problem with the potential exception of the Bali Strait Crossing Towers (Component 3) and the Gilimanuk-New Kapal TL (Component 5). The height of the Bali strait crossing towers are around 370 m each. Additional public consultation and outreach will be conducted to ensure the public is aware of the Project benefits and the measures taken to minimize aesthetic impacts (see Section VII).

m. Occupational Health and Safety

276. The construction of civil works such as transmission towers and substations poses an inherent risk of injury to workers from accidents and hazardous working environments.To mitigate these potential impacts:

i) Prior to the commencement of civil works the PIC EHS specialists will develop a construction phase Occupational Health and Safety Plan (OHSP) that is consistent with the relevant requirements of Indonesian law, PLN standard operating procedures (SOPs) and good international practice as reflected in internationally recognized standards such as the *EHS Guidelines.* PLN's SOPs for Environmental Management, Emergency Preparedness and Response and Health and Safety are in Appendix 16.The OHSP should:

- Identify and minimize, so far as reasonably practicable, the causes of potential hazards to workers, including communicable diseases such as HIV/AIDs and vector borne diseases;

- Provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions, with particular attention to live power lines, working at height, working above water, EMFs, high noise levels, and exposure to chemicals;

- Provide measures for the management and appropriate disposal of hazardous wastes to ensure protection of the workforce and the prevention and control of releases and accidents;

- Provide for the provision of appropriate fire extinguishers and fire response plans and appropriately trained first aid response staff;

- Provide for the provision of appropriately stocked first-aid equipment and stations at both work sites and temporary construction camps, including appropriately trained first-aid staff on site and provision of adequate transport facilities for moving injured persons to the nearest hospital;

- Provide for the provision of appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate (insulated if necessary) outerwear, boots and gloves; eye protectors; ear plugs safety helmets, etc.;

- Provide training for workers, and establish appropriate incentives to use and comply with health and safety procedures and utilize PPE;

- Include procedures for documenting and reporting occupational accidents, diseases, and incidents; and

- Include emergency prevention, preparedness, and response arrangements in place.

277. With the development of an effective OHSP, occupational health and safety risks can be minimized.

n. Community Health and Safety

278. The construction of transmission towers and substations also poses a modest risk to local communities from emergency events such as fires or spills, encroachment by the public into dangerous working environments, and construction traffic and localized increased traffic congestion in construction areas. To mitigate these potential impacts:

i) Prior to the commencement of civil works the PIC EHS specialists will develop a Community Health and Safety Plan (CHSP) that is consistent with the relevant requirements of Indonesian law, PLN SOPs and good international practice as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines.* The CHSP should include emergency response procedures developed in close collaboration and consultation with potentially affected communities and local authorities, and should address the following aspects of emergency response and preparedness:

- Procedures to identify and minimize, so far as reasonably practicable, the causes of potential Project related hazards to local communities, including communicable diseases such as HIV/AIDs and vector borne diseases;
- Specific emergency response procedures;
- Emergency contacts and communication systems / protocols;
- Procedures for interaction with local and regional emergency and health authorities;
- Relevant emergency equipment and facilities (e.g. substation first aid stations, fire extinguishers/hoses, sprinkler systems);
- Protocols for fire truck, ambulance and other emergency vehicle services;
- Evacuation routes and meeting points; and,
- Drills.

ii) The CHSP should also include procedures for posting warning signs and fences as required protecting local community members from dangerous work areas.

iii) In order to minimize risks from construction traffic, all delivery vehicles will be required to confirm with Indonesian traffic regulations and any on-site safety instructions.

iv) In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should avoid peak traffic hours between 6:30-8:30 am and 3:30-4:30 pm.

v) Diversions, danger points and works at culverts, bridges and construction sites should have appropriate warning signs; this is particularly important at night to avoid accidents.

o. Substation Upgrading and Extension

279. To deal with risks associated with the storage, handling and disposal of hazardous materials such as transformer oils and PCBs:

i) For new installations restrictions on the use of PCBs will be included as a requirement in the design and bidding contract documents.

ii) For replacement (upgrading) of existing transformers, transformers oils will be removed prior to transportation, tested and either reused or taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available.

iii) All transformers, either for substation extension or upgrading, will be equipped with appropriate sized impervious spill containment berms made of precast and reinforced concrete in accordance with relevant national standards.

280. Spoil from excavation for the transformer bases will be only a minor impact since the volume of soil excavated is very small. Other construction wastes will also be minimal. Spoil will be reused to the extent possible and appropriate spoil and waste disposal will be a requirement in the design and bidding contract documents.

3. Operation

281. Impacts from TLs are primarily related to the construction phase, and there are relatively few significant operation phase impacts. Potential operational issues include spills or release of oils or hazardous materials, EMF effects, occupational and community health and safety risks, and risks from wind loading, fires and earthquakes. Spills of transformer oil also pose a risk. Mitigation measures have been incorporated into the design to minimize these to acceptable levels.

a. Oils, Fuel Spills and Dangerous Goods

282. Transformer oil has a long life, typically more than 15 years depending on the level of load the transformer provides. Transformer oil spills are rare and can be avoided through routine maintenance and good practices. No significant impacts from oily residues such as transformer oil and lubricants are expected to occur during Project operation. Nonetheless, to avoid inappropriate disposal of transformer oil or accidental releases of other chemicals, fuels and oils, the following mitigation measures will be adopted:

- All transformers, either for substation extension, upgrading or new substation, will be equipped with spill containment berms in accordance with relevant national standards.
- A transformer maintenance schedule will be developed and transformer oils will be monitored on a regular basis.
- Chemicals and oils should be stored in secure designated areas with permanent impermeable bunds at distance of at least 100 m from any watercourse.
- No chemicals and oil will be stored in the national parks
- Transformer oil will be supplied in drums from an imported source and tap tanks will be topped up as necessary at the above noted secure designated areas.
- Refueling of machinery, equipment and vehicles should be undertaken at distance of at least 100 m from any watercourse.
- Any major work including oil changing and engine maintenance with the potential for oil to be spilled will be done in designated areas at distance of at least 100 m

from any water course and with containment to prevent any oil spills washing away.

- Transformer oil will be recycled if local facilities allow. Oil to be recycled should only be stored temporarily in designated areas (see above).
- Contaminated residues and waste oily residues should be disposed at an appropriate site approved by the relevant local environmental authority.
- An emergency spill response plan will be established and staff will be trained on spill response procedures.

b. Health Impacts

TL and Substation Operation and Maintenance

283. Operation and maintenance (O&M) of elevated high tension (EHT) lines and substations can pose an inherent risk to workers. O&M is currently undertaken by PLN staff adequately trained and experienced in EHT line maintenance up to 500kV. PLN has already established SOPs for Environmental Management, Emergency Preparedness and Response and Health and Safety (Appendix 16).PLN has an adequate supply of hot stick trailers imported from the USA, which are being utilized for live line works. PLN has also bare hand working tools imported from the USA and trained workers to undertake live line works on 500kV lines. Nonetheless, to avoid hazards from TL O&M:

- O&M of EHT lines and substations will be undertaken by adequately trained, certified and experienced PLN staff or contractors.
- All relevant Government health and safety laws will be complied with.
- In addition, an operation phase Occupational Health and Safety (OHS) plan will be developed

c. Human Exposure to Electromagnetic Fields (EMF)

284. During the operation phase the TL will be energized and there will be an increase in the level of electromagnetic fields (EMFs) in the RoW vicinity. During the public consultation some concerns were expressed about possible increased risks of cancer from exposure to EMFs from the TL. Extensive worldwide research has been undertaken into this issue including epidemiological studies and experimental studies in animals, tissues and cells.

285. In epidemiological studies, researchers try to establish whether there is a statistical correlation between selected groups of people with certain types of exposures and diseases. Some epidemiological studies have suggested a possible link between exposure to magnetic fields and childhood leukemia. It is unclear however, whether exposure to magnetic fields actually caused the disease. Some studies do not include magnetic field measurements when trying to determine a correlation and no epidemiological study has drawn direct conclusions about a link between cancer and EMF.

286. Experimental studies involve exposing cells, tissues and/or animals to magnetic fields under controlled conditions. These studies allow researchers to closely control magnetic field exposure and provide information about any small-scale biological changes that magnetic fields may cause. Experimental studies have not found that magnetic fields are the cause of any disease.

287. Many reputable health authorities such as the World Health Organization (WHO) and Health Canada have conducted thorough reviews of all the different types of studies and research

on EMF and health. These health authorities have examined the scientific weight-of-evidence and have determined that when all of the epidemiological and experimental studies are considered together, the consensus is that there is no cause-effect relationship between exposure to magnetic fields and human health. The WHO concludes:

> *From the current scientific literature there is no convincing evidence that exposure to radiation field shortens the life span of humans or induces or promotes cancer.* (WHO, 2006).

288. Similarly, the World Bank *Electric Power Transmission and Distribution EHS Guidelines* state:

> *Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern (World Bank, 2007).*

289. The World Bank *Electric Power Transmission and Distribution EHS Guidelines* recommend evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation (ICNIRP); average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure (Table 2.5).[35]The WHO reviews also conclude that exposures below the limits recommended by the ICNIRP international guidelines do not appear to have any known consequence on health.

290. To minimize potential EMF impacts from the Project the following mitigation measures have been adopted:

- During design the RoW alignment was selected so as to avoid settlements and sensitive receptors.
- The TL incorporates a 34 m RoW (17 m from each side of the TL alignment center line).
- Operation phase EMF monitoring will be undertaken. Average and peak exposure levels should remain below the ICNIRP recommendation for general public exposure.

291. The EMF below the proposed 500kV overhead TLs is predicted to be 40 microtelsa (μT), well below the ICNIRP guideline of 100 μT.[36]Overall no significant adverse EMF impacts are predicted during Project operation.

d. Electrocution and Induced Current

292. Electrocution can occur as a result of direct contact with high-voltage electricity or from contact with tools, vehicles, ladders, or other devices that are in contact with high-voltage

[35] ICNIRP published the “Guidelines for Limiting Exposure to Time-varying Electric, Magnetic, and Electromagnetic Fields” following reviews of all the peer-reviewed scientific literature, including thermal and non-thermal effects. The standards are based on evaluations of biological effects that have been established to have health consequences.

[36] In addition, a study carried out by Central Power Research Institute (CPRI) on 500 kV lines shows that the EMF about 1 m above ground near a 400 kV single circuit transmission line ranged from 3 – 7.2 μT at the edge of the ROW (30 m), which is equivalent to the EMF produced by domestic appliances such as refrigerators.

electricity. Power line fields can also induce voltages and currents on conductive objects such as metal roofs or building, fences, and vehicles. When a person or animal comes in contact with a conductive object a perceptible current or small secondary shock may occur. To mitigate against these impacts:

- A 34 m wide RoW will be established, and warning signs will be posted at towers along the RoW.

- Substations will be fenced with gates, locks and security personnel, and anti-climbing features will be installed on towers.

- Conducting objects (e.g. fences or other metallic structures) installed near power lines will be grounded to prevent shock.

- Education and information dissemination to the public will include information on electrical safety to prevent public contact with potentially dangerous equipment.

e. Use of Polychlorinated Biphenyls (PCBs) and Sulfur hexafluoride

293. Polychlorinated Biphenyls (PCBs) have historically been widely used as an insulating material in capacitors and transformers due to their high heat capacity, low flammability and low electrical conductivity. However PCBs are non-biodegradable, toxic and have carcinogenic tendencies, and PCB production was banned by the United States Congress in 1979 and by the Stockholm Convention on Persistent Organic Pollutants in 2001. To mitigate potential impacts with respect to PCBs and to comply with international commitments:

- PLN has banned the purchase of transformers using PCBs, and no PCBs will be utilized in the Project.

- PLN will obtain confirmations from suppliers at the time of bid offers that transformers will be free from the PCBs.

294. Sulfur hexafluoride (SF_6) is an inorganic, colorless, odorless, non-flammable widely used insulating gas. However, SF_6 is also a potent greenhouse gas (GHG), having a global warming potential of 23,900 times greater than CO_2 (100 year time horizon). To minimize potential releases of this GHG:

- Emission of SF_6 will be controlled by adopting good international practices for the use and handling of SF_6, including leak detection and repair, recycling of equipment, and training of employees on good practices.[37]

f. Occupational and Community Health and Safety

295. Prior to the commencement of operation the PIC EHS Specialists should prepare an operation phase Occupational Health and Safety Plan (OHSP) and a Community Health and

[37] These include:
- IEC (DIN EN) 9 60376 „Specification and acceptance of new sulfur hexafluoride“
- IEC (DIN EN) 60480 „Guide to the checking of sulfur hexafluoride (SF6) taken from electrical equipment“
- IEC 61634 „High-voltage switchgear and control gear – Use and handling of sulfur hexafluoride (SF6) in high-voltage switchgear and control gear“.
- Recommendations of the International Council on Large Electric Systems (CIGRE: SF6 Task Force: Handling and Handling and Recycling of SF6 Mixtures).

Safety Plan (CHSP) plans in accordance with relevant requirements of Indonesian law and in accordance with good international practice as reflected in the *EHS Guidelines.* OHS and CHSP plans will cover the following:

- Live power lines;
- Working at height;
- Electric and magnetic fields;
- Exposure to chemicals;
- Emergency procedures for spills, fire, evacuation, and natural disaster; and
- Community safety.

296. Community safety risks with power lines and substations include unauthorized access. As noted previously, to mitigate this risk:

- Towers will be fitted with anti-climbing devices.
- Substations will have a security fence and full-time security personnel on site.

g. Wind, Fire and Earthquake Hazards

297. Wind, fire and earthquakes pose risks to the Project operation. To mitigate against wind loading impacts:

- Transmission towers have been design as per relevant national building codes, which include earthquake resistance and loading requirements related to wind conditions.
- Transmission support structures such as tower foundations have also been designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads.

298. Electricity arcing from power lines can be a fire hazard. To mitigate against fire hazards:

- The fire hazards risk will be minimized through the use of tall towers and wide RoWs.
- Tall vegetation will be trimmed in the RoW to obtain the necessary conductor clearance as per SNI 04-6918-2002.
- System protection features designed to safeguard the public and line equipment will minimize fire hazards due to fallen conductors. The protection systems will consist of TL relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards.
- Regular maintenance of the protection system including conductors and circuit breakers will be undertaken.

299. Overall, given the nature of the RoWs and, the design of the TL and system protection features, the likelihood of electric arcing induced fires is remote.

300. To mitigate against the risk of fire at substations:

- Substations will be equipped with fire alarm and suppression systems.
- Emergency response plans will be developed.

301. To mitigate against the risk of earthquakes:

- Proper design of the Project and siting of the Project area.

h. Electromagnetic Interference

302. The corona of overhead TL conductors and high frequency currents of overhead TLs can create radio noise, which interferes with broadcast signals or electronic equipment. To mitigate against this:

- during design the RoW alignment was selected so as to avoid settlements;
- standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.
-

i. Positive Socio-economic and Environmental Impacts

303. Project operation will result in a number of significant positive socio-economic impacts in Bali, including:

- Contributing to long-term energy supply security;
- Supporting sustained socio-economic growth by providing power to existing industries and new industrial activities including the hotel sector;
- Increasing the tourist inflow to due to improved power supply (tourism in Bali contributes significantly to both the provincial and national GDP);
- Improving the electrification rate through the provision of connections to industries and rural areas which are currently waiting for power connections;
- Improving access to health, education and other social services;
- Generating employment opportunities; and
- Improving the technical skills of the implementing agency in both Java and Bali.

304. Project operation will also result positive environmental impacts including:

- Reductions in GHG emissions through the reduced use of low efficiency generators by individuals, businesses and hotels for power generation in Bali;
- Reductions in NOx, SO_2 and particulate emissions through the reduced use of low efficiency generators without emission control systems by individuals, businesses and hotels for power generation in Bali; and,
- Energy savings through the reduction of power losses due to the improved efficiency of the 500 kV transmission systems.

B. Potential Impacts and Mitigation Measures on the Status of Biodiversity in National Parks

305. The TL RoW passes through i) private agricultural lands and plantations, and shrub/barren areas; ii) state owned Production Forests on East Java and Limited Production Forests on Bali; and iii) Protection Forests in Baluran and Bali Barat National Parks. Construction of the Project will require removal of vegetation for transmission tower bases and substations, and cutting of tall vegetation in the RoW to maintain necessary conductor clearances. The loss of vegetative cover under the tower footing will mostly be permanent, though based on fieldwork most TL tower bases are at least partially naturally revegetated with adjacent species. The trimming of vegetative cover in the RoW will only be to the extent that necessary conductor clearances with taller trees are achieved. There will also be temporary disturbance or removal of vegetation for activities such as TL stringing and construction of temporary facilities such as storage and assembly areas, temporary worker camps and concrete batching plants.

306. Impacts on private lands including private plantations are covered by the LARP.

307. In terms of state owned forests, a total of 26.95 km of the RoW will pass through five areas of Production Forest in East Java, with a combined area of 94.36 ha affecting an estimated 57,162 trees. In Bali a total of 9.00 km of the RoW will pass through two areas of Limited Production Forest, with a combined area of 33.49 ha affecting an estimated 19,125 trees.

1. Baluran National Park in East Java

a. Biodiversity study on the Impacts of the TL in Baluran National Park

308. **General Impacts on Flora**. Within Baluran National Park, 18.6 km of the RoW passes through the western portion of the Park. The construction of the TL will result in clearing of vegetation at the tower sites and trimming of vegetation within the RoW covering a total of 63.3 ha (6.3 ha for tower base and 57 Ha TL RoW) of low ecological value Teak (*Tectona grandis)* and Gmelina *(Gmelina aciatica)* plantations*.* The RoW will encompass an estimated 25,320 plantation trees. Based on the latest information from the National Park officers, only teak with height of more than 20.5m will be trimmed.

309. Land clearing will result to the following impacts: reduce ecological integrity of the forest and probably cutting of *Swietenia macrophylla*, an IUCN status vulnerable; accelerated soil erosion; and the potential growth of invasive species *Acasia Nilotica*. On the other hand, land clearing for 48 tower bases will create an open area of about 6.3 ha. The open area will give an opportunity for grass and other sun loving shrubs to grow, which may be used as a food source for mammals or give an opportunity for invasive species to grow. Water pollution and disposal of waste during the construction phase may also have a temporary negative impact on flora.

310. Overall, given that the routing is through Teak and Gmelina plantation, the construction impacts to flora in the Baluran National Park is considerably low for the following reasons: the location is adjacent to an existing national highway; and any plantation removed will be rehabilitated after the TL construction is complete.

311. **General Impacts on Fauna**. The alignment of the proposed TL in this section is running mostly parallel to the existing 150 kV TL which is about 50-100 m away. It also running parallel and adjacent to the existing Paiton – Watudodol highway. The TL RoW alignment area between T236-T260 passing through Teak and Gmelina forest is known as the Banteng home range. It includes an area of non plantation forest which is known to have high biodiversity value and a corridor for big mammals (T245-T246). Based on field survey (Sept 2012), there are Ebony leaf monkey (IUCN endangered), Banteng and some other big mammal, Deer and wild pig observed

to thrive in this area. Project activities like tower construction, land clearing, land excavation and erection of tower and conductors may disturb and temporarily displace any wildlife found in the Project area.

Potential Risk of the Project on the population of Banteng

312. Baluran National Park is an important habitat of Banteng. However, it should be noted that this is not the only habitat of Bantengs in Java. Other habitats of Banteng in Java are in Meru Betiri National Park, in Alas Purwo National Park and in Ujung Kulon National Park (Pudyatmoko, 2012). The core habitat of Banteng in Baluran National Park is the Bekol area (approximately 12km from the Bitakol area). Based from the information of Park Rangers, about 7-8 Bantengs are found in this region.

313. The discussion on the population and home range of Banteng in Baluran National Park was based on the field survey conducted by the Project's biodiversity expert.The Banteng and big mammal experts consulted for the study of Banteng are Dr. Ali Kodra, Dr. Setyawan Pudyatmoko, Dr. Ahmad Sarmidi, and Dr. Eric Meijaard. The complete list and contact details of the experts consulted are listed in Appendix 3b (References for the Biodiversity study).

314. Banteng population in Baluran National Park shows a considerable decline in the last 20 years as shown in the Table 5.2

Table 5.2: Population of Banteng and Water Buffalo

Wildlife	Year								
	1941/48/52/68	1980	1996	1997	2000	2002	2005	2006	2007
Banteng	50-100 100-150	113	312-338	282	219-267	81-115	28-47	25	34
Wild Buffalo	100	343	248-441	226	48-64	19-29	nd	11	nd

Source: Baluran National Park, Sabarno, 2007

315. Based on the reports from the National Park, published research papers and personal communications with several biodiversity and Banteng experts, the following can be concluded regarding the possible reasons on the decline of the Banteng population (within the National Park).

(i) Water shortage at Bekol Area during dry season

- Water puddle, as a water source for Banteng at Bekol area dries out or the quality of water in the puddle deteriorates. There are two types of water puddle: the first water puddle is in the form of seepage water catchment and the other water puddle resulted from water runoff during rainy season.
- In 1989, the management of Baluran National Park decided to reduce water buffalo population, with the assumption that water buffalo is a food competitor for Banteng. Since the Water Buffalo population decreased, the role of water buffalo as a mud removal from the puddle resulted to the puddles getting filled up with sediment. The sediment clogged the seepage and reduced the puddle water storage capacity.
- The other water sources for wildlife at Bitakol are the Talpat spring water and Kacip River. Water from Kacip River flowed into Bekol through pipes into an artificial pond. In 2002, the piping system from Kacip River broke and the Talpat sping water dried in 2003. These events resulted to a lack of water source during dry season in the Bitakol area. The National Park provides water by using water pump but this is very expensive to maintain or unsustainable because of the high cost of fuel (Sabarno 2007).

316. Due to water shortages at the Bekol area during dry season, big mammal/Banteng have to search for other water source at Bajulmati River, which is located at the border between Perhutani forest and National Park.

(ii) Change in land cover and fodder quality

- Forest wildfires in TN Baluran created more savanna area. These savanna areas are invaded by *Acacia nilotica*. Based on recorded observations in 1981, the *Acacia nilotica* is increasingly becoming invasive. The following are the recorded observations on the population density of *Acacia nilotica*: 75 trees/ha in 1981; 3 337 trees/ha in 1986; and 5 369 trees/ha in 1987. A higher density of the invasive species, *Acacia nilotica* limits the area which serves as a habitat or homerange for mammals (*www.balurannationalpark.web.id*).
- *Acacia nilotica* is not a good fodder for Banteng. Big mammals eat *Acacia nilotica* only during dry season. They mostly eat the fruits and spread the seeds throughout the habitat.
- According Pudyatmoko (personal communication 2013) reduction in the population of Water Buffalo also affected the quality of fodder in Bekol, since the Water Buffalo ate most of the grass and shrubs, it maintained grass and shrub species composition and also refreshed the grass for Banteng. Since the water buffalo population decreased to nil (See Table 5.2), there is less fresh grass for Banteng and species composition of fodder changing, forage species that are less preferred by Banteng slowly becoming dominant species.

317. Due to temporary disturbance of habitat, shortage of food and fodder quality, Banteng had to look for food outside the National Park area, making their population vulnerable to poaching activities.

(iii) Poaching

318. Almost all references stated that Banteng population at Baluran NP declined due to because of poaching. Poaching activities had been a problem in Baluran National Park and other major national parks. Based on personal communications and interview with experts (personal communication: Pudyatmoko, Sarmidi and Meijaard 2013), poaching activities significantly reduced the population of large mammals (including Banteng). Hunters mostly use snares or firearms to capture Banteng.

319. Controlling poaching at Alas Purwo National Park successfully increased the Banteng population. At present, the population of Banteng in Alas Purwo National Park is 600 (personal communication Meijaard 2013).

(iv) Predator

320. Most of the documented researches about Banteng in Baluran National Park agree that dhole (a type of wild dog) may be one of the reasons in the decline of Banteng population. According to Sabarno (2007), national park officers observed signs of increasing dhole population (*Cuon Alpinus*) in Baluran National Park since 2001. Based on data from 2004-2005, pack of dholes are often found in 2 to 35. Distribution of dhole in the Baluran National Park Baluran is in the East and North area where big mammals (including Banteng) thrive.

321. Banteng predation by dhole occurred in Alas Purwo National Park earlier, and it caused the decline of Banteng population (personal communication Meijaard 2013).

(vi) Activities of local people inside the National Park

322. Local people use the National Park as grazing area for their cattle especially between tower T212 to T220 and the area between tower T212 to T260 which is used for the collection of fuel wood and grass (forage). Human activities inside the forest also create forest fire especially during the dry season.

Figure 5:2: Teak forest after forest fire

Figure 5.3: Cattle herding inside the National Park area

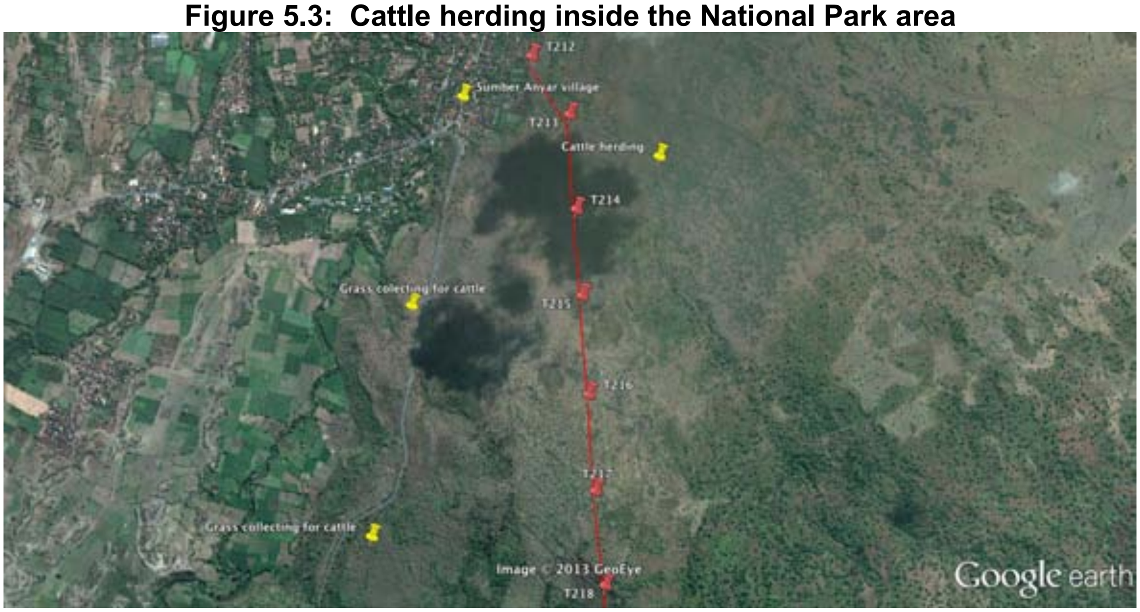


Figure 5.4: Location of cattle herding and area of grass collection in the National Park

Figure 5.5: Grass and wood collection from Baluran National Park

323. In summary, the potential impacts of the construction of the transmission line in the Baluran National Park based on the study of the biodiversity consultant are the following:

- Loss of trees, including rare species during land clearing and potential growth of invasive species;
- Noise during land clearing, land excavation, transportation of tower materials to the tower site and construction activities have the potential to disturb the habitat of animals such as nesting ground, feeding ground ;
- Excavation of land to establish the towers foundations to the size of 4x4x3 m^3 or $48m^3$ may accidentally trap animals;
- Impact to arboreal animal because of tree trimming to maintain safe distance of 9.5 m between transmission cable and a tip of tree within the transmission line RoW;
- Impact on animal because of construction waste and debris will harm wildlife;
- Worker activity can cause forest fires;
- Poaching activities on animals and other forest products by construction worker;
- Buzzing noise (corona) from operation of the transmission line disturb mammals movement;

324. Table 5.3 shows the summary of the impacts of the Project that is specific to the towers within the Baluran National Park. This table identifies the project activity, impacts, tower numbers, significance of impact and explanantory notes.

Table 5.3: Impact Assessment for Baluran National Park

No	Project activity	Impact	Impact Area	Significance	Remark/s
1	Land clearing for foundation of transmission towers.	Loss of production forest, wood and rare tree species	T212-T216	None to Low	• Savanna vegetation is dominated by *Acacia nilotica* shrubs.
			T217-260	Medium to High	Land clearing may potentially result to the removal/clearing of: • *Swietenia macrophylla*, IUCN Vulnerable • *Ficus* species tree which is a food source and resting ground for birds and Ebony Leaf Monkey (IUCN Vulnerable) • Teak and Gmelina wood from the Production forest.
		Growth of invasive species at TL tower base and construction trail	T212-T260	High	• Land clearing will increase the growth of invasive species, *Acasia nilotica*.
		Noise generated from construction activities may disturb wildlife	T212-T216	Low	• In savanna vegetation: No or Low impacts from noise, since only a small number of trees to none will be trimmed at T212-T216.
			T217-T260	Low	• Use of manual or handheld equipment during clearing operation
2	Cut and fill activities for tower foundation.	Noise generated from construction activities may disturb wildlife	T212 –T232	Medium	• Excavation of land to establish tower foundation in the rocky area (lava field) by using jack hammer and generator as power supply wiil create noise level up to 80-120 dB, at 15m from distance from jack hammer and generator
		Noise generated from construction activities may disturb wildlife	T233-T260	Low	• Manual excavation of land to establish tower foundation on non lava field area.

3	Excavation of land to establish the foundations to the size of $48m^3$ (dimension is 4m x 4m x 3m)	Mammals getting trapped in excavation pits	T212-T236	Low-Medium	• The area of T212 to T216 known as a home range of Barking deer • Local people use the area between towers T212 to 216 for cattle grazing. • Area near tower T27 to T29 is known as a water source for mammals called Tlogo.
			T236-260	High Home range of big mammals including Banteng	• The area, specifically between towers T236 to T250 is known as Banteng home range. Other big mammals are also found in the area.
4	Tree trimming to maintain a safe distance of 9.5m between transmission cable and a tip of tree within the transmission line RoW .	Arboreal animal	T212-T216	None	• The vegetation type is savanna which is dominated by shrubs and grasses, no tall trees and no arboreal animals. • No tree cutting in the savanna area (T212 to T216).
			T217-T260	None- Low Ebony Leaf Monkey (*Trachypithecus auratus auratus*, IUCN Vulnerable)	• Cable at the lowest point is 30 m above the ground. Tall trees will be trim at 20.5 m high. • No land clearing along the RoW. • No barrier for arboreal animal to cross under the transmission line
5	Transportation of tower materials to the tower site.	Noise and vibration may disturb wildlife	T212-T260	Low	• Construction materials to be transported by vehicle to the nearest distance to the tower site, then all materials to be transported manually to the tower site
6	Construction activity	Abandoned temporary construction structure may potentially disturb or harm wildlife	T212-T236	Medium	• Barking deer could be accidentally trapped or harm at the abandoned construction site
			T236 -T260	Medium - High	• Big Mammal could be trapped or harm at the abandoned construction site. • Corridor for mammal searching water during dry season

		Noise generated from construction activities will cause disturbance to wildlife	T212-T238 T242-T260	None - Low	• Noise generated during construction will cause disturbance to wildlife (i.e. use of concrete mixer)
			T239-T241	High	• Banteng home range and within Bajulmati corridor near the Panjaitan river, water source for mammals.
7	Activities of construction workers, such as cooking, smoking, animal poaching.	Forest fire	T212-T260	High	• Construction workers can cause forest fire from cigarette butts, accident from cooking, uncontrolled campfire when workers stay for the night.
		Animal poaching	T212-T236	Low to Medium	• Animal poaching by construction workers (Barking Deer).
			T236-T260	High	• Animal poaching by construction workers. • Home range of Banteng and other big mammal.
			T 238-T241	Very high	• Animal poaching by construction workers.
8	Operation phase of the transmission line.	Buzzing sound	T212- T260	Unknown	• Buzzing sound (audible or non audible by human ear) from corona discharge will disturb big mammals. The sound is enhanced during the wet season (i.e. during and after the rain)
			T239-T249	High	• Tower base covered by grass will attract Banteng for grazing, which will make them vulnerable to poaching.

b. Mitigation Measures on the Baluran National Park

325. In order to minimize the impacts of the Project in the Baluran National Park, in addition to the general mitigation measures during pre-construction, construction and operation of the Project, the following mitigation measures will be implemented:

- Vegetation removal will only be allowed within the designated tower bases and temporary construction path;
- Avoid cutting rare plant species and replanting the entire base of towers and temporary construction path with grass or shrubs such as *Digitaria ciliaris*, *Acasia tomentosa, Swietenia macrophylla*, and some *Ficus* trees *;*
- Tree trimming and cutting will be avoided as much as possible within the National Park, Banteng homerange and Gmelina forest. The height of the transmission line will be adjusted in order to avoid the cutting of trees in the National Park;
- Along with the maintenance of the TL tower, PLN will support the National Park in managing open areas at tower base from invasive species such as *Acacia nilotica*;
- Land clearing should immediately be followed by construction and will ony be undertaken by hand tools such as machete and manual saw;
- Soil excavation to establish the tower foundations should be done hy using hand tools;
- Spoils should immediately be back filled to the foundation pit;
- Secure or fence excavated pit to prevent animals getting trapped;
- All material should be transported by good condition vehicle to a temporary storage areas in the construction site and will be transported manually from the storage area to the construction site;
- Working space at the construction site should be cleared from dry leaves to prevent forest fires;
- Oil and fuel for the construction equipment should not be stored within the National Park;
- Construction waste such as cement bags, paint containers, used paint brush, any container, broken tools, unused material, any spill such as oil, concrete, paint, should be properly collected and disposed by accredited waste collectors;
- Temporary construction structures should be removed immediately upom completion of the construction. Construction site must be cleared from construction spoils from soil compaction, muddy puddles, soil erosion and sedimentation;
- During construction, the transmission line will be divided into nine (9) sections, each section consisting of five (5) towers. One tower per section will be constructed simultaneously; the distance between construction locations will be 1.5 km or the distance equivalent to five towers. This is to reduce the noise and reduce number of workers in each specific area and to avoid disturbance to animal movement;
- Construction activities will only be allowed during daylight hours, to avoid night time noise and glare generated by the construction activities;
- Workers' camp is not allowed in the national park;
- A schedule for the construction activities in Baluran National Park was prepared and will be strictly followed; and
- Poaching by workers should be strictly prohibited in the National Park. All construction workers will be informed and oriented regarding the National Park regulations.

326. The site-specific mitigation measures for Baluran National Park are presented in Chapter IX, Environmental Management Plan (Table 9.3) and general mitigation measures for contruction activities within National Parks are presented in Table 9.1. The site-specific mitigation measures for the Baluran National Park will be strictly followed and implemented by the contractors in addition to the general mitigating measures the Project.

2. Bali Barat National Park in Bali

a. Biodiversity study on the Impacts of the TL in Bali Barat National Park

327. **General Impacts on Flora**. Within Bali Barat National Park approximately 11.80 km of the proposed alignment of components 3 and 4 of the TL will pass through and require tower construction in the Wilderness Zone and Utilization Zones. The TL will also cross over (e.g. without tower construction) the portions of the Core Zone, Traditional Zone, and Marine Protection Zone (Figure 4.21). The RoW will also pass across Gilimanuk Bay (Component 4) and towers will be placed on one mangrove island (Gadung Island) and on two mangrove flats within the Wilderness Zone. The total RoW have an area of 40.12ha and encompassing an estimated 25,075 trees. The main crossing tower base will need up to one hectare land size (100 x 100 m). The TL is well served by existing roads. Vegetation clearing and cutting of trees may reduce the ecological integrity of the mixed monsoon forest and mangrove area, enhance soil erosion and probably will impact IUCN vulnerable plants species such as *Cycas rumphii* and *Dalbergia lastifolia* and some protected plants species such as *Manicara kauki (L) Dubard*, *Cassia fistula* and *Schleichera oleosa*. On the other hand, land clearing for 19 tower base within Bali Barat NP (excluding mangrove) will create an open area of about 2.5ha.The open area will give an opportunity for grass and other sun loving shrubs to grow and may be a source of food source for mammals or an area for invasive species to grow.

328. The mangroves at the mangrove islands of Gilimanuk Bay are considered as sensitive ecosystems and will require best construction practices to preserve their present state. No cutting of mangroves will be done except for the tower base at Gadung Island (23 ha) which will reduce the mangrove area at Gilimanuk bay by less than 1%. During field survey in September 2012 except annelid, no animal was found at these islands but according to local people different species of birds used to come to the islands. The anticipated impacts in the mangrove ecosystem brought about the TL construction are: reduction of mangrove trees; disturbance of bird habitat; feeding ground disturbance by construction worker; and siltation to the Gilimanuk aquatic system because of earthwork.

329. Transporting tower materials to Gadung Island using boat during low tide can damage seaweed around the Burung and Gadung mangrove islands. Figure 5.6 shows the recommended route for the transport of materials and equipments in Burung and Gadung Islands based on the consultation with the management of the National Park.

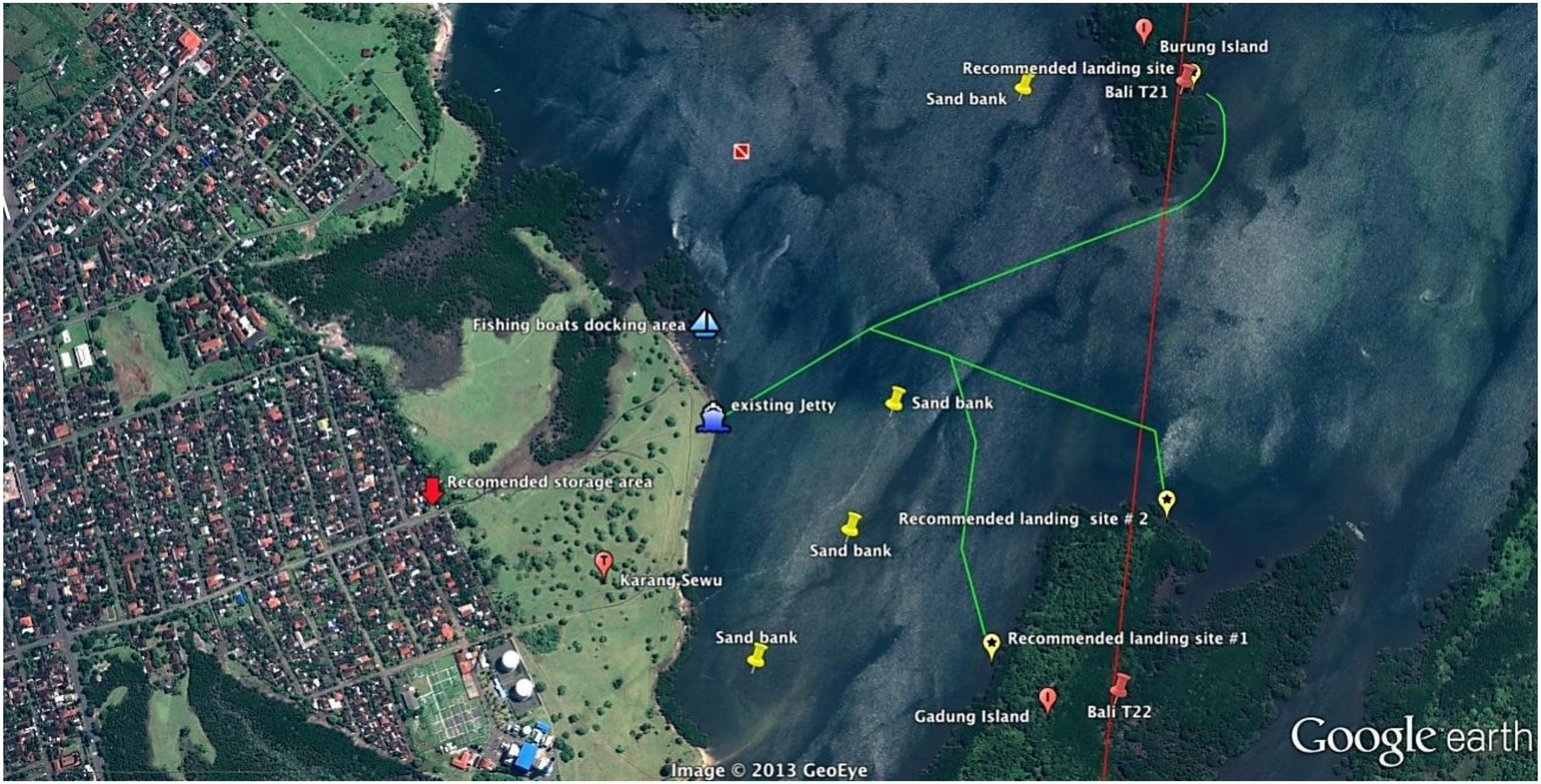


Figure 5.6: Recommended route for the transport of materials and equipments in Burung and Gadung Islands (Green line)

330. **General Impacts on Fauna and Wildlife.** In Bali Barat National Park, 11.80 km of the proposed alignment of components 3 and 4 will pass through the Wilderness and Utilization Zones and will also cross overhead (e.g. no tower bases) the Core Zone, Traditional Zone, and Marine Protection Zone. The Wilderness Zone of the Park includes several endangered species.

331. The following activities may disturb and temporarily displace the wildlife in the surrounding area.

- Crossing towers will generate noise and other disturbance especially during land clearing and earthworks to nesting area of blue tailed bee eater *Merops philipinus*, an IUCN Least Concerned migrant bird.
- The potential risk to animals getting trap in the excavating pit. The size of the excavation pit to establish tower foundation is $48m^3$ (dimensions: 4m x 4m x 3m).
- Disturbance to mammal due the construction activities close to salt lick pond (tower T12 and T13)
- Construction worker activities such as smoking, cooking, and campfire can cause forest fire.
- Animal poaching by the construction workers.
- Land clearing at tower base will result in grass and shrubs growing in the area. These grass and shrub are a source food for mammal, but cleared land also can also be infested by thick growth of invasive species such as *Lantana camara*.

329. The TL and crossing tower are not located in an area occupied by the Bali Starling bird. The main habitat area for Bali Starling is in the wild and for release through the captive breeding program is in the Berumbun Peninsula close to Menjangan Island, approximately 10 km to the east of the main Crossing Tower. It is expected that any birds displaced by construction will be relocated to adjacent habitat.

330. The RoW will also pass across Gilimanuk Bay (Component 4) and one tower will be placed on one of the two mangrove islands (Gadung Island) and on two mangrove flats within the marine protection zone. These are sensitive ecosystems and also serve as a resting and feeding ground for resident and migrant birds.

331. The land use in the Utilization Zone is mostly mixed forest vegetation. According to the park authority, the presence of wildlife in Utilization Zone is very rare, and there are no reports of endangered species of flora and fauna in the zone. Tower construction, land clearing land excavation and erection of tower and conductors will involve the presence of people and the use of equipment. These activities may disturb and temporarily displace any nearby wildlife.

332. In summary, the impacts of the TL alignment in Bali Barat National Park based on the study conducted by the biodiversity consultant are the following:

- Construction of temporary jetty for mobilization of construction material and heavy equipment at Prapat Agung will disturb animal activity at the Prapat Agung reef flat;

- Operation of the temporary jetty (Figure 5.6) may damage the coral reefs at the Prapat Agung reef from the increase in oil, grease, total suspended and dissolved solids in water;

- Lost of tree and rare tree species during land clearing for transmission towers and RoW;
- Noise during land clearing, land excavation, transportation of tower materials to the tower site and other construction activities will cause disturbance to wildlife habitats such as nesting and feeding grounds;
- Land excavation for the tower foundation 48 m^3 (dimension: 4m x 4m x 3m) may accidentally trap animals;
- Land excavation for the tower foundation near the salt lick area will cause siltation in salt lick pond;
- Construction of tower foundation at mangrove area will cause silt and sediment entering water bodies near the project area;
- Impact to arboreal animal because of tree trimming to maintain safe distance of 9.5 m between transmission cable and a tip of tree within the transmission line RoW;
- Impact on animals because of construction waste and debris;
- Worker activities can cause forest fires;
- Poaching activities by the construction workers (animals and other forest products);
Buzzing noise (corona) from operation of the transmission line may disturb the movements and food hunting of mammals.

333. Table 5.4 shows the impact assessment for Bali Barat National Park that is specific to towers within the National Park. This table identifies the project activity, impacts, tower numbers, significance of impact and some explanatory notes.

Table 5.4: Impact Assessment for Bali Barat National Park

No	Project activity	Impact	Impact Area	Significance	Remark/s
1	Temporary jetty construction.	Water pollution: increase in total suspended soilds (TSS), total dissolved soilds (TDS), oil and grease.	T15	High	• Jetty construction will pollute surrounding water and will affect the coral reef (Refer to Figure 5.6) • It should be noted that PLN needs to get an environmental permit for the construction of the temporary jetty.
		Noise	T15	High	• Construction of temporary Jetty will disturb animals, especially during low tide where animals are at reef flat, an area near the construction site.
2	Land clearing for the foundation of transmission towers.	Loss of low land monsoon forest and rare plant species	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	High	• Land Clearing will affect about 45 ha of land in monsoon forest. • Land clearing could potentially affect rare tree species, such as *Cycas rumphii, Dalbergia latifolia* and 4 othes tree species.
		Disturbance to Blue-tailed Bee-eater (*Merops philippinus)* nesting ground	T Cross B	High	• Tower base will be a potential nesting ground of Blue-tailed Bee-eater, an IUCN LC bird species
		Generated noise will disturb wildlife	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	Low	• Most of the trees in the RoW are shrubs and small trees.
		Growth of invasive species at TL tower base and construction path	T Cross B T ANC B1 T ANC B2 T03-T19	High	• Land clearing will increase the growth of invasive species, *Lantana camara*.
3	Cut and fill activities for the tower foundation.	Noise generated will disturb wildlife	T03-T26 T001-T002	Low	• Most land excavation to establish tower foundation will be done manually.
			T Cross B T ANC B1 T ANC B2	Medium	• Land excavation to establish crossing tower base will be done by using excavator. Excavator will generate noise up to 95 dB.

4	Excavation of land to establish the foundations to the size of $48m^3$ (dimension: 4m x 4m x 3m).	Mammals getting trapped in excavation pits	T Cross B T ANC B1 T ANC B2 T03-T20 T23-T26 T001-T002	High ,	• Home range of big mammal (Barking Deer and Rusa Deer).
		Mammals getting trapped in excavation pits	T20- T22	None	• No Mammal in the Burung and Gadung mangrove islands. • Construction of tower foundation will use bore pile technique.
		Water Pollution and sedimentation	T20-T23	High	• Construction of tower foundation at mangrove area will lead to silt and sediments entering the water bodies.
5	Tree trimming to maintain safe distance of 9.5 m between transmission cable and tip of tree within the transmission line RoW.	Arboreal animal	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	None- low	• Arboreal animal Ebony Leaf Monkey and palm civet. • Cable at the lowest point is 30 m above the ground. • Tree trimming will be minimum or none since most of the tree height at monsoon forest is less than 20.5 m.
6	Transportation of construction equipment and tower materials to the tower site.	Noise and Vibration to disturb wildlife	T Cross B	Medium	• Heavy equipment will be transported from temporary jetty to T cross B area by land as shown in Figure 5.6. • Construction material will be transported using vehicles of good condition.
			T ANC B1 T ANC B2 T03-T19 T20-T23 T24-T26 T001-T002	Low	• Material and equipment will be transported by vehicle to the nearest distance to the tower site and will be transported manually to the tower site.
			T20- T22	Low	• No mammal in the Burung and Gadung mangrove islands. • Material will be transported using small boat.

			T crossB TANC B1 T ANC B2 T03-T015	Medium	• Transport of excavator and small batching plant.
7	Construction activities	Abandoned temporary construction structure to disturb or harm wildlife	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	Medium	• Most of Project footprint in the home range of big mammal • Rusa deer, Barking Deer, Ebony leaf monkey, Long tailed macaque could be trapped or harm at the abandoned construction site.
		Generated noise to disturb wildlife	T Cross B T ANC B1 T ANC B2 T03-T19 T24-26 T001-T002 T20 andT23	Low	• Low noise generated by bore pile machine • Low noise generated during construction especially using mini concrete mixer/batching plant
8	Construction worker activities such as: cooking, smoking, over night stay, animal poaching	Forest fire that may disturb wildlife	T Cross B T ANC B1 T ANC B2 T03-T19 T24-T26 T001-T002	high	• Construction workers can cause forest fire from disposal of cigarette butts, accident during cooking, and uncontrolled campfire when workers stay over night.
		Animal poaching	T Cross B T ANC B1 T ANC B2 T03-T19 T20-T23 T24-T26 T001-T002	High	• Animal poaching (Barking deer, Rusa deer, Ebony Leaf Monkey, and birds etc.) by the construction workers.
			T20 -T23	High	• Bird poaching by the construction workers.
9	Operation phase of the transmission line.	Buzzing sound	T Crossing B ANC B1 ANC B2	None	• No electric current T Crossing to ANC Tower.

			T Crossing B T03-T26 T001-T002	Unknown	• Buzzing sound (audible or non audible) from corona discharge can disturb big mammals. The audible sound will be stronger during the wet season/during and after rain.
			T Crossing B T03-T19 T001-T002	Poaching	• Big mammals are vulnerable to poaching since the tower base is an open area, providing fodder.

b. Mitigation Measures on the Bali Barat National Park

334. In order to minimize the impacts of the Project in the Bali Barat National Park, in addition to the general mitigation measures during pre-construction, construction and operation of the Project, the following mitigation measures will be implemented:

- Avoid cutting rare plant species. Replanting of Replanting of *Cycas rumphii, Dalbergia latifolia, Schleichera oleosa Merr, Cassia fistula Manilkara kauki (L.) Dubard* ;
- Vegetation removal will only be allowd within the designated bases;
- Most of trees in TL RoW alignment are less than 15 m tall, since the lowest cable at the lowest point is 30 m above the ground or tree height should less than 20.5 m, so only few trees higher than 20 m have to be trimmed. If any trees have to be trimmed, it will be done by hand tools such as machete and manual saw;
- Tower foundation will use a bore pile. There will be no soil digging for foundation and no land clearing for tower base. Land clearing is only for bore pile, which has an area of $4m^2$;
- Land clearing should immediately be followed by tower construction to avoid open pits;
- Along with the maintenance of the TL tower, PLN will support the National Park in managing the open areas at tower base to prevent the growth of *Lantana camara* or other invasive species.
- All material should be transported by good condition vehicle to a temporary storage areas in the construction site and will be transported manually from the storage area to the construction site
- Soil excavation to establish tower foundations should be done by hand tools;
- Construction of the tower foundation should be carried out immediately when the foundation pit is ready;
- Secure or fenced the excavated pit to prevent animals of getting trapped;
- Spoils should immediately be back filled in the foundation pit;
- The contractor will build a working platform on Gadung island, to avoid mangrove cutting.
- Manpower, equipment and material transport to Gadung island (T22) will use canoe or small fishing boat from the jetty at Karang Sewu (See Figure 5.6) during high tide. The transport of construction materials and equipment to the island is not allowed during low tide season;
- Install silt screen around the construction site to avoid silt and sediments entering into the water bodies;
- Working space at the construction site should be cleared from dry leaves to prevent forest fire;
- Oil and fuel for construction equipment should not be stored within the National Park;
- Construction waste such as cement bags, paint containers, used paint brush, any container, broken tools, unused material, any spill such as oil, concrete, paint, should be removed from the construction site;
- Construction activities will only be allowed during day-light hours to avoid night time noise and glare generated by construction activities;
- Most of construction activity should be done during dry season when animals are concentrated at water source area. A schedule for the construction activities in Bali Barat National Park was prepared and will be strictly followed;
- Construction of transmission line will be divided into five (5) sections, each section consisting of about five (5) towers. One tower per section will be constructed simultaneously; the distance between construction locations will be 1.5 km or 5 towers. This is to reduce the noise and number of workers in each specific area and to avoid disturbance to wildlife;

- No workers' camp is allowed in the National Park;
- Poaching and trading of forest products by workers should be strictly prohibited in the National park; and
- Construction workers will be provided with orientation on NP park regulations and protocols to be followed while working within the National Park.

335. The site-specific mitigation measures for Bali Barat National Park are presented in Chapter IX-Environmental Management Plan in Table 9.2. The site-specific mitigation measures for the National Park will be strictly followed and implemented by the contractors in addition to the general mitigation measures of the Project.

3. Collaborative Agreements between the National Parks and PLN

335. Specific mitigations measures for National Parks will be implemented to address the construction and operation impacts of the Project on the state of biodiversity in National Parks. The mitigation measures are included in the National Park Collaborative Agreements which are required under the MoF Rent Use Permit.

National Park Collaborative Agreements

336. PLN received an Approval in Principle Permit from the MoF for TL construction activities inside Baluran and Bali Barat National Parks (Appendix 10). Under the Permit, Collaborative Agreements have been negotiated with each Park to offset negative impacts of the TL on the Park's biodiversity and to support Park conservation activities. The Collaborative Agreements thus form major mitigation measures for the Project's impacts on the Parks. The Collaborative Agreements have been developed in conjunction with, and are fully supportive of the management plans for each park (Baluran National Park Management Plan for 1995-2020 and the 25-year Workplan of Bali Barat National Park, 1997-2023).

Through Collaborative Agreements, support will be provided to Baluran and Bali Barat National Parks to offset the Project's biodiversity impacts and to support conservation activities in the parks.

Provisions of the Collaborative Agreements are:

i. In Baluran National Park the Collaborative Agreement includes provision of new water sources to minimize the need for Banteng and other animals to seek water sources outside of the Park, protection and enhancement of Banteng habitat, and a captive breeding program, which collectively should significantly contribute to increasing the protection and enhancement of Banteng in the Park. Key features of the Baluran Collaborative Agreement include:

- Establishment of new wells to provide water sources during dry season. This should minimize the need for Banteng to migrate out of the park during the dry season. Poaching and hunting outside of Park boundaries or at its periphery poses a significant risk, and new water sources within the Park will minimize this threat.
- Conservation outreach programs and information dissemination, including signage showing the importance of Banteng, etc.
- Programs for the conservation of Banteng, including:

- Habitat protection through eradication and management of the invasive *Acacia nilotica*, which is significantly impacting the Baluran savannas;
- Establishment of a Banteng captive breeding program using females from the Park and males imported from other breeding centers;
- Monitoring of the population of Banteng and movement in the wild using GPS collars.

ii. In Bali Barat National Park, the Collaborative Agreement includes habitat monitoring and restoration in the TL RoW area, control of invasive species, Bali Starling captive breeding and release, and monitoring in the wild.

4. Standard Vegetation Clearing Mitigation Measures

337. To mitigate impacts of vegetation cutting and trimming:

- All construction activities will be undertaken in close coordination with the MoF with respect to Production and Limited Production Forests, and with the National Park Authorities with respect to activities within each Park.

- Any alignment changes that occur during detailed design should have as a goal the minimization of forest land conversion, tree cutting and trimming or removal of vegetation.

- Vegetation removal will only be allowed within the designated width of the RoW and the minimum area required for other infrastructure and activities.

- Vegetation cutting within the RoW will only be undertaken to achieve the required clearances.

- Tree cutting and trimming within the national parks will be avoided. Trees will be trimmed if they are higher than 20.5m. It should be noted that the height of most of the trees in RoW within the national parks are less than 20m. Therefore, there will be no tree trimming within the two national parks. If avoidance is not possible, tree trimming will only be undertaken by hand tools or the height of the transmission line will be adjusted in order to avoid cutting and trimming of trees within the national parks.

- The use of heavy machinery will be limited.

- The use of herbicides will be strictly prohibited.

- Burning of cleared vegetation is a common practice in areas used for shifting cultivation. However, this will not be allowed, and instead this material will be used to protect construction sites from erosion, particularly in steeper slope areas, until more permanent soil protection measures are in place. Local people will also be allowed access to cleared vegetation for the collection of building materials and firewood. Remaining vegetative material will decompose naturally due to the tropical conditions in the Project area. However, large piles of coarse remaining vegetation shall be removed for off-site disposal so as to avoid the risk of accumulated vegetation, which may promote forest fires.
- Park officials will be consulted on a regular basis to ensure that no unauthorized activities are taking place or within the National Parks.

338. Forests may also attract illegal cutting of trees by construction workers which may further add to the loss of the trees and vegetation. To mitigate the illegal cutting of trees, the following should be implemented:

- Workers should be strictly prohibited from tree cutting and trimming outside of the RoW and along RoW in National Parks and will maintain the minimum buffer area required for other infrastructure.
- Firewood collection should be strictly prohibited.
- All timber and other building material for workers' housing should be brought from legal certified sources outside of the Project area.
- Workers should be supplied with non-wood fuels such as kerosene or liquefied petroleum gas for the duration of the construction and operation period.

339. To mitigate impacts of land clearing to the mangrove ecosystem:

- Build a platform/bridge over of mangrove vegetation for access from sea to tower base
- Minimize mangrove trees cutting eccept for the tower base
- During construction, siltscreen should be installed around the tower based to prevent silt from tower fondation in entering the water bodies

340. To mitigate impact on sea grass bed from material transportation:

- Tower material shoul be delivered by small boat only during high tide
- Tower material such as sand and gravel should be transported in a bag to avoid siltation in water bodies.

341. To mitigate the impacts of the construction and operation of the temporary jetty in Prapat Agung to coral reefs:

- Construction site should be covered by siltscreen and all waste should be carefully managed and will not be dumped directly into the sea

5. Standard Fauna Mitigation Measures

342. To mitigate impacts on fauna, in addition to the standard vegetation mitigation measures the following standard fauna mitigation measures in National Parks will be implemented:

Within National Parks:

- Construction activities in the area between towers T 239-T242 will not be allowed during the dry season, so as to minimize impacts on the movement of Banteng and other animals seeking water sources (Baluran National Park only).

- Construction activities in the area between towers T12-T12 will not be allowed during the dry season, so as to minimize impacts on the mammals coming to the salt lick pond (Bali Barat National Park only).

- Construction of Bali Crossing tower should start early during dry season to minimize impact to blue tailed bee eater.

To mitigate the impacts of construction activity to the bird community, the following should be implemented:

- No construction activities will be allowed during Spring low tide when mud flat, sandbar and reef flat are exposed.

- No construction activities will be allowed at Gilimanuk Bay, Prapat Agung and Buaya Bay during bird migration season.

- No construction activities will be allowed at Bali Crossing tower from January to March.

- Most of construction activities should be done during dry season when most of the animals are concentrated in the water source.

- Construction activities will only be allowed during day-light hours so as to allow nocturnal species to cross the alignment during the night time, and also avoid noise and glare generated by construction activities.

- Secure or fence the excavated pit to prevent accidental trapping of animals.

- Construction of the foundation should be carried out immediately after foundation pit is ready and spoil material should be immediately returned to the foundation pit.

- Land excavation should follow schedule of tower construction.

- Minimize the use of mechanical equipments during land clearing within the national parks.

- The transmission line is divided into sections, each section consisting of five towers. Gradual construction should be observed. One tower per section will be constructed simultaneously, the distance between construction locations should be maximized (e.g. 1.5 km or distance equivalent to five towers).This will reduce noise level and only a limited number of workers in each specific area, minimizing the disturbance to animal movement.

- Workers should pay special attention to minimize noise-generating activities within the park, and to limiting activities to the RoW as much as possible.

- Cleared tower based after tower construction should be revegetated by local grass and shrubs known as mammal food and tower base design should be accessible for big mammal.

343. Poaching and hunting of wild animals by the construction workers will significantly impact the wildlife. To mitigate the poaching of animals:

- Poaching including illegal hunting, trapping, wildlife collection and trading of forest products by workers should be strictly prohibited.

- Project staff and work crews should not be allowed to have firearms and animal traps.

- Clauses to prevent poaching and illegal wildlife trading should be clearly included in contract documents and be accompanied by strict penal provision in case of violation such as significant financial penalty to the contractor and direct deduction from contract payments. Anti-poaching measures should be in place before start of civil works and should include heavy penalties for transgressions of these clauses.

- Construction workers will be educated regarding the importance and threatened status of important wildlife species such as the Banteng.

- All workers should be registered with the NPs and issued with photo IDs. IDs will specify the areas of the park that they are allowed to enter and the period of entry. Workers must wear IDs at all times within the park. Construction vehicles and equipment should also be registered.

VI. ANALYSIS OF ALTERNATIVES

A. NO PROJECT ALTERNATIVE

346. Not proceeding with the proposed Project is considered not acceptable for the following reasons:

i) The existing electrical power generation capacity in Bali is not sufficient to meet existing or future demands. Bali is currently supplied by three major power plants, a number of small diesel plants, and two 150 kV submarines cables from Java, for a total aggregate capacity of 633 MW. The reserve margin is critically low, less than 15% and far below the 30% reserve margin considered safe nationally. In addition, the capacity of the transmission network is limited due to lack of investments in the past. Low reserve margin coupled with transmission bottlenecks has meant that the Bali power system has suffered from power outages and blackouts that take an average of 2-3 hours to restore.

ii) Furthermore, household electrification in Bali is only 72% whereas the Government's target is 100% electrification by 2020. Electricity demand in Bali averaged around 550 MW in 2010 and is expected to grow to about 2,300 MW by 2025 based on PLN's load forecast. According to PLN-Distribution Bali, over 50,000 applicants have been waiting for new connections for over a year, forcing several commercial consumers such as hotels to adopt an on-site generation using fuel oil, adding to pollution in an environmentally sensitive island.

iii) At present construction of new thermal power stations in Bali is restricted, as the provincial government has classified Bali as an environmentally protected area. Based on these factors transmission of power from East Java to Bali at the 500 kV level has been identified as the preferred option by PLN.

347. On the other hand, approval and implementation of the proposed Project will:

i) Strengthen the power transmission system by connecting Bali at 500 kV to the Java transmission grid, thus facilitating efficient utilization of existing and planned power plants in Java. This will enable transmitting comparatively cheaper power to Bali from the large power plants in East Java with lower technical losses.[38]

ii) Contribute to the long-term energy security in Bali and ensures provision of adequate and reliable power supply which is vital for the economic development activities identified in Bali under the recently developed 14-year master plan for accelerating economic development in Indonesia.

iii) Improve the status of socio-economic development in the Project area brought about by the employment generation due to increased commercial and industrial activities, and improved working efficiency because of enhanced security of electricity supply.

iv) Reduce of air pollution generated from power back up facilities and use of diesel generators at tourist sites in Bali, and reduction in energy loss during power transmission.

v) Lead to an overall improvement in environmental and socio-economic conditions in the Project area.

[38] Technical losses are less in 500 kV transmission than compared to 150 kV and 275 kV which are the standard high voltage transmission voltages in Indonesia.

B. TECHNOLOGICAL ALTERNATIVES

348. Various technological options were analyzed for tower type, conductor type, overhead vs. underground TLs particularly at sensitive areas such as National Parks and forest areas, using multi voltage multi circuit (MVMC), combining 500 kV and existing 150 kV lines, and construction and installation methods. With technical, social and environmental and cost considerations taken into account, the proposed configuration is considered to be the most appropriate.

C. ALTERNATIVES FOR THE JAVA-BALI INTERCONNECTION

349. A number of options for supplying electricity to Bali in order to meet the existing and future demands were conceptualized, assessed and discussed with PLN and ADB in the TA 7325 inception workshop. In particular, assessment of the options addressed environmental issues associated with the Bali Strait crossing, routing of the 500 kV TL in protected areas, and the local resistance in Bali to tall transmission towers from Gilimanuk to Kapal (the main load center). The options evaluated were:

Option 1: Interconnecting Java and Bali through 500 kV AC double circuit TL from Paiton to New Kapal (with a 500 kV substation at Kapal) with two sub-options:

Option 1(a): Overhead 500 kVTL crossing of the Bali Strait; or,

Option 1(b): Submarine 500 kV cable crossing of the Bali Strait (Figure 6.1).

Option 2: Construction of a 500kV TL from Paiton to Banuwangi (Java side) with a 500/150 kV substation at Banyuwangi, so as to avoid the 500kV crossing of the Bali Strait and the 500kV TL in Bali. This option would transmit power across the Bali Strait using existing 150kV submarine cables combined with new 150 kV submarine cables. The 150 kVTL from Gilimanuk (Bali side) to load centers in and around Denpasar would also need to be strengthened.

Option 3: Construction of a 500 kV TL from Paiton to Gilimanuk with a 500 kV submarine crossing of the Bali Strait and a 500/150 kV substation at Gilimanuk (3 potential sites were identified) transmitting the power at 150 kV level to the load center at Kapal, so as to avoid a 500 kV TL in Bali.

Option 4: Meeting the power demand of Bali through local generation at suitable locations, taking into account coal transportation facilities, environmental issues, load centers, and 150 kV transmission system capacity for reliably meeting the present and projected power demand in Bali. This option would include reinforcement of North (probable locations for coal fired power plants) to South (major load centers) 150 kV TLs in Bali with the option of using high temperature low sag (HTLS) conductors on existing towers to avoid construction of new TLs.

Option 5: Meeting the short-term power demand of Bali with local generation at suitable locations and strengthening of existing and proposed 150 kV TL/submarine cables with the long-term solution of using Java–Bali 500 kV interconnection after choosing the most optimal and technically suitable solution among options 1 to 3, above.

350. Table 6.1 presents the options in term of key features and associated environmental impacts.

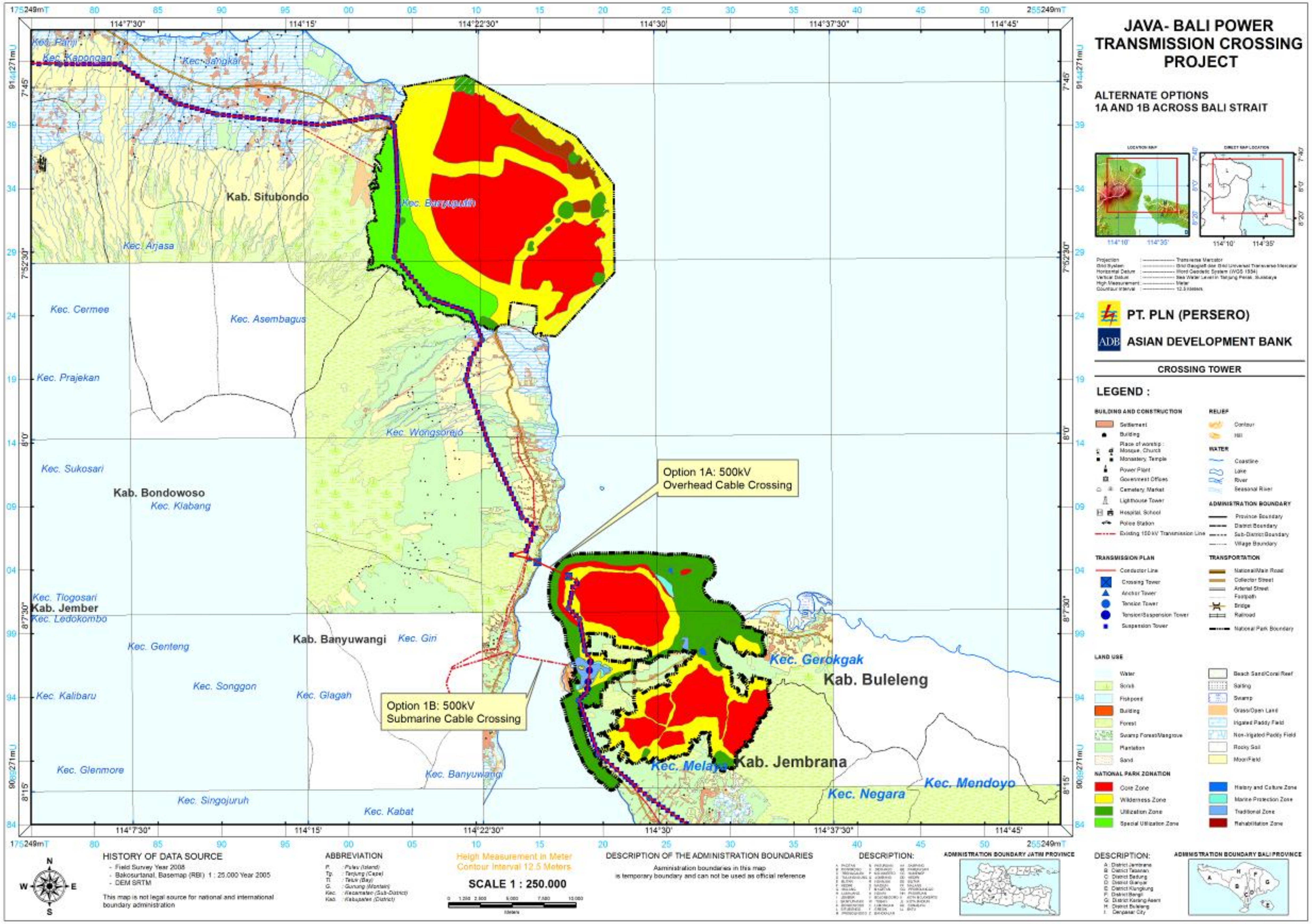


Figure 6.1: Map showing Options 1A and 1B of the Project: overhead crossing and submarine cable crossing of the Bali Strait

Table 6.1: Assessment of features, issues and mitigation strategies for Project alternatives

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
OPTION 1(a): Interconnecting Java and Bali through 500 kV AC double circuit TL from Paiton to New Kapal, with 500 kV substation at New Kapal and overhead 500 kV TL crossing of the Bali Strait.	• 500 kV TL: 220km • 500 kV overhead crossing at Bali Strait: 2.68km • 500kV substation at New Kapal	• National Parks: 30.4km • Production Forest: 26.95 km (East Java) • Limited Production Forest: 9.00km	18.60km of the 500kV TL passes through the Wilderness and Utilization zones of Baluran National Park. This cannot be avoided due to limitations imposed by topography. 11.80kmpasses through the Wilderness, Utilization, Marine Protection and Traditional Use zones of Bali Barat National Park. In Baluran National Park the TL route passes adjacent to the home range of the Endangered Banteng and will cross the migration used by the Banteng and other mammals in the dry season to access water. In Bali Barat National Park the wilderness zone also includes several endangered species, and the TL route is in an area where the Park hopes to reintroduce the Critically Endangered Bali Starling. The TL will also pass through sections of Production Forest in East Java and Limited Production Forest in Bali. The Bali side crossing towers and anchor towers will be in the Wilderness Zone of Bali Barat National Park. The TL will be within 350 m of the Segara Rupek Hindu Temple in Bali, in contravention to a Balinese regulation prohibiting structures higher than a major temple within a 2 km zone. Special permission from the Governor of Bali has been	Permits required from MoF for TL routing through Production/Limited Production Forests and through National Parks. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006 dated October 2, 2006. This is an ADB category ‘A’ project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board consideration.	Collaborative Agreements with parks to compensate for impacts so as to achieve no net loss of biodiversity. Compensation planting to offset impacts on Production/Limited Production Forests.	MoE and MoF will facilitate forestry permits and AMDAL processing.

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
			obtained; nonetheless this is still a highly sensitive issue.			
OPTION 1(b): Interconnecting Java and Bali through 500 kV AC double circuit TL from Paiton to New Kapal, with 500 kV substation at New Kapal and 500 kV submarine cable crossing of the Bali Strait.	• 500 kV TL: 220km • 500kV submarine cable at Bali Strait: 4.5 km • 500kV substation at Antosari	• National Parks: 30.4 km • Production Forest: 26.95 km (East Java) • Limited Production Forest: 9.00 km	18.60km of the 500 kV TL passes through the Wilderness and Special Utilization zones of Baluran National Park. This cannot be avoided due to limitations imposed by topography. Approximately 2.2kmpasses through the Utilization Zone of Bali Barat National Park. However, no crossing towers and anchor towers required. The submarine cable will have potential adverse impacts on marine ecosystem. In Baluran National Park the TL route passes adjacent to the home range of the Endangered Banteng and will cross the migration used by the Banteng and other mammals in the dry season to access water.	Permits required from MoF for TL routing through Production/Limited Production Forests and through National Parks. Permits also required from MoE, MMAF, as well as Inland Waterways Authorities. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006 dated October 2, 2006. This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.	Collaborative Agreements with parks to compensate for impacts so as to achieve no net loss of biodiversity. Compensation planting to offset impacts on Production/Limited Production Forests. Impacts on Bali Barat National Park can be avoided if submarine cable landing is taken out of the park. However, there will be additional approval from waterways authorities for new submarine cable corridor. Another possible option is to consider underground 500 kV cable within ROW of existing150 kVTL in Bali Barat Park. However, technical viability of this option needs to be examined.	MoE and MoF will facilitate forestry permits and AMDAL processing. With reduced impacts on Bali Barat National Park, project can be implemented at a faster pace. However, there will be additional requirements of getting approval from waterways authorities for new submarine cable corridor.

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
OPTION 2: Construction of a 500 kV TL from Paiton to Banyuwangi (Java side) with a 500/150 kV substation at Banyuwangi, so as to avoid the 500 kV crossing of the Bali Strait and the 500 kV TL in Bali. This option would transmit power across the Bali Strait using existing 150 kV submarine cables combined with new 150 kV submarine cables. The 150 kV TL from Gilimanuk (Bali side) to load centers in and around Denpasar would also need to be strengthened.	• 500 kVTL in East Java: 131.4 km • 150 kV submarine cables at Bali Strait: 4.5 km • 500/150 kV sub-station at Banyuwangi • 150 kV transmission system reinforcement from Gilimanuk to Denpasar load centers	• National Parks: 30.4 km • Production Forest: 26.95 km (East Java)	18.60km of the 500 kV TL passes through the Wilderness and Special Utilization zones of Baluran National Park. This cannot be avoided due to limitations imposed by topography. Approximately 3 km passes through the Utilization Zone of Bali Barat National Park. However, no crossing towers and anchor towers required, and TL will use existing 150 kV RoW. The submarine cable will have potential adverse impacts on marine ecosystem.	Permits required from MoF for TL routing through Production/Limited Production Forests and through National Parks. Permits also required from MoE, MMAF, as well as Inland Waterways Authorities. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006. This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.	CollaborativeAgreements with parks to compensate for impacts so as to achieve no net loss of biodiversity. Compensation planting to offset impacts on Production/Limited Production Forests. To further avoid impacts on National Parks, the option of using existing150 kV corridor in Baluran National Park using multi-circuit option could be explored.	MoE and MoF will facilitate forestry permits and AMDAL processing. With reduced impacts on Bali Barat National Park, project can be implemented at a faster pace. However, there will be additional requirements of getting approval from waterways authorities for new submarine cable corridor.
OPTION 3: Construction of a 500 kV TL from Paiton to Gilimanuk with a 500 kV submarine crossing of the Bali Strait and a 500/150 kV substation at Gilimanuk (3 sites were identified) transmitting the power at 150 kV level to the load center at Kapal, so as to avoid a 500 kV TL in Bali.	• 500 kV TL in East Java: 131.4 km • 500 kV submarine cables at Bali Strait: 4.5 km • 500/150 kV substation at Gilimanuk • 150 kV transmission system reinforcement from Gilimanuk to	• National Parks: 30.4 km • Production Forest: 26.95 km (East Java)	18.60km of the 500 kV TL passes through the Wilderness and Special Utilization zones of Baluran National Park. This cannot be avoided due to limitations imposed by topography. Approximately 3 km passes through the Utilization Zone of Bali Barat National Park. However, no crossing towers and anchor towers required, and TL will use existing 150 kV RoW. The submarine cable will have potential adverse impacts on marine ecosystem.	Permits required from MoF for TL routing through Production/Limited Production Forests and through National Parks. Permits also required from MoE, MMAF, as well as Inland Waterways Authorities. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006.	Same as option 1 B i.e. taking submarine cable landing outside Bali Barat National Park.	MoE and MoF will facilitate forestry permits and AMDAL processing. With reduced impacts on Bali Barat National Park, project can be implemented at a faster pace. However, there will be additional requirements of getting approval from waterways authorities for new submarine

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
	Denpasar load centers • Total Length of TL 500 + 150 kV:164.45+75.6 = 240.05 km			This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.		cable corridor.
OPTION 4: Meeting the power demand of Bali by having local generation at suitable locations duly considering coal transportation facilities, environmental issues, load centers, and 150 kV transmission system for reliably meeting the present and projected power demand in Bali. This option would include reinforcement of North (probable locations for coal fired power plants) to South (major load centers) 150 kV transmission link in Bali with options of using high temperature low sag (HTLS) conductors on existing towers to avoid construction of new TLs.	• Thermal (coal based) Power Plant in Bali • 150 kV transmission system for reliably meeting the present and projected demand in Bali	• Forest Land: No forest land involved in Power Plant 150 kV Transmission • Lines may involve some forest land depending on location of generation unit. • TL may need Paddy Fields/ Wetlands/Other Type of Land	Establishment of a new power plant will require land in Bali region and fuel (coal) mining / import. The operation of power plant will effect physical, biological as well as socio-economic environment. It will contribute to reduced ambient air quality in the region and increase greenhouse gas emissions. Associated 150 kV transmission system will also need land (forests as well as agricultural).	Permits required from MoF, MoE, and local Bali Administration. May be strong local opposition to a new power plant. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006. This is an ADB category 'A' project and a detailed EIA is required. The 120-day disclosure rule will apply, which requires disclosure and circulation of the EIA 120-days prior to board considerations.	New power plant will further increase GHG emissions due to reduced efficiency with power sources on Java. Interconnection is the better option to meet power demand of Bali using surplus power from Java region from a GHG emissions point of view.	Getting permission from MoE will take time from 6 months to 2 -3 years depending on follow up by EA.

Option Description	Project Components	Land Use	Potential Issues	Legal Implications / Remarks	Possible Mitigation measures / options	Associated Costs and Time Required for implementation
OPTION 5: Meeting the power demand of Bali with local generation at optimal locations and strengthening of existing and proposed 150 kV TL/submarine cables with long-term solution of using Java–Bali 500 kV interconnection after choosing the most optimal and technically suitable solution among Options 1 to 3, above.	• Thermal (Coal based) Power Plants in Bali: • 150 kV transmission system strengthening • 500 kV TLs between Java and Bali using overhead or submarine cable options	• Protected Areas: No forest land for small Power Plant. However, transmission system will need conservation forests and production forests	Establishment of new small generation plants will require land in Bali region and fuel (coal) mining / import. The operation of power plants will effect physical, biological as well as socio-economic environment. It will contribution to reduced ambient air quality in the region and increase greenhouse gas emissions. Associated transmission system in future will aggravate the impacts on forests resources, marine ecosystem.	Permits required from MoF, MoE, and local Bali Administration, as well as those associated with option 1 to 3. May be strong local opposition to the construction of a new power plants. AMDAL is necessary as per Regulations of the Minister of Environment No: 11 of 2006, dated October 2, 2006. As per ADB Guidelines: This is category ‘A’ project and detailed EIA is required, 120-day rule will be applicable to this option which requires disclosure and circulation of EIA 120-days prior to board consideration.	New power plants will further increase GHG emissions due to reduced efficiency with power sources on Java. Interconnection is the better option to meet power demand of Bali using surplus power from Java region from a GHG emissions point of view.	Getting permission from MoE will take time from 6 months to 2 -3 years depending on follow up by EA.

Source: adapted from TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, *Appendix 5: Draft Environmental Impact Assessment Report.* 2011

351. A comprehensive assessment of technical, economic, social and environmental considerations associated with the various options was undertaken. The activities and methodology of the assessment are summarized below:

(i) A desk review was conducted of available information from secondary sources.

(ii) Objective discussions were held with concerned officials from the Government line agencies including Ministry of Environment (MoE), Ministry of Forestry (MoF), Ministry of Marine Affairs and Fisheries (MMAF), as well as PLN's head office and regional offices in Java and Bali and ADB representatives.

(iii) Reconnaissance site visits to survey the environmental features in the project influence areas were undertaken covering three segments (East Java, Bali Strait crossing and Bali) of the TL route as well as the areas for any possible power generation in Bali itself. The survey covered an assessment and appraisal of the physical, biological and marine environment features.

(iv) A comprehensive environmental profile of project affected areas was prepared based on the desk review of secondary data, findings from the reconnaissance surveys and discussions with the key stakeholders.

(v) In order to evaluate the environmental impacts associated with each power supply option for Bali and to prioritize these options with an environmental sensitivity perspective, an iterative Delphi method was used. A panel of subject specialists was selected and appraised with the environmental features of the project area by sharing the environmental baseline profile of the project areas. Each specialist was requested to assign the weightage to each environmental component as well as specific scores to various power supply options to Bali. The environmental criteria used and the scale of scores is summarized in Tables 6.2 and 6.3, respectively.

(vi) After the scoring exercise, a panel discussion was organized and experts were allowed to revise their scores until they reached a consensus on the evaluation scores.

(vii) As various environmental impacts due to the project differ in terms of severity, weights for various environmental criteria were discussed in the panel and agreed upon as summarized in Table 6.4.

(viii) Based on the evaluation scores and weights assigned to each environmental criterion, a weighted average method was used to estimate the composite score for each power supply option. Based on detailed analysis of techno-economical, environmental and social parameters, the overall impact score for various options is presented in Table 6.5.[39]

352. The majority of the options (1a, 1b, 2 and 3) called for a 500 kV TL from Paiton to Banyuwangi on East Java. Java is almost entirely of volcanic origin; the steep volcanic topography severely limits corridor options. These limitations have been faced by previous infrastructure projects, and the proposed 500 kV TL RoW from the Paiton Power Complex to Watudodol (the Java side crossing point of the Bali Strait) along the flat coastal plains of the north and northeast coasts of Java closely follows the main Surabaya to Banyuwangi highway as well as an existing 150 kV line running from Paiton to Watudodol (Figure 4.1). No other corridor routing was considered practical.

[39] A detailed elaborate methodology and approach (techno-economic, environmental and social) is discussed and presented in Prioritization Study Report (Supplementary Appendix to the PPTA 7325 Main Report).

353. Although constraints generally limited RoW options on Java to a corridor along the north and northeast coastal plains, the alignment was fine-tuned during the design process to avoid to the maximum extent settlements and other sensitive areas.

354. With reference to Baluran National Park, again the proposed 500 kV TL closely follows the existing 150 kV line and road to Watudodol, passing predominantly through the Special Utilization Zone on the western side of the Park. Routing the TL along the coastline on the northern and eastern side of the Park was rejected as an unacceptable option because it would pass through the Core Zone, would require new access roads, and would increase the overall length of the TL. Routing the TL outside of the Park's southwest border was not possible due to the land belonging to the Indonesian National Armed Forces, and due to topographical constraints imposed by the northeastern slopes of the Raung volcanoes.

355. The options analysis determined that option 1B has the lowest environmental impact score and the lowest overall combined (technical, economic, environmental and social) impact score for meeting Bali's power needs. However, given that it was the least cost option and citing concerns for ecological impacts on coral reefs, it was decided by PLN that it would proceed with Option1A, a 500kV transmission interconnection with an overhead crossing of the Bali Strait.

Table 6.2: Environmental indicators used in Project options impact evaluation

Physical Components	Remark
Air Surface Water Land Use Soil and Geology Ground Water Visual Impact Noise Pollution	The impacts on thesecomponents can be minimized using mitigation measures for potential impacts, with the exception of visual impacts.
Biological Components	
Forest Aquatic Life Habitation Health Exposure	ADB and Government requirements for protection of biodiversity, forests and protected areas are highly significant and relevant
Other Environmental Issues	
Historical Monument Rare Species of Flora & Fauna Endangered Species Protected Wetland	These, being most environmentally/socially sensitive issues, are to be avoided to the maximum extent during the selection of the TL route .

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 6.3: Scoring scale used in Project options impact evaluation

Scoring Scale	Impact Category
1	No Adverse Impact
2	Less impact
3	Moderate
4	High Impact
5	Very High Impact

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 6.4: Weighting assigned to environmental components in Project options impacts evaluation

Environmental Component	Weight (%)
Physical Components	25
Biological Components	50
Other Environmental Issues	25

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 6.5: Project options impact evaluation scores

Option	Overall Techno-Economic Score	Overall Environmental Impact Score	Overall Social Impact Score	Overall Score
Option 1 A	4.375	-2.4	-2.56	-0.58
Option 1 B	4.250	-2.08	-2.25	-0.08
Option 2	3.000	-2.12	-2.25	-1.37
Option 3	2.625	-2.13	-2.30	-1.81
Option 4	3.500	-2.38	-3.53	-2.41
Option 5	3.625	-2.56	-2.76	-1.70

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

356. Information disclosure involves delivering information about a proposed project to the general public and to affected communities and other stakeholders, beginning early in the project cycle and continuing throughout the life of the project. Information disclosure is intended to facilitate constructive engagement with the affected communities and stakeholders over the life of the project. Consultation goes beyond information disclosure. It involves two-way communication between the proponent and the affected communities and stakeholders, and active participation of affected communities and stakeholders in project design and implementation.

A. FRAMEWORK FOR PUBLIC DISCLOSURE, CONSULTATION AND PARTICIPATION

357. Information disclosure, consultation and participation has been undertaken by the TA 7325 consultant as part of the preparation of this EIA, supported by subsequent due diligence activities undertaken by ADB; and by Udayana University as part of the domestic AMDAL process. In addition PLN is engaged in an ongoing consultation process which will continue during the Project construction and operation.

358. Public disclosure, consultation and participation process was initiated early in the feasibility stage, with the affected public informed about proposed project by PLN through communications to and through local government.During the subsequent TA implementation and preparation of this EIA the TA 7325 consultants undertook extensive stakeholder andpublic consultations. In addition, during surveys PLN field officials met people and informed them about the routing of TLs and siting of substations. The disclosure and consultation process was undertaken in accordance with ADB's "Public Consultation and Information Disclosure Guidelines". The public communication framework followed by the Project is shown in Appendix 14.

General Communication Strategy

Communication activities to be funded under the project should have two components: media relations strategy and development communications strategy. On the media front, communications plan aims to mitigate potential adverse publicity arising from the project and minimize inaccurate or sensational reporting. It also promotes awareness of the benefits of the project among stakeholders and the general public. On the Development Communication side, the strategy will assist in providing avenues for affected people, concerned civil society organizations and other groups to receive adequate information about the project and the resettlement activities in a timely manner, as well as providing space for sharing their concerns and feedbacks with ADB and the Government. The communication strategy and participation plan should support each other and not planned nor implemented in isolation.

Communications activities should take account of the (a) methods of communication and messages to be compatible with prevailing social or religious norms in the place where the communication activity is carried out, (b) activities should respect the local environment, (c) promote environment for two way dialogues among stakeholders, and (d) in all communication activities, the local language(s) and reader-friendly materials should be used.

This provides a generic sample of the various components of a communication strategy, as follows

- Overall communication objectives
- Target groups
- Specific objectives for each target group, related to the action's objectives and the phases of the project cycle
- Key messages
- Main activities that will take place during the period covered by the communication and participatory plan, including details of the nature of the activities and the responsibilities for delivering the activities
- Most appropriate communication channel for each target groups (media, interpersonal communication, online etc.)
- Completion of the communication objectives and indicators of achievement for the different tools proposed
- Provisions for feedback (when applicable) with details of assessment forms or other means used to get feedback on the activity from participants
- Human resources including person-days required to implement the communication activities and team members responsible for communication activities
- Financial resources such as budget required to implement the communication activities, which should be included in the financing agreement.

Elements of a Communication Plan

Different activities may be appropriate at different stages of the project cycle. In any event, communication activities should focus on achievements and the impact of the action, not on administrative and procedural milestones. These elements may be useful when drafting the communication plan, as well as in the absence of a formal plan. Before initiating any information, communication or participatory activity, contractors, implementing partners, along with Project Officer, should contact the External Relations and Information Officer of ADB country resident missions and that of the Borrower. Some key elements of the communication plan might include:

Media communication plan

- Press releases
- Press conferences
- Press visits
- Holding statement
- Multimedia (photographs, audiovisual productions, infographics)
- Cell phones and SMS
- Impact stories
- Web sites and social media
- Leaflets, brochures and newsletters

Development communication and participation plan

- Public consultations and town hall meetings
- Household visits and interpersonal communications
- Focus group meetings
- Reader-friendly materials
- Website and social media

359. The level of engagement varied amongst stakeholders with some registering minor comments and other proving more detailed feedback. Much of the consultation to date has focused around concerns on the TL alignment, mitigation of construction impacts, and potential health effects from electromagnetic field from proximity to high voltage power lines and substations. Stakeholder viewpoints have been taken into account and their concerns and suggestions for possible improvements, where appropriate, have been included. It is important to note that no stakeholders have registered any outright opposition to the Project.

360. There is also a requirement for ongoing consultation related to land acquisition and compensation; this process is documented separately in the land acquisition and resettlement plan (LARP).[40]

B. Stakeholder Consultations

361. The consultants undertook stakeholder consultations with:

- Officials from relevant Government and implementing agencies, including the Ministry of Environment, Ministry of Forestry, Pollution Control Board, Office of the Wildlife Conservator, Ministry of Fisheries, and Ministry of Marine and Coastal Affairs;
- PLN - officials in both headquarter and in local field offices;
- Officials from non-governmental organizations (NGOs) working on environmental and social fields in the Java and Bali Provinces;
- Relevant private consultants and other professionals.

362. Table 7.1 summarizes stakeholders consulted by the TA 7325 consultants during the EIA preparation.

363. In addition to these meetings, ongoing discussion sessions and meetings were undertaken between the TA 7325 consultant and PLN and its associated companies relating to project planning and design of the Project subcomponents, including formal workshops to discuss Project options and informal discussion sessions.

C. Public Consultations

364. Public consultations with affected communities and households were undertaken at the project planning phase (e.g. TA inception phase). Consultation were carried out through questionnaire surveys, individual interviews, focus group discussions and formal consultations, and included affected peoples, village heads, community leader, Bupatis, and staff from local government. A three phase consultation process was undertaken:

- Phase one - consultations were carried out during the TA inception phase (January 2010);

- Phase two - consultations were undertaken during the TA interim stage (May-July 2010);

- Phase three - detailed consultations were undertaken during preparation of the draft EIA and social and resettlement studies (October – December 2010).

[40] Java Bali 500 kV Power Transmission Crossing Project Land Acquisition and Resettlement Plan, 2012.

365. Details of the public consultations are summarized in Table 7.2. Photographic records of public consultations meetings are presented in Appendix 11, and signed attendance sheets are presented in Appendix 12.

D. RESULTS OF PUBLIC AND STAKEHOLDER CONSULTATIONS

366. The key concerns and issues expressed and recorded, during the consultations with stakeholders and affected people were:

- Appreciation and gratitude from residents towards the Government for initiating the project as there is an increasing demand for electricity in Bali;
- Concerns regarding the time required for processing various clearances and the schedule and time frame for completion of the Project;
- From Baluran and Bali Barat National Park officials - the general opinion is that the Project will have some negative impacts for the parks. However, efforts should be made to minimize impacts particularly from the location of towers, construction activities, operation of machinery, and disposal sites. Regular consultations should be carried out with park officials both at Baluran and Bali Barat field offices as well as at the MoF and MoE in Jakarta.
- No major concerns were raised by affected people during the consultation process.

367. The key issues raised and responses are summarized in Table 7.3.

Table 7.1: Stakeholder consultations conducted

Day / Date	Stakeholder / Meetings
Tue, 19 Jan 2010	• Meeting in PLN; Transmission Team, on 13 floor, PLN Central office Jakarta
Sun, 24 Jan 2010	• Meeting with the Manager of PLTU Paiton and other staff (pak Sugeng, pak Agus).
Mon, 25 Jan 2010	• Consultation with Villages and Local People at Perhutani Unit II Jawa Timur, Location: Village Ratakan, Sub-district Kendet, District Situbondo; Consultations with local people in Village Banyu Putih Sub-district Banyu Putih District Situbondo; (ii) Tower no. 98-99. • Discussion with Baluran National Park (East Java) field officers and village communities at Village Bangsirang, Sub-district Wongsorjo, District Banyuangi • Meeting with PLN Officers at Ketapang , location Switching Station or the last tower (150 kV), Existing condition of TLs Java-Bali Sub marine cable;
Tue, 26 Jan 2010	• Meeting with Bali Barat National Park Field Officers at Sumber Klompok Village, Grogak Sub-district, Buleleng District • Discussion with PLN Officials at Gardu Induk Gilimanuk, Gardu Induk Antosari, and Gardu Induk Kapal, Bali
Wed, 27 Jan 2010	• Meeting in PLN Distribution Officers at Jl. Diponegoro No. 17, Denpasar
1 February 2010	• Ministry of Environment • • Officials Present in the Meeting: 1. Ms. Ibu An, Technical Person, AMDAL 2. Mr. H. Chairuddin Haysim, Dy. Assistant for Environment Supervision and Evaluation Division 3. Mr. Riza Pahlevist, Technical Staff, AMDAL Directorate 4. Mr. Sunil K. Choukiker, International Environmental Specialist, ADB TA 7325 5. Dr. DT. Tumpatih Supriadi, National Environmental Specialist, ADB TA 7325 6. Ms. Maily, Local Support Staff, Environment, ADB TA 7325 Summary of Issues Discussed:

Day / Date	Stakeholder / Meetings
	• Current National Policies and Regulations regarding environmental protection in the Country • National Framework / Organizational Structure for Environmental Management including various Ministries and Departments • Roles and responsibilities of various agencies/ministries i.e. Ministry of Forestry, Ministry of Environment, Ministry of Marine Affairs and Fisheries etc. • Policies and Requirements to Conduct Environmental Impact Assessment (AMDAL) for Development Projects including Power Sector Projects • Procedural requirements to get clearance / approval of AMDAL • Legal implications to implement proposed 500 kV Java-Bali TLs Project.
22 March 2010	• Ministry of Forestry Officials Present in the Meeting: 1. Ms. Dian Sr. Kusumastuti, Head, Environmental Subdivision, Centre for Standardization and Environment 2. Mr. Dony Arif Wibowo, Technical Staff, Environmental Subdivision, Centre for Standardization and Environment 3. Mr. Sunil K. Choukiker, International Environmental Specialist, ADB TA 7325 4. Dr. DT. Tumpatih Supriadi, National Environmental Specialist, ADB TA 7325 5. Ms. Maily, Local Support Staff, Environment, ADB TA 7325 Summary of Issues Discussed: • The issue of overhead crossing at Bali strait and involvement of Bali Barat National Park were discussed. Officials informed that Ministry was well aware of the issues and they had already attended the previous discussions meetings invited by PLN. They informed that the proposal was rejected mainly because of opposition from local people considering their deep sentiments towards vicinity of Holy Temple. • About the development in Core Zone of National Park, Ministry informed that as per national regulations, no developmental activities are allowed within Core Zone of National Parks. • The option of multi circuit tower has also been discussed and Ministry informed that this could be taken up if the use of forest land for non-forest purpose for existing towers is permitted in the original agreement / memorandum. • Maintenance of existing towers is possible within National Park areas, only if it is permitted in the original agreement / memorandum for existing towers to use forest land for non-forest purpose. • On the type of forests, Ministry informed that as per national regulations, there are three types of forests i.e. Conservation Forest, Protection Forest and Production Forest. Development activities can be taken up in Protection Forest and Production Forests with prior permit from Ministry. However, within Conservation Forests, no development activities are allowed. Only forest related activities can be taken up in the Conservation forest. National Parks are covered under Conservation Areas. • On submarine cable option, they informed that Department of Fisheries need to be approached for permitting the submarine cable option. It is also informed that there are designated national parks within sea as well. If the submarine cable alignment passes through under sea national park, then permit from Ministry of Forestry is required. • On the issues of independent generation in Bali, Ministry informed that Ministry has no objection with this and they can consider the case for permission. However, they informed that Regional Planning and Development Office in Bali has to consult for local/provincial regulations and permissions to develop power plants within these areas. • On procedural requirements for permit, it is informed that project proponent has to submit application to the Ministry of Forestry with details of the proposal and Ministry will examine the case. They also informed that there will be joint discussion on the application among stakeholders once Ministry receives the application.

24 March 2010	• Ministry of Environment Officials Present in the Meeting: 1. Ms. Hermin Roosita, Deputy Minister, Special Environment Management, Ministry of Environment 2. Mr. Sunil K. Choukiker, International Environmental Specialist, ADB TA 7325 3. Dr. DT. Tumpatih Supriadi, National Environmental Specialist, ADB TA 7325 4. Ms. Maily, Local Support Staff, Environment, ADB TA 7325 Summary of Issues Discussed: • Explained and discussed various options considered under the TA for Java-Bali Power Interconnection • Requirements of Ministry of Environment for development of power TL projects • Possibility to develop interconnection with overhead TL option and submarine cable option as well as independent power generation in Bali region • Dy. Minister informed that Ministry was aware of 500 kV overhead TL option at Bali strait which had been submitted by PLN to the Ministry earlier. She informed that on the basis of issues associated with line passing through Bali Barat National Park and existence of Old Temple near lending towers on Bali side, Ministry has advised PLN to consider alternate option. • On various options, Dy. Minister informed that current proposal of 500 kV overhead TL crossing Bali strait in Bali Barat National Park is not feasible. However, she informed that options of submarine cable and independent generation could be approved by Ministry of Environment. • On the issue of permitting project activities in National Parks, she informed that Ministry could consider the case with special considerations provided project proponent furnished valid justifications. Also for any activity within national parks, project authority has to get clearance from the Ministry of Forestry for the case to be considered by Ministry of Environment. Both the Ministries have to be involved in the process of permission. • She further informed that environmental impacts associated with each option should be examined. • Dy. Minister has assured full cooperation of Ministry towards projects and she advised to initiate the process of clearance at the earliest possible.

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 7.2: Summary of public consultations

Date	Project Component	Venue / No. of Participants	Issues discussed / remarks
October–November 2010	500 kVTL	Situbondo District / 49	• Awareness of the project • General awareness of environmental pollution • Benefits of the projects • Likely impact on direct / indirect development • Environmental problems in the region • Presence of environmentally sensitive areas in the region. • Health and safety issues • Compensation payment mechanism • Initiatives for minimizing environmental / social impacts • Overall queries raised by people were replied to their satisfaction.
October – November 2010	500 kVTL	Badung District / 03	
October – November 2010	500 kVTL	Buleleng district / 01	
October – November 2010	500 kVTL	Jembrana district / 30	
October – November 2010	500 kVTL	Tabanan district/ 32	
27 May 2010	500 kVTL	Bali (Bupatis) / 31	
27 May 2010	500 kVTL	Banzar Village (Affected people) / 20	

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

Table 7.3: Summary of major issues discussed during public consultations

Issues	Suggestions from Stakeholders / Affected People	Proposed Action
Forestry Agency of Bali Province: The Agency complained that there were pegs set up in their area without coordination and permission from them.	It was decided to take the Forestry Agency of Bali Province in confidence and invite them for discussion	Noted and PLN to take suitable/appropriate action
Shepherd boys while playing might reach/climb transmission tower, which will be built in pasture.	The people expect that the incoming transmission tower which will be built in pasture secured by fence	Anti-climbing devices will be proposed in this project.
Land acquisition	The public expect that PLN maintain transparency in case of land acquisition and payment of compensation for impacted land. PLN should pay landowner directly under knowledge of the concerned heads of the locality.	Noted and will be informed to PLN to follow a suitable procedure
People blaming either village head or head of sub district in case of any crisis	Concerned heads should be involved in coordination and information dissemination to public, to develop partnership between PLN and local government.	Noted and will be informed to PLN to follow a suitable procedure
Some misunderstandings with local people	If the project team needs to enter the sites for any project related activities, it is expected that PLN and all of its counterparts to work in coordination with the local heads	Suitable CSR will proposed
	PLN Paiton will recruit more people of Situbondo and Banyuwangi Sub Districts as laborers in construction of coal fired power plant and its high voltage	

Issues	Suggestions from Stakeholders / Affected People	Proposed Action
	transmission.	
	Provide community development program in nearby areas surrounding transmission as CSR or as such.	
	Provide continuous assistance for affected people to keep supporting the community development program, and to avoid temporal responsibility of PLN side.	
Acquiring fertile land, impact people around, won't exacerbate scenery andwon't disturb sustainability of flora and fauna in Bali Barat National Park Region	People think that it is better to build 500 kVTL in the same route (ROW) of the existing route of 150 kVTL. Other way is using underground cable instead of overhead cable. New tower construction should be avoided as far as possible. Not to build the new TL, but rather to upgrade/up rate the existing one.	The proposed route would be decided in such a manner that it has the least impact on the national park. Wherever critical areas are encountered, alternate measures will be suggested. Laying of underground cable for a long distance is not technically possible and comparatively its cost is very high.
Problem in uniformity of payment	If it takes compensation for land along the TL, the compensation should be equal for plantation field and paddy field. If it is considered to paddy price, no wonder the compensation for it would be lower than the price of plantation products such as coconut, clove, durian, mangosteen, cacao, etc.	It will be recommended in the report for maintaining uniformity.
Compensation for lands within Right of Way (RoW) along the TL is given priority. It is due to the anxiety and fear of negative impacts that mat follow and moreover the sale price of lands within RoW is very low, even unwanted.	Compensation should be paid for lands around the RoW, which are considered to be impacted by electricity induction.	Noted
Compensation should be paid for lands around the RoW, which are considered to be impacted	Tower higher than coconut tree is not a problem as long as it is located far from religious site. In accordance with regional regulation, they should not be higher than coconut tree (about 15 meter) is inhabited buildings,	It will be recommended to follow regional regulations.
To conduct further dissemination in affected areas, so that the affected people can understand clearly the risks and the compensation they hold.	A representative should not be used on behalf of affected people	Noted and will be informed to PLN
Assurance fee for health impacts	Besides providing proper compensation, it is required that the impacted people along the TL are also provided with assurance fee for health, death and any destruction of building, plants and pets that may be caused by the transmission (such as collapsing tower, broken cable, etc.). The assurance fee should be legalized in written and detail per item, so that it won't cause loss to the impacted people.	Noted and suitable compensation mechanism will be proposed.
Staff of Bali Barat National Park suggested that TL should not pass	Even if it is possible technically, transmission cables shall not stretch	The proposed route would be decided in such a manner

Issues	Suggestions from Stakeholders / Affected People	Proposed Action
through the national park area. They were anxious about any negative impact on the Park.	overhead but planted underground, so that they won't exacerbate natural scenery and eliminate dangerous effects.	that it has the least impact on the national park.
TL over the National Park	The participants felt that visitors of the Park would mostly complain if TL stretches over the park (it is moreover high voltage transmission). It will affect the nationalpark directly and image of its management indirectly	The proposed route would be decided in such a manner that it has the least impact on the National Park.
All the villagers are willing to participate if PLN and investor maintain coordination with the community and keep their word that the development of power infrastructure will not adversely affect the community.	a. To pay more attention to matters of safety, conduciveness, security and health of local community during construction and operation of power infrastructure; b. Conduct continuous information dissemination, particularly concerning its negative effect; c. Valuation, redress and compensation of affected land, plant, building, etc. should be assessed based on market price; d. For the construction, local people should be deployed as labor.	CSR mechanism will be proposed
Compensation for lands along the TL have not been paid yet and complaints are not redressed.	This compensation has to be paid before any other transmission system is constructed. Safety measures, such as using safely covered cables and minimizing adverse impacts to local people such as long term health adverse impact. Upcoming redress for land acquisition shall be in line with present market price.	Noted and will be informed
1. Children with less IQ and vulnerable to diseases are due to existing transmission that passes over community settlements. 2. Some towers are so low in some regions that their cables touch plants (particularly the bamboo plantation). 3. The participants wanted the pending complaints/problems to be resolved before coming up with planned transmission. 4. Conduct comprehensive information dissemination.	a) To involve related stakeholders, so that positive and negative effects such as induction impact on health and so on, are known. b) Decide the upcoming TL and location for the towers in coordination with villagers along the TL. c) Any decision regarding tolerance or resistance for upcoming project depends on villagers' conference. d) To explore the possibility of upcoming planned transmission and existing transmission in the same route.	There is no negative health effect of the TL. CSR mechanism will be proposed.
Impact on paddy crops	The villagers communicated that paddy crops has failed as lights from Transmission Project attracts insect and pests as a consequence rice production is declining. They have some feeling that negative effects emerged from overhead transmission, but not yet complained firmly. Electricity is a basic need and people tried to seek possibility that upcoming TL is constructed to cross over or get through the mountains in order to avoid community settlement. Information dissemination to community, so	There is no negative health effect of the TL. CSR mechanism will be proposed.

Issues	Suggestions from Stakeholders / Affected People	Proposed Action
	that the safety matter and health impact could be considered. PLN need to inform about the dangers that might emerge from sparks from transmission cable.	
Fear of losing the livelihood	People who have agriculture field, fish pond and house near the power plant site were anxious and feared of losing livelihood, even though were provided compensation or land bought by government, but people were not convinced. People are worried about long-term negative impact on health, destruction of surrounding environment (surrounding plantation is wilted and dried off).	Noted the need to keep people aware.
Provision of job opportunity and social grant to community.	It Is necessary to conduct more awareness for communities in the villages surrounding the transmission regarding positive and negative effects of power transmission on community. For land acquisition or redress, the investor should directly be connected with land owner. During implementation of the Project local labor/manpower as per their ability/skill should be given priority for employment	CSR mechanism will be suggested PLN to take appropriate action

Source: TA 7325 - INO: Java–Bali 500 kV Power Transmission Crossing Project, Final Report, Appendix 5: Draft Environmental Impact Assessment Report. 2011.

E. DUE DILIGENCE CONSULTATIONS

368. ADB's due diligence review of the TA 7325 outputs also included stakeholder consultations with ADB, PLN, MoE, MoF and Udayana University, as well as site visits conducted in coordination with PLN to Baluran and Bali Barat National Parks (Appendix 13). The focus of the due diligence consultations was to better understand the status of project preparation, particularly with respect to the domestic AMDAL and MoF permits.

F. DISCLOSURE AND CONSULTATIONS UNDERTAKEN BY UDAYANA UNIVERSITY

369. During the preparation of the ANDAL report Udayana University has also undertaken Project related information "dissemination" and consultations in order to inform the affected public about the proposed Project and to seek their feedback and input. The process was also used to seek the public's input on determining significant impacts in the context of preparing the ANDAL ToR.

370. Dissemination and consultation activities have been carried out three times and were focused on communities which would be directly affected by the Project. Methods utilized included:

- Announcements in local newspapers (e.g. January 14, 2011 in the Bali Daily News, and January 21, 2011 in the Daily Post Java).
- Notices in public places in the affected districts.
- Announcements in District government and related institutions; and

- Public forum including the proponent, the Udayana EIA Study Team, and local community leaders and representatives from the villages and local districts. Meetings were held at three locations on the RoW alignment: 2 March 2011 in Situbondo, 16 March 2011 in Jembrana, and 30 March 2011 in Tabanan.

371. The preliminary results obtained are:

- land acquisition procedures should be implemented directly from PT PLN (Persero) to residents affected by land acquisition without a third party, but with the involvement of village and district heads;
- the impact of magnetic and electric fields on health should be considered;
- cutting of trees at the National Parks should be minimized;
- the Project should be accelerated to provide benefits to those not receiving electric power.

G. EIA Disclosure

372. The EIA executive summary, in both English and Bahasa Indonesia, will be made available for public review at the PLN regional offices in Bali and Java. The full draft EIA was also posted on the ADB website on August 2012 for the 120-day public disclosure requirement and was available at the PLN headquarters in Jakarta and PLN regional offices in Bali and Java.

373. The AMDAL, prepared by by Udayana University, will also be publiclly disclosed. However, the Indonesian AMDAL process only requires the disclosure to the public after the EIA has been approved by the MoE. The environmental permit for the AMDAL was issued by MoE in April 2013.

H. Recommendations and Future Consultation Activities

374. Overall, the consultations taken to date shows that affected residents and local communities expressed support for the Project as they clearly understand the benefits to the community as well as the region.

375. Environment related public consultation process will continue through the Project construction phase and into the operation phase as part of the Project Public Communications Framework. This will include disclosure and public consultation techniques including public meetings, small group meetings, informal meetings, brochures, advertisements, signs and other outreach activities. During such consultations the public will be further informed about the Project in general and, in particular about:

- finalized project design (i.e. TL route and siting of substations);
- PLN design standards in relation to approved international standards;
- EMF health impacts;
- measures taken to avoid public utilities and sensitive receptors;
- measures taken to minimize aesthetic impacts;
- other impacts associated with TLs and PLN's approach to minimize and mitigate them;
- land and assets acquisition and compensation; and,
- socioeconomic benefits of the Project.

376. The Project Public Communications Framework is presented in Appendix 14. As required by the framework, separate Communication Strategy/Plan will be developed for Java and Bali.

VIII. GRIEVANCE REDRESS MECHANISM

377. The ADB's SPS requires implementing agencies to establish a grievance redress mechanism (GRM) to receive and facilitate resolution of affected persons (APs) concerns and complaints about the Project's environmental performance. A GRM should be scaled to the risks and adverse impacts of the project; should address affected people's concerns and complaints promptly, using an understandable and transparent process; should be readily accessible to all sections of the community at no cost and without retribution; and,should not impede access to local judicial or administrative remedies.

378. Extensive information disclosure and public consultation and participation have been undertaken through the Project environmental assessment processes (see Chapter 7) and through the land acquisition and compensation processes, and based on the results public support for the Project is strong. Nonetheless, during construction and operation it is possible that unanticipated impacts may occur if the mitigation measures are not properly implemented, or unforeseen issues occur. In order to address complaints if or when they arise, a Project GRM has been developed in accordance with ADB requirements and Governmentpractices (Figure 8.1).

379. The Project GRM includes procedures for receiving grievances, recording/ documenting key information, and evaluating and responding to complainants in a timely, open and effective manner. It consists of fiveescalating stages, with an emphasis on addressing problems locally on site if possible, and escalating to the next management level if a resolution cannot be reached. A Grievance Redress Committee will be formed in each district with locally elected members.

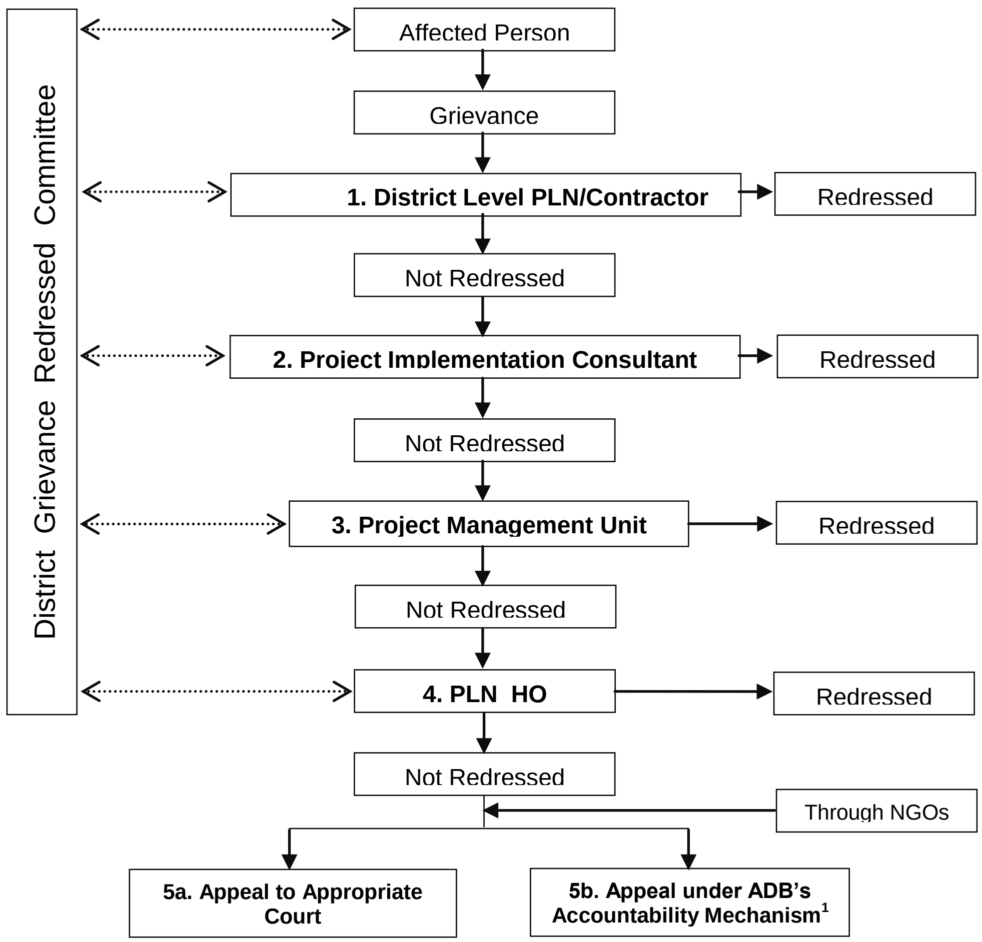
380. The AP initially submits their grievance formally or informallyto the relevant PLN District Office or local government representative who will forward it to the District Office, or directly to the contractor who will forward it to the PLN District Office. The District Office will record and document the grievance. If possible the grievance will be resolved at this level, with the District Office working together with the contractor.If the complaint is not settled to the satisfaction of the AP within 15 days it will be elevated by the District Office to the Project Implementation Consultant (PIC), and if not resolved satisfactorily within a further 15 days the grievance will be elevated by the PIC to the Project Management Unit (PMU), and then after a further 15 days to PLN Headquarters, if necessary. At each stage the District Grievance Redress Committee will act as third party to ensure a fair and just resolution, and assist in grievance mediation.

381. If the grievance cannot be resolved at the PLN HQ level to the satisfaction of the AP the AP may choose to access the local judicial system or appeal to ADB under the Accountability Mechanism.

382. A record of grievances filed will be kept by each District Office and will be maintained centrally by the PMU. It will be evaluated periodically to determine common complaints in order to avoid such grievance in the future, if possible, and to improve procedures in handling them. Lessons learned from the complaints will be incorporated in revising and streamlining of the grievance process.

383. Appeals to the GRM will be free of charge, and all reasonable expenses incurred should be paid from project funds. The GRM is consistent with the Land Acquisition and Resettlement Plan (LARP).

384. PLN has overall responsibility for establishing, maintaining and implementing the GRM and District Grievance Redress Committees. Once the operation phase commences and the PIC no longer exists, the PIC portion of the GRM (i.e. Stage 2) will be eliminated.



[1] The ADB Accountability Mechanism provides a forum where people adversely affected by ADB-assisted projects can voice and seek solutions to their problems and report alleged noncompliance of ADB's operational policies and procedures. It consists of two separate but complementary functions: consultation phase and compliance review phase. For more information see: http://beta.adb.org/site/accountability-mechanism/main

Figure 8.1: Grievance redress mechanism (GRM)

IX. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

385. Environmental Management Plan (EMP) is prepared for all the identified environmental impacts during pre-construction, construction and operation phases of the project. This EMP outlines mitigation and monitoring requirements that will ensure compliance with the GOI environmental laws and regulations, comply with the Safeguards Policy Statement of ADB and other international and related standards. The methodology followed for preparing the EMP consists of the following steps:

- Identifying the significant environmental impacts of the project for each phase of the project,
- Formulating the mitigation/protection measures for the anticipated impacts of the project,
- Implementation and monitoring of the proposed mitigation measures,
- Estimating the budget requirements for implementing and monitoring the mitigation measures, and
- Identifying responsibilities of various agencies involved for the implementation and monitoring of the mitigation measures.

386. The EMP includes general measures for the overall transmission line as well as specific measures for the sections through the two national parks. Collaborative Agreements between National Parks and PLN should also be implemented for the conservation, protection and preservation of the status of biodiversity within the national parks. The Baluran and Bali Barat National Park Authorities will be responsible for implementing the respective collaborative agreements.

387. In the event of any change of alignment or the identification of unanticipated environmental impact during the project implementation, PLN will revise the EMP and will submit to ADB for approval.

A. ENVIRONMENTAL MITIGATION PLAN

388. The mitigation measures to address the identified impacts during preparation, construction and operation stages of the project are summarized in Table 9.1.

389. A comprehensive package of environmental mitigation and offset measures has been designed to support biodiversity conservation in the two national parks. Specifically, the environmental management plan includes measures to: (i) avoid negative impacts to sensitive wildlife species through careful construction timing and poaching prevention; (ii) minimize vegetation clearing to TL bases, with limited or no clearing along the project RoW; (iii) offset vegetation clearing through targeted restoration actions and the management of invasive species.

Other than the Collaborative Agreements with the Bali Barat and Baluran National Park, cost for the mitigation measures are included in the Project costs. PLN is responsible for the the provision of funding and monitoring of the implementation of the Collaborative Agreements. Example of the Collaborative Agreements between the National Parks and PLN are discussed in Chapter V in the section of National Park Collaborative Agreements.

390. The table of mitigation measures (Table 9.1) include the general impacts and mitigation measures for each phase of the project. The site-specific mitigation measures are also included in the EMP for the protection of the biodiversity in Bali Barat and Baluran National Parks which are presented in Tables 9.2 and 9.3. The site-specific mitigation measures for the National Park will be strictly followed and implemented by the contractors in addition to the general mitigation measures of the Project

391. The EMP will form part of the bidding documents and will be implemented by the contractors. As part of the bidding process, the contractor will be required to prepare a Contractors Environmental Management Plan (CEMP) which details the measures, budgets and schedule for complying with the Project EMP.

Table 9.1: Summary of Environmental Impacts and Mitigation Measures

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
Design/Pre-Construction					
1. Project Awareness/Introduction of the Project to the Local Community					
Disclosure of project information	Prior to start of site works, local residents and establishments, local authorities and other stakeholders who are likely to be affected by the project shall be informed on the construction schedule and activities, potential environmental impacts and mitigation measures through public meetings at each community.	Public consultation	Included in the project cost	PLN,PIC	PLN,PIC
Lack of mechanism to resolve environmental complains due to project implementation	Prior to start of works, PLN and PIC shall undertake the following: (a) establish a grievance redress mechanism (GRM) as discussed in the EIA (b) through public awareness campaigns and inform the public about the GRM (c) ensure that the names and contact numbers of representatives of PLN and PIC are placed on the notice boards outside the construction site	Public consultation and information dissemination	Included in the project cost	PLN,PIC	PLN,PIC
Preparation and implementation of environmental management plans	Prior to start of works, the environmental management plans should be prepared by the contractor and shall be submitted to the project supervising consultant for approval.	Proper planning and environmental measures should be included in the contract documents. Careful monitoring	Included in the project cost	Preparation: Contractors Approval: PLN and PIC	PLN, PIC, EHS specialists
2. Land Acquisition and Resettlement					
Land acquisition or the potential loss of agricultural, forestry and grazing land	• The alignment of the transmission lines were designed to avoid existing land uses wherever possible (see detailed TL. • If temporary and permanent acquisition of land cannot be avoided, a “Land Acquisition and Resettlement	Proper planning to be added in relevant parts of the documents. Implementation of	Included in the project cost	Design consultants, PLN, PIC	PLN

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	Plan (LARP) was developed in accordance with Government and ADB requirements to accurately compensate and relocate the affected people.	the LARP.			
RoW in sensitive receptors: school; hospitals, environmentally sensitive areas and other existing infrastructure (i.e. roads, railways, TLs)	• The alignment of the transmission lines were designed to avoid the temporary acquisition of RoW to existing sensitive receptors and other infrastructures. • If avoidance is not possible, a buffer of 500m from the edge of the RoW will be maintained to minimize potential environmental impacts • Engineering design were incorporated in the design to minimize such impacts • Continuous public consultation to increase public awareness about the GRM.	Proper Planning and careful engineering design. Careful monitoring.	Included in the Project Cost	Design Consultants, PLN, PIC	PLN, PIC
RoW in PCRs or on areas with significant archaeological significance	• The alignment of the transmission lines were designed to avoid the PCRs and significant archaeological sites. • A chance find procedure is prepared if archaeological relics/artifacts were found.	Proper planning and careful engineering design.	Included in the project cost	Design consultants, PLN, PIC	PLN, PIC
RoWs on National Parks (see Tables 9.3 and 9.5 for the site-specific mitigation measures)	• The alignment of the transmission lines were designed to avoid the alignment and passing of the transmission lines along national parks. • If avoidance is not possible, a collaborative agreement should be negotiated between PLN and the National Parks to compensate or rehabilitate any loss of biodiversity in the area (detailed mitigating measures are discussed in the section on site-specific mitigation measures for National Parks in Tables 5.4 and 5.6)	Proper planning and careful engineering design. Collaborative Agreements between ADB,PLN and the National Parks		Design consultants, PLN, PIC , National Parks	PLN, PIC and National Parks

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
Excavation of construction materials and development of quarries and borrow areas causing loss of alternative land use.	• Maximum use of existing quarry and borrow areas already in operation, • Degraded, barren, riverbeds and waste lands to be used for borrow materials • For temporary acquisition of agricultural lands for RoW, provision of adequate and timely compensation for standing crops and trees prior to clearing of the site. • Proper cutting and storing of vegetations and storing at suitable locations for burning • Use the best management practices for the protection of flora and fauna.	Proper planning and measures to be added in the relevant part of contract documents	Included in the Project Cost	Design consultants, contractors and PLN	PLN,PIC, EHS specialist
Construction					
1. General Construction Impacts and Mitigation Measures					
Earthworks for new access roads and construction on steep slopes leading to erosion and encroachment.	• Slopes along access roads will be provided with catchments/cut-off drains and chutes to minimize soil erosion and masonry for retaining structures • Formation of sediment basins and slope drains • Materials used for tower foundations and surface dressing will consist mainly of aggregates and gravel, which do not contain silt • Maximum usage of materials in fill areas • Spoils planning particularly on steep slopes with bench terracing for high cut areas and to avoid any soil erosion of materials on down slopes • Tree planting programs • Most of excavation and earthworks should be done during dry season to minimize silt run-off and erosion • Rehabilitate areas used for temporary construction.	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists
Quarrying of Borrow Materials with potential for loss and degradation of land	• The location of temporary borrow and spoil pits, construction camps and contractor's facilities will be determined during detailed design in accordance with the applicable laws and regulations in Java and Bali provinces. • Borrow and disposal pits will not be located in environmentally sensitive areas, including within 100m of wetlands, mangroves, national parks (except those	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	within the RoW) and other area of high ecological value • Borrow and disposal pits are to be located away from settlements so as to minimize visual impacts • Disposal pits are only to be used for spoil disposal and not for construction or other soild wastes • No earth will be borrowed from cultivated lands • Borrowing to take place from barren wastelands and riverbeds • For new borrow areas, all measures will be taken to avoid loss of any productive soil • Any borrowed areas will be refilled, re-vegetated and landscaped with tree planting. • Rehabilitate the quarry area. This include covering the quarry area with good quality soil and planting native vegetation. Surfaces should be provided with a low angel slope sufficient to avoid pooling of water which may be breeding area for insects.				
Taking of Quarry Materials with loss and degradation of land	• Quarry materials will be obtained from existing operating sites with the appropriated licenses and environmental clearances • New quarries to be opened should have environmental clearance from respective authorities	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists
Damage of local roads, disruption of public utilities. Impacts on traffic safety.	• Repair all damaged roads to their original state after the construction of the project is complete. • Any public utilities likely to be impacted, such as water supply pipe system, power/phone lines, etc. must be relocated to suitable places in consultation with local communities/affected people • Dust suppression measures with spraying water should be taken for all roads used to transport construction materials. • Ensure that all construction vehicles observe speed limits on the construction sites and on public roads • As much as possible, schedule the delivery of construction materials and equipment during non-peak hours. The peak traffic hours in Indonesia is between 6:30-8:30am and 3:30-4:30pm.	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
Air Quality Impacts due to gaseous and dust emissions	• Wherever possible, use electrically powered equipment rather than gas or diesel-powered equipment • Position any stationary emission sources (e.g. potable diesel generators, compressors, etc) as far as is practical from sensitive receptors • Burning of wastes generated at the construction sites, work camps and other project-related activities be strictly prohibited • Emission levels of all construction vehicles and equipment should be in compliance with Indonesian emission standards • Keep stockpiles moist and cover vehicles with tarpaulin sheets or other suitable materials to minimize dust emission. • Pollutant parameters will be monitored during construction • Concrete mixing areas shall be located at least 100 m from the nearest residential area and sensitive areas (e.g. school, place of worships, etc) • Hot mix and batching plants should be sited according to the mitigation measures presented in Chapter 5 and should be operated in accordance with applicable Worldbank EHS Guidelines. • Onlycontrolled blasting should be carried out. • Implement a 24-h community complaints hotline	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists
Water pollution from construction activities and construction equipments. Potential contamination of groundwater due to spills of fuel and other hazardous substances	• Construction sites within 50m of waterways should be protected by silt fences • Fuel storage and refueling will have adequate containment away from water bodies/channel, at least 100m away from any watercourse. • The contractors should prepare a Spill Management Plan • Ensure availability of spill clean up materials (e.g. absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored • Store hazardous materials above flood level • Precautions to be taken to prevent water pollution due to increased siltation and turbidity from construction	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	activities particularly in dry months when flows are low • Approved sited defined for storage and disposal of waste materials • Any petroleum waste products will be collected ,stored and disposed at approved sites				
Drains: Drains if not constructed as per design will overflow during monsoon.	• Strict adherence to design standards and dimensions • Reduce infiltration of contaminated drainage through storm water management design • Avoid placement of construction materials, waste storage areas or equipment in or near drainage channels • Prohibit disposal of waste materials to drainage channels	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists
River crossing, streams and irrigation channels	• Natural watercourses should be maintained as much as possible. • The work on access roads, culverts and bridges should be limited during dry season when many of the smaller streams have low water flows. • Debirs and vegetation clogging culverts should be regularly cleared. • Affected irrigation ditches and canals should be engineered so as to maintain their original function. Careful monitoring and design should be observed for the New Kapal substation, where an underground conduit or diversion channel will be required to maintain the natural flow of water in the irrigation channel	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists
Noise impacts due to operation of construction equipment vehicles and various construction activities	• All construction equipments and activities will conform to Indonesian standards • Any blasting works will be in accordance to Indonesian standards • All vehicles and equipment to be fitted with noise abatement devices	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	• Construction-related activities will be done during daylight (between 22:00 and 06:00 hrs) and construction site should be 500m away from settlements. • Provide temporary noise barriers as necessary to construction activities near sensitive receptors (i.e. schools, place or worship, etc) • No construction activities near schools during examination period • Provide prior notification to the community on schedule of construction activities • Construction workers will be provided with ear protection. • Native trees will be planted along the boundary of New Kapal and Paiton • TL close to water source for Big Mammal with in the National parks should be used conductor which less causing corona • Impact buzzing noise from the High voltage TL to big mammal movement should be monitored.				
Construction camp. Pollution from wastewater and solid waste	• Workers' camps will have properly designed sewage system for wastewater effluent and solid waste collection. • Latrines ahould be at least 100m away from any water source • Provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste. • Observe proper housekeeping within the project site. • Separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on site in secure facilities with weatherproof flooring and roofing, security fencing and access control and drainage/wastewater collection systems • Regular collection and disposal of waste at the Project sites approved by local authorities. • Upon completion of construction, all soild wastes should be completely removed and revegetated.	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
Hazards to health and safety of workers and the public due to construction	• Strictly implement approved Occupational and Occupational Health and Safety Plan (OHSP), Community Health and Safety Plan (CHSP) and approved Emergency Response Plan (this should be submitted by the contractor and approved by the PIC). The OHSP, CHSP and other standard operation procedures (SOP) should be consistent with the the requirements of Indonesian Law, international standards such as the Worldbank Group's *Environment, Health and Safety Guidelines*. • Camps should be provided with health care clinics and appropriate place of worship • Appoint an environment, health and safety manager (PIC EHS Specialist) to look after the implementation of required environmental mitigation measures, and to ensure health and safety precautions are strictly implemented for the protection of the workers and the general public • The PIC EHS Specialist will provide a public health education program for workers and villagers covering proper hygiene, vector-borne diseases and sexually transmitted diseases (e.g HIV/AIDS). • Establish a safe water supply for the workers • Provide first aid facilities, fire fighting equipment, PPEs • Implement fall prevention and protection measures (i.e. guard rails, ladder, harness, etc.) whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening in a work surface. • Diversions, danger points and works at culverts, bridges and construction sites should have appropriate warning signs. • Information dissemination regarding the schedule of construction activities • All workers' camps should be decommissioned when no longer required and should be restored to their original condition. Temporary structures should be	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	removed, sold wastes collected and disposed properly and toilet pits sealed.				
Social conflicts due to presence of workers	• Consider the location of construction camps away from communities in order to avoid social conflict in using resources and basic amenities such as water supply • Maximize the number of local people employed in construction works • Maximize goods and services sourced from local commercial enterprises	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists
Loss of vegetation and tree cover	• All construction activities will be undertaken in close coordination with the MoF. • No trees will be removed without prior approval • Compensation for lost trees • For vegetation clearing, hand tools including chain saws will be used. • Use of herbicide will be strictly prohibited • Burning of cleared vegetation is strictly prohibited. • Firewood collection is strictly prohibited	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists
General impacts on wildlife	• Construction workers to be educated for wildlife conservation with no hunting and poaching to be allowed within the project area	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists
Any discovery of artifacts or articles of historic interest and importance	• For cases where an artifact or articles of historic interest and importance was found during site preparation, work will be stopped and the find will be reported to the concerned agency (i.e. Department of Culture Information) • If trees with religious significance are to be removed, written permission should be obtained from relevant forest authority. Chance Find Procedure: • If physical cultural resources are encountered during the construction phase, all works at the find should be immediately halted. • The find should be assessed by a competent expert,	Careful monitoring	Included in the contractor's cost	Contractor's environment engineer, PIC	PLN reports to AMDAL, PIC, EHS specialists

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	and procedures to avoid, minimize or mitigate impacts to the physical cultural resources should be developed by the expert in cooperation with relevant local heritage authority. • Work should not continue until the procedures to avoid, minimize and mitigate impacts to the physical cultural resources had been implemented. • When avoidance is not feasible and the Project benefits outweigh the loss of the cultural heritage, the physical cultural resourcs should be removed and preserved according to the best available practices and be in accordance to relvant national laws.				
2. Site-Specific Mitigation Measures for the National Parks					
Loss of Vegetation/Vegetation Clearing	• clearing of vegetation on the tower base can be minimized by restricting clearing to the tower footprint and/or the area to be cleared would be clearly delineated; • clearing and disturbance for equipment access and storage can be avoided or minimized in most cases through careful planning and implementation and particular attention must be given to sensitive sites; • vegetation clearing along the RoW can and should be avoided by adjustment of tower heights to maintain existing vegetation below the TL, that is, vegetation clearing within the RoW will only be undertaken to achieve the required clearance of 9.5 m and of a maximum permissible tree height of 20.5 m; • avoid or minimize the tree trimming and/or clearing of native plant species like the *Gmelina Fores* or *Ficus* tree by adjusting the height of the tower; • area disturbed during construction would be seeded	Careful monitoring and Collaborative Agreement between PLN and the administrators of the National Parks	Included in the contractor's cost	Contractor's environment engineer, PIC, biodiversity expert, National Park representative	PLN reports to AMDAL, PIC, EHS specialists, biodiversity expert, National Park workers

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	or replanted immediately and monitored for the spread of invasive plant species; • locally native species should be used as part of restoration efforts, including, where appropriate, rare, threatened or protected species including Kasembi *(Schleichra oleosa)*, Trengguli (*Cassia fistula),* and Mohoni (*Swietenia macrophylla),* Pakis haji (*Cycas rumphi),* Sono keling (*Dalbergia latifolia)*; • use handheld equipment like machete and manual saw for vegetation maintenance in sensitive areas; • working space at the construction site should be cleared prevent forest fire. • equipment would be cleaned after leaving areas where invasive species are known to occur and before entering sensitive areas; • all materials (e.g. gravel) used in the construction area would be from sources that had inspected and found to be free of invasive species; • to decrease the potential for spreading invasive species, mulched or chipped vegetation would not be used in areas of the parks outside the area in which the vegetation was removed; and • borrow pits within the NPs should be prohibited, and any soils excavated for tower bases should be removed off site, or immediately used within restoration areas to avoid colonization by invasive species;				

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
Wildlife Habitat and Wildlife	• construction should be restricted to daylight hours; • construction activities within the forest should be done during dry season when the animals are concentrated at the water source area; • construction activity which are close to water sources such as tower T227 –T229, should be done during wet season, while animal are not concentrated at the water source; • To prevent Banteng from Bekol area come to Bajulmati corridor seeking water during dry season, Project should provide sufficient water quantity at Bekol area • following the clearing of vegetation, brush piles would be left alongside the ROW to provide habitat for a variety of wildlife species; • workers should be provided with site access identification, and access to the site should be strictly controlled and monitored; • worker camps should be outside of the NPs and periodic monitoring of worker camps should be undertaken by the NP; • worker access checkpoints should be established and monitored; • workers must take part in an awareness program on wildlife conservation, and their obligations; • NP staff should be present on site at all times to	Careful monitoring and Collaborative Agreement between PLN and the administrators of the National Parks	Included in the contractor's cost	Contractor's environment engineer, PIC, biodiversity expert, National Park representative	PLN reports to AMDAL, PIC, EHS specialists, biodiversity expert, National Park workers

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	monitor construction; • any infringement by workers should result in immediate dismissal and application of legal penalty; • any infringement should immediately be reported by the contractor to the NP authorities, PLN and ADB, and repeat infringement should be seen as grounds for contract suspension; • an independent monitor should be engaged to support NP staff and to provide a third party review of EMP implementation; • ADB and/or PLN should consider providing additional technical assistance to the NPs to strengthen monitoring and enforcement capacities, including support for operational management planning, wildlife and avian/bird monitoring and enforcement, including, where needed, and what additional equipment are required. • Control of wildlife poaching should be strictly enforced.				
Special Status Species (Endangered and Endemic Species	Preconstruction surveys would be conducted for presence of special-status species and habitat. If special-status species, nests, dens, or habitats are found, then the suitable habitat would be flagged and avoided during construction if possible. • Prior to any ground-disturbing or vegetation clearing activities, a qualified biologist would conduct pre-construction surveys for special status species, and determine if relocation was an appropriate mitigation measure for any species found. It is possible that some species identified during the preconstruction	Careful monitoring and Collaborative Agreement between PLN and the administrators of the National Parks	Included in the contractor's cost	Contractor's environment engineer, PIC, biodiversity expert, National Park representative	PLN reports to AMDAL, PIC, EHS specialists, biodiversity expert, National Park workers

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	surveys could be collected and relocated prior to or during construction activities, if this was found to be beneficial or appropriate for the species present at the site. • If relocation were to be undertaken, a plan for the relocation of the special status species would be designed in accordance with the appropriate federal and state agencies and a qualified and permitted biologist would collect and relocate individuals to nearby suitable habitat. • If special status plant populations could not be avoided, consultations with appropriate federal and state agencies might be required, depending on the listing status of the species present. These consultations would determine appropriate mitigation measures for any populations affected by the proposed project. Appropriate measures could include the creation of offsite populations through seed collection or transplanting, preservation, and enhancement of existing populations, or restoration or creation of suitable habitat in sufficient quantities to compensate for the impact. • Translocation includes digging up plants and moving them to appropriate portions of the corridor that would not be affected by the proposed construction activities. • Seeds can also be collected from plants that will be removed and either planted directly or germinated in a nursery and then planted in appropriate locations. • If special–status wildlife species or occupied habitat cannot be avoided, mitigation would include species-specific Conservation and Mitigation plans to be prepared and implemented by conservation agencies. These individuals would complete on-site monitoring. These plans would include: Conservation measures, such as time-of-year restrictions; pre-construction surveys; Construction monitoring; habitat preservation habitat restoration components; post-construction				

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	monitoring as needed. • Park staff or representatives from appropriate, state or federal agencies who were experienced in managing or monitoring special status species would also be on site to monitor for special-status species during the construction activities to verify that special-status species are not in the active construction area.				
3. Bali Barat National Park: Site-Specific Mitigation Measures are in Table 9.2.					
Ecologically sensitive sites in Bali Barat National Park: **<u>Salt-lick pond and monsoon forest adjacent to Prapat Agung Temple</u>**	• construction should not be undertaken during the dry season, when animal concentrations are likely to be at their highest; • vegetation clearing or trimming outside of the tower base footprint should be prohibited, and silt fences should be used to ensure that there are no sedimentation impacts on the pond area; • heavy equipment and oils or fuels should not be stored on or adjacent to the site; and • Tower construction in this area should also be staggered, so that only one tower at a time is constructed. This will minimize disturbance and will allow wildlife to move out of the disturbance area rather than creating simultaneous disturbance over the whole area.	Careful monitoring and Collaborative Agreement between PLN and the administrators of the National Parks	Included in the contractor's cost	Contractor's environment engineer, PIC, biodiversity expert, National Park representative	PLN reports to AMDAL, PIC, EHS specialists, biodiversity expert, National Park workers
Ecologically sensitive sites in Bali Barat National Park: **<u>Mangrove Area</u>**. The RoW will pass across a mangrove area at Gilimanuk Bay including one TL tower base (T22) placed on Gadung mangrove island.	• it is recommended that the feasibility of constructing the TL Tower on pylons, rather than concrete base, should be considered; • silt fences will therefore need to be carefully erected and maintained around the islands during construction; • equipment and construction materials should also not	Careful monitoring and Collaborative Agreement between PLN and the administrators of the National Parks	Included in the contractor's cost	Contractor's environment engineer, PIC, biodiversity expert, National Park representative	PLN reports to AMDAL, PIC, EHS specialists, biodiversity expert, National Park workers

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	be stored or placed temporarily on the mudflats, which will require either the construction of a temporary platform or construction from a low-water-draw barge; and • barge and equipment access will however be difficult, given low water levels and inter-tidal nature of the mangrove ecosystem and all care must be taken to ensure that boat and equipment access does not disturb the mangroves, seasgrass or offshore coral reefs. • Jetty construction. Construction site should be covered by Silt screen and all waste (domestic and construction) should be carefully managed and not allowed dump into the sea. Construction should avoid the strong current season. • PLN should get environmental permit (environmental certificate) for jetty construction. PLN can get the permit/certificate by submitting the UKL UPL (environmental management and monitoring) Document to Local Commission or make an addendum to the existing Amdal Document and submit to MoE.				
4. Baluran National Park: Site-Specific Mitigation Measures are in Table 9.3.					
<u>Bajul Mati Corridor and Banteng habitat is Teak and Gmelina plantations</u> **<u>Home range for Banteng specifically for towers T239-243 (see Table 9.3)</u>**	• construction should not be undertaken during the dry season, when Banteng will require unrestricted access to the Bajul Mati Corridor; • vegetation clearing or trimming outside of the tower base footprint should be prohibited; • avoid or minimize the tree trimming and/or clearing of native plant species like the *Gmelina Fores* or *Ficus* tree by adjusting the height of the tower • tower construction in this area should also be staggered to minimize the extent of disturbance at any	Careful monitoring and Collaborative Agreement between PLN and the administrators of the National Parks	Included in the contractor's cost	Contractor's environment engineer, PIC, biodiversity expert, National Park representative	PLN reports to AMDAL, PIC, EHS specialists, biodiversity expert, National Park workers

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	one time; • workers must be strictly monitored at all times, to avoid any poaching risks; • worker access to the site should be restricted to daytime construction hours and worker camps should be outside of the NP; • equipment should not be stored on site, to minimize any additional impact areas; • heavy equipment for digging should also be avoided in favour of manual digging; • excavation areas should be covered when not actively used to avoid mammals falling in; and • any disturbed areas should be immediately restored using appropriate local species and taking to care to avoid the establishment of invasive species.				
Operation					
Noise Pollution	• Noise monitoring will be included in the environmental monitoring plan • Trees will be planted along the boundary of the New Kapal and Paiton substations to minimize noise pollution	Monitoring	Included in the project cost	PLN, PIC	EHS specialist, PLN
Disposal of hazardous waste and/or accidental release of transformer oil or fuels	• Contractors should submit and implement a Spill Emergency Response Plan • Workers should be given training for the proper handling and disposal of waste and the spill response plan • Chemicals and oils should be stored properly in properly sealed and secured area (at least 100m from any water body) • Refueling of machinery, equipment and vehicles should be undertaken at a distance 100 m away from a watercourse • Transformer oil and other hazardous wastes should be collected, transported and treated by accredited waste treaters	Monitoring	Included in the project cost	PLN, PIC	EHS specialist, PLN
Use of PCBs and potential release of SF_6	• PLN has banned the purchase of transformers using PCBs and no PCBs will be utilized for the project	Monitoring	Included in the project	PLN, PIC	EHS specialist, PLN

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
			cost		
Health impacts from electromagnetic field (EMF)	• All relevant and government health and safety laws will be implemented and an operational phase OHSP will be submiited by the contractors. • RoW alignments were designed to avoid settlement and sensitive receptors. • If avoidance is not possible, regular monitoring will be performed. Average and peak exposure should remain below the ICNIRP recommended standard for general public exposure • Information dissemination on the possible effects of EMF	Monitoring: electromagnetic field instrument	Included in the operation cost	PLN, PIC	EHS specialist, PIC, PLN
Accidents: electrocution and induced current	• A 34-m wide RoW will be established and warning signs will be posted at towers along the RoW • Substations will be fenced with gates, locks and security personnel will be assigned on transmission towers • Conducting objects (e.g fence and other metallic structures) installed near power lines will be grounded to prevent shock • Public information on electrical safety in substations and transmission lines	Monitoring	Included in the operation cost	PLN, PIC	EHS Specialist, PIC, PLN
Occupational and community health and safety plan	• Prior to the commencement of operation the PIC EHS Specialists should prepare an operation phase Occupational Health and Safety Plan (OHSP) and a Community Health and Safety Plan (CHSP) plans in accordance with relevant requirements of Indonesian law, PLN SOPs and good international practice as reflected in the *EHS Guidelines.* It is anticipated that the plans would include OHS and CHS mitigations noted in Section V, as well as operation phase OHS and CHS aspects covering: - live power lines; - working at height; - electric and magnetic fields; - exposure to chemicals; - emergency procedures for spills, fire, evacuation, and natural disaster; and community safety.	Monitoring	Included in the operation cost	PLN, PIC	EHS Specialist, PIC, PLN
Natural Disasters: Typhoons/tropical storms,	Wind Hazards:	Monitoring	Included	PLN, PIC	EHS

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
wind, fire, earthquake	• Transmission towers have been designed as per relevant national building codes which include loading requirements related to wind conditions. • Transmission support structures such as tower foundations have also be designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads. Arcing and other fires: • The fire hazards risk will be minimized through the use of tall towers and wide RoWs. • Tall vegetation will be trimmed in the RoW to obtain the necessary conductor clearance as per SNI 04-6918-2002. • System protection features designed to safeguard the public and line equipment will minimize fire hazards due to fallen conductors. The protection systems will consist of TL relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards. • Regular maintenance of the protection system including conductors and circuit breakers will be undertaken. Fire risks at substations: • Substations will be equipped with fire alarm and suppression systems. • Emergency response plans will be developed. Earthquake risks: • Transmission towers have been design as per relevant national building codes		in the operation cost		Specialist, PIC, PLN
Electromagnetic interference	• During design the RoW alignment was selected so as to avoid settlements.				

Environmental Aspect/Potential Impact	Mitigation Measures	Means of Implementation	Budget Cost	Institutional Responsibility	
				Implementation	Supervision
	• Standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.				
Poaching	• Install surveillance camera at the tower T239 to T243 to prevent poaching attempts • All workers should be registered with the NPs and issued with photo IDs. IDs will specify the areas of the park that they are allowed to enter and period of entry. Workers must wear their IDs at all times • Construction vehicles and equipment should also be registered.			PLN	

Table 9.2: Mitigation Measures in Bali Barat National Park

No	Project activity	Impact	Impact Area	Significance	Mitigation Measures
1	Temporary jetty construction.	Jetty construction (Figure 5.6) will pollute surrounding water and will affect the coral reef	T15	High	• Use silt screen around the construction site to prevent the deposit of sediments in the ocean. • PLN should get environmental permit (environmental certificate) for jetty construction. PLN can get the permit/certificate by submitting the UKL UPL (environmental management and monitoring) Document to Local Commission or make an addendum to the existing Amdal Document and submit to MoE.
		Construction of temporary Jetty will disturb animal, especially during low tide where animals are usually found at reef flat, an area close to the construction site.	T15	High	• Construction activity not allowed during dry season and during spring low tide (usually occurs three days after full moon) which usually lasts for three days and happens every 14 days.
2	Land clearing for transmission towers.	Loss of rare plant species.	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	High	• Avoid cutting rare plant species • Replanting of *Cycas rumphii, Dalbergia latifolia, Schleichera oleosa Merr, Cassia fistula Manilkara kauki (L.) Dubard* • Vegetation removal will only allowed within the designated tower bases • To minimize cutting trees all construction equipment and materials should be stored or installed in the middle area of tower base.
		Loss of Low Land monsoon Forest	T Cross B TANC B1 T ANC B2 T03 –T19 T24, T001 and T002	High	• Vegetation removal only allowed within the designated tower bases. • To minimize land clearing all construction equipment and materials should be placed in the middle of cleared tower base

		Loss of Mangrove	T20 –T23	high	• Tower foundation will use a bore pile. There will be no soil digging for foundation and no land clearing for tower base. Land clearing is only for bore pile, which has an area of $4m^2$. • The contractor will build a working platform on Gadung island, to avoid mangrove cutting.
		Noise generated to disturb wildlife	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	Low	• Vegetation cutting only within tower base. Hand tools to be used for any tree removal such as machete and manual saw. Use of chain saw will be avoided. • Land clearing should immediately be followed by tower construction to avoid open pits.
		Growth of Invasive species at TL tower base and construction path	T Cross B T ANC B1 T ANC B2 T03-T19	High	• Replanting the entire base of towers and construction temporary path with grass or shrubs • Along with the maintenance of the TL tower, PLN will support the National Park in managing the open areas at tower base to prevent the growth of *Lantana camara* or other invasive species.
3	Cut and fill activities for tower foundation.	Noise generated to disturb wildlife	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	Low	• Soil excavation to establish the tower foundations should be done by hand tools, • Use of heavy equipment only when necessary.
4	Excavation of land to establish the foundations to $48m^3$ (dimension: 4m x 4m x 3m).	Mammals getting trapped in excavation pits	T Cross B T ANC B1 T ANC B2 T03-T19 T24-T26 T001-T002	Medium	• Secure or fence the excavated pit to prevent animals of getting trapped • Construction of the tower foundation should be carried out immediately when foundation pit is ready • Dug material or spoils should immediately be back filled to the foundation pit.
		Water pollution and sedimentation	T 19 –T22	High	• Install silt screen around the construction site to avoid silt entering into water bodies

5	Tree trimming to maintain safe distance of 9.5 m between transmission cable and a tip of tree within the transmission line RoW.	RoW barrier to Arboreal animal	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	None- low	• Most of trees in TL RoW alignment are less than 15 m tall, since the lowest cable at the lowest point is 30 m above the ground or tree height should less than 20.5 m, so only few trees higher than 20 m have to be trimmed. • If any tree has to be trimmed, it will be done by hand tools as machete and manual saw. Using chain saw only as necessary.
6	Transportation of tower materials to the tower site.	Noise and Vibration will disturb wildlife	T Cross B, T ANC B1, T ANC B2, T 03 - T26, T001 - T002	Low	• All material should be transported by good condition vehicle to a temporary storage at the nearest available road to construction site. • Temporary storage for material and equipment at the road side is not allowed. • All material and equipment should be transported manually to construction site • Manpower, equipment and material transport to Burung and Gadung islands (T22) will use canoe or small fishing boat from the jetty at Karang Sewu (See Figure 5.6) during high tide. The transport of material and equipment to the island should not be allowed during low tide season. • Before using existing jetty at Karang Sewu, Jetty should be fixed and improved.
7	Construction activities	Forest Fire	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	High	• Working space at the construction site should be cleared from dry leaves to prevent forest fire • Oil and fuel for construction equipment should not be stored within National Park
		Construction waste		High	• No waste will remain in the site after completion of construction. • Construction waste such as cement bags, paint containers, used paint brush, any container, broken tools, unused material, any spill such as oil, concrete, paint, should be removed and site to be cleaned.

		Abandoned temporary construction structure to disturb or harm wildlife		Medium	• No waste materials will remain in the site after the completion of construction. • Construction waste such as cement bags, paint containers, used paint brush, any container, broken tools, unused material, any spill such as oil, concrete, paint, should be removed from the construction site.
		Noise generated to disturb wildlife	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	High	• Use machinery only when necessary • Construction activities will only be allowed during day-light hours, to avoid night time noise and glare generated by construction activities • Most of construction activity should be done during dry season when animals are concentrated at water source area. • Construction activity, which are close to salt lick pond (tower T12 –T13), should be done during wet season to avoid animal concentration at the water source. To avoid soil erosion to the pond the dug soil should be put in a sack and install silt screen around the construction site. • Construction of tower T20 to T22 in the mangrove islands is only allowed from May to August. Construction during November and December allowed only when necessary. Construction is not allowed during January, February, March, April, September and October. • Construction of Crossing Tower should be started in month of May, June, or July to avoid the arrival of Blue Tailed Bee Eater. • Construction of transmission line will be divided into 5 sections, each section consisting of about 5 towers. One tower per section will be constructed simultaneously; the distance between construction locations will be 1.5 km or 5 towers. This is to reduce the noise and number of workers in each specific area and to avoid disturbance to wildlife. Construction of T12 and T13 is not allowed during dry season.

8	Construction worker activities such as; Littering, cooking, smoking, overnight stay,animal poaching	Construction worker waste	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	high	• Construction workers are not allowed to litter within construction site • Contractor should provide garbage bin at the construction site and collected waste should be transported out of National Park daily.
		Forest fire	T Cross B T ANC B1 T ANC B2 T03-T19 T23-T26 T001-T002	high	• No workers' camp is allowed in the National Park • No cooking allowed in the National Park • Working space at the TL tower base should be clear from dry leaves especially at the teak forest to prevent forest fire • Fire risk reduction and management training will be provided for the construction workers
		Poaching	T Cross B T ANC B1 T ANC B2 T03-T26 T001-T002	high	• Poaching and trading of forest products by workers should be strictly prohibited and imposing penalty for violators. • Construction workers will be provided with orientation on NP park regulations and protocols to be followed while working within the National Park.
9	Operation phase of the transmission line.	Buzzing sound	T12-T13	unknown	• PLN should use TL conductor with buzzing/humming sound especially at T12 and T13 • PLN and National Park should conduct a monitoring of big mammal behavior (Rusa deer, ebony leaf monkey) within TL RoW. If the big mammals refuse to cross under the TL, PLN with guidance from NP should provide new permanent watering points for big mammal or improve the capacity of Salt lick pond at Tegal Bunder.

Table 9.3: Mitigation Measures in Baluran National Park

No	Project activity	Impact	Impact Area	Significance	Mitigation Measures
1	Land clearing for the foundation of the transmission towers.	Loss of rare plant species	T212-T260	Medium	• Vegetation removal will only be allowed within the designated tower bases and temporary construction path • Avoid cutting rare plant species, • Replanting *Swietenia macrophylla* • To minimize land clearing all construction equipment and materials should be stored or installed in the middle area of tower base. • Tree trimming and cutting will be avoided as much as possible within the National Park and height of the transmission line will be adjusted in order to avoid the cutting of trees in the National Park.
		Loss of Production forest wood	T217-T260	Low- Medium	• Vegetation removal only allowed within the designated tower bases and temporary construction path • To minimize land clearing all construction equipment and materials should be placed in the middle of cleared tower base • Tree compensation and identify wood owner (PERHUTANI or Baluran National Park).
		Growth of invasive species	T212-T260	High	• Replanting the entire base of towers and temporary construction path with local forage plant such as Grass or shrubs such as *Digitaria ciliaris*, *Acasia tomentosa* and some Ficus trees. • Along with the maintenance of the TL tower, PLN will support National Park in managing the open areas at tower base from invasive species such as *Acacia nilotica*.

No	Project activity	Impact	Impact Area	Significance	Mitigation Measures
		Noise generated will disturb wildlife	T212-T216	Low	• Vegetation cutting only within tower base. • Land clearing will only be undertaken by hand tools such as machete, manual saw, using chain saws when necessary.
			T217-T260	Low-Medium	• Vegetation cutting only within tower base using hand tools such as machete and manual saw. Use chain saws only as necessary. • Land clearing should immediately be followed by construction.
			T239-T249	High	• Tree trimming will be avoided at the Banteng homerange. If avoidance is not possible, land clearing at Banteng home range should be done manually. Use of chainsaw is not allowed.
2	Cut and fill activities for tower foundation	Noise generated will disturb wildlife	T212 –T232	Medium	• Soil excavation to establish the tower foundations should be done by using hand tools, • Use of jack hammer or other heavy equipment only when necessary
		Noise generated will disturb wildlife	T233-T260	Low	• Soil excavation to establish the tower foundations should be done by hand tools. Use of jack hammer or other heavy equipment, only when necessary.
3	Excavation of land to establish the foundations to the size of $48m^3$ (dimension: 4m x 4m x 3m) or bigger.	Mammals getting trapped in excavation pits. Home range of big mammal.	T212-T236	Low - Medium	• Secure or fence the excavated pit to prevent animal getting trapped. • Construction of the foundation should be carried out immediately after the foundation pit is ready. • Spoils should immediately be back filled to the foundation pit
			T236-260	Medium	• Secure or fence the excavated pit to prevent animal getting trapped. • Construction of the foundation should be carried out immediately after foundation pit is ready. • Spoils should immediately be back filled to the

No	Project activity	Impact	Impact Area	Significance	Mitigation Measures
					foundation pit
4	Tree trimming to maintain safe distant 9.5 m between transmission cable and tip of tree within the transmission line RoW	RoW barrier to arboreal animal movement	T236-T249	High	• Vegetation cutting within the RoW will only be undertaken to achieve the required clearances of 9.5 m. Maximum permissible tree height is 20.5 meter. • Tree trimming will only be undertaken by hand tools. • Avoid or minimize tree trimming at Gmelina forest or Ficus tree by adjusting the tower height.
5	Transportation of construction equipment and tower materials to the tower site	Noise and vibration will disturb wildlife	T212-T260	Low	• All material should be transported by good condition vehicle to a temporary storage in the construction site. • Temporary storage for material and equipment at roadside is not allowed. • All material and equipment should be transported manually to construction site.
6	Construction activities.	Forest fire	T212-T260	High	• Working space at the construction site should be cleared from dry leaves especially at the teak forest (litter) to prevent forest fire. • Oil and fuel for construction equipment should not be stored within National Park.
		Construction waste will disturb or harm wildlife	T212-T260	Medium	• No construction waste will be left in the construction site at all times. • Construction waste such as cement bags, paint containers, used paint brush, any container, broken tools, unused material, any spill such as oil, concrete, paint, should be properly collected and disposed by accredited waste collectors.
		Abandoned temporary construction structure will disturb or harm wildlife	T212-T260	Medium	• Temporary construction structures should be removed immediately upon completion of the construction. • Construction site must be cleared from construction spoils from soil compaction, muddy puddles, soil erosion and sedimentation.

No	Project activity	Impact	Impact Area	Significance	Mitigation Measures
		Noise generated during construction will disturb wildlife	T212-T260	low	• Use machinery only when necessary • Construction activities will only be allowed during day-light hours, to avoid night time noise and glare generated by construction activities • Construction activity at T212 to T237 and T243-T260 should be done during dry season when the animals are at water source area • To prevent Banteng from Bekol area to come to Bajulmati corridor during dry season, Project should provide sufficient water supply such as ponds at Bekol area • Construction activity which are close to water sources such as tower T228, should be done during wet season, • Construction at the Banteng home range T239-T249 where all the tower bases on the teak forest should be done during dry season • Construction at the Banteng home range between towers T239-T242 not allowed during Banteng mating season (July and September) • To avoid soil erosion, the dug soil should be put in sacks. • (It should be noted that the construction of tower T228,T242 to T246 will only be allowed during the season)
7	Construction workers activities such as littering, cooking, smoking, overnight stay, and animal poaching.	Construction worker waste	T212-T260	Medium	• Construction workers are not allowed to litter within construction site. All workers will be provided with identification cards with photo which will be worn at all times within the national park. IDs will specify the areas of the park that they are allowed to enter and the period of entry. Construction vehicles and equipment should also be registered. • Contractor should provide garbage bin at the

No	Project activity	Impact	Impact Area	Significance	Mitigation Measures
					construction site and collected waste should be transported out of national park daily.
		Forest fire will disturb wildlife		Medium	• Workers' camp is not allowed in the national park • Cooking is not allowed in the national park • Working space at the TL tower base should be clear from dry leaves, especially at the teak forest to prevent forest fire • Fire risk reduction and management training will be administered to construction workers.
		Poaching	T212-T236	Low	• Poaching, collecting peafowl eggs and trading of forest products by workers should be strictly prohibited. • Construction workers will be educated regarding National Park regulation (i.e. what they should do and cannot do while working within the National Park and the corresponding sanctions and penalties on violations).
			T236-T260	High	• Poaching, collecting peafowl eggs and trading of forest products by workers should be strictly prohibited. • Construction workers will be provided with an orientation regarding national park regulations.
8	Operation phase of the transmission line	Buzzing sound	T227-T229 T239 - T249	Unknown	• PLN should use TL conductor with less buzzing/humming sound especially at towers T227 to T249. • PLN and National Park should conduct monitoring of big mammal behavior (Banteng, Rusa deer, ebony leaf monkey) within the TL RoW. If the big mammals refuse to cross under the TL, PLN with the guidance of the national park officers will create a new permanent watering points for them.
		Poaching	T239-T242	High	• Install surveillance camera at the towers T239 to T242 to prevent poaching.

In order to mitigate and minimize the impacts of the construction activities to the biodiversity status of the National Parks, the following are the recommended construction schedule for the Project. The construction schedule will be included the EMP, which is a part of the bidding documents which will be implemented by the contractors. This schedule will also be included in the CEMP which details the measures, budgets and schedule for complying with the Project EMP.

1. Construction schedule in Baluran National Park

Construction of the transmission line in the Baluran National Park will be divided into nine (9) sections, each consisting of five (5) towers per section. One tower for each section will be constructed simultaneously. A distance of approximately 1.5 km will be maintained between construction locations. The following table (Table 9.4) is the suggested schedule for tower construction in Baluran National Park in order to minimize the impacts of the Project activities to the status of biodiversity in the national park.

Table 9.4: Tower construction schedule in Baluran National Park

Tower	Anticipated Impacts	Schedule of Construction
T212-T227	Disturbance to wildlife	May to September
T228	Banteng’s homerange: the tower location is near a water source for big mammals.	October to April
T229-T238	Disturbance to wildlife	May to September
T239-243	Banteng’s homerange Disturbance to reproductive activities of Banteng	October to April
T244	Disturbance to wildlife	May to September
T245-T246	Banteng’s homerange : Bajulmati corridor near the Bajulmati River	October to April
T247-260	Disturbance to wildlife	May to September

Rainy Season: October-April
Dry Season: May-September

The following are the reasons for the suggested schedule of construction for each tower:

T228: Tower near Tlogo, a water source for big mammals during dry season.

T239-T243: The locations of the towers are in the middle of Banteng home range and close to water source Bajulmati river at Panjaitan area

T245-T246: Located near Bajulmati Coridor, an important corridor for Banteng and big mammals during dry season

T247-T249: Located at teak forest inside the banteng home range, but outside big mammals corridor, and far from water source. The TL alignment about < 60 m close to the road (Surabaya – Situbondo Highway).During dry season, there are no Banteng in the area (i.e. no grass and water). Tower constructions during dry season will have a minor impact to the disturbance of wildlife.

T250-T260: Located at teak forest outside banteng home range and outside big mammals corridor. During dry season no Banteng in the area since under teak forest no grass and no water. Tower Constructions during dry season will have a minor impact to wildlife disturbance

Other considerations to be observed by the contractors during construction are the following:

Mating season for Banteng at Baluran NP is August to September and gestation period 9.5 to 10 months (*www.balurannationalpark.web.id*). Mother breastfeed for 60 days and weaning at 10 months old. (Ali Kodra,1983). Dry season, specifically the months of June to September are critical for Banteng's reproduction. Any disturbance at this period will impact the increase in Banteng's population. In addition, during dry season, Bantengs are usually found at the Bitakol area, home range close to the water source at Bajulmati river in the Panjaitan area, which is near towers T239 to 243. Therefore, construction in this area (T239-243) is not allowed during dry season, especially June to September.

2. Construction schedule in Bali Barat National Park

Construction of the transmission line in the Bali Barat National Park will be divided into five (5) sections, each consisting of five (5) towers per section. One tower for each section will be constructed simultaneously. A distance of approximately 1.5 km will be maintained between construction locations. The following table (Table 9.5) is the suggested schedule for tower construction in Bali Barat National Park in order to minimize the impacts of the Project activities to the status of biodiversity in the national park.

Table 9.5: Tower construction schedule in Bali Barat National Park

Tower/Jetty	Anticipated Impacts	Construction Schedule
Temporary Jetty	Disturbance to wildlife during construction and transport of building materials.	Construction should not be allowed during low tide season (this usually happens three days after full moon and three days after half moon). Construction should be during the rainy season-October to April
T Cross B T ANC B1 T ANC B2 T03-T12 T13-T26 T001-T002	Disturbance to wildlife	Construction should be done during rainy season-May to September
T12 –T13	Disturbance to wildlife	Construction schedule should be done during rainy season-October to April

Tower/Jetty	Anticipated Impacts	Construction Schedule
T20-T22	Transport of building materials to Burung island and Gadung island may destroy the sea grass. Construction activities at mangrove areas will disturb migratory birds	Construction should not be allowed during low tide season (this usually happens three days after full moon and three days after half moon). Only allowed from May-August. November-December only when necessary. Not allowed from January, February, March, April, September, and October.
TB Crossing	Impacts on migratory birds: Blue Tailed Bee Eater	Construction of Crossing Tower should be from May to July

Rainy Season: October-April
Dry Season: May-September

The following are the reasons for the suggested schedule of construction:

Temporary Jetty: The location of the temporary jetty is near the salt lick pond. Construction should be done during the rainy season (October to April) so as not to disturb the animals visiting the salt lick pond during the dry season. Also, construction and the transport of building materials during the operation of the temporary jetty should not be done during low tide season in order to minimize the impacts to animals at the reef flat area. During low tide season, most of the animals are at the reef flat area (near the construction site) looking for food.

T Cross B, T ANC B1, T ANC B2, T03 –T12, T13- T26, T001-T002: Schedule of construction for these towers should be during the dry season in order to minimize the impacts on the wildlife in these areas. The rationale for this is during dry season, most of the animals are concentrated at the salt lick pond area which is far from the location of these towers.

T12-T13: The locations of these towers are near the salt lick pond area. Construction should be done during rainy season (October to April) so as to minimize the impacts on animals visiting this area during dry season.

T20-T22: The transport of materials should not be done during low tide season so as to minimize the impacts on the sea grass. Also, the construction should not be done during the months of bird migration-January, February, March, April, September, and October.

TB Crossing: Construction of Crossing Tower should be from May to July, so as to avoid the arrival of the Blue Tailed Bee Eater at the construction site for nesting.

B. ENVIRONMENTAL MONITORING PLAN

392. The construction and operation phase environmental monitoring plan (EMoP) is presented in Table 9.6. The EMoP focuses on monthly mitigation implementation compliance monitoring undertaken by the PIC EHS specialists and quarterly ambient air quality and noise monitoring undertaken by qualified national environmental monitoring consultants. Compliance monitoring involves inspections to verify compliance with EMP requirements and with relevant laws and regulations. Ambient monitoring is undertaken to provide useful feedback on the extent and severity of actual air, water and noise impacts against predicted impacts and relevant ambient standards specified in the EMP.

393. Biodiversity monitoring will also be included in the environmental management and monitoring plan. Semiannual monitoring on the population of Banteng and other mammals of concern in Baluran National Park and a continuous bird survey on migratory birds in the Bali Barat National Park during construction activities and annual monitoring during the operation of the Project.

394. During the construction phase, semiannual environmental monitoring reports will be submitted to ADB and the MoE. The reports will be prepared by the PIC EHS Specialists based on the results of EMoP and the GRM. Monitoring reports will first be submitted to the PMU, which will review and finalize the reports and then convey them to the ADB.

395. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has already been addressed, the report should explain the manner by which the issue was resolved. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has not yet been addressed, a corrective action plan (CAP) should be developed. The CAP should describe actions necessary to address each area of concern; prioritize these actions; identify responsibilities for implementation of each corrective action; identify a time-line for their implementation; and, present a schedule for communicating the results of plan implementation to affected communities, the ADB, and the MoE.

396. During the operation phase it is expected that ADB will require annual reporting during the first two years of operation.

Table 9.6: Environmental Monitoring Plan

Aspects to be Monitored	Location	Means of Monitoring	Frequency	Cost	Responsible to undertake the monitoring
1. Preconstruction Phase / Siting – Compliance Inspections					
EMP incorporation into detailed Project design	• Detailed substation design • Detailed RoW and tower design	• Ensure detailed design incorporates required mitigations and good international practice.	• During detailed design	Included in cost of EHS Specialists	EHS Specialists
Impacts on sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, TLs) due to Project siting incorporated into detailed Project design	• Detailed substation design • Detailed RoW and tower design	• Ensure detailed design incorporates required mitigations and good international practice.	• During detailed design	Included in cost of EHS Specialists	EHS Specialists
Impacts on Physical Cultural Resources due to Project siting incorporated into detailed Project design	• Detailed substation design − Detailed RoW and tower design	− Ensure Chance Find Procedure in place prior to construction	• During detailed design	Included in cost of EHS Specialists	EHS Specialists
Impacts on Baluran and Bali Barat National Parks due to Project Siting incorporated into detailed Project design	− Detailed RoW and tower design	− Ensure CollaborativeAgreement with Baluran Park in place	• During detailed design	Included in cost of EHS Specialists	EHS Specialists
Impacts due to siting borrow and spoil disposal pits, sourcing of materials from quarries, and siting of temporary construction (worker) camps and other contractor's facilities	− Detailed substation design − Detailed RoW and tower design	− Ensure siting mitigation measures incorporated into detailed design	• During detailed design	Included in cost of EHS Specialists	EHS Specialists
2. Construction Phase– Compliance Inspections					
Erosion protectionmitigation measures being implemented	All active construction sites	− Compliance inspections	− Monthly	Included in cost of EHS Specialists	EHS Specialists

Aspects to be Monitored	Location	Means of Monitoring	Frequency	Cost	Responsible to undertake the monitoring
River, stream and irrigation channel protection mitigation measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
Storage and use of chemicals, fuels and oils mitigation measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
Construction and solid waste management measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
Dust control mitigation measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
Vehicle and equipment emission mitigation measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
Noise mitigation measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
Temporary construction camp mitigation measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
Standard vegetation clearing mitigation measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
Compensation Planting being undertaken or planned	Replanting sites	– Compliance inspections	To be decided based on compen-sation planting schedule	– Included in cost of EHS Specialists	– EHS Specialists
Standard fauna mitigation measures being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists

Aspects to be Monitored	Location	Means of Monitoring	Frequency	Cost	Responsible to undertake the monitoring
Collaborative Agreement with Baluran and Bali Barat National Parks being implemented	Baluran National Park, Bali Barat National Park	– Compliance inspections	– To be decided dependent upon agreement schedule	– Included in cost of EHS Specialists	– EHS Specialists
Chance Find Procedure being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
OHSP and CHSP being implemented	All active construction sites	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– EHS Specialists
2. Construction Phase– Ambient Monitoring					
Noise	– 15 sites. Locations will be finalized by the PIC EHS Specialists, but will focus on settlements.	– Ambient monitoring evaluated against standards presented in Section II.	– Quarterly	– 84,000 USD for noise, air and water quality ambient monitoring.	– National monitoring consultant
Air (TSP, PM10, SO2, NO2)	– 15 sites. Locations will be finalized by the PIC EHS Specialists, but will focus on settlements.	– Ambient monitoring evaluated against standards presented in Section II.	– Quarterly		– National monitoring consultant
Water (TDS, TSS, Conductivity, pH, DO, salinity, oil & grease, total fecal coliform, NH4+, total nitrates, total phosphates)	– 8 river crossings.	– Ambient monitoring evaluated against standards presented in Section II.	– Quarterly		– National monitoring consultant
Biodiversity Monitoring Banteng population Migratory Birds Other endangered and endemic species	– Bali Barat and Baluran National Park	– Monitoring of the status of biodiversity-number of species observed	– Quarterly	Included in cost of biodiversity specialist	– National biodiversity expert

3. Operation Phase– Compliance Inspections					
Storage and use of chemicals, fuels and oils mitigation measures being implemented	– Substations – RoWs	– Compliance inspections	– Monthly	– Included in Operation Costs	– PLN EHS Staff
Health – O&M safety mitigations implemented	– Substations – RoW	– Compliance inspections	– Monthly	– Included in Operation Costs	– PLN EHS Staff
Health – electrocution and induced impacts mitigations implemented	– Substations – RoW	– Compliance inspections	– Monthly	– Included in Operation Costs	– PLN EHS Staff
PCBs and SF_6 mitigations implemented, transformer oil checked regularly	– Substations – RoW	– Compliance inspections	– Monthly	– Included in Operation Costs	– PLN EHS Staff
OHSP and CHSP being implemented	– Substations – RoW	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– PLN EHS Staff
Fire hazard mitigations implemented	– Substations – RoW	– Compliance inspections	– Monthly	– Included in cost of EHS Specialists	– PLN EHS Staff
3. Operation Phase– Ambient Monitoring					
Noise	– Substations	– Ambient monitoring	– Quarterly	– Included in Operation Costs	– PLN EHS Staff
EMF	– Substations – RoW	– EMF monitoring	– Quarterly	– Included in Operation Costs	– PLN EHS Staff
Biodiversity	– Bali Barat and Baluran National Park	– Biodiversity Monitoring	– Quarterly	–	– National Biodiversity Expert

C. INSTITUTIONAL FRAMEWORK FOR EMP IMPLEMENTATION

397. PLN will be the Executing Agency (EA) for the Project. A Project Management Unit (PMU) headed by a full-time Project Director (PD, a senior PLN staff member) and supported by technical and administrative staff has been established by PLN and will have direct responsibility for Project management and supervision, including the overall responsibility for EMP implementation. The PMU will include environmental and social safeguards staff to regularly monitor the EMP implementation. The environmental and social safeguards staff will report to the PMU PD. Table 9.7 presents a summary of the roles and responsibilities for the EMP preparation and implementation.

Table 9.7: Summary of Roles and Responsibilities for EMP Implementation

Company/Institution	Responsibilities
Asian Development Bank	• Responsible for monitoring and supervising the overall environmental performance of the Project. • Disclosure of the Project EIA report and subsequent monitoring reports on its website.
PLN Project Management Unit (PMU)	• Project implementing agency with designated overall responsibility for project construction and operation including environmental performance • Establish a GRM as described in the EIA • Establish an Environmental Management Unit with environmental and social specialist, occupational health and safety officer • Ensure that the contractors submitted an EMP for each stage of the project • Ensure that EMP provisions are strictly implemented for each stage of the project • Undertake monitoring of the implementation of the EMP. • Ensure the provision of funding and monitoring of the implementation of the Collaborative Agreements in Bali Barat and Baluran National Parks
Project Implementation Consultant (PIC)	• To support the PMU in project administration and management, management of detailed design, procurement, management and supervision of works, and monitoring. • Prepare the required environmental monitoring reports for EMP implementation
Environment Health and Safety Specialist (EHS)	• Day-to-day liaison with the PMU safeguards staff and contractors; • Liaison as required with relevant district, provincial and national environmental, health and other authorities. • Updating EMPs prior to construction and preparing site-specific EMPs for the national parks. • Ensuring EMP commitments are appropriately

Company/Institution	Responsibilities
	incorporated into contract documents. • Reviewing and approving Contractors Environmental Management Plans (CEMPs). • Ensuring appropriate implementation of, and compliance with, the EMP during construction, including development of detailed good construction procedures as required. • Development of construction and operation phase occupational health and safety (OHS) and community health and safety (CHS) plans. • Environmental compliance monitoring as per the EMoP. • Coordinating ambient environmental monitoring with the national environmental consultant, as per the EMoP. • Developing and delivering training on the EMP and EMoP. • Coordinating on outreach and public participation activities. • Assisting in the response to complaints submitted to the Grievance Redress Mechanism (GRM)
Biodiversity Specialist	• Responsible for supporting Baluran and Bali Barat National Parks on the implementation of activities under the Collaboration Agreement. • To prepare biodiversity monitoring reports (Bali Barat and Baluran) for each stage of the project.
Communications and Outreach Specialist	• Responsible for implementing the Project Public Communications Framework, developing and implementing outreach materials and programs and for supporting the PMU with ongoing public participation activities, including liaison with NGOs and affected community representatives.
Contractors	• The Contractor for each component will be responsible for the implementation of civil and other works, including the EMP mitigations. As part of the bidding process each component contractor will be required to prepare a Contractors Environmental Management Plan (CEMP) which details the means by which the contractor will comply with the Project EMP. The contractors will also be required to prepare monthly monitoring reports which document CEMP implementation, including any environmental, health or safety incidents that occurred and the manner in which such incidents

Company/Institution	Responsibilities
	were resolved • Each contractor is expected to have sufficient environmental expertise to undertake environmentally sensitive and safe construction practices, though training on the EMP and EMoP will be provided by the EHS Specialists. • Each contractor will be required to appoint an appropriately qualified EHS Manager who will have direct responsibility for ensuring compliance with the EMP, including ongoing liaison with the PMU safeguards staff and the PIC EHS Specialists.
Park Authorities	• The Baluran and Bali Barat National Park Authorities will be responsible for implementing the respective Collaborative Agreements. The Park Authorities will also liaison closely the PMU and EHS Specialists in relation to mitigation implementation in and around the Park boundaries.
AMDAL	• Approval of the GOV EIA in accordance to Indonesian Regulations • Monitoring of the environmental performance of the project throughout the construction and operation of the Project • Environmental monitoring and supervision during construction and operation

D. CAPACITY BUILDING FOR EMP IMPLEMENTATION

398. PLN has extensive experience in transmission line construction and operation in Indonesia. Nonetheless, PLN, contractors and other stakeholders will benefit from training on the EMP requirements. The EHS Specialists will develop construction phase and operation phase training programs on all aspects of the EMP, including mitigation requirements, health and safety requirements, and monitoring. The training will be aimed at PLN staff, PMU staff, contractors and Park Authorities. Relevant government departments such as the MoE will also be invited to participate. The training programs will be delivered at least twice before the start of construction, and twice before the start of the operation phase.

399. The Baluran and Bali Barat Park Authorities have qualified and knowledgeable staff with extensive knowledge of the Parks and protected and endangered flora and fauna. Based on consultations and site visits, there is no need to provide training or capacity building related to the implementation of the Collaborative Agreements. However, as noted above, staff from the Park Authorities will be invited to participate in the EMP training.

400. It is recommended that ADB will provide an additional TA to support the operational management of the two NPs. This is needed to address the capacity gaps within the national parks and to support the environmental management related to the Project, particularly issues not covered in the PLN Collaborative Agreements. The outcome of the TA should be: strengthened capacity of the two national parks for operational management, monitoring and enforcement. Indicative outputs: (i) conservation needs assessment and updating of operational management plans; (ii) updating of management plans for target species of high biodiversity value; (iii) forest restoration and invasive species management plans; (iv) monitoring and enforcement capacity strengthening, including support for training and equipment. Additional due diligence is needed to confirm and develop the TA.

E. BUDGET FOR EMP IMPLEMENTATION

401. Table 9.8 presents a summary of the estimated EMP budget and Table 9.9 shows a detailed estimated EMP budget. Many of the mitigation measures are focused on good housekeeping and construction practices, and are incorporated into base costs. Costs items include Collaboration Agreement with Baluran National Park, tree compensation planting, environmental monitoring, PIC EHS consultants, training and capacity building, and outreach expenses.

Table 9.8: Summary of the EMP Budget Estimate

Item		Cost USD
1. Collaborative Agreements with two National Parks	$	934,980
2. Environmental Monitoring (Compliance and Ambient)	$	84,000
3. PIC Environmental Consultants	$	531,000
4. Training and Capacity Building Expenses	$	42,500
5. Outreach Expenses	$	70,000
6a. Subtotal PLN Non-loan Funds	$	934,980
6b. Subtotal ADB Loan Funds	$	727,500
6c. Subtotal	*$*	*1,662,480*
7a. Contingency (10%) PLN Non-loan Funds	$	93,498
7b. Contingency (10%) ADB Loan Funds	$	72,750
8a. TOTAL PLN NON-LOAN FUNDS	*$*	*1,028,478*
8b. TOTAL ADB LOAN FUNDS	*$*	*800,250*
8c. TOTAL PROJECT	***$***	***1,828,728***

Table 9.9: Detailed EMP Budget Estimate

				Construction Phase			Operation Phase		Subtotal	Notes
Item	Unit	Unit Cost	No.	Yr 1	Yr 2	Yr 3	Yr 1	Yr 2		
1. Collaborative Agreements with two National Parks										
Compensation Support for Baluran National Park	LS	$ 434,783	1	158,696	$ 103,804	$ 75,543	$ 48,370	$ 48,370	$ 434,783	
Compensation Support for Bali Barat National Park	LS	$ 500,196	1	136,755	$ 155,777	$ 155,837	$ 37,842	$ 42,462	$ 500,196	
Compensation Reforestation Java 2:1 ratio	LS	tbd							$ --	1
Compensation Reforestation Bali, 2:1 ratio)	LS	tbd							$ --	1
Subtotal									*$ 934,980*	
2. Environmental Monitoring (Compliance and Ambient)										
Compliance Monitoring	*Covered under PIC EHS Specialists see below*									2
Quarterly Ambient Monitoring (undertaken by national environmental consultants)										3
Noise	Sample	$ 100	150	$ 6,000	$ 6,000	$ 3,000			$ 15,000	
Air (TSP, PM10, SO2, NO2)	Sample	$ 200	150	$ 12,000	$ 12,000	$ 6,000			$ 30,000	
Water (TDS, TSS, Conductivity, pH, DO, salinity, oil & grease, total fecal coliform, NH4+, total nitrates, total phosphates)	Sample	$ 250	80	$ 8,000	$ 8,000	$ 4,000			$ 20,000	
Monitoring Consultant Travel and Per Diem	LS per Quarter	$ 1,500	10	$ 6,000	$ 6,000	$ 3,000			$ 15,000	
EMF Monitoring	Equipment	$ 2,000	2				$ 4,000		$ 4,000	
Subtotal									*$ 84,000*	
3. PIC Environmental Consultants										
International PIC EHS Specialist	PMs	$ 15,000	6	$ 27,000	$ 27,000	$ 18,000	$ 18,000		$ 90,000	
National PIC EHS Specialist	PMs	$ 3,500	36	$ 37,800	$ 37,800	$ 25,200	$ 25,200		$ 126,000	
National PIC Biodiversity Specialist	PMs	$ 3,500	18	$ 25,200	$ 25,200	$ 12,600			$ 63,000	
National PIC Communications Specialist	PMs	$ 3,500	18	$ 25,200	$ 25,200	$ 12,600			$ 63,000	
Per diems	PMs	$ 1,500	78	$ 35,100	$ 35,100	$ 23,400	$ 23,400		$ 117,000	
Vehicle Rental (assumes 2 vehicles rented 50% of time over 4 years)	Monthly Rental	$ 1,500	48	$ 21,600	$ 21,600	$ 14,400	$ 14,400		$ 72,000	
Subtotal									*$ 531,000*	
4. Training and Capacity Building Expenses										
Environmental Monitoring Training Materials	LS	$ 3,000	5	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 15,000	
Participants Honorarium	Participant	$ 50	500	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 25,000	
Venue	Rental Fee	$ 500	5	$ 500	$ 500	$ 500	$ 500	$ 500	$ 2,500	
Subtotal									*$ 42,500*	
5. Outreach Expenses										
Outreach (Advertising, Pamphlets, Signs, etc)	Materials	$ 20,000	1	$ 6,000	$ 6,000	$ 4,000	$ 4,000		$ 20,000	

Public Meetings, Workshops, etc.	Meeting Costs	$ 5,000	10	$ 15,000	$ 15,000	$ 10,000	$ 10,000		$ 50,000
Subtotal ADB + PLN Non-loan Funds									*$ 70,000*
6a. Subtotal PLN Non-loan Funds									**$ 934,980**
6b. Subtotal ADB Loan Funds									**$ 727,500**
6c. Subtotal									***$ 1,662,480***
7a. Contingency (10%) PLN Non-loan Funds									**$ 93,498**
7b. Contingency (10%) ADB Loan Funds									**$ 72,750**
8a. TOTAL PLN NON-LOAN FUNDS									$ 1,028,478
8b. TOTAL ADB LOAN FUNDS									$ 800,250
8c. TOTAL PROJECT									***$ 1,828,728***

Notes:

1. At the time of writing this information is still forthcoming, and will be updated in the next version of this EIA.
2. Compliance monitoring inspections will be undertaken by the PIC EHS Specialists.
3. Ambient monitoring is quarterly over the 2 1/2 construction period (10 times) at 15 locations for noise and air, and 8 for water. Locations will be finalized by the PIC EHS Specialists, but for air noise and air will focus on sensitive areas: substations, Baluran National Park, and settlements. Water monitoring will be at river crossings.

X. CONCLUSIONS AND RECOMMENDATIONS

402. The proposed Java-Bali Power Transmission Crossing Project will construct a 220km long 500kVTL and associated substations or substation upgrades or extensions for transferring power from the Paiton Power Complex and East Java power grid to the Bali power grid, thereby enhancing the availability and reliability of power supply to a province which is a major tourist destination and a nationally important source of GDP.

403. The Project has been classified by ADB as environment category A, requiring the preparation of an environmental impact assessment (EIA). This document forms the Project EIA report and has been prepared based on detailed line route surveys undertaken by PLN, preliminary design work undertaken by the TA 7325 consultant for the components to be financed by ADB, and due diligence undertaken for the components to be directly financed by PLN (3 and 4) and Component 7. Work undertaken in its preparation included surveys, field studies, site visits, and public and stakeholder consultations. Impact predictions are based on previous experiences on similar projects; data collected in the field; international good practice guidelines such as the World Bank *EHS Guidelines*; and discussions with local communities, relevant and knowledgeable governments officials and relevant experienced technical specialists.

404. Overall, Project impacts are predicted to be typical with similar high voltage TLs, with the major concerns that the Project does route through two National Parks and include the construction of two large Bali Strait Crossing Towers. Preconstruction phase impacts are primarily related to Project siting including i) land acquisition and resettlement; ii) potential impacts on sensitive receptors (schools, hospitals, environmentally sensitive areas) and existing infrastructure (roads, railways, transmission lines); iii) potential impacts on physical cultural resources (PCRs); iv) potential impacts on national parks; and iv) potential impacts related to the siting of temporary borrow and disposal pits, quarries and temporary worker camps. Mitigations are primarily related to careful selection of the RoW alignment so as to avoid or minimize impacts. There are also preconstruction phase environmental assessments and other clearances required from ADB, the Ministry of Environment (MoE) and the Ministry of Forestry (MoF).

405. Construction phase impacts include site erosion and landslides; impacts on surface and groundwater; solid waste management; air quality issues, primarily related to dust generation; noise; vegetation removal or cutting and other impacts on flora and fauna; destruction of PCRs; aesthetic impacts; and occupational and community health risks. Of these arguably the most important are flora and fauna issues associated with construction inside the Baluran and Bali Barat National Parks. Mitigation measures include good construction and housekeeping practices which were discussed in Chapter IX. Site-specific mitigation measures will also be implemented for construction activities in national parks (Table 9.2 and 9.3). Collaborative Agreements exists between PLN and the Baluran and Bali Barat Park Authorities to offset negative impacts and support conservation activities in the Park, TL site ecological rehabilitation, and compensation planting for the loss of trees in the RoW.

406. In Baluran National Park the Collaborative Agreement includes provision of new water sources, protection and enhancement of Banteng habitat, and a captive breeding program, which collectively should significantly contribute to increasing the protection and enhancement of Banteng in the Park. In Bali Barat National Park the Collaborative Agreement includes habitat monitoring and restoration in the TL RoW area, control of invasive species, and Bali Starling captive breeding, release and monitoring in the wild. With the implementation of the Collaborative Agreements, support for the conservation of the endangered Banteng and Bali Starling will be substantially increased. PLN is responsible for ensuring the provision of funding and monitoring of the implementation of the Collaborative Agreements.

407. It is recommended that ADB provides an additional TA to support the operational management of the two NPs. This is needed to address capacity gaps within the national parks, and to support environmental management related to the project, particularly issues not covered by the PLN Collaborative Agreements.

408. Impacts from TLs are primarily related to the construction phase, and there are relatively few significant operation phase impacts. Potential operational issues include spills or release of oils or hazardous materials, EMF effects, occupational and community health and safety risks, and risks from wind loading, fires and earthquakes. Mitigation measures have been incorporated into the design to minimize these to acceptable levels.

409. An environmental management plan (EMP) has been developed which includes mitigation measures; compliance and ambient environmental monitoring and reporting with corrective actions if required; development and implementation of occupational and community health and safety plans; and training and capacity building. In addition, a comprehensive package of environmental mitigation and offset measures has been designed to support biodiversity conservation in the two national parks. A Project Implementation Consultant (PIC) will be recruited to support the PMU in project administration and management, management of detailed design, procurement, management and supervision of works, and monitoring and reporting. The PIC will include two Environment Health and Safety (EHS) Specialists, a Biodiversity Specialist, and a Communications and Outreach Specialist.

410. Based on the analysis conducted in this assessment to date, it is the concluded that overall the Project will result in significant positive socioeconomic benefits, and though there are significant potential environmental impacts within the two national parks, they can be minimized adequately through good design and the appropriate application of mitigation measures especially during construction.

Appendices

Environmental Impact Assessment

INO: Java–Bali 500 kV Power Transmission Crossing Project

Appendices

Appendix 1: Rapid Environmental Assessment Checklist

Appendix 2: Questionnaires and Formats used for Environmental Surveys

Appendix 3a: References for the EIA Main Report

Appendix 3b: References for Biodiversity Study

Appendix 4a: Ministry of Environment Approval of Terms of Reference for Java Bali 500 kV Transmission Line AMDAL (Bahasa original and unofficial English translation)

Appendix 4b: Summary of Terms of Reference for Java Bali 500 kV Transmission Line AMDAL (unofficial English summary translation)

Appendix 5a: AMDAL Environmental Permit (Bahasa Original)

Appendix 5b: AMDAL Environmental Permit (unofficial English translation)

Appendix 6: Project TL Detailed Strip Maps

Appendix 7: Detailed Features and Land Use along TL Alignment

Appendix 8: Due Diligence Review of Components 3 and 4

Appendix 9: Due Diligence Review of Component 7

Appendix 10: MoF Forestry Rent Use Permit in Principle (Bahasa original and unofficial English translation)

Appendix 11: Public Consultation Photos

Appendix 12: Public Consultation Signed Attendance Sheets

Appendix 13: Due Diligence Stakeholder Consultations and National Park Site Visits

Appendix 14: Project Public Communication Framework

Appendix 15: Bird Species in Gilimanuk Bay based on Field Survey

Appendix 16: PLN Standard Operating Procedures for Environmental Management, Emergency Preparedness and Response and Health and Safety

Appendix 1: Rapid Environmental Assessment (REA) Checklists

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to Environment and Safeguards Division (RSES) for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

Country/Project Title:	**INO: Java – Bali 500 kV Power Transmission Crossing Project**
Sector Division:	SERD

Note: The proposed Project consists of six components located in East Java and Bali provinces:

Component 1: Paiton substation extension, East Java.
Component 2: Paiton to Watudodol 500 kV TL (including Baluran National Park), East Java.
Component 3: Watudodol (East Java) to Segara Rupek overhead sea crossing 500 kV TL.
Component 4: Segara Rupek to Gilimanuk 500 kV TL (through Bali Barat National Park), Bali.
Component 5: Gilimanuk to New Kapal 500 kV TL, Bali.
Component 6: New Kapal 500/150 kV distribution substation, Bali.
Component 7: upgrading of 26 number of 150 kV substations: 21 in Java and 4 in Bali

Components 1, 2, 5 and 6 will be co-financed by ADB and PLN; Components 3 and 4 will be financed directly by PLN and Component 7 will be financed by PLN.

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site	X		The Component 3 Bali Strait crossing tower on the Bali side is within 350 m of the Segara Rupek Temple within Bali Barat National Park. Special permission from the Governor of Bali has been obtained.

Screening Questions	Yes	No	Remarks
▪ Protected Area	X		Component 2 includes 17 km of TL passing through Utilization Zones of Baluran National Park. Component 3 includes crossing and anchor towers within of Bali Barat National Park. Component 4 involves 10.44 km of TL through the Bali Barat National Park. Mitigation measures will be adopted to minimize impacts and through a collaborative permit granted through the Ministry of Forestry PLN will finance conservation activities in the two National Parks.
▪ Wetland		X	No known significant wetlands other than mangroves (see below).
▪ Mangrove	X		The Component 4 TL route in Bali Barat National Park will pass across Manuk Bay. Towers will be placed on one mangrove island and on two mangrove flats within the marine protection zone. In addition, through a collaborative permit granted through the Ministry of Forestry PLN will finance conservation activities in the park.
▪ Estuarine	X		See response to "Mangrove" screening question, above.
▪ Buffer zone of protected area	X		See response to "Protected Area" screening question, above. While not passing through zones classified as "buffer", Components 2, 3 and 4 involve works inside national parks. Mitigation measures will be adopted to minimize impacts and through a collaborative permit granted through the Ministry of Forestry PLN will finance conservation activities in the two National Parks.
▪ Special area for protecting biodiversity	X		See response to "Protected Area" screening question, above.
B. Potential Environmental Impacts Will the Project cause…			
▪ encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?	X		There are no known historical / cultural areas within the TL RoW (Components 2, 4 and 5. However, a chance find procedure will be put in place to deal with any finds during construction.
▪ ENCROACHMENT ON PRECIOUS ECOSYSTEM (E.G. SENSITIVE OR PROTECTED AREAS)?	X		Yes, two National Parks (see response to "Protected Area" screening question, above). Yes, mangroves (see response to "Mangrove" screening question, above).

Screening Questions	Yes	No	Remarks
▪ alteration of surface water hydrology of waterways crossed by roads and resulting in increased sediment in streams affected by increased soil erosion at the construction site?	X		Localized impacts during transmission and crossing tower construction are possible (Components 2, 3, 4, 5). Construction of the New Kapal substation (Component 6) will affect a local rice paddy irrigation channel, and drainage measures will be required to minimize impacts.
▪ damage to sensitive coastal/marine habitats by construction of submarine cables?		X	No submarine cables.
▪ DETERIORATION OF SURFACE WATER QUALITY DUE TO SILT RUNOFF, SANITARY WASTES FROM WORKER-BASED CAMPS AND CHEMICALS USED IN CONSTRUCTION?	X		Localized impacts during construction and from worker camps are possible. Mitigation measures will be put in place to minimize erosion and siltation, fuels and chemicals will be strictly controlled, and worker camps will be equipped with sanitation facilities.
▪ increased local air pollution due to rock crushing, cutting and filling?	X		Localized impact during foundation construction for substations and crossing towers are possible; dust control measures will be put in place.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	X		Physical works on substations and transmission lines poses occupational health and safety risks; an occupational health and safety plan will be developed.
▪ chemical pollution resulting from chemical clearing of vegetation for construction site?		X	Chemical defoliants will not be utilized (to be confirmed)
▪ noise and vibration due to blasting and other civil works?	X		Possible localized impacts during construction; noise mitigation measures will be implemented.
▪ dislocation or involuntary resettlement of people?	X		There will be land acquisition; a land acquisition and resettlement plan will be implemented.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	Poor will benefit from increased rates of electrification.
▪ social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing roads?		X	Not anticipated; TL is well served by existing road network, and consultations indicate broad public support for project.
▪ hazardous driving conditions where construction interferes with pre-existing roads?		X	The RoW is well served by good quality main and access roads, impacts are expected to be minimal.
▪ creation of temporary breeding habitats for vectors of disease such as mosquitoes and rodents?		X	No standing water pools are expected to be created.
▪ dislocation and compulsory resettlement of people living in right-of-way of the power transmission lines?		X	RoW has been selected to avoid settlements. Nonetheless, there will be land acquisition; a land acquisition and resettlement plan will be implemented.
▪ environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?	X		RoW will need to be maintained within the national parks, which may create impacts on flora and fauna; mitigations will be put in place to minimize impacts.

Screening Questions	Yes	No	Remarks
▪ facilitation of access to protected areas in case corridors traverse protected areas?	X		See response to “Protected Area” screening question, above. There is a risk of increasing encroachment on the two parks, especially during the construction phase. Access will be controlled to the maximum extent possible.
▪ disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?		X	No herbicides will be used.
▪ large population influx during project construction and operation that cause increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Worker requirements are moderate and very dispersed.
▪ social conflicts if workers from other regions or countries are hired?	X		Possible. Local workers will be utilized to the extent practical.
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	X		Possible. Camps will be equipped with sanitation facilities.
▪ risks to community safety associated with maintenance of lines and related facilities?	X		Possible, community health and safety program will be implemented.
▪ community health hazards due to electromagnetic fields, land subsidence, lowered groundwater table, and salinization?		X	TL will be constructed to GoI standards to minimize potential EMF risks, and TL alignment avoids communities. Further, according to World Bank Group EHS guidelines, there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	X		Possible, handling, storage and disposal of explosives, fuel and other chemicals will be controlled.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., high voltage wires, and transmission towers and lines) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	X		Possible, community health and safety program will be implemented.

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	***Remarks***
▪ Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)?	X		There is a potential for erosion and landslides. Tower sites will be selected to minimize risks, and erosion protection measures will be put in place.

▪ Could changes in precipitation, temperature, salinity, or extreme events over the Project lifespan affect its sustainability or cost?		X	
▪ Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		X	
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., increasing traffic or housing in areas that will be more prone to flooding, by encouraging settlement in earthquake zones)?		X	

Appendix I: Environments, Hazards and Climate Changes

Environment	Natural Hazards and Climate Change
Arid/Semi-arid and desert environments	Low erratic rainfall of up to 500 mm rainfall per annum with periodic droughts and high rainfall variability. Low vegetative cover. Resilient ecosystems & complex pastoral and systems, but medium certainty that 10–20% of drylands degraded; 10-30% projected decrease in water availability in next 40 years; projected increase in drought duration and severity under climate change. Increased mobilization of sand dunes and other soils as vegetation cover declines; likely overall decrease in agricultural productivity, with rain-fed agriculture yield reduced by 30% or more by 2020. Earthquakes and other geophysical hazards may also occur in these environments.
Humid and sub-humid plains, foothills and hill country	More than 500 mm precipitation/yr. Resilient ecosystems & complex human pastoral and cropping systems. 10-30% projected decrease in water availability in next 40 years; projected increase in droughts, heatwaves and floods; increased erosion of loess-mantled landscapes by wind and water; increased gully erosion; landslides likely on steeper slopes. Likely overall decrease in agricultural productivity & compromised food production from variability, with rain-fed agriculture yield reduced by 30% or more by 2020. Increased incidence of forest and agriculture-based insect infestations. Earthquakes and other geophysical hazards may also occur in these environments.
River valleys/ deltas and estuaries and other low-lying coastal areas	River basins, deltas and estuaries in low-lying areas are vulnerable to riverine floods, storm surges associated with tropical cyclones/typhoons and sea level rise; natural (and human-induced) subsidence resulting from sediment compaction and ground water extraction; liquefaction of soft sediments as result of earthquake ground shaking. Tsunami possible/likely on some coasts. Lowland agri-business and subsistence farming in these regions at significant risk.
Small islands	Small islands generally have land areas of less than 10,000km^2 in area, though Papua New Guinea and Timor with much larger land areas are commonly included in lists of small island developing states. Low-lying islands are especially vulnerable to storm surge, tsunami and sea-level rise and, frequently, coastal erosion, with coral reefs threatened by ocean warming in some areas. Sea level rise is likely to threaten the limited ground water resources. High islands often experience high rainfall intensities, frequent landslides and tectonic environments in which landslides and earthquakes are not uncommon with (occasional) volcanic eruptions. Small islands may have low adaptive capacity and high adaptation costs relative to GDP.

Mountain ecosystems	Accelerated glacial melting, rockfalls/landslides and glacial lake outburst floods, leading to increased debris flows, river bank erosion and floods and more extensive outwash plains and, possibly, more frequent wind erosion in intermontane valleys. Enhanced snow melt and fluctuating stream flows may produce seasonal floods and droughts. Melting of permafrost in some environments. Faunal and floral species migration. Earthquakes, landslides and other geophysical hazards may also occur in these environments.
Volcanic environments	Recently active volcanoes (erupted in last 10,000 years – see www.volcano.si.edu). Often fertile soils with intensive agriculture and landslides on steep slopes. Subject to earthquakes and volcanic eruptions including pyroclastic flows and mudflows/lahars and/or gas emissions and occasionally widespread ashfall.

Appendix 2: Questionnaires and Formats used for Environmental Surveys

1. Environmental Features within Project Corridor

ENVIRONMENTAL FEATURES SURVEY OF WITHIN THE ROW OF PROJECT = GAMBARAN SURVEI LINGKUNGAN DI JALUR PROYEK

Tgl: (date)_ _ _ _ _ _ _ _ _ _ _ _   Data Collector = Pengumpul: _ _ _ _ _ _ _ _ _ _ _ _

Nomor Tower = Nomor Menara : **Dari ……………….sampai ………………….**

Nama Seksi:……………………….

(Untuk diisi selama Lapangan Reconnaissance sepanjang Saluran Rute Transmisi)

Sl. No.	Environmental Features = Gambaran Lingkungan		Name of Feature = Nama Gambaran	Exact location (Distance from Transmission Line Route) = Ketepatan lokasi (Jarak dari rute Jalur Transmisi)		
				Left side = Sisi Kiri	Right side = Sisi Kanan	Remarks = Keterangan
1	Permukiman	RU / SU / U				
2	Business Amenities and Others (Fasilitas Bisnis dan lainnya)	Industries = Industri				
		Construction sites = Konstruksi lokasi				
		Quarry sites = Lokasi kuari				
		Commercial Sites = Lokasi Komersial				
		Recreation Facilities = Fasilitas Rekreasi				
		Bus /Taxi Stands = Pangkalan Bus/Taxi				
		Others = Lain-lain				
3	Domestic Disposal Sites = Lokasi pembuangan sampah Domestik	Effluent = limbah cair				
		Solid Waste = Limbah Padat				
		Hazardous Waste = Limbah Berbahaya				
4	Archaeology = Arkeologi	Religious site/Monastery = Agama situs/Biara				
		Cremation Ground = Kremasi Tanah				
		Historical/Cultural Site = Sejarah Situs / Budaya				
5	Sensitive & Critical Natural Habitats = Sensitif & Kritis Habitat Alam	Wildlife Habitat = Habitat satwa liar				
		Protected Area = Kawasan Lindung				
		Mountain / Hill = Gunung / Bukit				
		Scenic / Recreation Points = Daerah rekreasi alam				
		Others = Lain-lain				
6	Water Resources = Sumber Air	Rivers/Streams = Sungai / Streaming				
		Ponds/ Reservoirs = Kolam/Waduk				

Sl. No.	Environmental Features = Gambaran Lingkungan		Name of Feature = Nama Gambaran	Exact location (Distance from Transmission Line Route) = Ketepatan lokasi (Jarak dari rute Jalur Transmisi)		
				Left side = Sisi Kiri	Right side = Sisi Kanan	Remarks = Keterangan
		Cold/Hot spring = Dingin/Panas Musim Semi				
		Others = Lain-lain				
7	Land Use type = Jenis Penggunaan Lahan	Agricultural wetland = Pertanian Lahan Basah :				
		Agricultural dryland = Pertanian Lahan Kering :				
		Agricultural Crops = Pertanian Tanaman				
		Horticultural plantation = Hortikultura perkebunan				
		Vegetable garden = Kebun Sayur				
		Pasture = Padang Rumput				
		Grassland/scrub vegetation = Padang rumput / belukar vegetasi				
		Forest (indicate forest type) = Hutan (menunjukkan tipe hutan)				
8	Government /Private Establishment = Pendirian Pemerintah/Swasta	Power Stations = Stasiun Pembangkit				
		Army camp = Kamp Tentara				
		Post Office = Kantor Pos				
		Hospital/Health Facility = Rumah Sakit/Fasilitas Kesehatan				
		Sekolah				
		Training Center = Pusat Pelatihan				
		Lainnya				
9	Natural Disasters = Bencana Alam	Banjir/Dam				
		Pendangkalan / Tanah Erosi				
		Land Slide =Longsor				
		Lainnya				
11	Fasilitas sosial	Power line=Jaringan listrik				
		Roads / Highways=Jalan Raya				
		Telephone line=Jaringan telepon				
		Water pipe=Pipa air				
		Underground cable=Kabel bawah tanah				
		Gas/fuel station= SPBU				
		Lainnya				

RU = Rural Urban, SU = Sub-urban, U = Urban

2. Environmental Features in Forest Areas

Data for sample plots (25m x 25m) at points 100mts on the left and right side of transmission line = Data untuk plot sampel (25m x 25m) pada titik-titik 100mts di sisi kiri dan kanan jalur transmisi

Date = Tanggal : Name of data collector = Nama pengumpul data :
Name of section/point = Nama Bagian / titik : Plot # = Alur :
Slope = Lereng : Aspect = Aspek : Altitude = Tinggi :

Vegetative data (If species name is not known take photo ad write photo #) = Vegetatif data (Jika nama spesies tidak dikenal mengambil foto menulis iklan foto #)

1.	**Canopy layer = Canopy lapisan**	
No.	**Species/Common Name = Nama Jenis / Common**	**No. of trees/Approximate percentage coverage = Jumlah pohon / Perkiraan persentase cakupan**
2.	**Undergrowth = Semak-semak**	
No.	**Species/Common name = Nama Spesies/Umum**	**No. of Trees/Approximate percentage coverage = Jumlah Pohon / persentase cakupan Perkiraan**

Data for Volume of Trees (Measure only trees with dbh > 10 cm) = Data untuk Volume Pohon (Ukur pohon hanya dengan diameter 10 cm>)

No.	Tree species = Jenis pohon	Dbh	Height = Tinggi

No.	Tree species = Jenis pohon	Dbh	Height = Tinggi

Wildlife Data = Data Satwa

Date = Tanggal : Name of data collector = Nama pengumpul data :

(Data for every day should be filled in a different sheet) = (Data untuk setiap hari harus diisi dalam lembar yang berbeda)

No.	Exact location/Plot number and local name of area = lokasi Tepat/Alur jumlah dan nama lokal daerah	Name of wildlife species/common name = Nama jenis satwa / nama umum	Sighting (Actual animal or sign of animal – footprint, droppings etc.) = Pengamatan (hewan Realisasi atau tanda binatang - tapak, kotoran dll)	Frequency of sighting = Frekuensi peninjauan	Approximate distance between two sightings = Perkiraan jarak antara dua penampakan

3. Questionnaire for Community Consultation / Focus Group Discussion

QUESTIONNAIRE FOR FOCUS GROUP DISCUSSIONS/COMMUNITY = KUESIONER UNTUK DISKUSI KELOMPOK FOKUS / MASYARAKAT

Date = Tanggal : **Interviewer = Pewawancara :**

Sl. No.	Village = Desa	Tower Number (from –to) = Tower Nomor (dari-ke)	Names of participants = Nama peserta

Physical Environmental Features = Lingkungan Fisik Fitur

1. From where do you source your drinking water = **Dari mana Anda sumber air minum** ?
   ……………………………………………………………………………………………………

2. Are there any issues with water in your community? If yes, what is the issue and what do you think is causing it ?
   Apakah ada masalah dengan air di komunitas Anda? Jika ya, apa masalah dan apa yang menurut Anda adalah penyebabnya?
   ……………………………………………………………………………………………………
   ……………………………………………………………………………………………………

3. What do you think will solve the water problem = **Apa yang Anda pikir akan memecahkan masalah air** ?
   ……………………………………………………………………………………………………

4. Do you have any problems with noise? If so what is causing it = **Apakah Anda memiliki masalah dengan kebisingan? Jika demikian apa yang menyebabkan itu**?
   ……………………………………………………………………………………………………

5. Do you have any problems with soil (erosion, low fertility etc.)? If yes what do you think is causing it? For how long has the problem been existing = **Apakah Anda memiliki masalah dengan tanah (erosi, kesuburan rendah dll) ? Jika ya apa yang menurut Anda penyebabnya ? Untuk berapa lama masalah sudah ada ?**
   ……………………………………………………………………………………………………

6. What do you think would help solve the soil problem = **Apa yang Anda pikir akan membantu menyelesaikan masalah tanah**?
   ……………………………………………………………………………………………………

7. Is there any past history of natural calamities such as flood, drought, hailstones, earthquake etc. in your village? If so describe and mention when it happened ?
   Apakah ada riwayat bencana alam seperti banjir, kekeringan, hujan es, dsb gempa di desa Anda? Jika demikian menggambarkan dan menyebutkan kapan itu terjadi?
   ……………………………………………………………………………………………………

Vegetation = Tumbuh-tumbuhan

1. Do you consume any trees or plants from the forest next to your village? If yes what is the local name of the plants and what do you use them for? (edible plants, medicinal plants etc.) = **Apakah Anda mengkonsumsi pohon atau tanaman dari hutan di sebelah desa anda? Jika ya apa nama lokal dari tanaman dan apa yang Anda menggunakannya untuk? (Tanaman pangan, tanaman obat dll)**

S. No.	Local name of plant = Nama lokal tumbuhan	Use = Gunakan

2. Which plant or tree is most abundantly found in the forest next to your village? How would you measure the abundance? (number of trees per decimal/acre or other measurements)
   Yang tanaman atau pohon yang paling berlimpah ditemukan di hutan di samping desa anda? Bagaimana Anda mengukur kelimpahan? (Jumlah pohon per desimal / pengukuran acre atau lainnya)

………
………

***Wildlife* = Margasatwa**

1. What are the wild animals (including birds) found in the forest next to or village? = **Apa binatang liar (termasuk burung) yang ditemukan di hutan di samping atau desa?**

Sl. No.	Animal name (Mention actual sighting or signs of animal) = Hewan nama (Sebutkan penampakan aktual atau tanda-tanda hewan)	Timing of seeing (month and time of day) = Waktu melihat (bulan dan waktu hari)	Frequency of sighting animal/ animal sign = Frekuensi hewan penampakan / tanda binatang	Location of sighting = Lokasi peninjauan

Golden Langur = Keemasaan Lutung

1. How many Langur's did you see this year ?
   Berapa banyak Lutung apakah kamu melihat tahun ini?

………

2. Do you notice any changes in the numbers of Langur's that you see today in comparison to the past? How long ago would be "the past"?
   Apakah Anda melihat adanya perubahan dalam jumlah Lutung yang Anda lihat sekarang dibandingkan dengan masa lalu? Berapa lama yang lalu akan menjadi "masa lalu"?

………
………

3. What is the change? What do you think is causing the change?
   Apa itu perubahan? Apa yang Anda pikirkan adalah menyebabkan perubahan?

………

4. Have there been any Langur accidents with vehicles this year? If so, how many? Have there been any accidents over the past few years? Is this a common occurrence?
   Apakah ada kecelakaan Langur dengan kendaraan tahun ini? Jika demikian, berapa banyak? Apakah ada kecelakaan selama beberapa tahun terakhir? Apakah ini umum terjadi?

………
…………………………………………………………………………

5. According to your observation do you notice any changes in the behavior of the langur's? (more friendly to humans? More shy? Anything else etc.)
   Menurut pengamatan Anda apakah anda melihat perubahan apapun dalam perilaku lutung itu? (Lebih ramah terhadap manusia Lebih malu?? Ada lagi dll)

   ……………………………………………………………………………………………………

Tiger = Harimau

1. In which area and what kind of conditions do you usually notice the Tiger or signs?
   Di daerah mana dan seperti apa kondisi yang Anda biasanya melihat harimau atau tanda-tanda?

   ……………………………………………………………………………………………………

2. Do you notice a reduction or increase in the incidences of sighting the Tiger or signs of the Tiger? If so what do you think is causing it and what do you feel about it?

Apakah Anda melihat penurunan atau peningkatan dalam insiden penampakan Tiger atau tanda-tanda dari Harimau?
Jika demikian apa yang menurut Anda adalah menyebabkannya dan apa yang Anda rasakan tentang hal itu?

……………………………………………………………………………………………………
……………………………………………………………………………………………………

Rufous necked Hornbill = Rufous Hornbill berleher

3. Where specifically do you see/hear the hornbills usually? (on trees, flying overhead?)
   Dimana khusus Anda melihat / mendengar enggang biasanya? (Di pohon-pohon, terbang overhead?)

……………………………………………………………………………………………………
……………………………………………………………………………………………………

4. Do you notice any reduction/increase in the number of sightings of the bird? What do you think is causing the reduction/increase? What could prevent a decrease of the bird number?
   Apakah Anda melihat pengurangan apapun / kenaikan jumlah penampakan burung? Apa yang Anda pikirkan adalah menyebabkan penurunan / kenaikan? Apa yang bisa mencegah penurunan jumlah burung?

……………………………………………………………………………………………………

Religious/Cultural sites = Agama / situs Budaya

1. Are there any religious/cultural/historical sites monuments around your village? If so name them and give a slight background on them.
   Apakah ada / agama budaya / situs sejarah monumen di sekitar kampung Anda? Jika demikian nama mereka dan memberikan sedikit latar belakang mereka.

   ……………………………………………………………………………………………………
……………………………………………………………………………………………………

2. Where is the site/monument located?
   Dimana situs / monumen yang terletak?

   ……………………………………………………………………………………………………
……………………………………………………………………………………………………

Others = Lain-lain

1. Would you have any suggestions/ideas to improve the natural environment of your area?
   Apakah Anda memiliki saran / ide untuk memperbaiki lingkungan alam daerah Anda?

   ……………………………………………………………………………………………………
……………………………………………………………………………………………………

2. Are you worried as your village is close to the transmission line? Why?
   Apakah Anda khawatir sebagai desa Anda dekat dengan jalur transmisi? Mengapa?

……………………………………………………………………………………………………

(Note down any other relevant information that you may get from the people) = **(Tuliskan informasi terkait lainnya yang mungkin Anda dapatkan dari orang)**

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2. Wetlands Indonesia , Bogor, Contact person Ferry
3. Raptor Indonesia, Bogor, Contact person Asman Adi Purwanto

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   b) Herry Kusumanegara
   c) Sugiarto
2. Baluran National Park
   a) Joko Susilo
   b) Gatot
   c) Birowo

Appendix 4a: Ministry of Environment Approval of Terms of Reference for Java Bali 500 kV Transmission Line (*Bahasa original and unofficial English translation*)

KEPUTUSAN DEPUTI TATA LINGKUNGAN
SELAKU KETUA KOMISI PENILAI AMDAL PUSAT
KEMENTERIAN LINGKUNGAN HIDUP
NOMOR 07 TAHUN 2012

TENTANG
KERANGKA ACUAN ANALISIS DAMPAK LINGKUNGAN HIDUP (KA-ANDAL) RENCANA KEGIATAN SALURAN UDARA TEGANGAN EKSTRA TINGGI (SUTET) 500 kV PAITON-ANTOSARI DAN SALURAN UDARA TEGANGAN TINGGI (SUTT) 150 kV ANTOSARI-KAPAL, PROVINSI JAWA TIMUR DAN PROVINSI BALI, OLEH PT. PLN (PERSERO) UNIT INDUK PEMBANGUNAN JARINGAN JAWA BALI

KEPUTUSAN KETUA KOMISI PENILAI AMDAL PUSAT,

Menimbang :

a. bahwa rencana kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT.PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali;

b. bahwa Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL) Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT.PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali, sebagai salah satu bagian dari studi AMDAL wajib mendapatkan kesepakatan berdasarkan hasil penilaian Komisi Penilai AMDAL Pusat;

c. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a dan huruf b, perlu menetapkan Keputusan Ketua Komisi Penilai Amdal Pusat Kementerian Lingkungan Hidup tentang Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL) Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT.PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali;

1

Mengingat :

1. Undang-Undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya (Lembaran Negara Republik Indonesia Tahun 1990 Nomor 49, Tambahan Lembaran Negara Republik Indonesia Nomor 3419);

2. Undang-Undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah (Lembaran Negara Republik Indonesia Tahun 2004 Nomor 125, Tambahan Lembaran Negara Republik Indonesia Nomor 4437), sebagaimana telah beberapa kali diubah, terakhir dengan Undang-Undang Nomor 12 Tahun 2008 tentang Perubahan Kedua atas Undang-Undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah (Lembaran Negara Republik Indonesia Nomor 59, Tambahan Lembaran Negara Nomor 4844);

3. Undang-Undang Nomor 26 Tahun 2007 tentang Penataan Ruang (Lembaran Negara Republik Indonesia Tahun 2007 Nomor 68, Tambahan Lembaran Negara Republik Indonesia Nomor 3838);

4. Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup (Lembaran Negara Republik Indonesia Tahun 2009 Nomor : 140, Tambahan Lembaran Negara Republik Indonesia Nomor : 5059);

5. Peraturan Pemerintah Nomor 27 Tahun 2012 tentang Izin Lingkungan (Lembaran Negara Republik Indonesia Tahun 2012 Nomor 48, Tambahan Lembaran Negara Republik Indonesia Nomor 5285);

6. Peraturan Presiden Nomor 91 Tahun 2011 tentang Perubahan Ketiga Atas Peraturan Presiden Nomor 47 Tahun 2009 tentang Pembentukan dan Organisasi Kementerian Negara;

7. Peraturan Presiden Nomor 92 Tahun 2011 tentang Perubahan Kedua Atas Peraturan Presiden Nomor 24 Tahun 2010 tentang Kedudukan, Tugas, dan Fungsi Kementerian Negara Serta Susunan Organisasi, Tugas, dan Fungsi Eselon I Kementerian Negara;

8. Peraturan Menteri Negara Lingkungan Hidup Republik Indonesia Nomor 16 Tahun 2010 tentang Organisasi dan Tata Kerja Kementerian Negara Lingkungan Hidup Republik Indonesia;

9. Peraturan Menteri Negara Lingkungan Hidup Nomor 5 Tahun 2012 tentang Jenis Rencana Usaha dan/atau Kegiatan Yang Wajib Memiliki Analisis Mengenai Dampak Lingkungan;

10. Keputusan Menteri Negara Lingkungan Hidup Nomor 356 Tahun 2005 tentang Pendelegasian Kewenangan Untuk Menandatangani Surat Keputusan Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL);

Memperhatikan :

1. Hasil Rapat Komisi Penilai AMDAL Pusat pada tanggal 2 Agustus 2011 di Jakarta, dan Rapat Komisi Penilai AMDAL Pusat Lanjutan pada tanggal 4 Agustus 2011 di Bali, mengenai penilaian KA-ANDAL Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT. PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali;

2. Surat Rekomendasi Gubernur Bali Nomor: 671/2215/Bappeda tanggal 18 Juni 2012 perihal Revisi Rekomendasi Pembangunan Jaringan Transmisi Jawa-Bali *Crossing*;

3. Surat Rekomendasi Gubernur Jawa Timur (A.n. Gubernur Jawa Timur, Kepala Badan Penanaman Modal Provinsi Jawa Timur) Nomor: P2T/023/0101/XI/2010 tanggal 18 November 2010 perihal Surat Izin Pemanfaatan Ruang;

MEMUTUSKAN:

Menetapkan :

PERTAMA : KEPUTUSAN KETUA KOMISI PENILAI AMDAL PUSAT KEMENTERIAN LINGKUNGAN HIDUP TENTANG KERANGKA ACUAN ANALISIS DAMPAK LINGKUNGAN HIDUP (KA-ANDAL) RENCANA KEGIATAN SALURAN UDARA TEGANGAN EKSTRA TINGGI (SUTET) 500 kV PAITON-ANTOSARI DAN SALURAN UDARA TEGANGAN TINGGI (SUTT) 150 kV ANTOSARI-KAPAL, PROVINSI JAWA TIMUR DAN PROVINSI BALI, OLEH PT. PLN (PERSERO) UNIT INDUK PEMBANGUNAN JARINGAN JAWA BALI.

KEDUA : Ruang lingkup Keputusan Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL) Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT. PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali, sebagaimana dimaksud dalam diktum PERTAMA, meliputi:

a. Berita Acara Rapat Komisi Penilai AMDAL Pusat Nomor: B-74/BA/Komisi/Dep.I/LH/08/2011 tanggal 2 Agustus 2011;

b. Berita Acara Rapat Komisi Penilai AMDAL Pusat Lanjutan Nomor: B-77/BA/Komisi/Dep.I/LH/08/2011 tanggal 4 Agustus 2011;

c. dokumen KA-ANDAL,

sebagaimana tercantum dalam lampiran yang merupakan bagian tidak terpisahkan dari Keputusan Ketua Komisi Penilai Amdal Pusat ini.

KETIGA : Kerangka Acuan Analisis Dampak Lingkungan Hidup (KA-ANDAL) Rencana Kegiatan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV PAITON-ANTOSARI dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV ANTOSARI-KAPAL, Provinsi Jawa Timur dan Provinsi Bali, oleh PT. PLN (PERSERO) Unit Induk Pembangunan Jaringan Jawa Bali, wajib digunakan sebagai acuan dalam pelaksanaan kajian Analisis Dampak Lingkungan Hidup (ANDAL), Rencana Pengelolaan Lingkungan Hidup (RKL), dan Rencana Pemantauan Lingkungan Hidup (RPL).

KEEMPAT	:	Keputusan Ketua Komisi Penilai Amdal Pusat ini dinyatakan kadaluwarsa, apabila pemrakarsa tidak melakukan penyusunan dokumen ANDAL, RKL dan RPL paling lambat 3 (tiga) tahun sejak Keputusan Ketua Komisi Penilai Amdal Pusat ini ditetapkan.
KELIMA	:	Keputusan Ketua Komisi Penilai Amdal Pusat ini mulai berlaku pada tanggal ditetapkan.

Ditetapkan di Jakarta
pada tanggal: 4 Juli 2012

DEPUTI MENTERI NEGARA LINGKUNGAN HIDUP BIDANG TATA LINGKUNGAN,

selaku Ketua Komisi Penilai Amdal Pusat Kementerian Lingkungan Hidup,

Imam Hendargo Abu Ismoyo

Keputusan Deputi ini disampaikan kepada Yth.:
1. Menteri Dalam Negeri;
2. Menteri Energi dan Sumber Daya Mineral;
3. Menteri Perhubungan;
4. Gubernur Jawa Timur;
5. Gubernur Bali;
6. Walikota Probolinggo;
7. Bupati Situbondo
8. Bupati Banyuwangi;
9. Bupati Jembrana;
10. Bupati Badung;
11. Bupati Buleleng;
12. Bupati Tabanan;
13. Kepala Pusat Pengelolaan Ekoregion Bali, Nusa Tenggara;
14. Kepala Badan Lingkungan Hidup Provinsi Jawa Timur;
15. Kepala Badan Lingkungan Hidup Provinsi Bali;
16. Kepala Badan Lingkungan Hidup Kota Probolinggo;
17. Kepala Badan Lingkungan Hidup Kabupaten Situbondo;
18. Kepala Badan Lingkungan Hidup Kabupaten Banyuwangi;
19. Kepala Badan Lingkungan Hidup Kabupaten Jembrana;
20. Kepala Badan Lingkungan Hidup Kabupaten Badung;
21. Kepala Badan Lingkungan Hidup Kabupaten Buleleng;
22. Kepala Badan Lingkungan Hidup Kabupaten Tabanan;
23. Yang Bersangkutan.

Appendix 4b: Summary Terms of Reference for Java Bali 500 kV Transmission Line (*unofficial English summary translation)*

DECISION OF DEPUTY PROCEDURE FOR THE ENVIRONMENT
AS HEAD OF CENTRAL EIA APPRAISER COMMISSION
MINISTRY OF ENVIRONMENT NUMBER 07 OF 2012

ABOUT TERMS OF REFERENCE ENVIRONMENTAL IMPACT ANALYSIS
(KA-ANDAL) ACTION PLAN OF TRANSMISSION LINE EXTRA HIGH VOLTAGE
(SUTET) 500kV PAITON - ANTOSARI AND TRANSMISSION LINE
HIGH VOLTAGE (SUTT) 150 kV ANTOSARI – KAPAL,
EAST JAVA PROVINCE AND BALI PROVINCE, BY PT. PLN (LIMITED)
UNIT OF JAVA BALI MAIN NETWORK DEVELOPMENT
DECISION OF THE CHAIRMAN OF CENTRAL EIA APPRAISER COMMISSION

Considering: a. that the Action Plan of Transmission Line Extra High Voltage (SUTET) 500-kV PAITON -ANTOSARI and Transmission Line High Voltage '(SUTT) 150 kV ANTOSARI- KAPAL in East Java Province and Bali Province by PT PLN (LIMITED) Unit of Java-Bali Main Network Development;

b. that the Terms of Reference for Environmental Impact Analysis (KA-ANDAL), the Action Plan of Transmission Line Extra High Voltage (SUTET) 500-kV PAITON -ANTOSARI and Transmission Line High Voltage '(SUTT) 150 kV ANTOSARI- KAPAL in East Java Province and Bali Province by PT PLN (LIMITED) Unit of Java-Bali Main Network Development as one part of the EIA study must obtain agreement based on the results of Central EIA Commission assessment;

c. Upon consideration of referred to in letters a and b, it is necessary to set up by the Chairman of the Central EIA Appraisal Commission of the Ministry of Environment Terms of Reference for Environmental Impact Analysis (KA-ANDAL) Concerning Action Plan Transmission Line Extra High Voltage (SUTET) 500kV PAITON - ANTOSARI and Transmission Line High Voltage (SUTT) 150 kV ANTOSARI-KAPAL in East Java Province and Bali Province by PT PLN (LIMITED) Unit of Java-Bali Main Network Development;

Given:

1. Law Number 5 Year 1990 on Conservation of Natural Resources and Ecosystems (State Gazette of the Republic of Indonesia 1990 No. 49, Supplement Republic of Indonesia Number 3419);

2. Law Number 32 Year 2004 on Local Government (State Indonesia Year 2004 Number 125, Supplement Republic of Indonesia Number 4437), as amended several times, last by Act No. 12 of 2008 about the Second Amendment Act Number 32 Year 2004 on Regional Governance (State Gazette of the Republic of Indonesia Number 59, Supplement Number 4844);

3. Law Number 26 Year 2007 on Spatial Planning (State Indonesia Year 2007 Number 68, Supplement Republic of Indonesia Number 3838);

4. Law Number 32 Year 2009 on Environmental Protection and Management (State Gazette of the Republic of Indonesia Year 2009 Number: 140, Additional State Gazette Indonesia Number 5059);

5. Government Regulation Number 27 Year 2012 Regarding Environmental Permit (State Indonesia Year 2012 Number 48, Supplement Republic of Indonesia Number 5285);

6. Presidential Regulation Number 91 Year 2011 regarding Third Amendment to Presidential Decree Number 47 In 2009 on the Establishment and Organization Ministry of State;

7. Presidential Regulation Number 92 Year 2011 about pliers Second Amendment to Presidential Decree Number 24 Year 2010 regarding Position, Duties, and Functions Ministry of State and the Organizational Structure, Duties, and Functions of the State Ministry of Echelon;

8. Regulation of the Minister of Environment of the Republic Indonesia Number 16 Year 2010 concerning Organization and Administration of the Ministry of Environment of the Republic of Indonesia;

9. Regulation of the Minister of Environment No. 5 Year 2012 Concerning the types of Business Plans and / or Have Mandatory Activities Analysis Environmental Impact;

10. Decree of the Minister of Environment No. 356 of 2005 on Delegation of Authority for the Signing of the Framework Decision Reference Environmental Impact Analysis (KA-);

Attention to: 1. The results of the Central EIA Appraisal Committee Meeting dated August 2, 2011 in Jakarta, and Meetings Central EIA Assessment Commission dated August 4, 2011 in Bali, for the assessment of KA-ANDAL Action Plan of Transmission Line Extra High Voltage (SUTET) 500-kV PAITON - ANTOSARI and Transmission Line High Voltage (SUTT) 150 kV ANTOSARI – KAPAL, East Java Province and Bali Province, by PT. PLN (LIMITED) Unit of Bali Java Main Network Development;

2. Recommendation Letter of Governor of Bali Number: 671j2215jBappeda dated June 18, 2012, concerning Revised Recommendation of Network Development Java-Bali Transmission Crossing;

3. Recommendation Letter of Governor of East Java (on Behalf of East Java Governor, Head of Capital Investment of East Java Province) Number: P2T/023/0101jXI/2010 18 November 2010 regarding the Land Use Permit;

DECIDE

FIRST: APPRAISER COMMISSION DECISION OF THE CHAIRMAN OF CENTRAL EIA, MINISTRY OF CONCERNING TERMS OF REFERENCE ENVIRONMENT IMPACT ANALYSIS (KA-ANDAL) CONCERNING ACTION PLAN OF TRANSMISSION LINE EXTRA HIGH VOLTAGE (SUTET) 500 Kv PAITON -ANTOSARI AND

TRANSMISSION LINE HIGH VOLTAGE (SUTT) 150 Kv ANTOSARI - KAPAL, EAST JAVA PROVINCE AND BALI PROVINCE, BY PT. PLN (LIMITED) UNIT OF JAVA BALI MAIN DEVELOPMENT NETWORK.

SECOND: The scope of the Terms of Reference of Environmental Impact Analysis (KA-ANDAL) Action Plan of Transmission Line Extra High Voltage (SUTET) 500 kV Paiton-ANTOSARI and Transmission Line High Voltage (SUTT) ANTOSARI - KAPAL 150 kV, Province of East Java and Province of Bali, by PT. PLN (LIMITED) Unit of Java Bali Main Network Development, as mentioned in the FIRST dictum, including:

a. Minutes of Meeting of Central Commission for EIA Appraisal Number: B-74jBAjKomisijDep.IjLHj08j2011 dated August 2, 2011;
b. Minutes of Meeting of Central Commission for EIA Appraisal Continued Number: B-77 BAjKomisijDep.IjLHj08j2011 dated August 4, 2011;
c. The TOR of EIA document as listed in the appendix which is an integral part of Decree of Chairman of Central EIA Appraisal Committee

THIRD: Terms of Reference for Environmental Impact Analysis (KA - ANDAL) Transmission Extra High Voltage (SUTET) 500-kV PAITON - ANTOSARI and Channels Transmission Line High Voltage (SUTT) 150 kV ANTOSARI-KAPAL Province of East Java and Province of Bali, by PT. PLN (LIMITED) Main Unit Network Development Java Bali, shall be used as a reference in the implementation of the study of Environmental Impact Assessment (EIA), the Environmental Management Plan (RKL), and Environmental Monitoring Plan (RPL).

FOURTH: Decision of Chief Commission of Central EIA Appraiser otherwise expire, if the proponent does not do preparation of documents ANDAL, RKL and RPL no later than 3 (three) years from the Chairman of the Central EIA Commission Decision Appraisers is set.

FIFTH: the Chairman of Commission’s Decision of Central EIA Appraisal shall enter into force on the date of enactment.

Stipulated in Jakarta on: 4 July 2012

DEPUTY MINISTER OF ENVIRONMENTAL
FIELD PROCEDURES FOR THE ENVIRONMENT
As Chairman of the Commission for Central EIA Appraisal
Ministry of Environment

Imam Abu Ismoyo Hendago
Deputy's decision was conveyed to the:
1. Minister Of Domestic Affairs;
2. Minister of Energy and Mineral Resources;
3. Minister of Transportation;
4. Governor of East Java;
5. Governor of Bali;
6. Mayor Probolinggo;
7. Regent of Situbondo;
8. Regent of Banyuwangi;
9. Regent of Jembrana;
10. Regent of Badung;

11. Regent of Buleleng;
12. Regent of Tabanan;
13. The Management of Ecoregion Bali, Nusa Tenggara;
14. Head of Environment Agency the province of East Java;
15. Head of Environment Agency the Province of Bali;
16. Head of Environment Agency Probolinggo;
17. Head of Environment Agency Situbondo;
18. Head of Environment Agency Banyuwangi;
19. Head of Environment Agency Jembrana;
20. Head of Environment Agency Badung;
21. Head of Environment Agency Buleleng;
22. Head of Environment Agency Tabanan;
23. The Aforesaid.

Appendix 5a: AMDAL Environmental Permit (Bahasa original)

KEMENTERIAN LINGKUNGAN HIDUP
REPUBLIK INDONESIA
JALAN D.I. PANJAITAN, KEBON NANAS, JAKARTA 13410, INDONESIA • KOTAK POS 7777 JAT 13000
TELEPON : 021-8517148, 8580067-69 (OPERATOR) • FAKSIMILIE 021-8517147 • SITUS : www.menlh.go.id

Nomor : B- 4304 /Ro.Hkm&Hms/LH/PDAL/04/2013 16 April 2013
Lampiran : Satu berkas
Hal : **Penyampaian SK MENLH**

Yth.
Sdr. Ir. Yusuf Mirand
General Manager
PT. PLN (Persero) Unit Induk
Pembangunan Jaringan Jawa Bali
di
Semarang

Sehubungan dengan telah ditetapkannya Keputusan Menteri Lingkungan Hidup Nomor 121 Tahun 2013 tentang Izin Lingkungan Kegiatan Pembangunan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV Paiton-Antosari dan Saluran Udara Tegangan Tinggi (SUTT) 150 kV Antosari-Kapal di Provinsi Jawa Timur dan Provinsi Bali oleh PT. PLN (Persero) Unit Induk Pembangunan Jaringan Jawa Bali, bersama ini kami sampaikan Salinan Keputusan Menteri tersebut untuk dapat digunakan sebagaimana mestinya.

Demikian kami sampaikan, atas perhatian Saudara diucapkan terima kasih.

Kepala Biro Hukum dan Humas,

Rosa Vivien Ratnawati, SH, MSD
NIP 19700501 199603 2 005

Appendix 5b: Environmental Certificate (unofficial English translation)

No: B-4304/Ro.Hkm&Hms/LH/PDAL/04/2013 16 April 2013
Attachment: I set
Re: Delivery of Minister of Environment Decree

To:
Mr. Ir. Yusuf Mirand
General Manager
PT. PLN (Persero) Unit Induk
Pembangunan Jaringan Jawa Bali
(Main Unit for Jawa Bali Network Development)
Semarang

With regards to the confirmation of the Minister of Environment Decree No. 121/2013 on Environmental Permit for the Development of 500 kV Paiton-Antosari of Extra High Voltage Overhead Transmission Line (SUTET) and the 150 kV Antosari-Kapal of High Voltage Overhead Transmission (SUTT) in the Province of East Jawa and Bali by PT. PLN (Persero) Unit Induk, Pembangunan Jaringan Jawa Bali, we herewith attach the Copy to the above Minister of Environment Decree to be used as necessary.

Thank you for your kind attention.

Head of Bureau for Law and Public Relations

Rosa Vivien Ratnawati, SH, MSD
NIP:

COPY

REPUBLIC OF INDONESIA
MINISTER OF ENVIRONMENT DECREE
NO. 121/2013
ON
ENVIRONMENTAL PERMIT FOR THE DEVELOPMENT OF 500 Kv PAITON-ANTOSARI EXTRA HIGH VOLTAGE OVERHEAD TRANSMISSION LINE (SUTET) AND THE 150 Kv ANTOSARI-KAPAL HIGH VOLTAGE OVERHEAD TRANSMISSION LINE (SUTT) IN THE PROVINCE OF EAST JAWA AND BALI BY PT. PLN (PERSERO) *UNIT INDUK PEMBANGUNAN JARINGAN JAWA BALI* (MAIN UNIT FOR DEVELOPMENT OF JAWA BALI NETWORK)

BY THE GRACE OF GOD THE ALMIGHTY

THE MINISTER OF ENVIRONMENT FOR THE REPUBLIC OF INDONESIA,

In consideration of the following:

a. that the development project for the 500 kV (five hundred kiloVolt) Paiton-Antosari Extra High Voltage Overhead Transmission Line (SUTET) and the 150 kV (one hundred and fifty kiloVolt) High Voltage Overhead Transmission Line (SUTT) Antosari-Kapal in the Province of East Jawa and Bali by PT. PLN (Persero*) Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network), is an activity which is compulsory to have an environmental document – (*Analisis Mengenai Dampak Lingkungan Hidup – Amdal* or Environmental Impact Analysis - EIA);
b. that for every project which is compulsory to be equipped with EIA is declared to be feasible in terms of environmental aspect, is required to be issued with an environmental permit;
c. that based on the considerations stated in the above article a and b, there is a need to confirm the Minister of Environment Decree on Environmental Permit for the Development Project of the 500 kV Paiton-Antosari Extra High Voltage Overhead Transmission Line (SUTET) and the 150 kV Antosari-Kapal High Voltage Overhead Transmission Line (SUTT) in the Province of East Jawa and Bali by PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network);

and in remembrance of the following:

1. Law No. 32/2009 on Environmental Protection and Management (Republic of Indonesia, State Gazette Year 2009 No. 140 and Republic of Indonesia, Additional State Gazette No. 5059);
2. Government Regulation No. 27/2012 on Environmental Permit (Republic of Indonesia, State Gazette Year 2012 No. 48, Republic of Indonesia Additional State Gazette No. 5285);

3. Presidential Regulation No. 47/2009 on the Formation and Organization of State Ministry, which has been amended several times and the latest being the Presidential Regulation No. 91/2011 (Republic of Indonesia, State Gazette Year 2011 No. 141);
4. Presidential Regulation No. 24/2010 on Position, Duty and Function of State Ministry and Hierarchy of Organization, Duty and Function of Echelon I in State Ministry, which has been amended several times and the latest being the Presidential Regulation No. 92/2011 on Second Amendment to the Presidential Regulation No. 24/2011 (Republic of Indonesia, State Gazette Year 2011 No. 142);
5. State Minister of Environment Regulation No. 05/2008 on Job Description of the Commission for Evaluators of Environmental Impact Analysis;
6. State Minister of Environment Regulation No. 13/2010 on Environmental Management Effort and Environmental Monitoring Effort and Letter of Commitment for Environmental Management and Monitoring;
7. State Minister of Environment Regulation No. 05/2012 on Business and/or Activity (Project) that is Compulsory to have an Environmental Impact Analysis (Republic of Indonesia, State Report Year 2012 No. 408); and

In notification of the following:

1. Minister of Environment Decree No. 120/2013 on Decision of Environmental Feasibility for the Development Project of the 500 kV Paiton-Antosari Extra High Voltage Overhead Transmission Line (SUTET) and the 150 kV) Antosari-Kapal High Voltage Overhead Transmission Line (SUTT) in the Province of East Jawa and Bali by PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network);
2. Governor of Bali, Letter No. 671/221/Bappeda dated 29 January 2013, regarding the EIA Process for the Development Project of the 500 kV Paiton-Antosari Extra High Voltage Overhead Transmission Line (SUTET) and the 150 kV) Antosari-Kapal High Voltage Overhead Transmission Line (SUTT);

DECREES

To confirm the following:

MINISTER OF ENVIRONMENT DECREE ON ENVIRONMENTAL PERMIT FOR THE DEVELOPMENT OF 500 Kv PAITON-ANTOSARI EXTRA HIGH VOLTAGE OVERHEAD TRANSMISSION LINE (SUTET) AND THE 150 Kv PAITON-KAPAL HIGH VOLTAGE OVERHEAD TRANSMISSION LINE (SUTT) IN THE PROVINCE OF EAST JAWA AND BALI BY PT. PLN (PERSERO) *UNIT INDUK PEMBANGUNAN JARINGAN JAWA BALI* (MAIN UNIT FOR DEVELOPMENT OF JAWA BALI NETWORK).

FIRST: To issue environmental permit to the following:

1. Company Name: PT. PLN (Persero) Unit Induk Pembangunan Jaringan Jawa Bali
2. Type of Business and/or Activity: Electricity
3. Person In–charge of Business and/or Activity: Ir. Yusuf Mirand
4. Position: General Manager

5. Office Address: Jalan Slamet No. 1, Candi Baru, Semarang
6. Project Location: Regency of Probolinggo, Regency of Situbondo and Regency of Banyuwangi, Province of East Jawa; and Regency of Jembrana, Regency of Buleleng and Regency of Tabanan, Province of Bali

SECOND: The scope of project activity in the environmental permit covers the following:

1. The construction and operation of the 500 kV (five hundred kiloVolt) Paiton-Antosari Extra High Voltage Overhead Transmission Line (SUTET) with a SUTET transmission distance across East Jawa and Bali of 227.14 km (two hundred and twenty seven point fourteen kilometers) and area of 507,029 m2 (five hundred seven thousand and twenty nine square meters); and the number of towers in East Jawa is 311 (three hundred and eleven) and in Bali, it is 202 (two hundred and two). The Right of Way (ROW) below the 500 kV (five hundred kiloVolt) transmission line covers an area of 7,722,760 m2 (seven million seven hundred twenty two thousand and seven hundred and sixty square meters).
2. The construction and operation of 150 kV (one hundred fifty kiloVolt) Antosari-Kapal High Voltage Overhead Transmission Line (SUTT) in Bali with a transmission distance of 25.29 km (twenty five point two nine kilometers); and the number of towers is 78 (seventy eight). The ROW below the 150 kV (one hundred fifty kiloVolt) transmission line covers an area of 859,860 m2 (eight hundred fifty nine thousand and eight hundred sixty square meters).
3. Distance of crossing tower is 4.12 km (four point one two kilometers) will be constructed in the Straits of Bali that is located between the regions of Watudodol and Segara Rupek. Land area for the suspension tower construction in Watudodol is 10,000 m2 (ten thousand square meters) and in Segara Rupek, it is 11,025 m2 (eleven thousand and twenty five square meters). The 2 (two) anchor towers will be erected in the respective region whereby for Watudodol (East Jawa), the 2 towers will occupy a land area of 1,760 m2 (one thousand seven hundred and sixty square meters); and for Segara Rupek (Bali), it is 1,760 m2 (one thousand seven hundred and sixty square meters).
4. Construction and operation of the Main Grid (*Gardu Induk* – GI) for Extra High Voltage (GITET) and Main Grid (*Gardu Induk* – GI) in Antosari over a land area of 5 Ha (five hectares).

THIRD:

The person in-charge of the business and/or activity (project) is required to submit an application for amendment to environmental permit in the event of change in business and/or activity in accordance with the criteria for amendment as stipulated in Section 50 of Government Regulation No. 27/2012 on Environmental Permit.

FOURTH:

The person in-charge of the business and/or activity is required to submit and/or renew the permit on Environmental Protection and Management, and to have business permit and/or other permit relevant to its activity.

FIFTH:

The agency that issues the permit is required to take note of the environmental permit as a prerequisite for permit issuance in project implementation as intended in dictum SECOND.

SIXTH:

The Person in-charge of the business and/or activity in project implementation is required to conduct environmental management and monitoring as stipulated in Appendix I that is an inseparable part from this Ministerial Decree.

SEVENTH:

Besides the responsibility as intended in dictum SIXTH, the person in-charge of the business and/or activity is required to conduct environmental management and monitoring with a technological and institutional approach as intended in Appendix II that is an inseparable part from this Ministerial Decree.

EIGTH:

Permit issuance as intended in dictum FIFTH is required to include all obligations that are attached in Appendix I of this Ministerial Decree.

NINTH:

The person in-charge of the business and/or activity is required to submit project implementation report as requisite and obligation intended in the Appendix of this Ministerial Decree, once every 6 (six) months since the Ministerial Decree is confirmed, to the following agencies:

1. Minister of Environment;
2. Governor of East Jawa, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Province of East Jawa;
3. Governor of Bali, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Province of Bali;
4. Regent of Probolinggo, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Regency of Probolinggo;
5. Regent of Situbondo, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Regency of Situbondo;
6. Regent of Banyuwangi, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Regency of Banyuwangi;
7. Regent of Buleleng, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Regency of Buleleng;
8. Regent of Jembrana, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Regency of Jembrana;
9. Regent of Tabanan, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Regency of Tabanan; and

10. Regent of Badung, attention to Head of Environmental Agency (*Badan Lingkungan Hidup* – BLH), Regency of Badung.

TENTH:

The person in-charge of the business and/or activity is required to submit carbon copy of project implementation report as requisite and obligation intended in this Ministerial Decree, once every 6 (six) months since this Ministerial Decree is confirmed, to other relevant agencies as attached in the Appendix of this Ministerial Decree.

ELEVENTH:

In the event of implementation of the business and/or activity, there arises environmental impact that is beyond the significant impact, which is managed as intended in Appendix I and Appendix II of this Ministerial Decree, the person in-charge of the business and/or activity is required to report to the agency as intended in dictum TENTH and dictum ELEVENTH, at the latest 30 (thirty) working days since discovery of the environmental impact that is beyond the significant impact that is required to be managed.

TWELVETH:

This Ministerial Decree is valid for the same period as for business and/or activity permit.

THIRTEENTH:

This Ministerial Decree becomes effective on the date it is confirmed.

Confirmed in Jakarta
on 11 April 2013
MINISTER OF ENVIRONMENT
REPUBLIC OF INDONESIA

Signed

BAKTHASAR KAMBUAYA

Copy is in accordance with the original
Head of Bureau for Law and Public Relations,

Rosa Vivien Ratnawati

APPENDIX 1

REPUBLIC OF INDONESIA
MINISTER OF ENVIRONMENT DECREE
No. 121/2013
ON ENVIRONMENTAL PERMIT FOR DEVELOPMENT PROJECT
OF 500 kV PAITON-ANTOSARI EXTRA HIGH VOLTAGE OVERHEAD TRANSMISSION LINE (SUTET)
AND 150 Kv ANTOSARI-KAPAL HIGH VOLTAGE OVERHEAD TRANSMISSION LINE (SUTT)
IN THE PROVINCES OF EAST JAWA AND BALI
BY PT. PLN (PERSERO) *UNIT INDUK PEMBANGUNAN JARINGAN JAWA BALI*
(MAIN UNIT FOR DEVELOPMENT OF JAWA BALI NETWORK)

A. MATRIX OF ENVIRONMENTAL MANAGEMENT PLAN FOR SIGNIFICANT NEGATIVE IMPACT FROM THE DEVELOPMENT OF 500 kV PAITON-ANTOSARI SUTET AND 150 kV ANTOSARI-KAPAL SUTT

No	Type of Impact	Source of Impact	Impact Indicator	Environmental Management Objective	Environmental Management Plan	Environmental Management Location	Environmental Management Period	Management Institution		
								Executor	Supervisor	Reporting
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A	PRE-CONSTRUCTION PHASE									
1.	Emergence of Social Perception and Negative Attitude	Acquisition of land and crops for tower site (GITET and GI); and provision of compensation.	Existence of social complaint/protest that is potential to cause disturbance to social security and order.	To prevent and reduce possibility of social impact such as the emergence of negative social perception and attitude towards the proposed project, and increase in crimes cause by project activity.	a. To provide places or centers for public complaints and compensation for residents directly and indirectly impacted by the construction of SUTET/SUTT. b. To coordinate with village/sub-district head in villages crossed by the 500 kV Paiton-Antosari SUTET and 150	In all villages/sub-districts in particular hamlet/quarter/neighborhood crossed by the 500 kV Paiton-Antosari SUTET and 150 kV Antosari-Kapal SUTT.	Once every 3 months in the initial pre-construction phase or incidental in the event of social anxiety that is potential to cause disturbance to social security and order.	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network)	National Agrarian Agency/Office and Environmental Office/Agency (*Badan Lingkungan Hidup* – BLH) for East Jawa, Bali, and the Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana,	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana,

						kV Antosari-Kapal SUTT. Specifically for Bali, coordination is with the *bendesa/kelian* of local customs and PHDI of Bali Province and Jembrana Regency.				Tabanan and Badung.	Tabanan and Badung.
B	CONSTRUCTION PHASE										
1	Decrease in Water Quality	Cut and fill works related to construction of crossing tower, GITET and GI.	Qualitative change in physical characteristic of water such as clear to turbid. Quantitative change in ambient water standard especially in terms of turbidity i.e. < 5 NTU as set in the Governor of Bali Regulation No. 8/2007; and existence of complaints from residents around the project site regarding turbidity of irrigated water (*subak*).	To maintain water quality so as not to exceed the required ambient standard.	a.	To conduct cut and fill works in stages by placing cut materials at the filled sites. To construct soil retaining wall on the cut areas along the perimeter of the *subak* to prevent eroded soil flowing into the irrigation canal. To quickly close soil cracks before the rainy season.	The construction area for crossing tower in Segara Rupek as well as GITET and GI in Antosari.	During cut and fill works in the construction phase; once every 3 months.	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network	Department of Public Works and Office/Agency in Bali and Regencies of Buleleng, Jembrana and Tabanan.	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.
2	Occurren	Cut and fill	Does not	To ensure	a.	Not to undertake	Irrigation canal	Once every	PT. PLN	Department of	Ministry of

	ce of Erosion and Sedimentation	works related to construction of crossing tower, GITET and GI.	exceed the permitted erosion level as well as the ambient standard for sediment entering irrigation canal/*subak* around the GITET and GI of Antosari and the sea in front of the crossing tower site at Segara Rupek.	erosion and sedimentation that occurred can be reduced and sedimentation does not occur in the irrigation canal and sea as well.	cut and fill works in the rain. b. To immediately conduct physical construction after cut and fill works are completed. c. To build temporary canal to prevent sediment entering the subak irrigation canal around the GITET and GI of Antosari, and flowing to the sea at Segara Rupek. d. Clarification via public socialization regarding activities that cause erosion and sedimentation and its mitigation efforts.	at GITET and GI Antosari and the sea in front of the crossing tower site in Segara Rupek.	3 months throughout the construction phase.	(Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network.	Public Works and Office/Agency in East Jawa and Bali and Regencies of Banyuwangi, Buleleng, Jembrana and Tabanan.	Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.
3	Emergence of Social Perception and Negative Attitude	a. Manpower mobilization activity. b. Erection of GITET and GI	Social anxiety that is expressed through protest or mass demonstration.	To prevent and reduce potential social anxiety over employment opportunity from the	a. To provide places or centers for public complaints. b. To facilitate employment opportunity for local residents.	In all villages/sub-districts in particular hamlet/quarter/neighborhood crossed by the 500 kV Paiton-	Once every 3 months in the initial construction phase or incidental in the event of social	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for	Department of Manpower and Transmigration as well as BLHs in East Jawa and Bali, and the Regencies of	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and

		towers, in particular construction of crossing tower in Segara Rupek.		crossing tower construction works in Segara Rupek.	c. To coordinate with village/sub-district head in villages crossed by the 500 kV Paiton-Antosari SUTET and 150 kV Antosari-Kapal SUTT. Specifically for Bali, coordination is with the *bendesa/kelian* of local customs and PHDI of Bali Province and Jembrana Regency.	Antosari SUTET and 150 kV Antosari-Kapal SUTT.	anxiety that is potential to cause disturbance to social security and order.	Development of Jawa Bali Network.	Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.	East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.
4	Disturbance to cultural heritage	Construction of GITET and GI towers, in particular the crossing tower in Segara Rupek.	Damage to temple or violation of the sacred/holy radius that has been agreed.	To prevent and reduce potential social impact such as disturbance to cultural heritage.	a. Conduct re-check to ensure that tower distance with the temple is in accordance with the issued permit. b. To direct workers and staff to take note and respect local customs. c. Coordination with relevant agencies such as village head and *bendesa* Sumber Kelampok, PHDI in Bali as well as the Regencies of Buleleng and Jembrana.	Village of Sumber Kelampok, District of Gerokgak, Regency of Buleleng.	Once every 3 months in the initial construction phase or incidental in the event of social anxiety that is potential to cause disturbance to social security and order.	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network.	PHDI and BLH of Bali, and Environmental Agency in Buleleng Regency.	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.

5	Increase in traffic volume	Equipment and material mobilization	Traffic congestion	To prevent increase in traffic volume	a. Undertake traffic management such as regulating transportation of tower equipment and material; and to install traffic signs to inform local road users to be more careful. b. To deploy a professional traffic officer to regulate vehicle traffic to the project site. c. Cooperate with the Department of Transportation for East Jawa (specifically for Regencies of Situbondo and Banyuwangi) and for Bali (specifically for Regencies of Jembrana and Tabanan) as well as the Traffic Police Unit of Situbundo, Banyuwangi, Jembrana and Tabanan with regards to time schedule for	Along the Paiton-Kapal corridor mainly along the road intersection which is potential to cause traffic congestion such as Cekik, Gilimanuk and Antosari (Bali); and Watudodol, tri-junction Subeh, Situbondo and the forest area in Baluran (East Jawa).	Once every 3 months during equipment and material mobilization in the construction phase.	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network.	Department of Transportation of East Jawa and Bali provinces, and the Regencies of Situbondo, Banyuwangi, Jembrana and Tabanan.	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.

					tower equipment and material mobilization.					
6	Disturbance to Flora	Land clearing	Rare vegetation species are not cut and invasive species are controlled.	a. To prevent decrease in rare vegetation species. b. To prevent growth of invasive species.	a. Land clearing is limited to construction site. b. To re-plant rare species that had to be cut. c. To quickly re-plant the cleared area with vegetation cover found around the tower site.	All tower sites in the national forests of Bularan and West Bali.	Land clearing is conducted in the dry season except for towers located near water source such as in Bajul Mati in the Baluran national forest and Prapat Agung in national forest of West Bali. Vegetation cover is re-planted in the rainy season after tower construction is completed.	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network	National Forests of Baluran and West Bali, BLHs in East Jawa and Bali; and the Regencies of Situbondo and Jembrana.	KLH, Ministry of Forestry, National Forests of Baluran and West Bali, BLHs in East Jawa and Bali and the Regencies of Situbondo and Jembrana.
7	Disturbance to Fauna	Land clearing, construction works, and workers' activity.	Noise intensity from land clearing activity at distance of 100 m from tower site is	a. To prevent disturbance to protected species.	a. Do not use heavy equipment for land clearing; chainsaw is only used as necessary.	All tower sites in the national forests of Bularan and West Bali.	Throughout the construction phase.	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali*	National Forests of Baluran and West Bali, BLHs in East Jawa and Bali;	KLH, Ministry of Forestry, National Forests of Baluran and West Bali,

			less than 80 dB. Mammals are not found trapped in the tower foundation excavated hole.	b. To prevent hunting and trading of wild fauna.	b. The excavation site for tower foot will be barricaded or fenced to prevent fauna from falling into the hole. c. Strict prohibition of hunting and trading of wild fauna is enforced on all contractors and their workers; and sanctions will be imposed against violators. d. Construction workers will be informed on what can and cannot be done in the national forest; and legal actions will be taken against violators.			(Main Unit for Development of Jawa Bali Network	and the Regencies of Situbondo and Jembrana.	BLHs in East Jawa and Bali and the Regencies of Situbondo and Jembrana.
C	OPERATIONAL PHASE									
1	Emergence of Social Perception and Negative Attitude	Electrical power transmission and operations of GITET and GI.	Public complaints/protests that are potential to disturb social security and order.	To prevent and reduce anxiety among residents impacted by the project.	• Emergency system is installed with DFR (Distance Fault Relay) to quickly identify disruption. When disruption occurs, residents via local	In all villages/sub-districts in particular hamlet/quarter/neighborhood crossed by the 500 kV Paiton-Antosari SUTET and 150 kV	Once every 6 months in the initial operational phase or incidental in the event of social anxiety that is potential	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa	BLHs in East Jawa and Bali, and the Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East

					government can report to the nearest GI staff who will relay to PLN (P3B Jawa Bali) which will be responsible to tackle the disruption. • Conduct intensive socialization via various available communication media such as print and electronic, especially for residents whose villages are crossed by the SUTET/SUTT. • Coordination with heads of village/sub-district crossed by the 500 kV Paiton-Antosari SUTET and 150 kV Antosari-Kapal SUTT. Coordination for Bali in particular will be with *bendesa/kelian* (village customs leader).	Antosari-Kapal SUTT.	to cause disturbance to social security and order.	Bali Network	Badung.	Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.
2	Emergence of	Electrical power	In excess of the ambient	To ensure that exposure to	• To heighten the suspension	Below the SUTET, inside	Once every 6 months	PT. PLN (Persero)	Department of Health and	Ministry of Environment

	magnetic and electrical fields	transmission and operations of GITET and GI.	standard for public exposure to electrical field over 24 hours/day i.e. 5 kV; and ambient standard for public exposure to magnetic field over 24-hours/day i.e. 0.1 mT, according to the standard set by the World Health Organization (WHO).	electromagnetic field does not exceed the ambient standard.	cables and tower when crossing settlement and protected forest. • Planned and sustainable maintenance. • Grounding of building parts made from metal such as roof, iron fence and others.	and around the GITET and GI.	throughout the operational phase.	*Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network	BLHs of East Jawa and Bali, and the Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.	(*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.

B. MATRIX OF ENVIRONMENTAL MONITORING PLAN FOR SIGNIFICANT NEGATIVE IMPACT FROM THE DEVELOPMENT OF 500 kV PAITON-ANTOSARI SUTET AND 150 kV ANTOSARI-KAPAL SUTT

No	Significant Impact	Source of Impact	Monitored Environmental Parameter	Environmental Monitoring Objective	Environmental Monitoring Plan				Environmental Monitoring Institution		
					Data Collection & Analysis	Environmental Monitoring Location	Period & Frequency	Method of Analysis	Executor	Supervisor	Reporting
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	10)	(11)	(12)
A	PRE-CONSTRUCTION PHASE										
1.	Emergence of Social Perception and Negative Attitude	Acquisition of land, crops and property and provision of compensation.	Public complaints/protests that are potential to cause disturbance to social security and order.	To identify occurrence/ emergence of social perception and negative attitude as a result of project activity.	Field survey and direct observation of community affected by the impact spread.	In all the nearest villages/sub-districts crossed by the 500 kV Paiton-Antosari SUTET and 150 kV Antosari-Kapal SUTT.	Once every 3 months or when there is an indication of social complaint and or disturbance to social security and order.	Simple analysis of before and after project observation	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network)	BLH of East Jawa and Bali, and the Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.
B	CONSTRUCTION PHASE										
1	Decrease in water quality	Cut and fill works related to construction of crossing tower, GITET and	Water color and turbidity.	To identify water quality due to cut and fill activity related to construction of crossing	In-situ and visual observation of water color; water measurement and/or	Observation is conducted around the GITET and GI constructio	Routine observation throughout the construction phase, once every	To compare result from laboratory analysis with the maximum limit	PT. PLN (Persero)	BLHs of Bali and Regencies of Buleleng and Tabanan.	KLH carbon copied to Governor of Bali, BLH of Bali and the Regencies of Buleleng and

		GI.		tower, GITET and GI.	sampling for laboratory analysis. Indirect observation is based on reports from local residents/officials.	n site in Antosari and around the crossing tower site in Watudodol and Segara Rupek.	3 months and incidental in the event of report and complaint from local residents.	permitted for turbidity i.e. < 5 NTU over 24 hours.			Tabanan.
2	Occurrence of erosion and sedimentation	Cut and fill works related to construction of crossing tower, GITET and GI.	Actual and potential magnitude of erosion and sediment.	To identify intensity of erosion and sedimentation.	Field measurement and observation of erosion and sedimentation magnitude. Erosion analysis refers to USLE method and sedimentation is measured by suspended load.	*Subak* irrigation canal near the GITET and GI in Antosari; and the sea in front of crossing tower in Segara Rupek.	Throughout the construction phase, once every 3 months.	Visual analysis based on USLE erosion and suspended load value.	PT. PLN (Persero)	BLHs of Bali and Regencies of Buleleng and Tabanan.	KLH carbon copied to Governor of Bali, BLH of Bali and the Regencies of Buleleng and Tabanan.
3	Emergence of Social Perception and Negative Attitude	a. Manpower mobilization b. Erection of tower, GITET and GI.	Public complaints/protests that are potential to cause disturbance to social security and order.	To identify occurrence/ emergence of social perception and negative attitude as a result of project activity.	Field survey and direct observation of community affected by the impact spread.	In all the nearest villages/sub-districts crossed by the 500 kV Paiton-Antosari SUTET and 150 kV Antosari-	Once every 3 months or when there is an indication of social perception and or disturbance to social security	Simple analysis of before and after project observation	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali	BLH of East Jawa and Bali, and the Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and

						Kapal SUTT.	and order.		Network)		Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.
4	Disturbance to cultural heritage	Erection of tower, GITET, GI and in particular construction of crossing tower.	Damage to temple and violation of the sacred/holy radius that has been agreed.	To identify any public complaint regarding disturbance to cultural heritage.	Survey of type and incidence of disturbance to cultural heritage; and in-situ observation of impacted site in the field.	Village Sumber Kelampok and surrounding.	Once every 6 months or when there is an indication of social anxiety over disturbance to cultural heritage.	Simple analysis of before and after project observation	PT. PLN (Persero)	BLH of Bali and BLH of Buleleng Regency	KLH carbon copied to Governor of Bali, BLH of Bali and BLH of Buleleng Regency
5	Increase in traffic volume	Equipment and material mobilization	Traffic congestion due to increase in traffic volume during mobilization of tower equipment and material.	To identify increase in traffic volume due to project activity.	Survey of traffic volume, observation and data collection on complaints by residents along the project mobilization corridor.	Cekik, Gilimanuk and Antosari (Bali), and Watudodol, tri-junction Subeh, Situbondo and Baluran forest (East Jawa).	Once every 3 months or when there is an indication of social complaint and or disturbance to social security and order.	Simple analysis of before and after project observation	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network)	Department of Transportation of East Jawa and Bali provinces, and the Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.
6	Disturba	Land	a. Rare	a. To	a. In-situ	At each	a. Observ	a. Direct	PT. PLN	National	KLH, Ministry

	nce to Flora	clearing activity	vegetation species at the tower site. b. Revegetation with rare species that had to be cut. c. Growth of invasive species.	prevent or minimize cutting of rare species. b. To identify success of revegetation of rare species. c. To identify growth of invasive species as early as possible.	observation of rare species at each site that will be cleared. b. To observe and ensure that rare species are re-planted. c. In-situ observation of invasive species on land planted with vegetation cover.	tower site in the Baluran and West Bali National Forests/Parks.	ation of rare species is done once during land clearing b. Observation of growth of rare species is done twice a year i.e. during the rainy and dry seasons c. Observation of invasive species is done once a year in the second month of rainy season (January).	observation. A supervising consultant will give guidelines to identify rare and invasive species. b. To observe the height and width of canopy of rare vegetation species.	(Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network)	Forests of Baluran and West Bali, BLHs in East Jawa and Bali; and the Regencies of Situbondo and Jembrana.	of Forestry, National Forests of Baluran and West Bali, BLHs in East Jawa and Bali and the Regencies of Situbondo and Jembrana.
7	Disturbance to	Land clearing,	Noise intensity from land	To prevent disturbance to	a. To observe	At each tower site.	a. Noise monitor	a. Direct reading	PT. PLN (Persero)	National Forests of	KLH, Ministry of Forestry,

	Fauna	construction works, and workers' activity.	clearing activity at distance of 100 m from tower site is less than 80 dB. Incidence of wild fauna found trapped in the excavated tower hole. Incidence of hunting and trading of wild faunSa.	wild fauna in the Baluran and West Bali National Forests/Parks	land clearing activity and measure noise intensity at 100 m from activity. b. To observe the effectiveness of tower foundation hole barricade or fence. c. To record incidence of wild fauna found trapped in the foundation hole. d. Direct supervision of construction workers.		ing during land clearing b. Routine monitoring throughout construction phase.	of noise intensity by supervising consultant during land clearing b. Direct supervision and observation of construction works and workers by supervising consultant.	*Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network)	Baluran and West Bali, BLHs in East Jawa and Bali; and the Regencies of Situbondo and Jembrana.	National Forests of Baluran and West Bali, BLHs in East Jawa and Bali and the Regencies of Situbondo and Jembrana
C	OPERATIONAL PHASE										
1	Emergence of	Electrical power	Public complaints/prot	To identify anxiety among	Field survey and	In all villages/sub	Throughout the	Simple analysis of	PT. PLN (Persero)	BLH of East Jawa and Bali,	Ministry of Environment

	Social Perception and Negative Attitude	transmission and operations of GITET and GI.	ests that are potential to disturb social security and order.	residents impacted by the project.	observation of incidence of complaint and protest; and impacted residents.	-districts in particular hamlet/quarter/neighborhood crossed by the 500 kV Paiton-Antosari SUTET and 150 kV Antosari-Kapal SUTT.	operational phase; once every 3 months or when there is an indication of social anxiety and or disturbance to social security and order.	before and after project observation	*Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network)	and the Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.	(*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.
2	Emergence of magnetic and electrical fields	Electrical power transmission and operations of GITET and GI.	Value of exposure to electromagnetic fields.	To identify value of electromagnetic fields.	Direct reading of exposure to electromagnetic fields in the managed locations and field observation of reports from local residents/officials.	Below the SUTET, inside and around the GITET and GI.	Once every 6 months throughout the operational phase.	Comparison with current standards in effect.	PT. PLN (Persero) *Unit Induk Pembangunan Jaringan Jawa Bali* (Main Unit for Development of Jawa Bali Network)	BLH of East Jawa and Bali, and the Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.	Ministry of Environment (*Kementerian Lingkungan Hidup* - KLH) carbon copied to Governors of Bali and East Jawa, and BLHs of East Jawa, Bali and Regencies of Probolinggo, Situbondo, Banyuwangi, Buleleng, Jembrana, Tabanan and Badung.

MINISTER OF ENVIRONMENT
REPUBLIC OF INDONESIA
Signed

BALTHASAR KAMBUAYA
Copy is in accordance with the original

Rosa Vivien Ratnawati

APPENDIX II
MINISTER OF ENVIRONMENT DECREE
REPUBLIC OF INDONESIA
NO.   YEAR 2013
ON
ENVIRONMENTAL PERMIT
FOR THE DEVELOPMENT OF 500 KV PAITON-ANTOSARI
EXTRA HIGH VOLTAGE OVERHEAD TRANSMISSION LINE (SUTET)
AND 150 KV ANTOSARI-KAPAL
HIGH VOLTAGE OVERHEAD TRANSMISSION LINE (SUTT)
IN THE PROVINCE OF EAST JAWA AND PROVINCE OF BALI
BY PT. PLN (PERSERO) *UNIT INDUK PEMBANGUNAN JARINGAN JAWA BALI*
(MAIN UNIT OF JAWA BALI DEVELOPMENT NETWORK)

A. Technological Approach

The technological approach aims to minimize the negative impact, as follows:

a. To undertake recheck to ensure that none of the towers is built very close to the temple and that none of the cables crosses over the temple;
b. To minimize tree felling since the transmission corridor which passes through the Baluran National Park is the best corridor (in terms of bio-diversity impact) among several alternative corridors identified from the field survey by PLN;
c. To determine the chosen transmission corridor that avoids dominant tree vegetation area, so that tower site is located in the bush and savanna areas;
d. To minimize trimming of tree canopy located along the transmission corridor which enters the ROW areas in the forest, by raising the minimum height of ROW (+7 m from the requirement in SNI 04.6918-2002 on Free Space and Minimum Free Distance);
e. Trimming of forest vegetation if its height is > 9.5 m; however trimming is minimized by increasing the height of tower in the forest so that the trees can reach a height of 16 m;
f. Will not fell *kesambi* trees but will try to undertake routine yearly maintenance and trimming of branches and twigs;
g. To regulate mobilization of equipment and material so as not to disrupt activities of residents who use that road;
h. To deploy vehicles suitable to the road classification of the corridor and to require use of trucks that are road worthy and have passed the emission test;
i. To prohibit heavy vehicles from entering national park and will use wheelbarrow or manual labor to transport from the main road to the tower construction site;
j. To prevent increase in dust concentration in the ambient air, site management will be undertaken such as watering down the dust covered ground around the project location;
k. Transporting vehicles from which materials can easily spillover (such as sand, gravel and limestone) and are dusty will be covered by canvas sheet;
l. To install necessary traffic signs along the roads that will be passed by material transportation vehicles through coordination with the Department of Public Works and Department of Transportation;
m. The material transporting trucks will not stop or park along the roads it passes, especially the inter-city and inter-provincial road/corridor;
n. Drivers should ensure that vehicle tires especially for trucks leaving and entering the project site are not covered by mud/soil;
o. To routinely measure electromagnetic fields;

p. To post danger warning signs for exposure to electromagnetic fields and signs that prohibit activities that can damage the SUTET/SUTT;
q. The use of sagging cable with the lowest height in the national park with a minimum distance of 25 m, which is higher than the proposed lowest sagging on community land which is 18 m, so that tree trimming in the national park during the operational phase, can be minimized; and
r. Planned and sustainable maintenance of SUTET, SUTT, GITET and GI.

B. Social Economic Approach

The social economic approach aims to minimize negative, as follows:

a. To undertake intensive public socialization through various available communication media such as print and electronic, specifically for residents in villages crossed by the SUTET/SUTT;
b. Provide compensation for residents directly and indirectly impacted by the construction of SUTET/SUTT;
c. Land below the electricity transmission lines will be compensated according to the Minister of Energy and Mineral Resources Decree No. 975/K/47/MPE/1999;
d. To list species and number of vegetation stands that are predicted to enter the ROW;
e. To make an inventory of land and building that are within the vertical and horizontal ROW for the 500 kV SUTET and 150 kV SUTT; this includes land area, land status, land classification and land owner;
f. Identification of land ownership status from the land owner and direct inspection to the village, sub-district and authorized agency;
g. Identification of owner of vegetation stands that are predicted to enter the ROW;
h. To publicly informed the vegetation stand owners regarding the ROW, which is done in stages up to the village level;
i. To directly approach and negotiate with the owners of vegetation stands in order to reach a price agreement;
j. To undertake direct payment to land owner when an agreement from the residents, has been obtained; and
k. To document and report the direct compensation payment that will be used as proof of relinquish of rights from the residents.

C. Institutional Approach

Environmental impact management of the project must involve multi-sector or various stakeholders. In this case, PT PLN (Persero) Main Unit Development of Jawa Bali Network remains as the main party responsible for environmental management in cooperation with other agencies. The stakeholders are as follow:

a. Officials from the village/sub-district government where the villages are crossed by the SUTET/SUTT transmission;
b. Local endogenous groups including NGOs;
c. District head and local police precinct whose region is crossed by the SUTET/SUTT transmission;
d. Regent/Mayor whose region is crossed by the SUTET/SUTT transmission;
e. Governor of East Jawa and Governor of Bali;
f. Ministry of Environment; and
g. Other necessary agencies.

Confirmed in Jakarta
on date
MINISTER OF ENVIRONMENT
REPUBLIC OF INDONESIA
signed
BALTHASAR KAMBUAYA

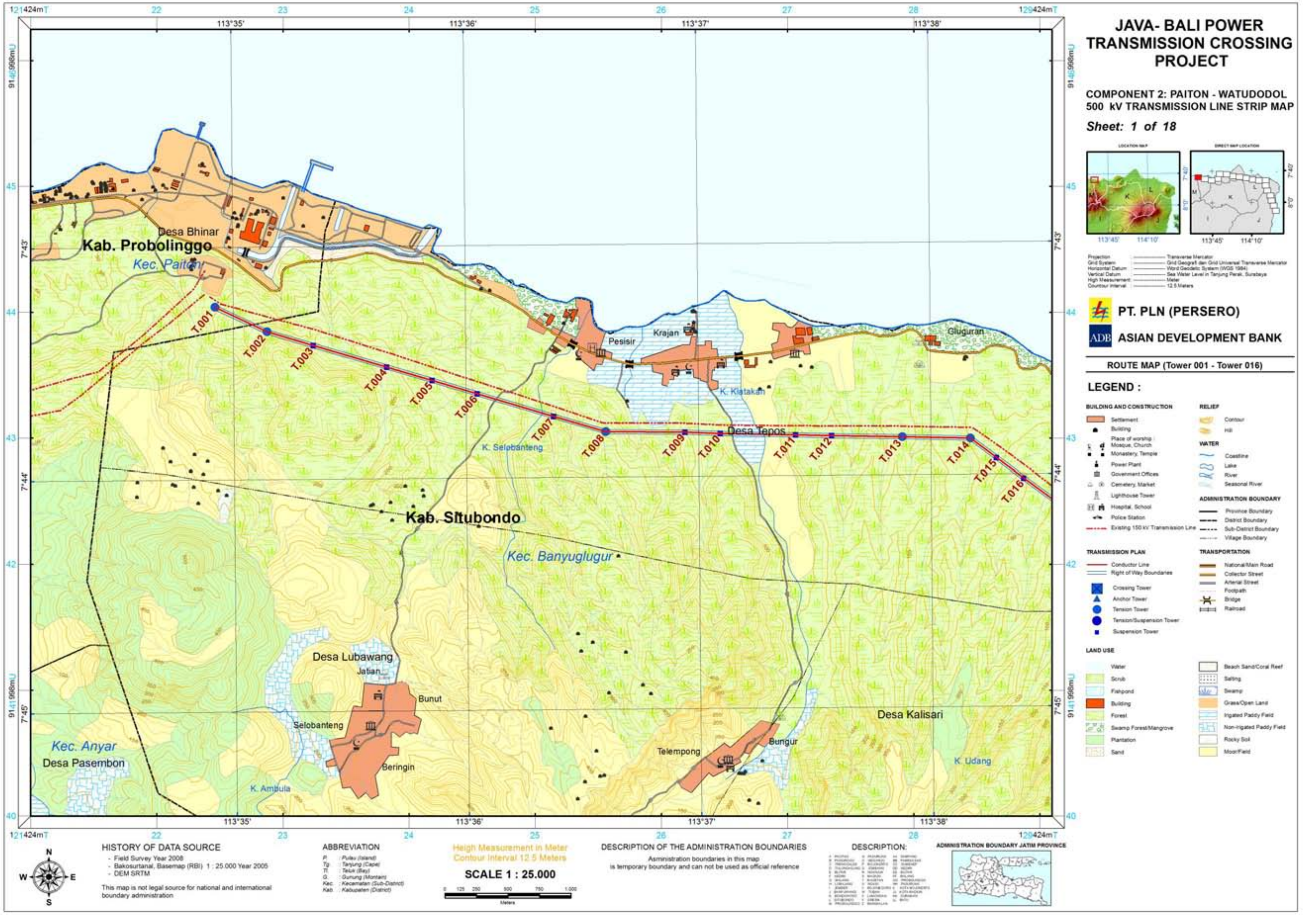
Appendix 6: Project TL Detailed Strip Maps

Component 2: 18 Maps

Component 3: 1 Map

Component 4: 2 Maps

Component 5: 9 Maps


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 1 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 001 - Tower 016)
LEGEND :
Kab. Probolinggo
Kec. Paiton
Desa Bhinar
Kab. Situbondo
Kec. Banyuglugur
Kec. Anyar
Desa Pasembon
Desa Lubawang
Desa Tepos
Desa Kalisari
Pesisir
Krajan
Gluguran
K. Selobanteng
K. Klatakan
K. Udang
K. Ambula
Jatian
Bunut
Selobanteng
Beringin
Telempong
Bungur
T.001
T.002
T.003
T.004
T.005
T.006
T.007
T.008
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T.010
T.011
T.012
T.013
T.014
T.015
T.016
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
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Asministration boundaries in this map is temporary boundary and can not be used as official reference
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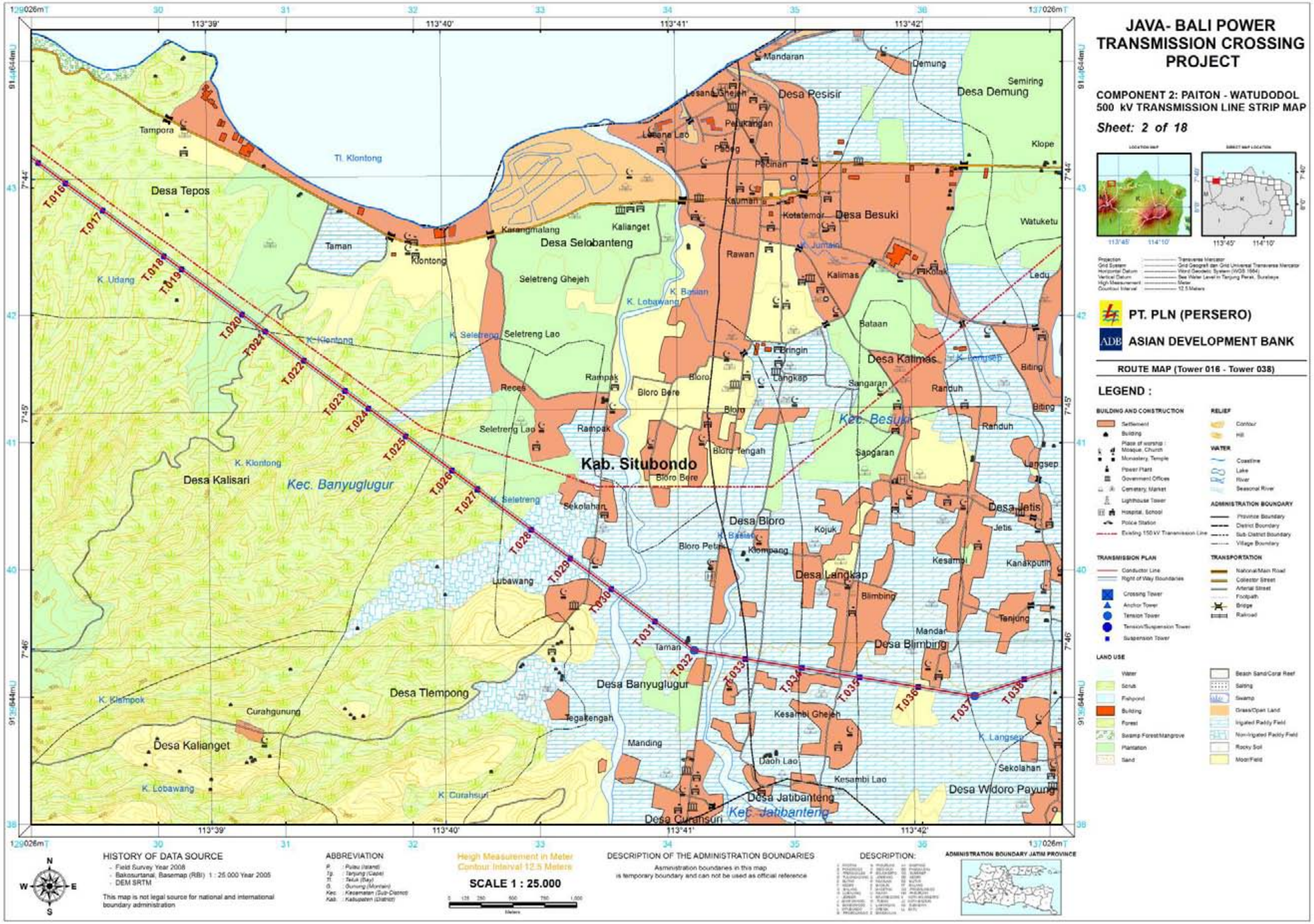
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 2 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 016 - Tower 038)
LEGEND :
Kab. Situbondo
Kec. Banyuglugur
Kec. Besuki
Kec. Jatibanteng
Desa Tepos
Desa Kalisari
Desa Kalianget
Desa Tlempong
Desa Selobanteng
Desa Pesisir
Desa Demung
Desa Besuki
Desa Kalimas
Desa Bloro
Desa Langkap
Desa Blimbing
Desa Banyuglugur
Desa Jatibanteng
Desa Widoro Payung
Desa Jetis
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
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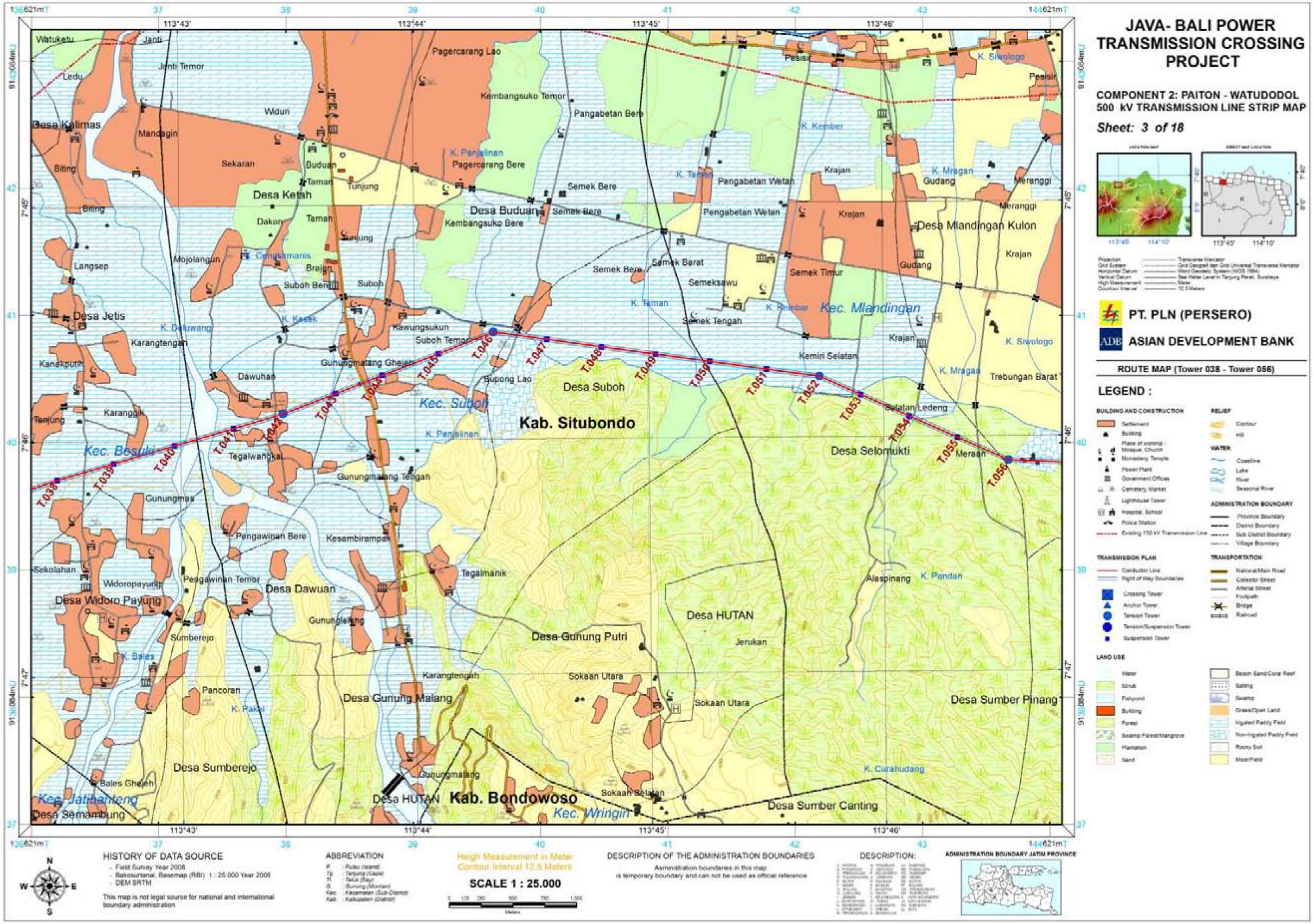
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE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COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 3 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 038 - Tower 056)
LEGEND :
Kab. Situbondo
Kab. Bondowoso
Kec. Besuki
Kec. Suboh
Kec. Mlandingan
Kec. Jatibanteng
Kec. Wringin
Desa Kalimas
Desa Ketah
Desa Buduan
Desa Mlandingan Kulon
Desa Jetis
Desa Suboh
Desa Selomukti
Desa Widoro Payung
Desa Dawuan
Desa HUTAN
Desa Gunung Putri
Desa Gunung Malang
Desa Sumberejo
Desa Sumber Pinang
Desa Sumber Canting
Desa Semambung
HISTORY OF DATA SOURCE
ABBREVIATION
SCALE 1 : 25.000
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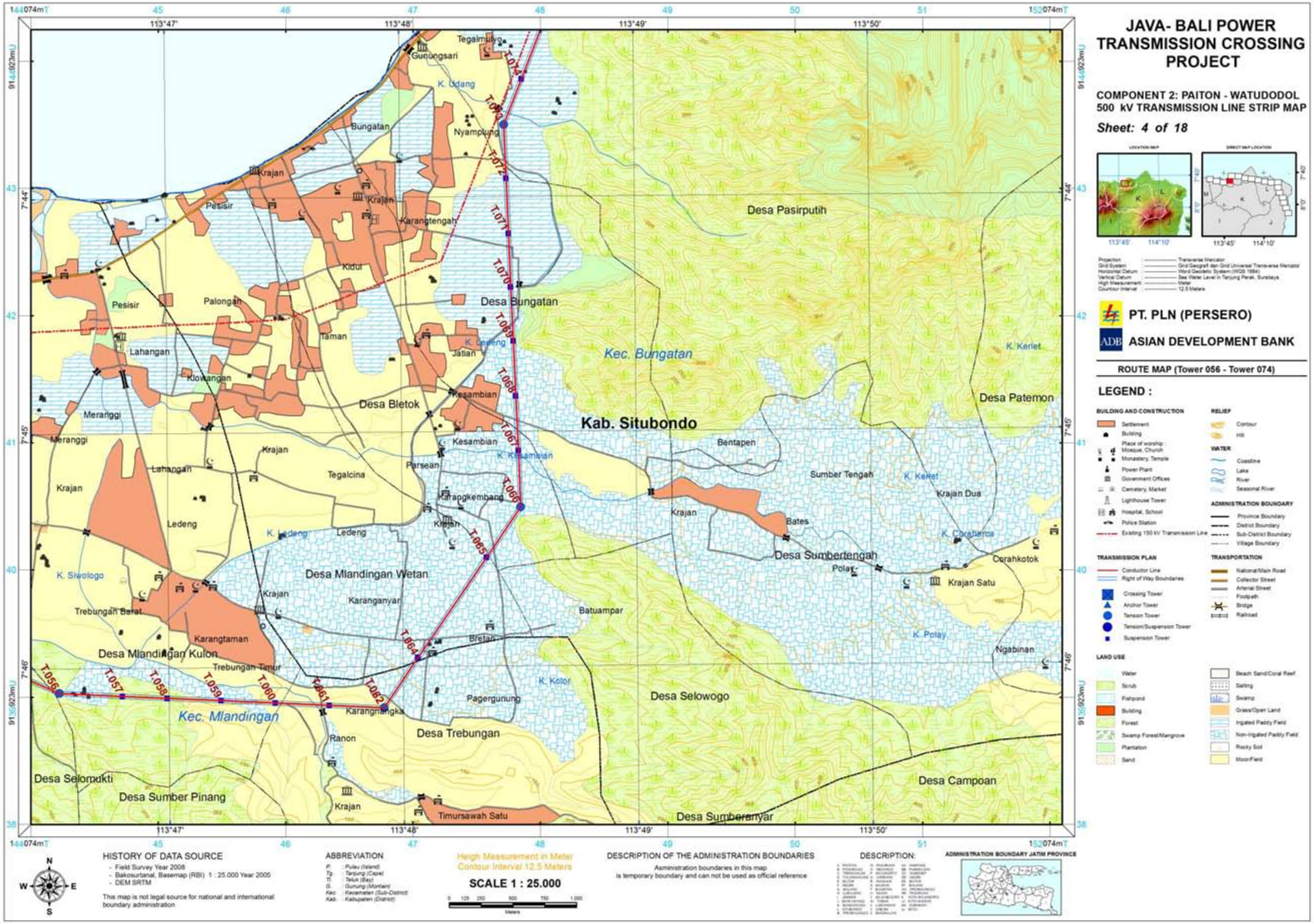
DESCRIPTION: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COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 4 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 056 - Tower 074)
LEGEND :
Kab. Situbondo
Kec. Bungatan
Kec. Mlandingan
Desa Pasirputih
Desa Bungatan
Desa Bletok
Desa Patemon
Desa Mlandingan Wetan
Desa Mlandingan Kulon
Desa Sumbertengah
Desa Selowogo
Desa Trebungan
Desa Selomukti
Desa Sumber Pinang
Desa Campoan
Desa Sumberanyar
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
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Contour Interval 12.5 Meters
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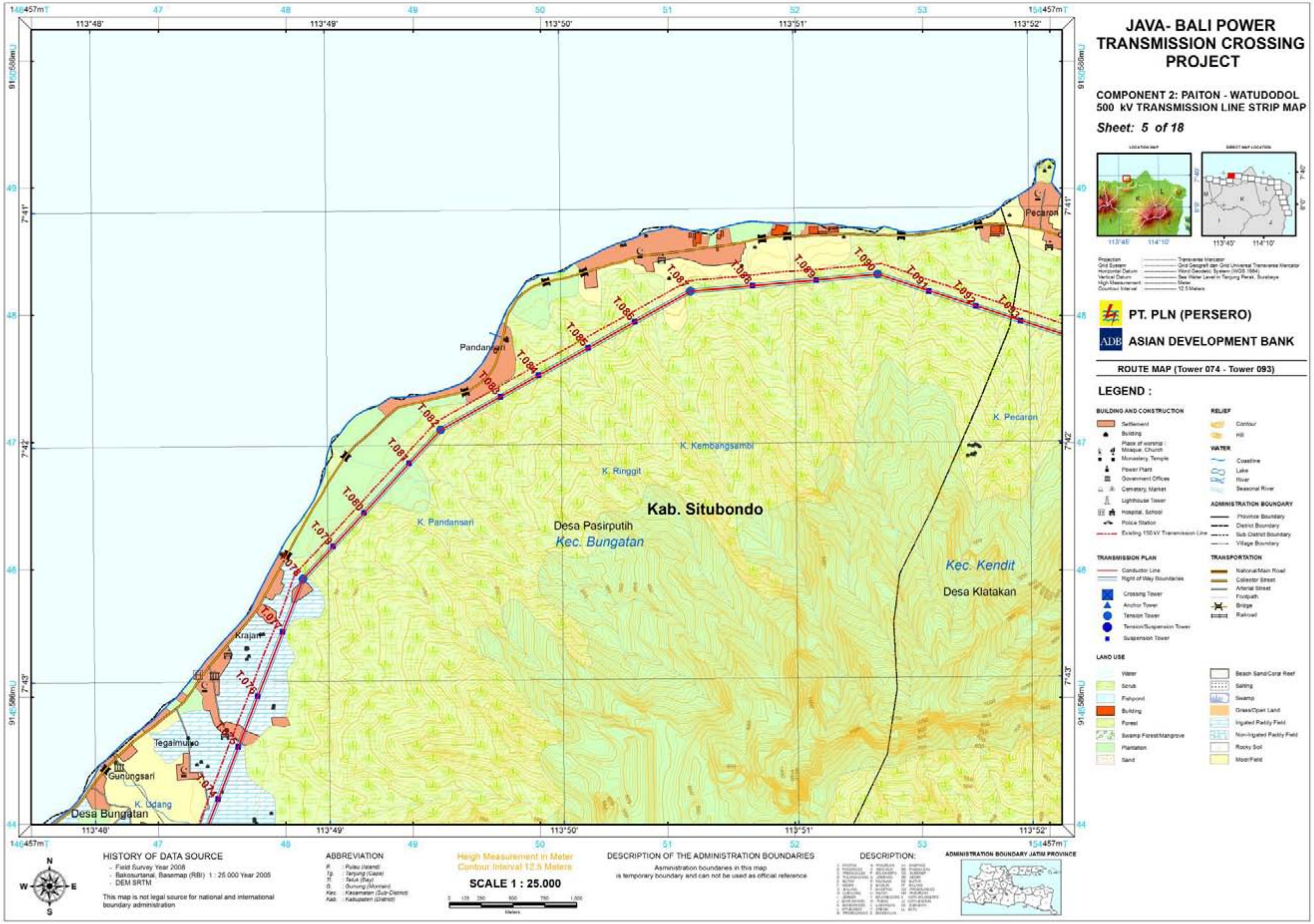
JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 5 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 074 - Tower 093)
LEGEND :
Kab. Situbondo
Desa Pasirputih
Kec. Bungatan
Kec. Kendit
Desa Klatakan
K. Pecaron
K. Kembangsambi
K. Ringgit
K. Pandansari
Pandansari
Pecaron
Krajan
Tegalmulyo
Gunungsari
K. Udang
Desa Bungatan
HISTORY OF DATA SOURCE
ABBREVIATION
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DESCRIPTION:
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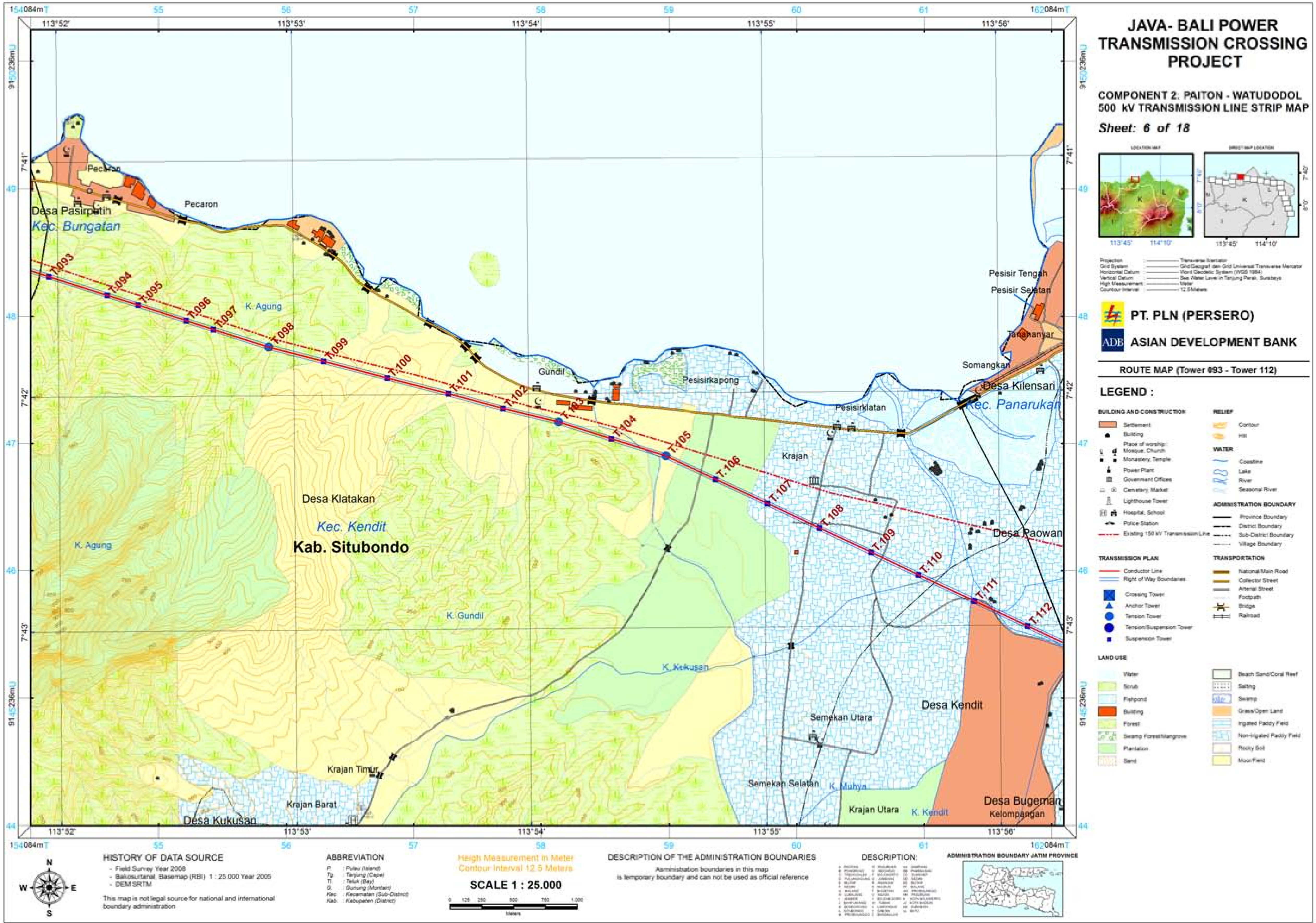
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COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 6 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 093 - Tower 112)
LEGEND :
Kab. Situbondo
Kec. Kendit
Desa Klatakan
Kec. Bungatan
Desa Pasirputih
Pecaron
Kec. Panarukan
Desa Kilensari
Desa Paowan
Desa Kendit
Desa Bugeman
Desa Kukusan
Pesisirkapong
Pesisirklatan
Krajan
Semekan Utara
Semekan Selatan
Krajan Timur
Krajan Barat
Krajan Utara
Kelompangan
Pesisir Tengah
Pesisir Selatan
Tanahanyar
Somangkan
Gundil
K. Agung
K. Gundil
K. Kukusan
K. Muhya
K. Kendit
T.093
T.094
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T.112
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
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ABBREVIATION
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SCALE 1 : 25.000
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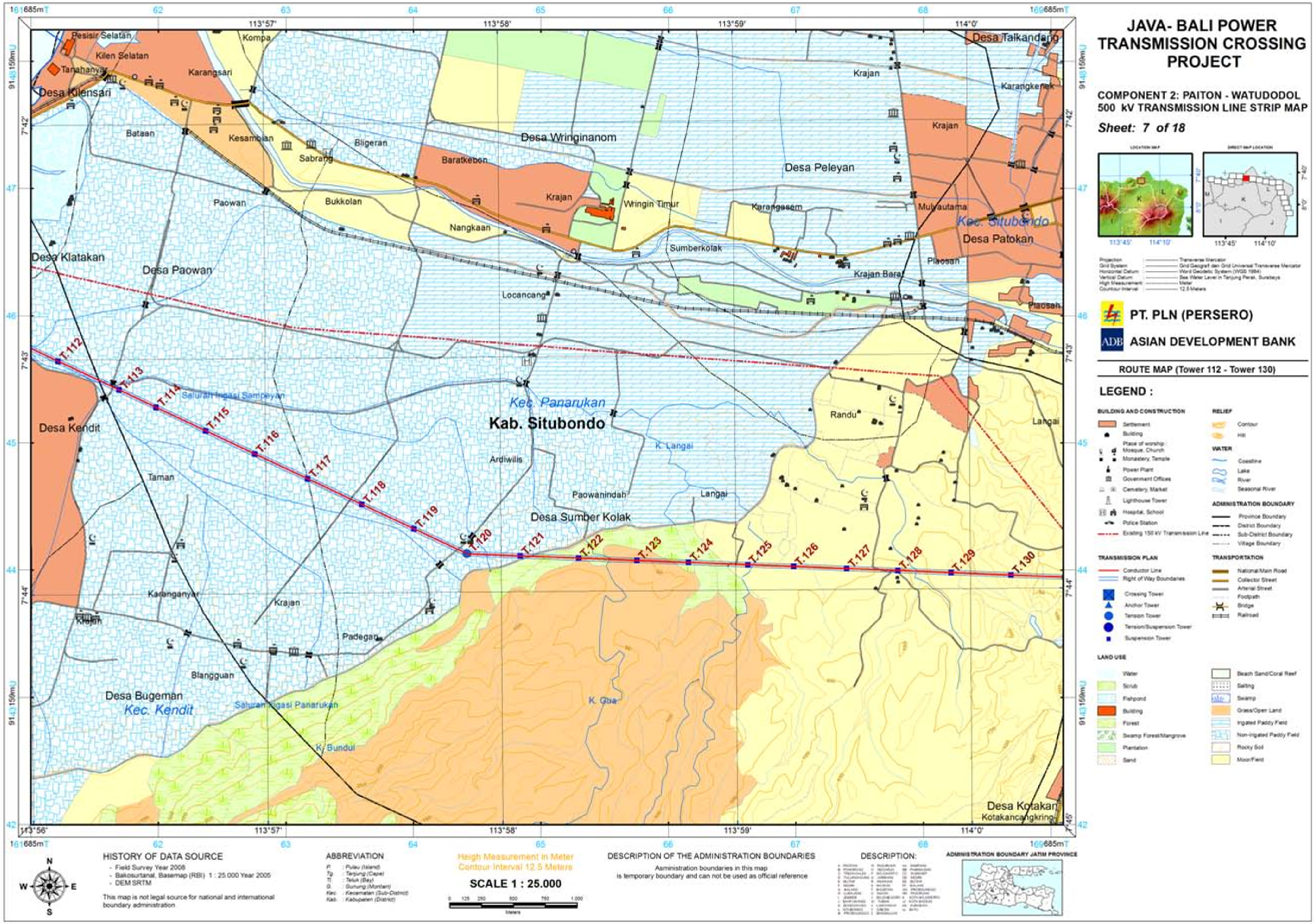
JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 7 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 112 - Tower 130)
LEGEND :
Kab. Situbondo
Kec. Panarukan
Kec. Kendit
Kec. Situbondo
Desa Wringinanom
Desa Peleyan
Desa Paowan
Desa Klatakan
Desa Kendit
Desa Sumber Kolak
Desa Bugeman
Desa Patokan
Desa Kilensari
Desa Talkandang
Desa Kotakan
SCALE 1 : 25.000
HISTORY OF DATA SOURCE
ABBREVIATION
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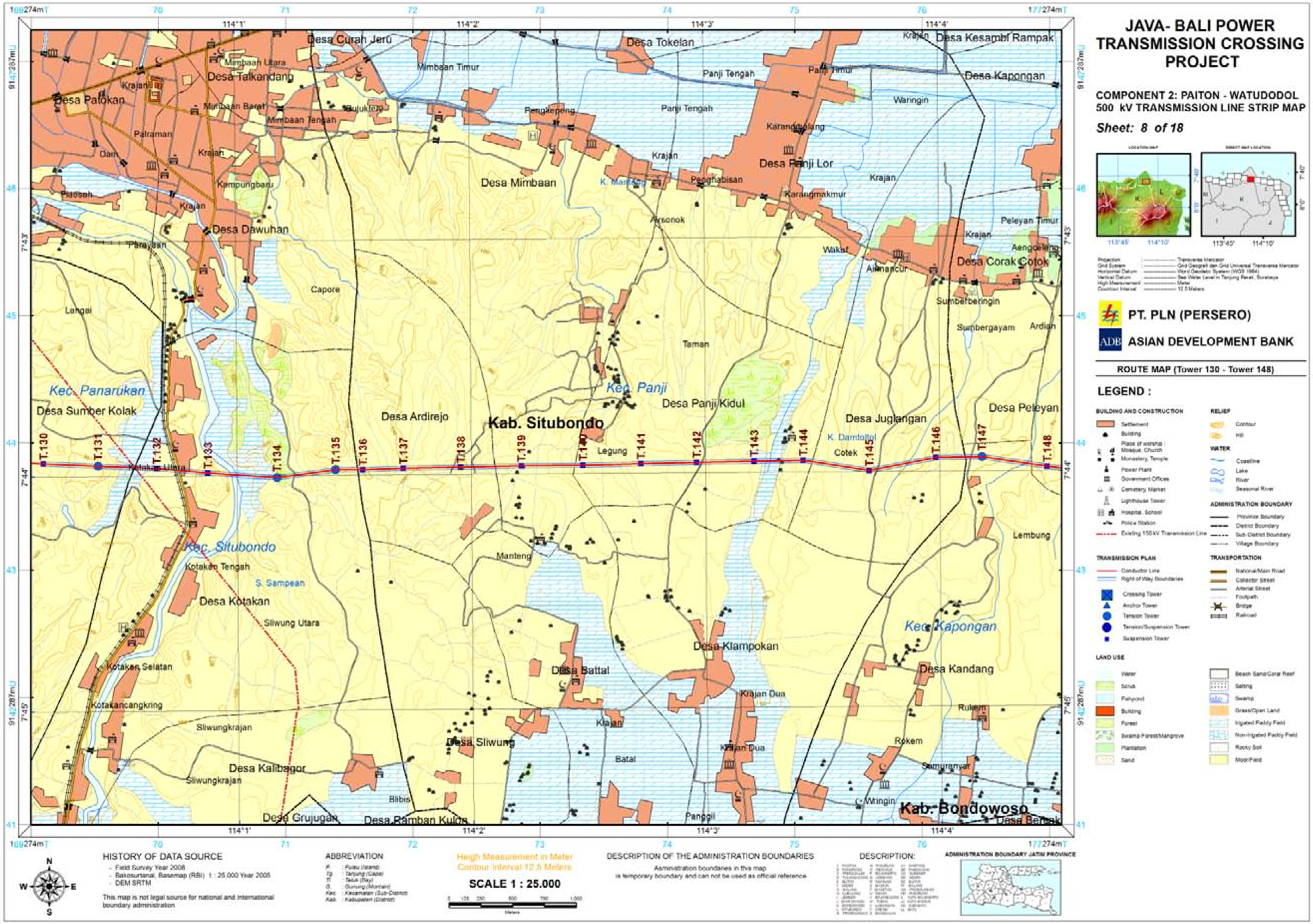
DESCRIPTION:


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 8 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 130 - Tower 148)
LEGEND :
Kab. Situbondo
Kec. Panarukan
Kec. Situbondo
Kec. Panji
Kec. Kapongan
Kab. Bondowoso
Desa Patokan
Desa Talkandang
Desa Curah Jeru
Desa Tokelan
Desa Kesambi Rampak
Desa Kapongan
Desa Mimbaan
Desa Panji Lor
Desa Dawuhan
Desa Corak Cotok
Desa Sumber Kolak
Desa Ardirejo
Desa Panji Kidul
Desa Juglangan
Desa Peleyan
Desa Kotakan
Desa Klampokan
Desa Battal
Desa Kandang
Desa Sliwung
Desa Kalibagor
Desa Grujugan
Desa Ramban Kulon
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T.148
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
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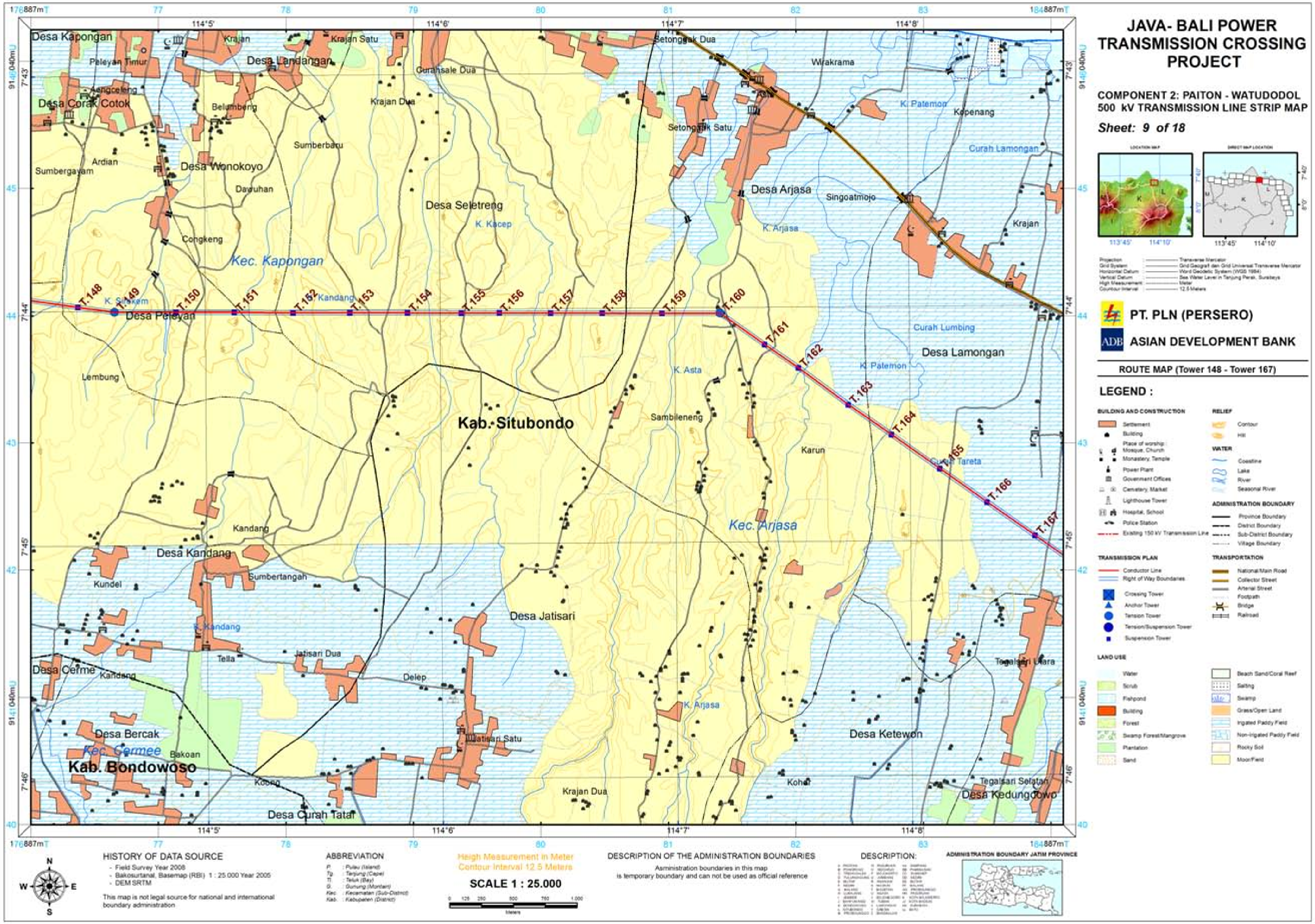
JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 9 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 148 - Tower 167)
LEGEND :
Kab. Situbondo
Kab. Bondowoso
Kec. Kapongan
Kec. Arjasa
Kec. Cermee
Desa Kapongan
Desa Landangan
Desa Corak Cotok
Desa Wonokoyo
Desa Seletreng
Desa Arjasa
Desa Peleyan
Desa Lamongan
Desa Kandang
Desa Jatisari
Desa Cerme
Desa Bercak
Desa Curah Tatal
Desa Ketewon
Desa Kedungdowo
T.148
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- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
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ABBREVIATION
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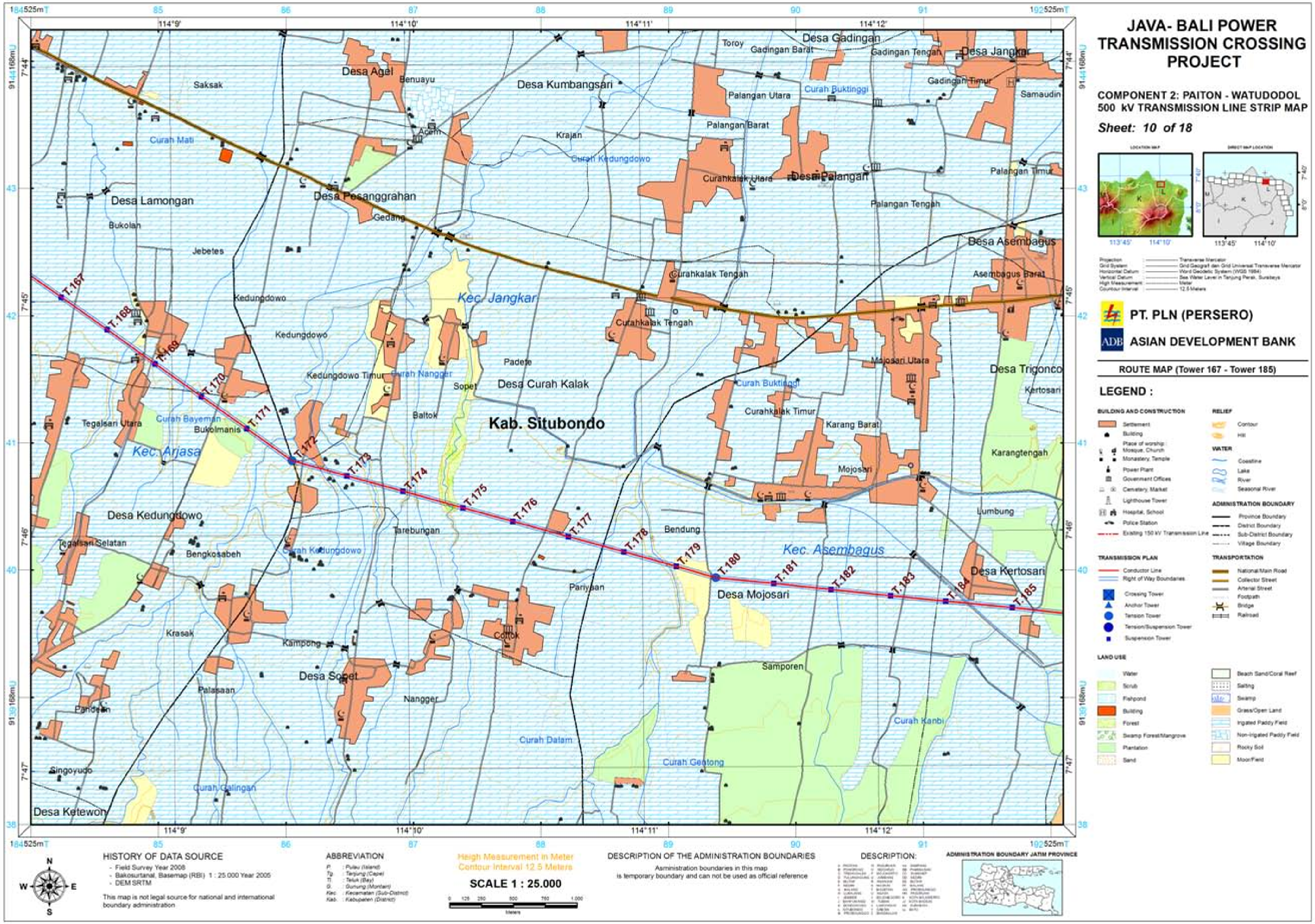
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 10 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 167 - Tower 185)
LEGEND :
Kab. Situbondo
Kec. Jangkar
Kec. Arjasa
Kec. Asembagus
Desa Curah Kalak
Desa Mojosari
Desa Kumbangsari
Desa Lamongan
Desa Pesanggrahan
Desa Kedungdowo
Desa Sopet
Desa Agel
Desa Ketewon
Desa Gadingan
Desa Jangkar
Desa Palangan
Desa Asembagus
Desa Trigonco
Desa Kertosari
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
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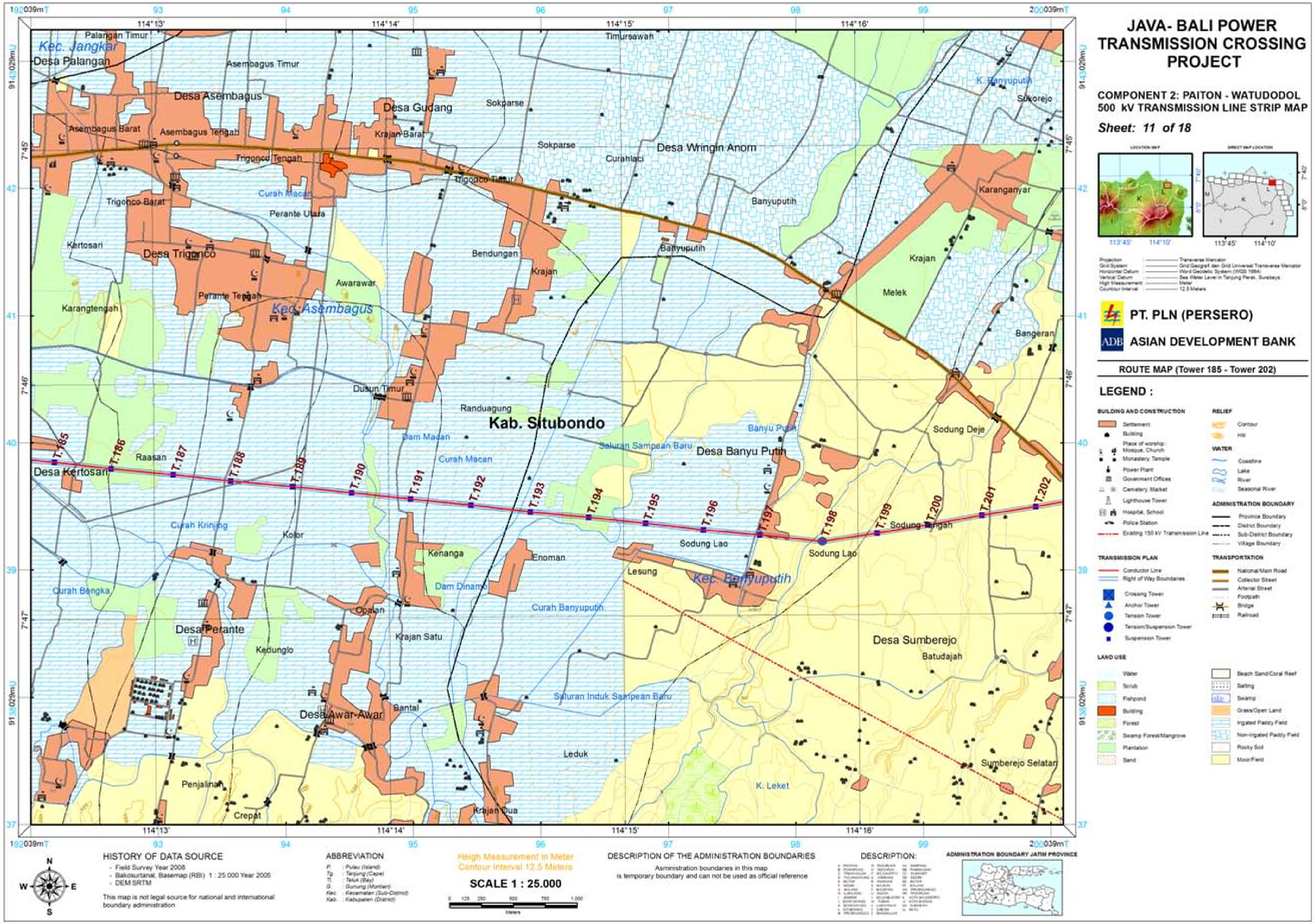
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 11 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 185 - Tower 202)
LEGEND :
BUILDING AND CONSTRUCTION
RELIEF
WATER
ADMINISTRATION BOUNDARY
TRANSMISSION PLAN
TRANSPORTATION
LAND USE
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
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Contour Interval 12.5 Meters
SCALE 1 : 25.000
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Kec. Jangkar
Kec. Asembagus
Kec. Banyuputih
Desa Palangan
Desa Asembagus
Desa Gudang
Desa Wringin Anom
Desa Trigonco
Desa Kertosari
Desa Banyu Putih
Desa Perante
Desa Awar-Awar
Desa Sumberejo
T.185
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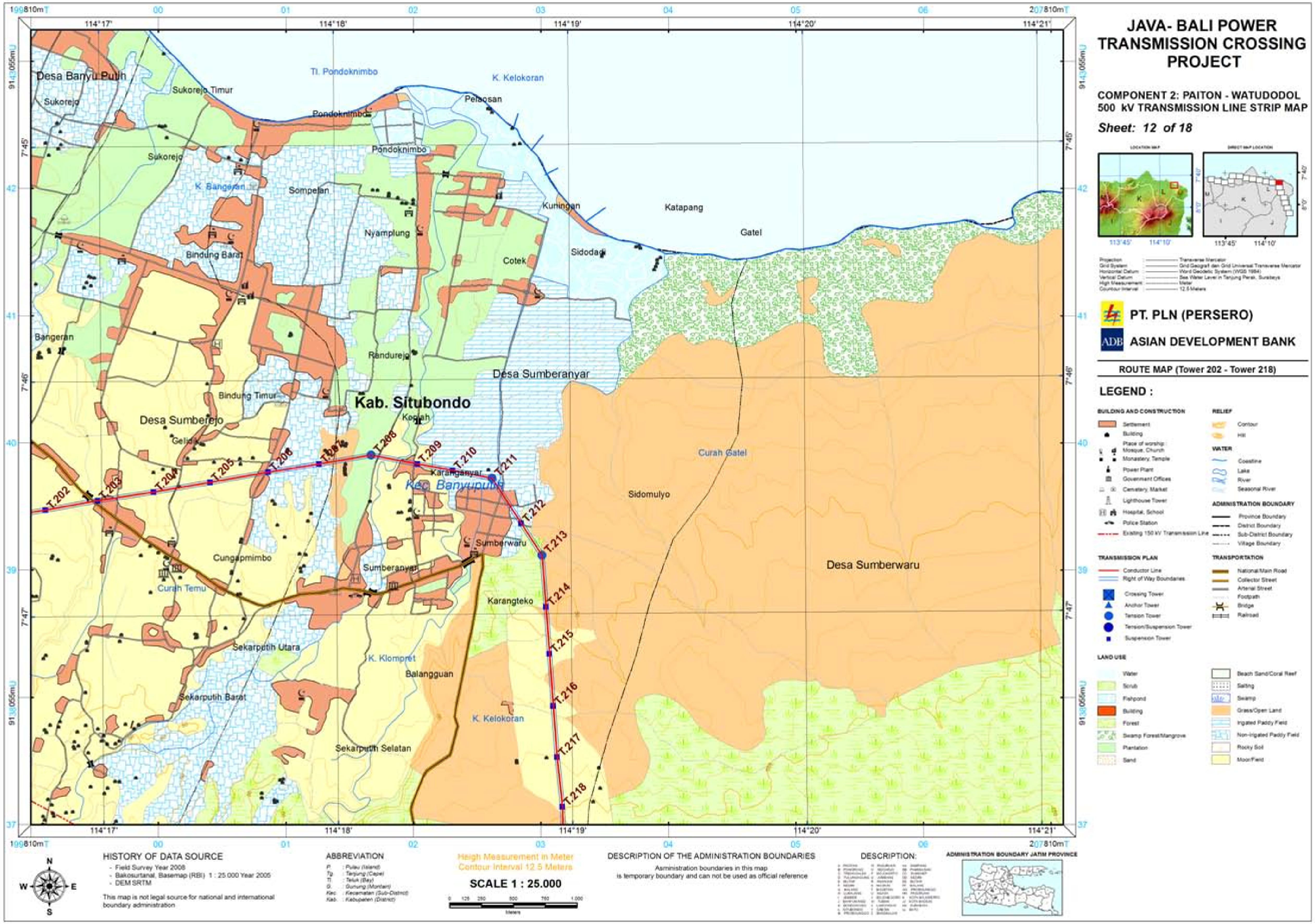
JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 12 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 202 - Tower 218)
LEGEND :
Desa Banyu Putih
Sukorejo Timur
Sukorejo
Tl. Pondoknimbo
K. Kelokoran
Pondoknimbo
Pelaosan
Sompelan
K. Bangeran
Nyamplung
Kuningan
Katapang
Gatel
Bindung Barat
Cotek
Sidodadi
Bangeran
Randurejo
Desa Sumberanyar
Bindung Timur
Kab. Situbondo
Desa Sumberejo
Karanganyar
Kec. Banyuputih
Curah Gatel
Sidomulyo
Cungapmimbo
Curah Temu
Sumberwaru
Sumberanyar
Karangteko
Desa Sumberwaru
Sekarputih Utara
K. Klomprat
Balangguan
Sekarputih Barat
K. Kelokoran
Sekarputih Selatan
T.202
T.203
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T.206
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T.208
T.209
T.210
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T.212
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T.214
T.215
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T.218
114°17'
114°18'
114°19'
114°20'
114°21'
7°45'
7°46'
7°47'
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
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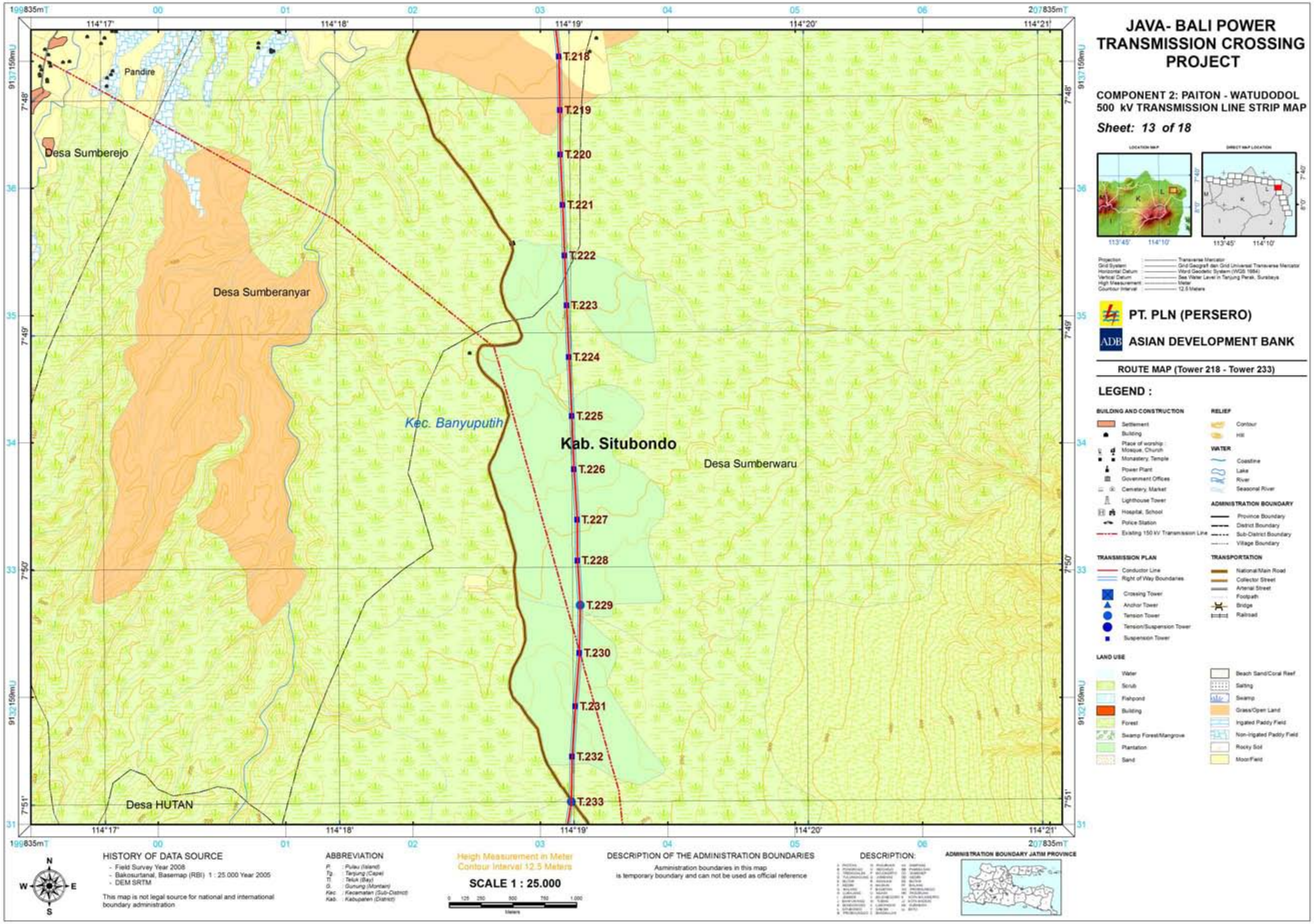
JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 13 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 218 - Tower 233)
LEGEND :
Pandire
Desa Sumberejo
Desa Sumberanyar
Kec. Banyuputih
Kab. Situbondo
Desa Sumberwaru
Desa HUTAN
T.218
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HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
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ABBREVIATION
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SCALE 1 : 25.000
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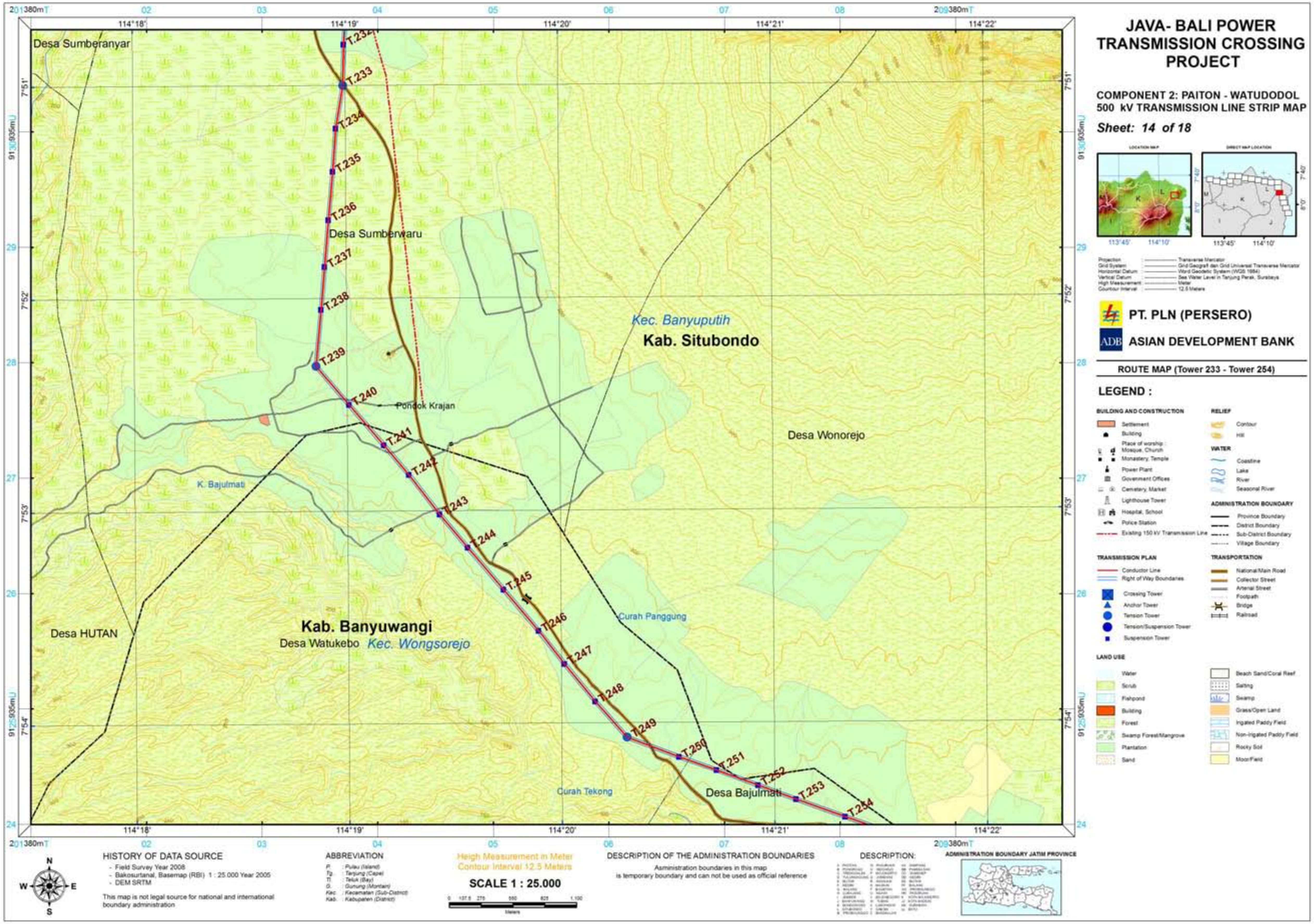
JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 14 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 233 - Tower 254)
LEGEND :
Desa Sumberanyar
Desa Sumberwaru
Kec. Banyuputih
Kab. Situbondo
Pondok Krajan
Desa Wonorejo
K. Bajulmati
Curah Panggung
Desa HUTAN
Kab. Banyuwangi
Desa Watukebo
Kec. Wongsorejo
Curah Tekong
Desa Bajulmati
T.232
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T.254
HISTORY OF DATA SOURCE
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- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
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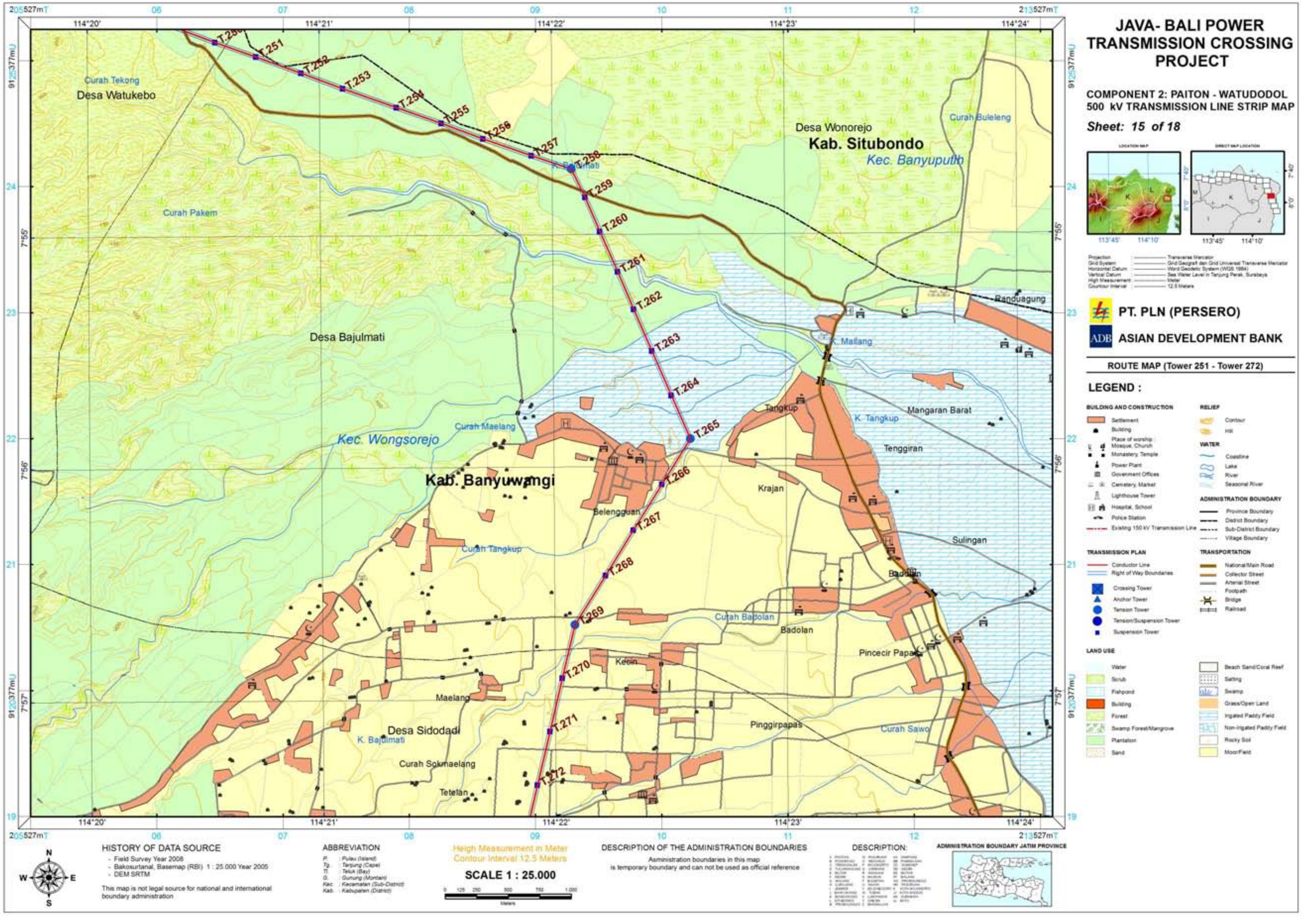
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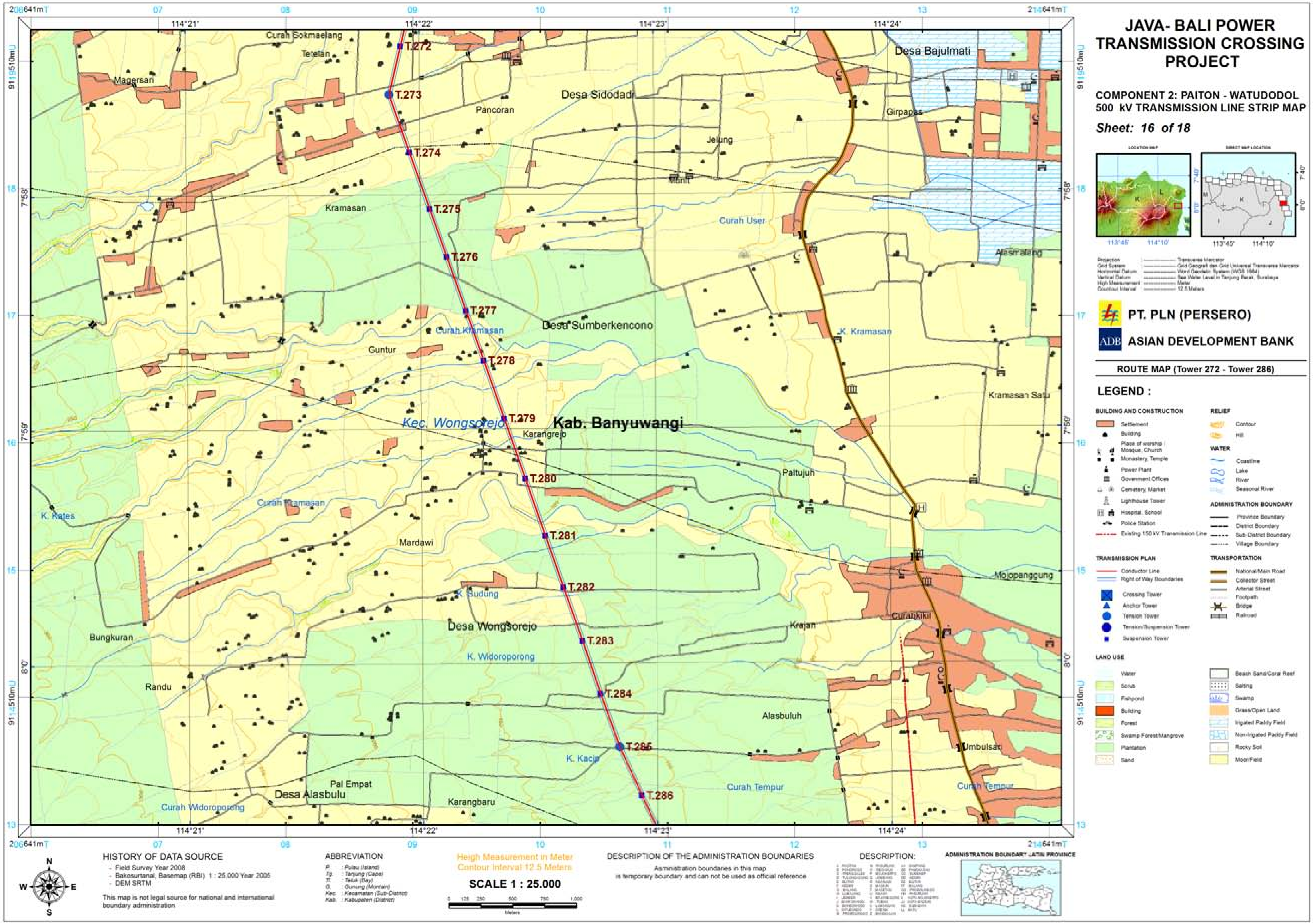
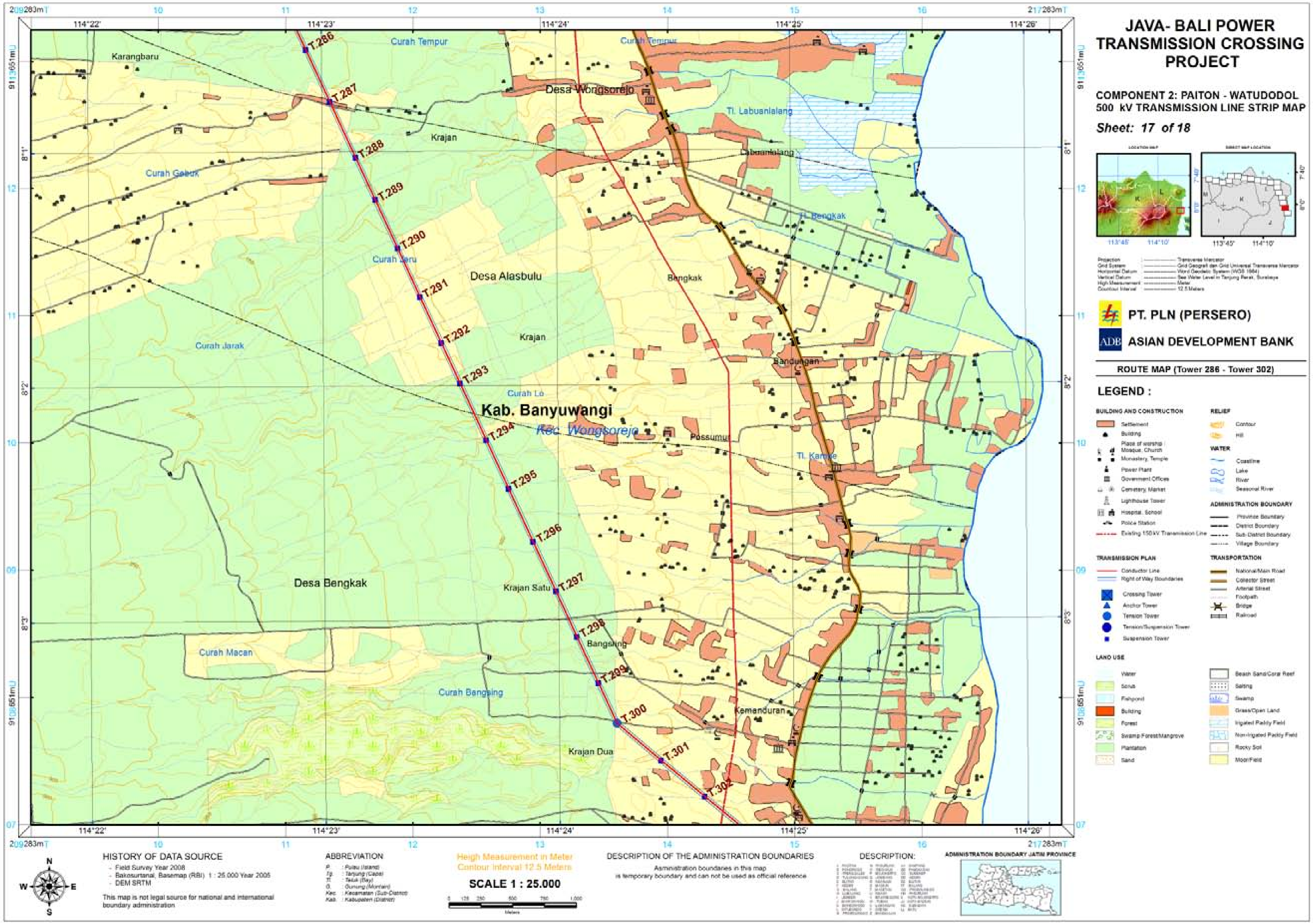
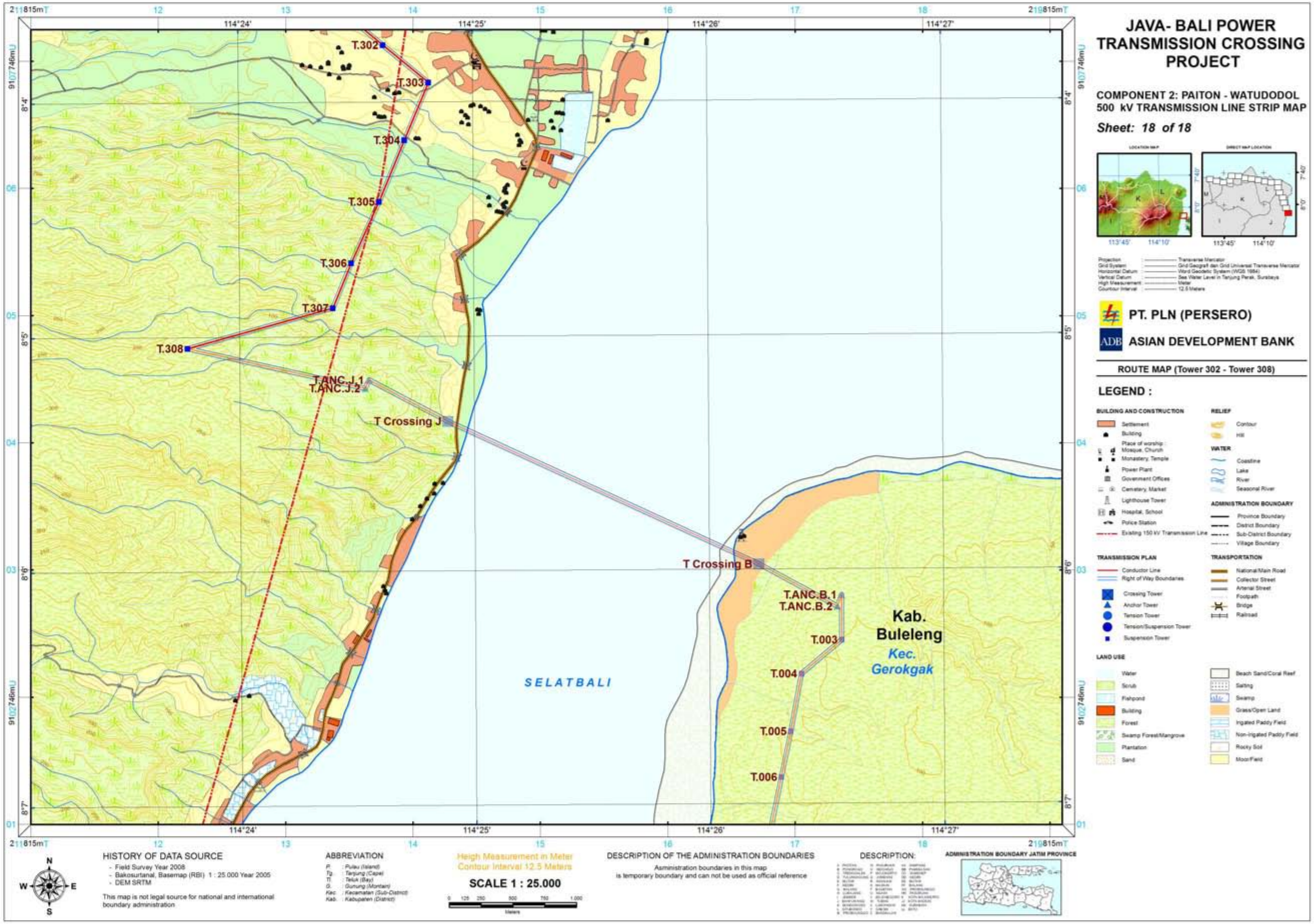
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 15 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 251 - Tower 272)
LEGEND :
Kab. Situbondo
Kec. Banyuputih
Desa Wonorejo
Kab. Banyuwangi
Kec. Wongsorejo
Desa Watukebo
Desa Bajulmati
Desa Sidodadi
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 16 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 272 - Tower 286)
LEGEND :
T.272
T.273
T.274
T.275
T.276
T.277
T.278
T.279
T.280
T.281
T.282
T.283
T.284
T.285
T.286
Kab. Banyuwangi
Kec. Wongsorejo
Desa Bajulmati
Desa Sidodadi
Desa Sumberkencono
Desa Wongsorejo
Desa Alasbulu
Curah Sokmaelang
Tetelan
Magersari
Pancoran
Jelung
Girpapas
Kramasan
Curah User
Alasmalang
Curah Kramasan
K. Kramasan
Guntur
Kramasan Satu
Karangrejo
Paltujuh
K. Kates
Mardawi
K. Sudung
Mojopanggung
Curahkikil
Krajan
Bungkuran
K. Widoroporong
Randu
Alasbuluh
K. Kacip
Umbulsari
Pal Empat
Karangbaru
Curah Tempur
Curah Widoroporong
HISTORY OF DATA SOURCE
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
DESCRIPTION:
This map is not legal source for national and international boundary administration


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 17 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 286 - Tower 302)
LEGEND :
Kab. Banyuwangi
Kec. Wongsorejo
Desa Wongsorejo
Desa Alasbulu
Desa Bengkak
Karangbaru
Krajan
Krajan Satu
Krajan Dua
Bengkak
Bangsring
Kemanduran
Bandungan
Pessumur
Labuanlalang
Tl. Labuanlalang
Tl. Bengkak
Tl. Kande
Curah Tempur
Curah Gebuk
Curah Jeru
Curah Jarak
Curah Lo
Curah Macan
Curah Bangsing
T.286
T.287
T.288
T.289
T.290
T.291
T.292
T.293
T.294
T.295
T.296
T.297
T.298
T.299
T.300
T.301
T.302
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE


JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 2: PAITON - WATUDODOL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 18 of 18
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 302 - Tower 308)
LEGEND :
T.302
T.303
T.304
T.305
T.306
T.307
T.308
T.ANC.J.1
T.ANC.J.2
T Crossing J
T Crossing B
T.ANC.B.1
T.ANC.B.2
T.003
T.004
T.005
T.006
Kab. Buleleng
Kec. Gerokgak
SELATBALI
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
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Contour Interval 12.5 Meters
SCALE 1 : 25.000
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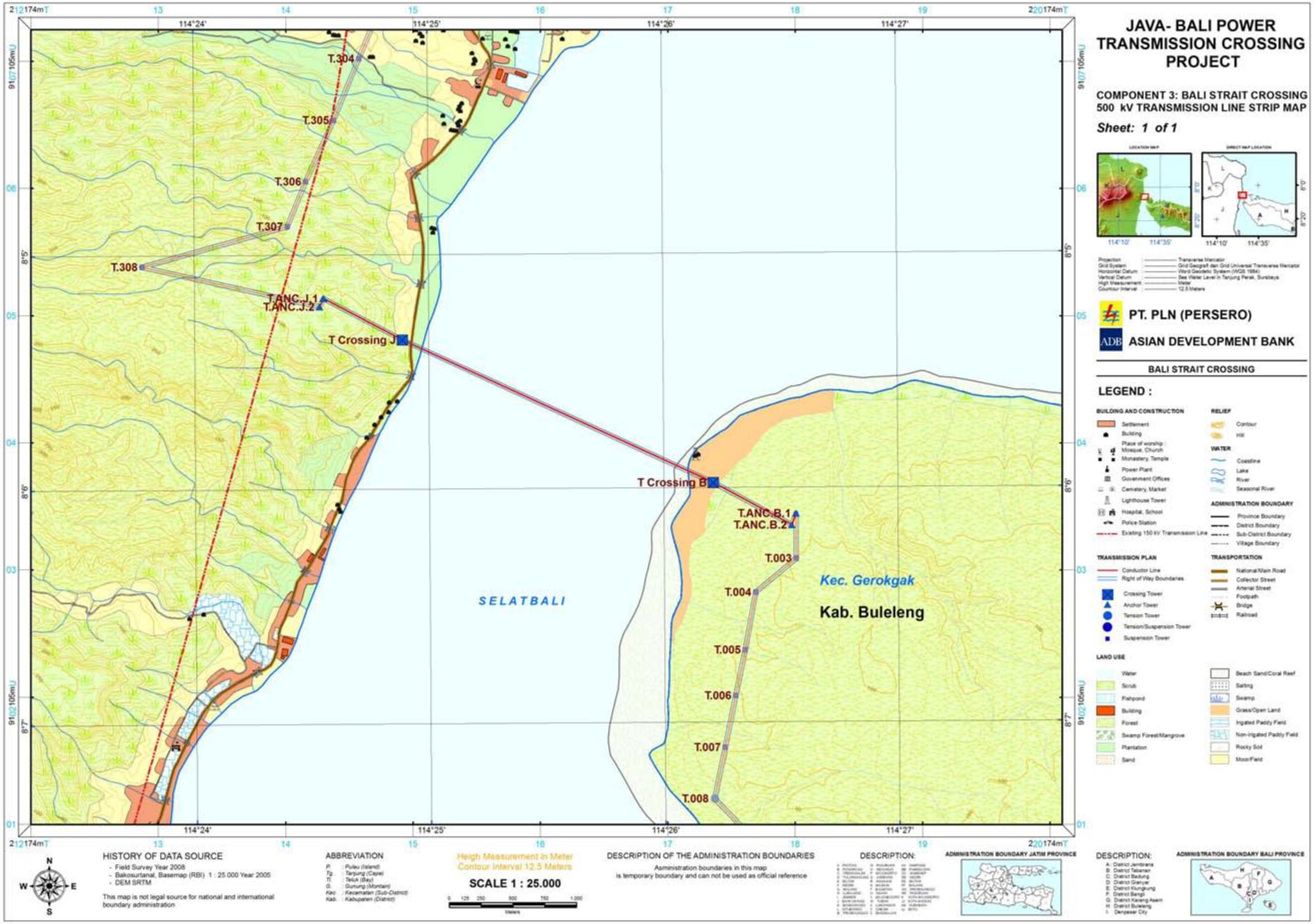
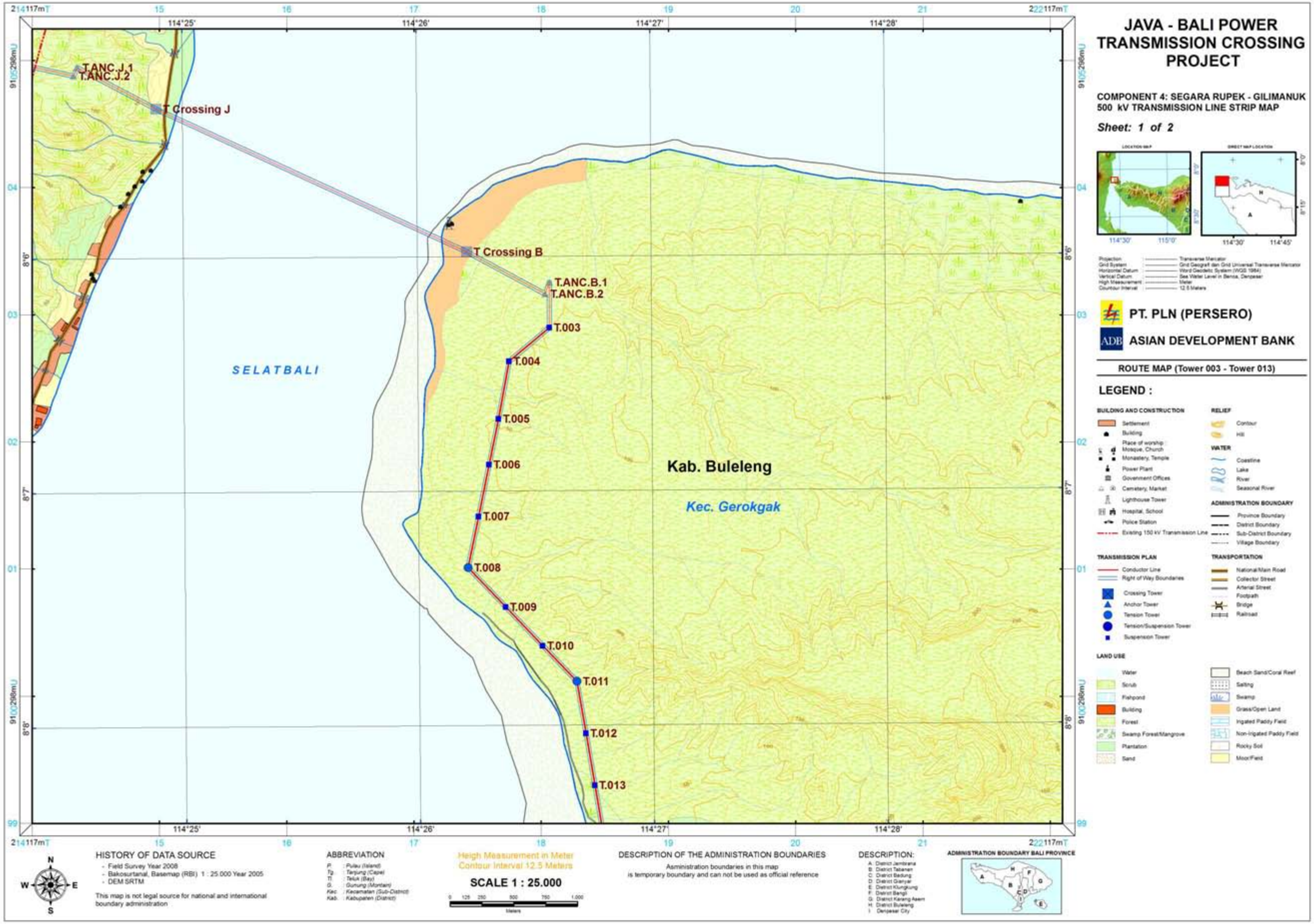
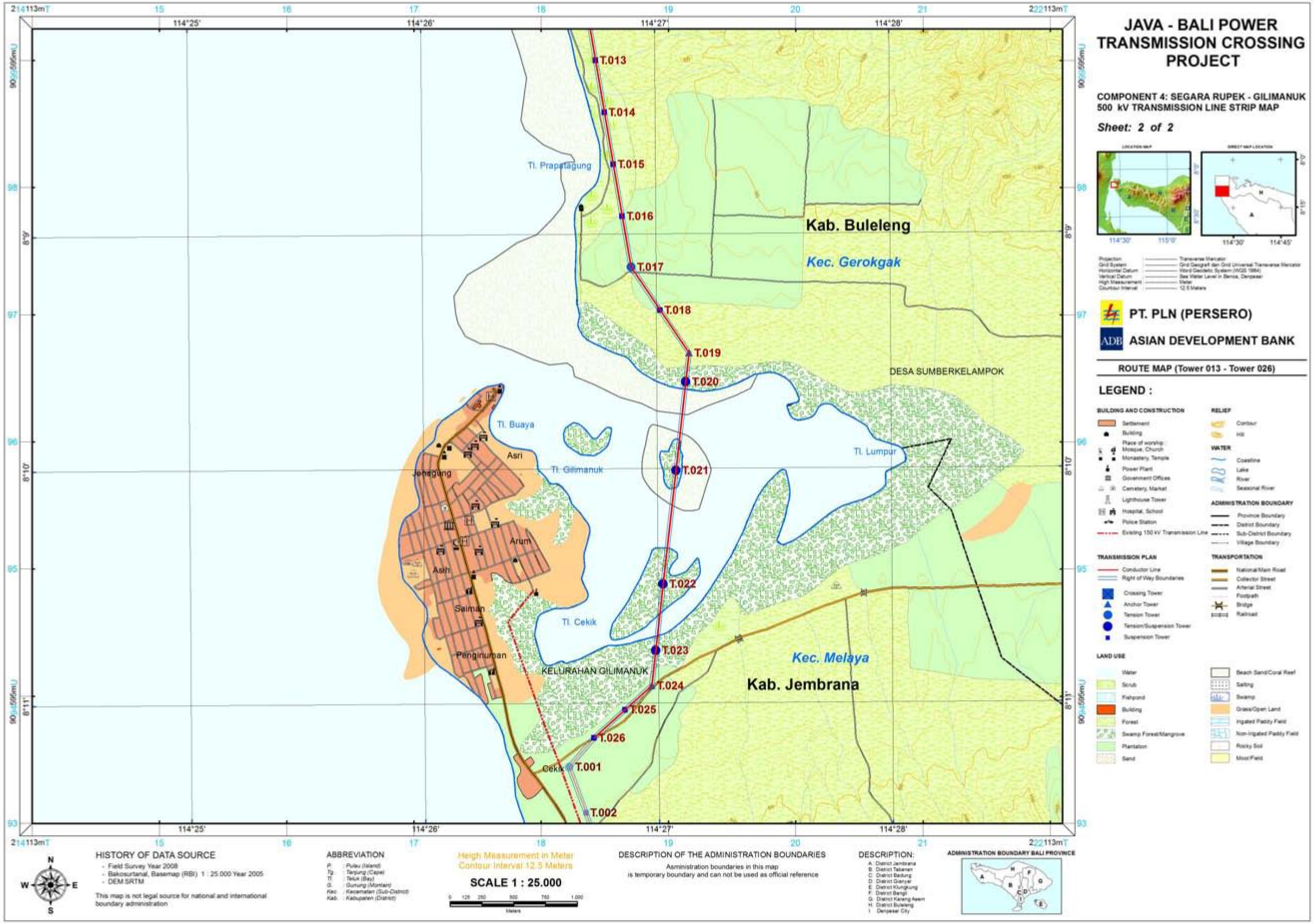
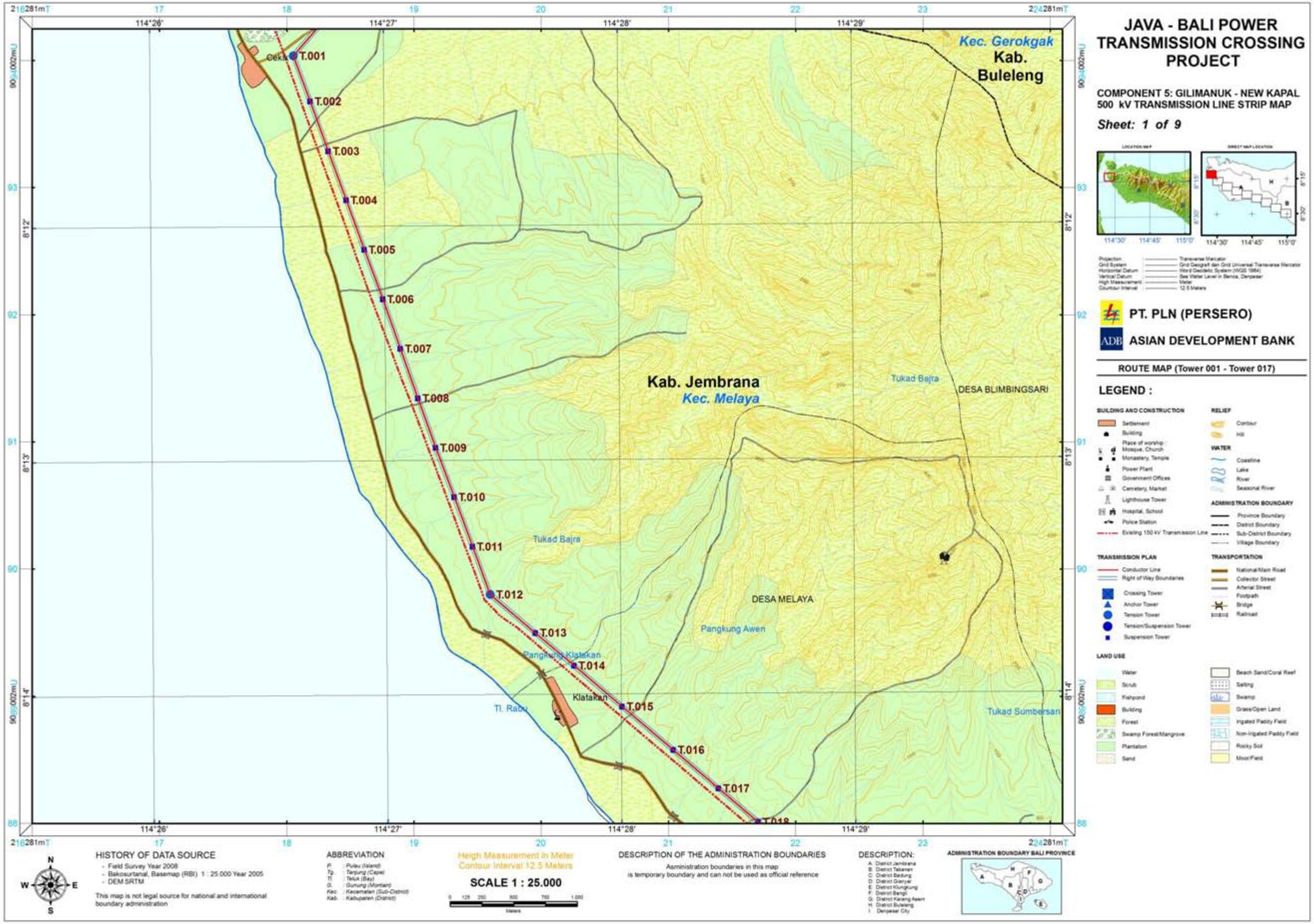
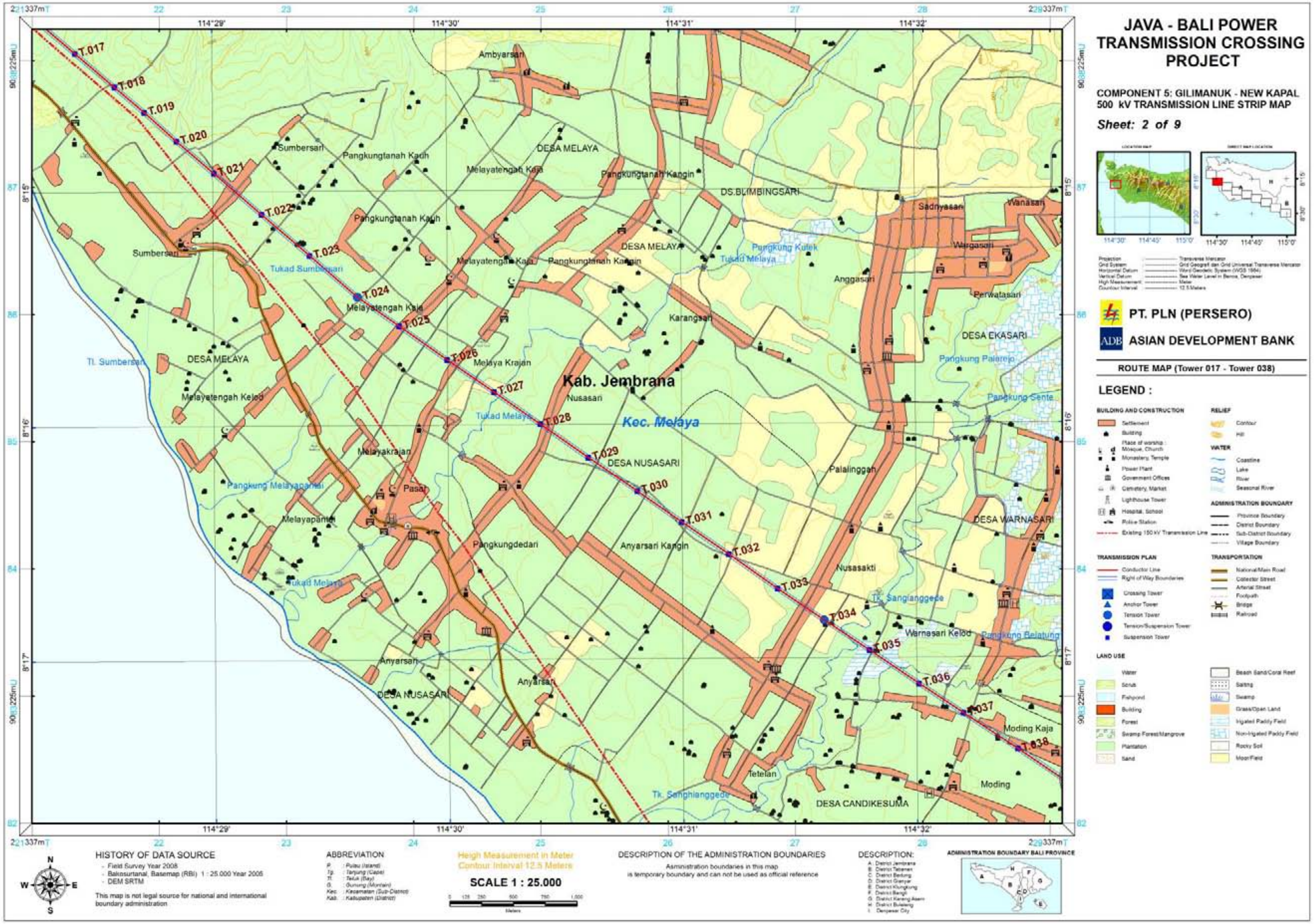
DESCRIPTION:
ADMINISTRATION BOUNDARY JATIM PROVINCE

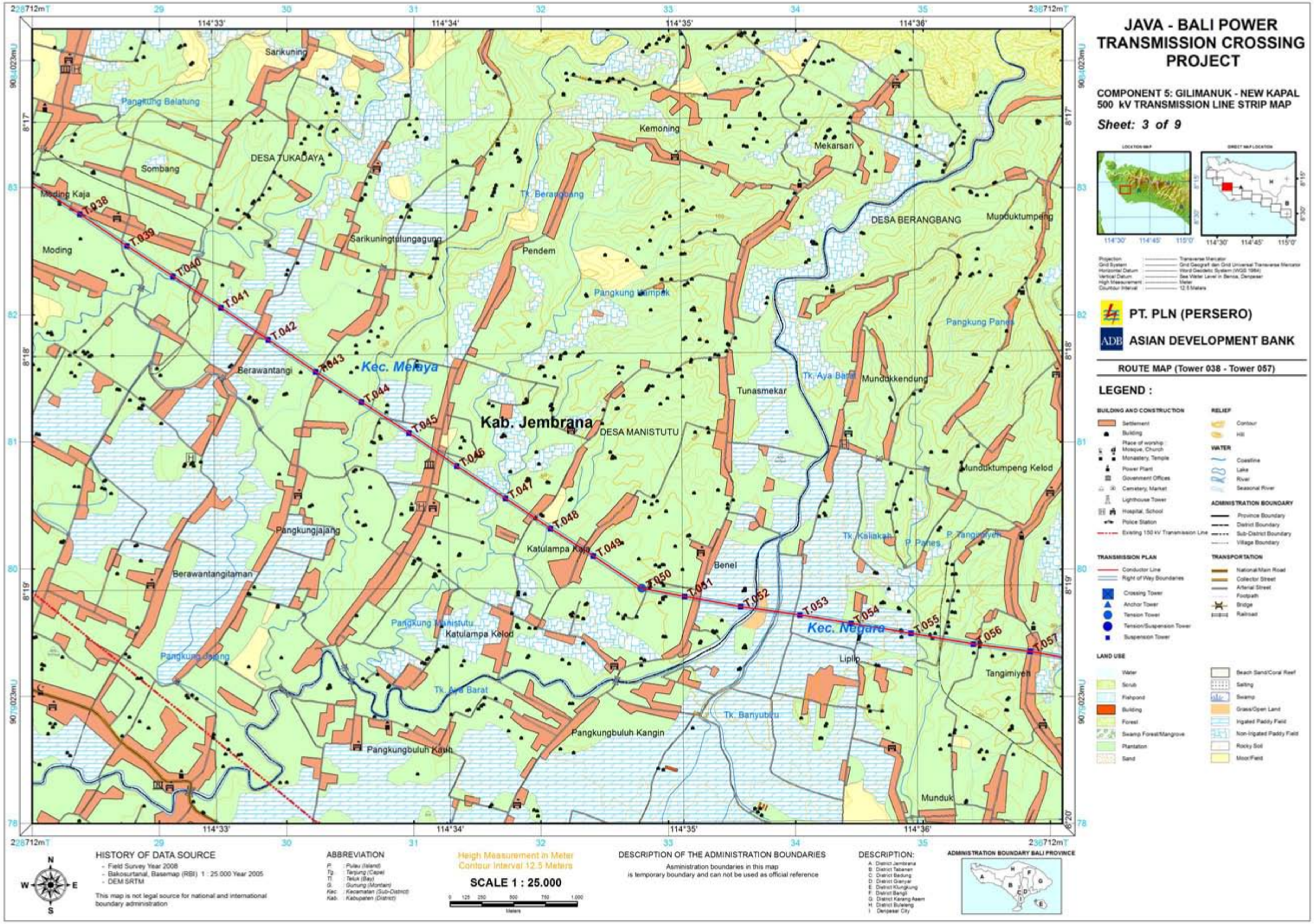

JAVA- BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 3: BALI STRAIT CROSSING
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 1 of 1
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
BALI STRAIT CROSSING
LEGEND :
T.304
T.305
T.306
T.307
T.308
T.ANC.J.1
T.ANC.J.2
T Crossing J
T Crossing B
T.ANC.B.1
T.ANC.B.2
T.003
T.004
T.005
T.006
T.007
T.008
SELATBALI
Kec. Gerokgak
Kab. Buleleng
HISTORY OF DATA SOURCE
ABBREVIATION
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
DESCRIPTION:

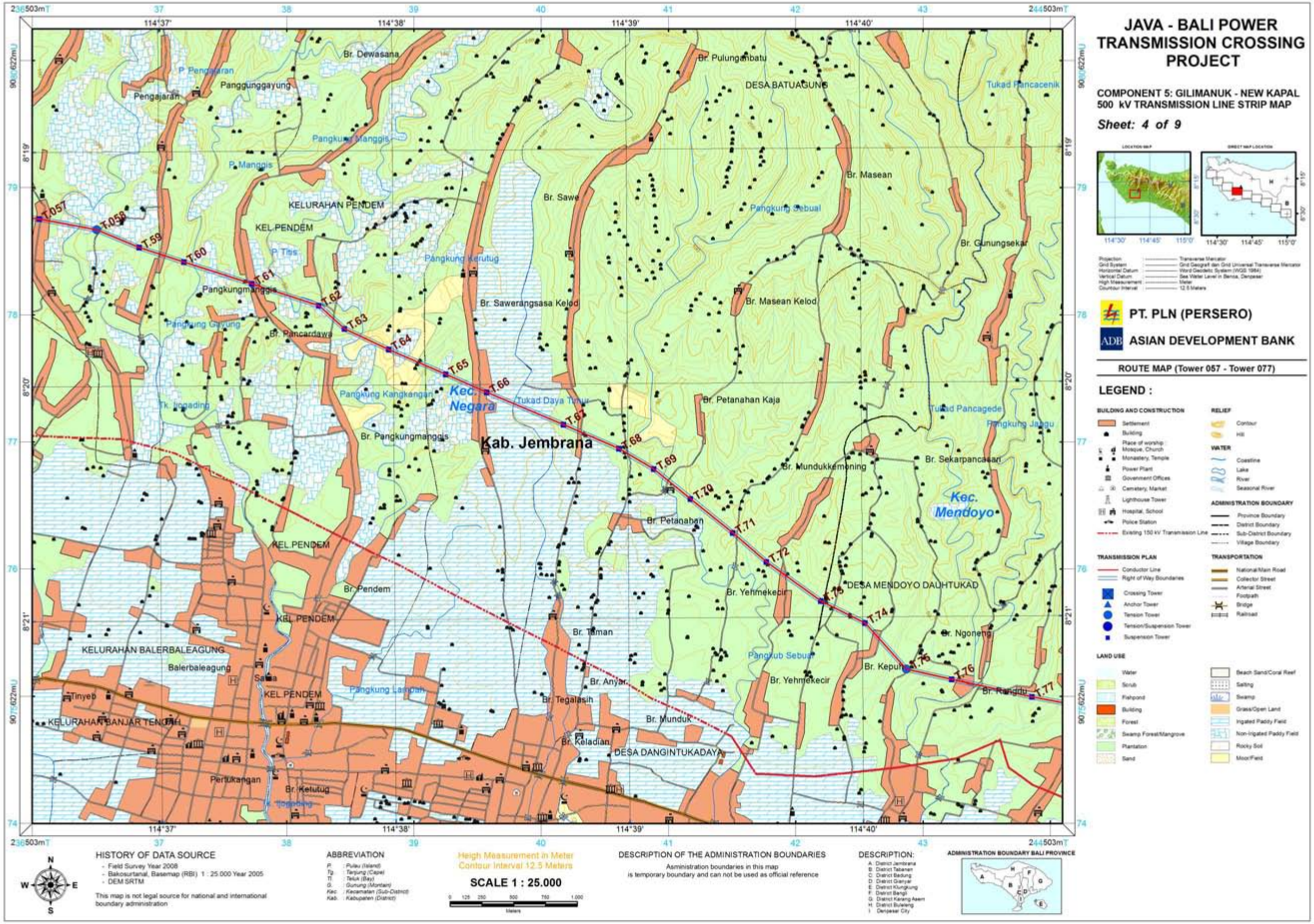

JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 4: SEGARA RUPEK - GILIMANUK
500 kV TRANSMISSION LINE STRIP MAP
Sheet: 1 of 2
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 003 - Tower 013)
LEGEND :
T.ANC.J.1
T.ANC.J.2
T Crossing J
T Crossing B
T.ANC.B.1
T.ANC.B.2
T.003
T.004
T.005
T.006
T.007
T.008
T.009
T.010
T.011
T.012
T.013
SELATBALI
Kab. Buleleng
Kec. Gerokgak
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE

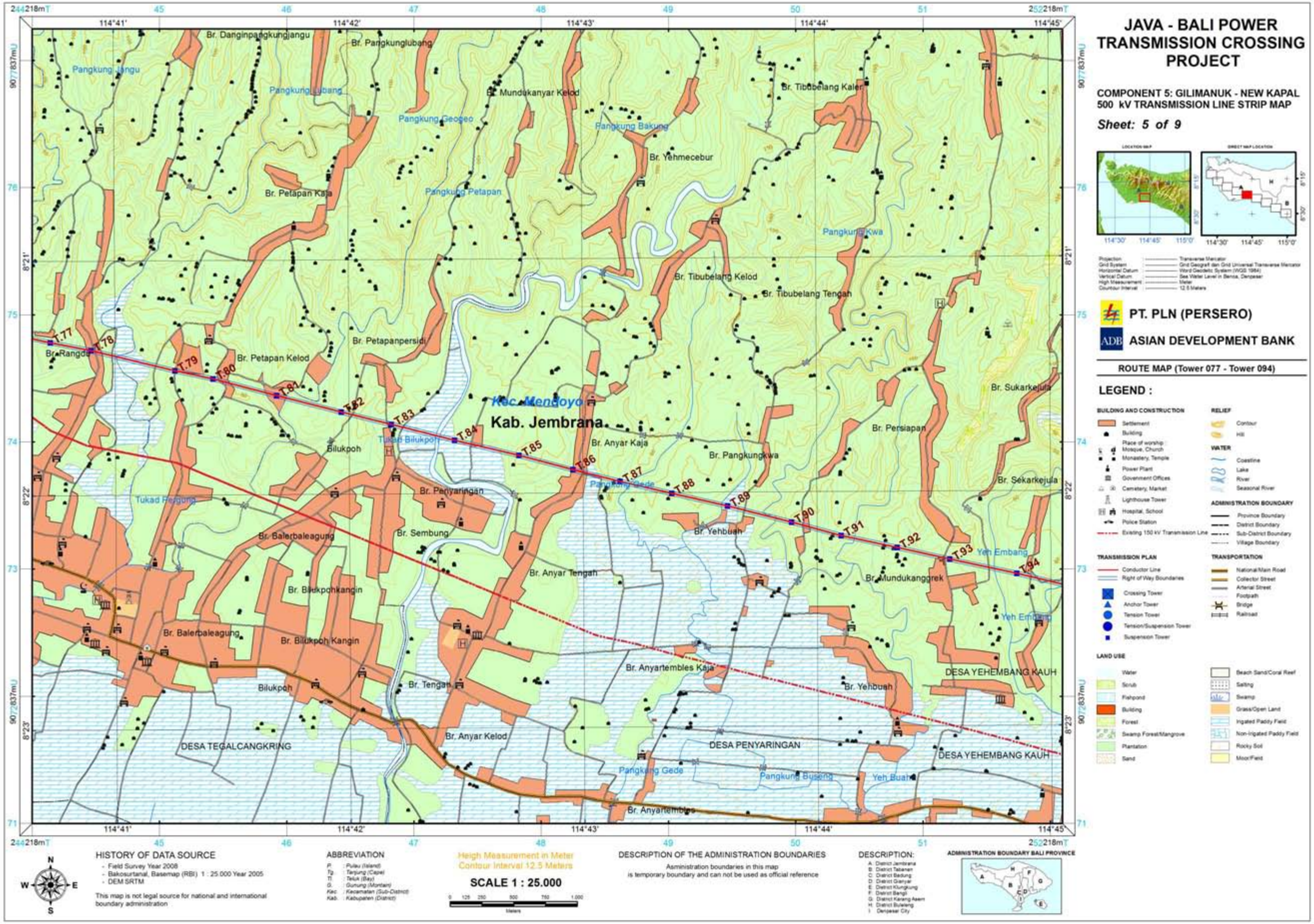

JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 4: SEGARA RUPEK - GILIMANUK 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 2 of 2
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 013 - Tower 026)
LEGEND :
Kab. Buleleng
Kec. Gerokgak
Kab. Jembrana
Kec. Melaya
DESA SUMBERKELAMPOK
KELURAHAN GILIMANUK
Tl. Prapatagung
Tl. Buaya
Tl. Gilimanuk
Tl. Lumpur
Tl. Cekik
Asri
Jembrana
Arum
Asih
Selman
Penginuman
Cekik
T.013
T.014
T.015
T.016
T.017
T.018
T.019
T.020
T.021
T.022
T.023
T.024
T.025
T.026
T.001
T.002
114°25'
114°26'
114°27'
114°28'
8°9'
8°10'
8°11'
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 1 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 001 - Tower 017)
LEGEND :
Kec. Gerokgak
Kab. Buleleng
Kab. Jembrana
Kec. Melaya
DESA BLIMBINGSARI
DESA MELAYA
Tukad Bajra
Pangkung Awen
Pangkung Klatakan
Klatakan
Tl. Rabu
Tukad Sumbersari
T.001
T.002
T.003
T.004
T.005
T.006
T.007
T.008
T.009
T.010
T.011
T.012
T.013
T.014
T.015
T.016
T.017
HISTORY OF DATA SOURCE
ABBREVIATION
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 2 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 017 - Tower 038)
LEGEND :
Kab. Jembrana
Kec. Melaya
DESA MELAYA
DESA NUSASARI
DESA EKASARI
DESA WARNASARI
DESA CANDIKESUMA
HISTORY OF DATA SOURCE
ABBREVIATION
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
DESCRIPTION:
SCALE 1 : 25.000


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 3 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 038 - Tower 057)
LEGEND :
Kab. Jembrana
Kec. Melaya
Kec. Negara
DESA TUKADAYA
DESA MANISTUTU
DESA BERANGBANG
HISTORY OF DATA SOURCE
ABBREVIATION
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 4 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 057 - Tower 077)
LEGEND :
Kab. Jembrana
Kec. Negara
Kec. Mendoyo
T.057
T.058
T.59
T.60
T.61
T.62
T.63
T.64
T.65
T.66
T.67
T.68
T.69
T.70
T.71
T.72
T.74
T.75
T.76
T.77
Br. Dewasana
Pengajaran
Panggunggayung
KELURAHAN PENDEM
KEL.PENDEM
Pangkungmanggis
Br. Pancardawa
Br. Sawe
Br. Sawerangsasa Kelod
Br. Pulungambatu
DESA BATUAGUNG
Br. Masean
Br. Masean Kelod
Br. Gunungsekar
Br. Petanahan Kaja
Br. Sekarpancasari
Br. Mundukkemoning
Br. Petanahan
DESA MENDOYO DAUHTUKAD
Br. Yehmekecir
Br. Ngoneng
Br. Kepuh
Br. Rangdu
Br. Pendem
Br. Taman
Br. Anyar
Br. Tegalasih
Br. Munduk
Br. Keladian
DESA DANGINTUKADAYA
KELURAHAN BALERBALEAGUNG
Balerbaleagung
KELURAHAN BANJAR TENGAH
Tinyeb
Perlukangan
Br. Ketutug
Br. Pangkungmanggis
Tukad Pancacenik
Tukad Pancagede
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Asministration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 5 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 077 - Tower 094)
LEGEND :
Kec. Mendoyo
Kab. Jembrana
DESA TEGALCANGKRING
DESA PENYARINGAN
DESA YEHEMBANG KAUH
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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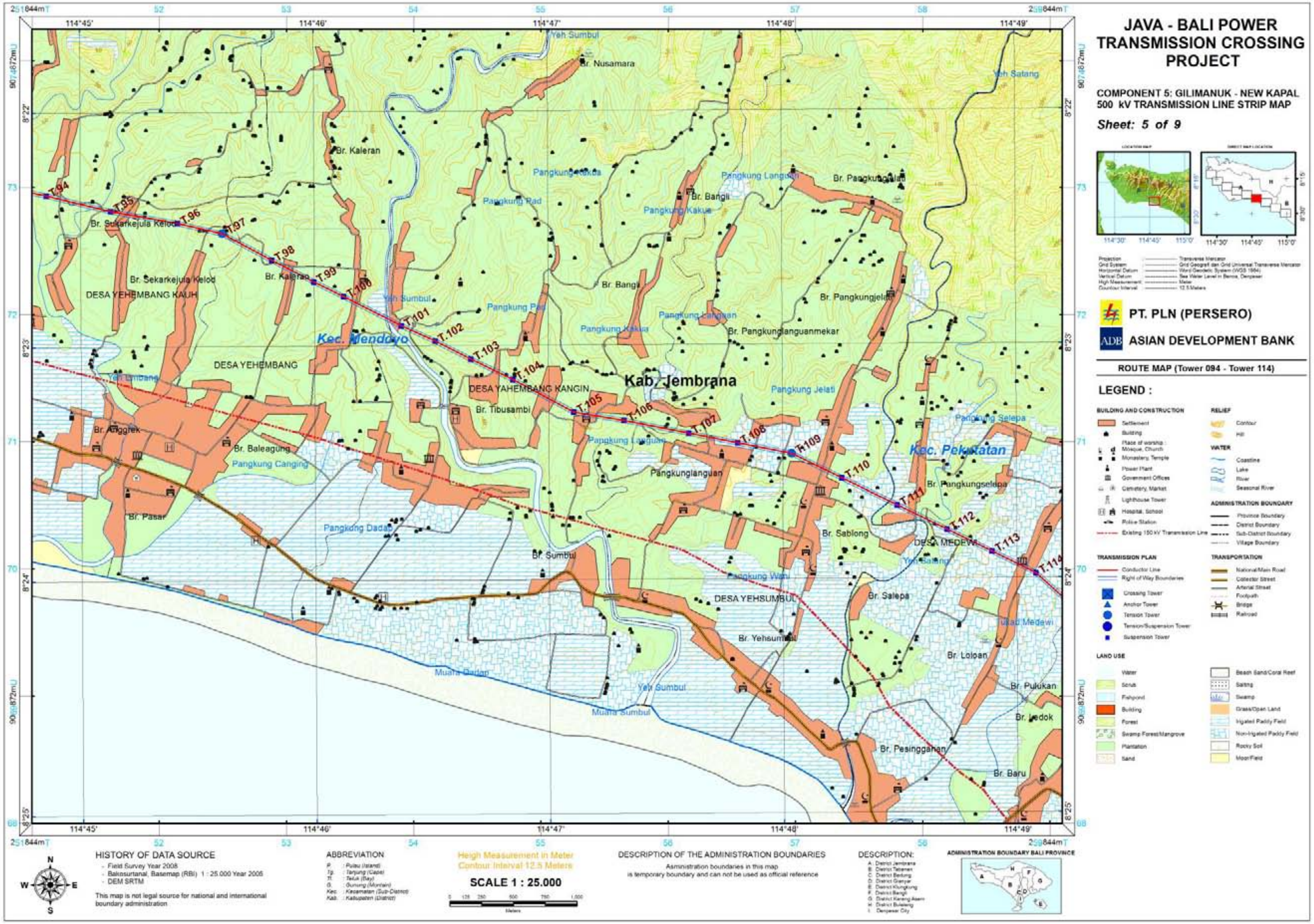
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 5 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 094 - Tower 114)
LEGEND :
Kab. Jembrana
Kec. Mendoyo
Kec. Pekutatan
DESA YEHEMBANG KAUH
DESA YEHEMBANG
DESA YAHEMBANG KANGIN
DESA YEHSUMBUL
DESA MEDEWI
Br. Nusamara
Br. Kaleran
Br. Sukarkejula Kelod
Br. Sekarkejula Kelod
Br. Bangli
Br. Pangkungjelati
Br. Pangkunglanguanmekar
Br. Tibusambi
Br. Anggrek
Br. Baleagung
Br. Pasar
Br. Sumbul
Br. Sablong
Br. Salepa
Br. Yehsumbul
Br. Loloan
Br. Pulukan
Br. Ledok
Br. Pesinggahan
Br. Baru
Br. Pangkungselepa
Pangkunglanguan
Yeh Sumbul
Yeh Satang
Muara Sumbul
Muara Dadap
Pangkung Dadap
Pangkung Canging
Pangkung Jelati
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2008
- DEM SRTM
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ABBREVIATION
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Contour Interval 12.5 Meters
SCALE 1 : 25.000
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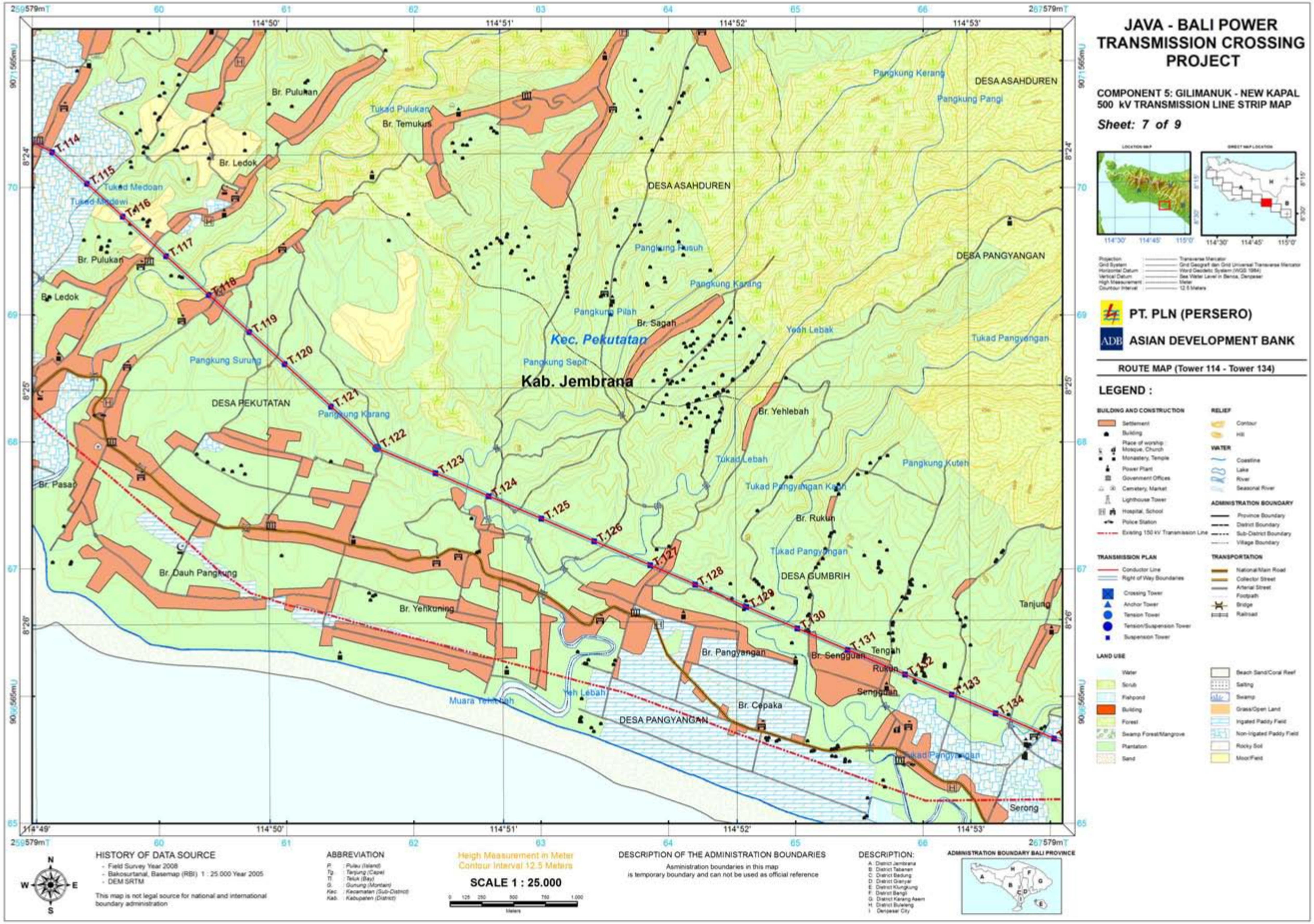
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 7 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 114 - Tower 134)
LEGEND :
Kab. Jembrana
Kec. Pekutatan
DESA ASAHDUREN
DESA PEKUTATAN
DESA PANGYANGAN
DESA GUMBRIH
T.114
T.115
T.116
T.117
T.118
T.119
T.120
T.121
T.122
T.123
T.124
T.125
T.126
T.127
T.128
T.129
T.130
T.131
T.132
T.133
T.134
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
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ABBREVIATION
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Contour Interval 12.5 Meters
SCALE 1 : 25.000
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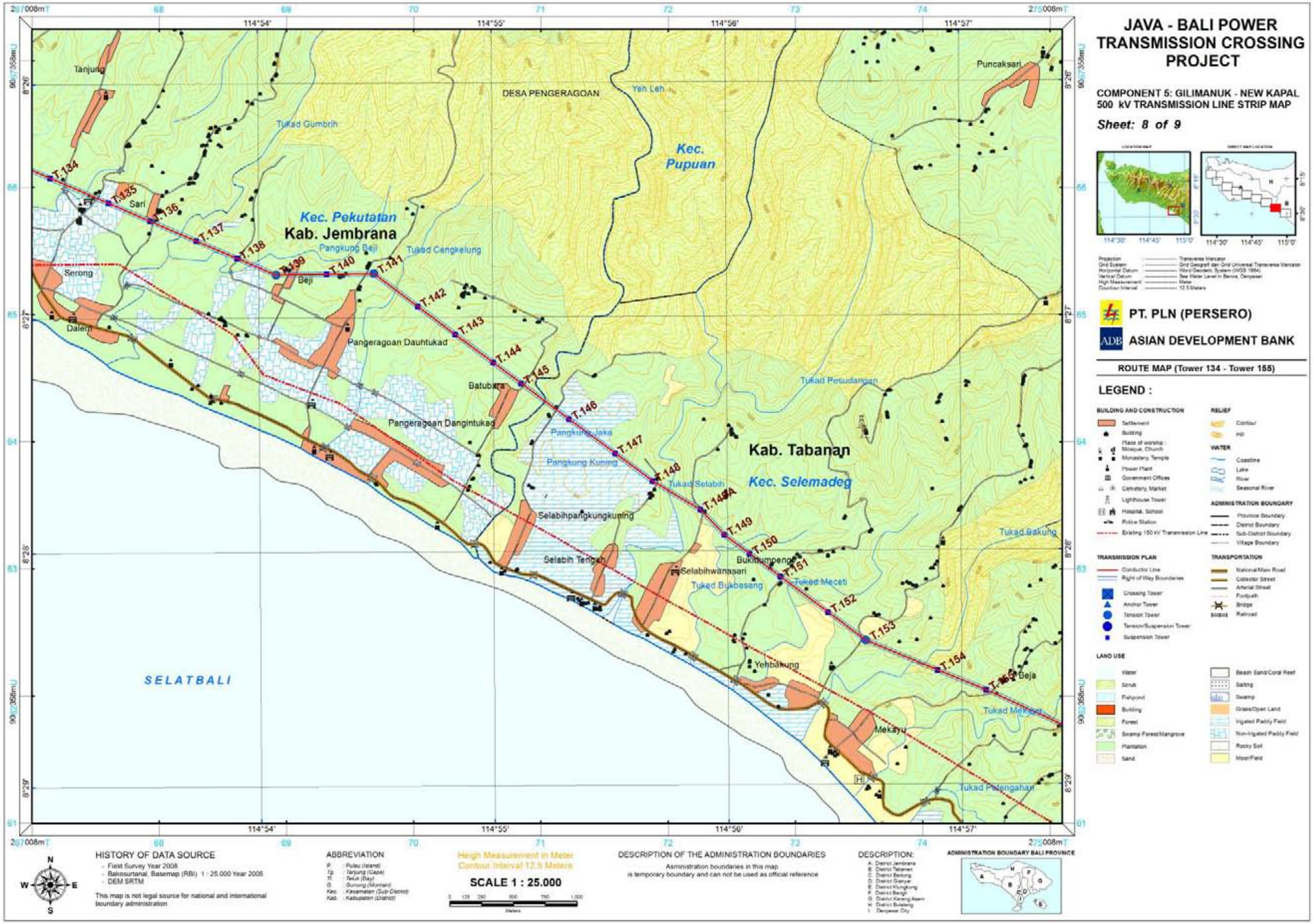
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 8 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 134 - Tower 155)
LEGEND :
Kab. Jembrana
Kec. Pekutatan
Kec. Pupuan
Kab. Tabanan
Kec. Selemadeg
SELATBALI
DESA PENGERAGOAN
Tanjung
Sari
Serong
Dalem
Beji
Pangeragoan Dauhtukad
Pangeragoan Dangintukad
Batubara
Selabihpangkungkuning
Selabih Tengah
Selabihwanasari
Bukitumpeng
Yehbakung
Mekayu
Beja
Puncaksari
Tukad Gumbrih
Tukad Cengkelung
Pangkung Beji
Yeh Leh
Tukad Pesudangan
Pangkung Jaka
Pangkung Kuning
Tukad Selabih
Tukad Bukbasang
Tukad Meceti
Tukad Bakung
Tukad Mekayu
Tukad Pelengahan
T.134
T.135
T.136
T.137
T.138
T.139
T.140
T.141
T.142
T.143
T.144
T.145
T.146
T.147
T.148
T.149A
T.149
T.150
T.151
T.152
T.153
T.154
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2005
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
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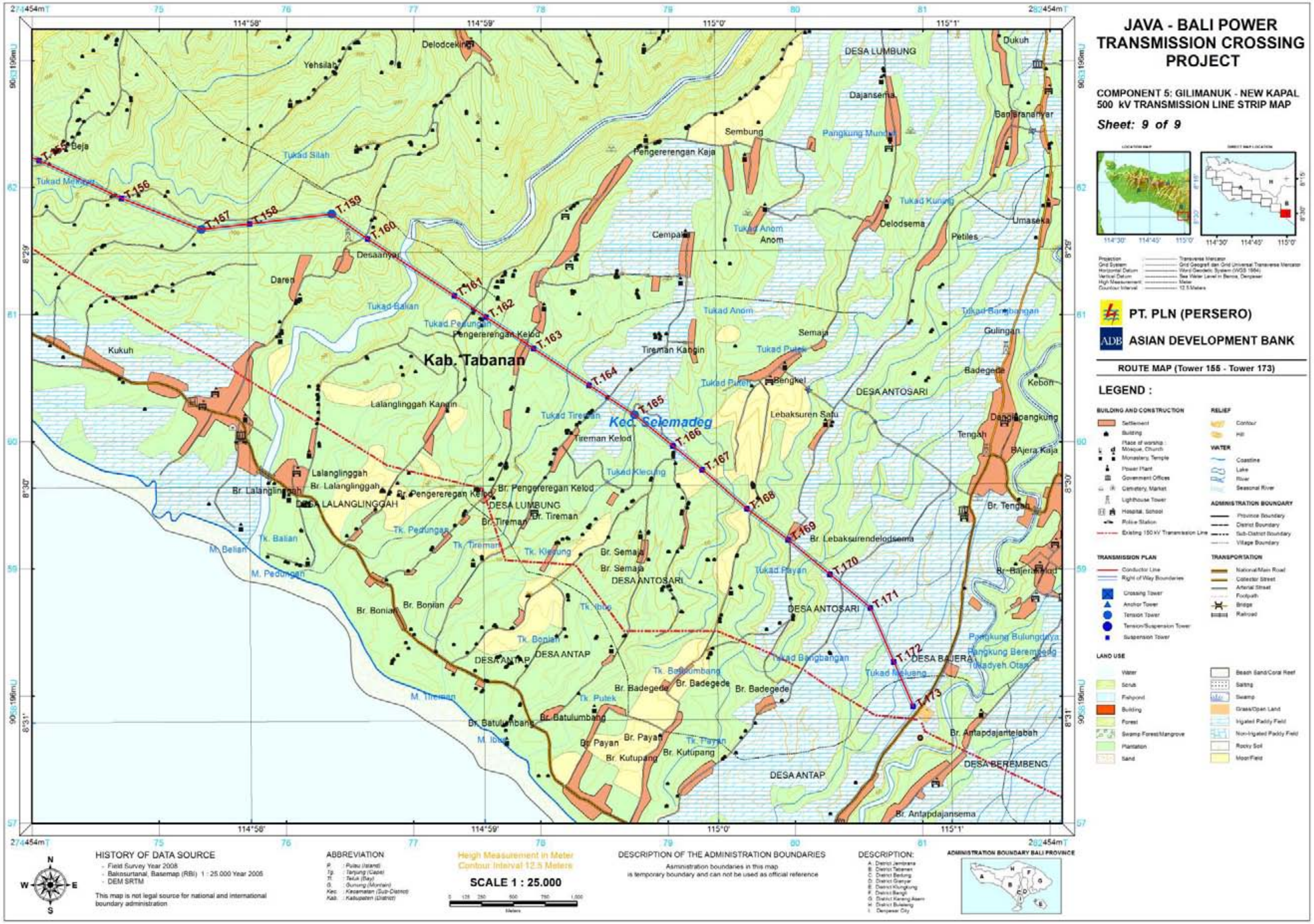
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE


JAVA - BALI POWER TRANSMISSION CROSSING PROJECT
COMPONENT 5: GILIMANUK - NEW KAPAL 500 kV TRANSMISSION LINE STRIP MAP
Sheet: 9 of 9
PT. PLN (PERSERO)
ASIAN DEVELOPMENT BANK
ROUTE MAP (Tower 155 - Tower 173)
LEGEND :
HISTORY OF DATA SOURCE
- Field Survey Year 2008
- Bakosurtanal, Basemap (RBI) 1 : 25.000 Year 2006
- DEM SRTM
This map is not legal source for national and international boundary administration
ABBREVIATION
Heigh Measurement in Meter
Contour Interval 12.5 Meters
SCALE 1 : 25.000
DESCRIPTION OF THE ADMINISTRATION BOUNDARIES
Administration boundaries in this map is temporary boundary and can not be used as official reference
DESCRIPTION:
ADMINISTRATION BOUNDARY BALI PROVINCE
Kab. Tabanan
Kec. Selemadeg
DESA LUMBUNG
DESA ANTOSARI
DESA LALANGLINGGAH
DESA ANTAP
DESA BAJERA
DESA BEREMBENG
T.155
T.156
T.157
T.158
T.159
T.160
T.161
T.162
T.163
T.164
T.165
T.166
T.167
T.168
T.169
T.170
T.171
T.172
T.173

Appendix 7: Detailed Features and Land Use along TL Alignment

(based on surveys undertaken by PLN and TA 7325 Consultant)

1. Paiton – Watudodol Section

NO	TOWER NUMBER	TOWER TYPE		ANGLES				FOUND. CLASS APPR.	ACT. SPAN	PROGRESSIVE DISTANCE	SPAN TENSION	EQUIV. SPAN	GROUND LEVEL	SPAN			CROSSING REMARKS	AREA TOWER	CONDITION OF TOWER LOCATION	WILAYAH ADMINISTRASI = ADMINITRATIVE ZONE		
														WEIGHT	WIND	WT/WD				DESA / KELURAHAN=VILLAGE	KECAMATAN = SUB-DISTRICT	KABUPATEN = DISTRICT
				°	'	"	L/R		(M)	(M)	(M)	(M)	(M)	(M)	(M)	-		(M2)				
01.	T.001	FF	+ 0					1	0.000	0.000			-		227.967	0.000		1764	Semak=bush/ Pohon Kesambi	Bhinar	Paiton	Probolinggo
02.	T.002	BB	+ 3	08	22	13	L	1	455.934	455.934	455.934	455.934	-	789.757	421.094	1.875	Semak =bush/ Pohon Kesambi=kesambi tree	1156	Semak =bush/ Pohon Kesambi	Bhinar	Paiton	Probolinggo
03.	T.003	AA	+ 6					1	386.254	842.188			-	383.918	496.758	0.773	Semak=bush / Pohon Kesambi=kesambi tree	784	Semak=bush/ Pohon	Bhinar	Paiton	Probolinggo
04.	T.004	AA	- 3					1	607.261	1,449.449			-	745.457	525.521	1.419	Sungai=river, Semak=buhs / Pohon Kesambi=kesambi tree	784	Semak=bush/ Pohon Kesambi	Banyuglugur	Banyuglugur	Situbondo
05.	T.005	AA	+ 0					1	443.780	1,893.229	2,799.737	484.116	-	373.896	466.311	0.802	Jalan Setapak=footpath, Semak / Pohon Kesambi=kesambi tree	784	Semak/ Pohon Kesambi	Banyuglugur	Banyuglugur	Situbondo
06.	T.006	AA	+ 0					1	488.842	2,382.071			-	434.244	481.641	0.902	Jalan = road, Semak = bush / Pohon Kesambi= kesambi tree, Pohon Jati = teak	784	Semak = bush /Pohon Jati =	Banyuglugur	Banyuglugur	Situbondo
07.	T.007	BB	- 3					1	474.439	2,856.510			-	258.818	436.800	0.593	Jalan Setapak = footpath, Sungai = river, Semak = bush / Pohon Kesambi = kesambi	1156	Semak = bush/ Pohon Kesambi	Banyuglugur	Banyuglugur	Situbondo
08.	T.008	CC	- 3	15	25	26	L	1	399.161	3,255.671			-	737.169	515.561	1.430	Sungai = river, Jalan Perhutani = Perhutani road, Semak - bush / Pohon Kesambi =	1156	Ladang = field	Banyuglugur	Banyuglugur	Situbondo
09.	T.009	AA	- 3					1	631.961	3,887.632			-	390.573	454.965	0.858	Sungai=river, Semak=bush / Pohon Kesambi=kesambi tree, Ladang=field	784	Semak = busxh/Pohon	Banyuglugur	Banyuglugur	Situbondo
10.	T.010	AA	+ 0					1	277.969	4,165.601	2,340.836	537.837	-	348.050	439.182	0.792	Sungai=river, Semak=bush / Pohon Kesambi=kesambi tree, Ladang=field	784	Semak/Pohon Kesambi	Banyuglugur	Banyuglugur	Situbondo
11.	T.011	AA	- 3					1	600.395	4,765.996			-	452.659	441.664	1.025	Jalan=road, Semak=bush / Pohon Kesambi=kesambi tree, Ladang=field,	784	Ladang = field	Banyuglugur	Banyuglugur	Situbondo
12.	T.012	AA	+ 0					1	282.932	5,048.928			-	414.682	415.256	0.999	Jalan Perhutani=Perhutani road, Semak=bush / Pohon Kesambi=kesambi	784	Ladang = field	Banyuglugur	Banyuglugur	Situbondo
13.	T.013	BB	+ 0	03	01	19	R	1	547.579	5,596.507			-	684.281	572.674	1.195	=river, Semak=bush / Pohon Kesambi=kesan	1156	Semak=bush/Pohon Kesambi =	Banyuglugur	Banyuglugur	Situbondo
14.	T.014	DD	- 3	32	31	53	R	1	597.769	6,194.276	597.769	597.769	-	199.921	386.909	0.517	Jalan Setapak=footpath, Sungai=river, Semak / Pohon Kesambi=kesambi tree	1521	Ladang = field	Banyuglugur	Banyuglugur	Situbondo
15.	T.015	BB	- 3					1	176.048	6,370.324			-	424.192	236.104	1.797	=field, Semak=bush / Pohon Kesambi=kesar	1156	Semak= bush/ Pohon Kesambi	Kalianget	Banyuglugur	Situbondo
16.	T.016	BB	- 3					1	296.159	6,666.483			-	219.638	334.967	0.656	Sungai=river, Semak=bush / Pohon Kesambi=kesambi tree	1156	Semak = bush/ Pohon Kesambi	Kalianget	Banyuglugur	Situbondo
17.	T.017	AA	- 3					1	373.774	7,040.257			-	487.472	479.880	1.016	Sungai=river, Semak=bush / Pohon Kesambi=kesambi tree	784	Semak = bush	Kalianget	Banyuglugur	Situbondo
18.	T.018	AA	- 3					1	585.985	7,626.242	6,619.152	422.863	-	422.479	380.860	1.109	Sungai=river, Semak-bush / Pohon Kesambi=kesambi tree	784	Semak = bush	Kalianget	Banyuglugur	Situbondo
19.	T.019	AA	- 3					1	175.734	7,801.976			-	402.306	383.180	1.050	Semak / Pohon Kesambi	784	Ladang=field	Kalianget	Banyuglugur	Situbondo
20.	T.020	AA	- 3					1	590.626	8,392.602			-	344.638	407.413	0.846	=river, Semak=bush / Pohon Kesambi=kesan	784	Semak = bush	Kalianget	Banyuglugur	Situbondo
21.	T.021	AA	- 3					1	224.200	8,616.802			-	469.490	302.621	1.551	Jalan-road, Semak=bush / Pohon Kesambi=kesambi tree, Ladang=field	784	Semak=bush/ Pohon Kesambi	Kalianget	Banyuglugur	Situbondo
22.	T.022	BB	+ 0					1	381.042	8,997.844			-	99.723	391.566	0.255	=river, Ladang=field, Sawah=rice field, Semak	1156	Ladang = field	Kalianget	Banyuglugur	Situbondo
23.	T.023	BB	- 3					1	402.089	9,399.933			-	573.384	315.871	1.815	=river, Semak=bush / Pohon Kesambi=kesan	1156	Ladang = field	Kalianget	Banyuglugur	Situbondo

									229.652	9,629.585	6,619.152	422.863					bush / **Pohon Kesambi=kesambi tree**, Lada					
24.	T.024	AA	**- 3**					1	363.211	9,992.796			-	303.660	296.432	1.024	Sungai=river, Semak=bush / **Pohon Kesambi=kesambi tree**, Ladang=field	784	Ladang = field	Kalianget	Banyuglugur	Situbondo
25.	T.025	AA	- 3					1	454.015	10,446.811			-	375.645	408.613	0.919	Sungai=river, Jalan=road, Semak=bush / **Pohon Kesambi=kesambi tree**,	784	Ladang = field	Kalianget	Banyuglugur	Situbondo
26.	**T.026**	**BB**	**- 3**					1	246.956	10,693.767			-	233.943	350.486	0.667	Sungai=river, Ladang=field, Semak=bush / **Pohon Kesambi=kesambi tree**	**1156**	Ladang = field	Kalianget	Banyuglugur	Situbondo
27.	T.027	AA	- 3					1	470.571	11,164.338			-	448.911	358.764	1.251	Sungai=river, Semak=bush / **Pohon Kesambi=kesambi tree**	784	Ladang = field	Kalianget	Banyuglugur	Situbondo
28.	T.028	AA	+ 6					7	437.345	11,601.683			-0.55	426.768	453.958	0.940	Sawah=rice field	784	Sawah - rice field	Lubawang	Banyuglugur	Situbondo
29.	T.029	AA	+ 0					7	402.659	12,004.342			0.90	398.618	420.002	0.949	Sungai-river, Jalan=road, Sawah=sawah	784	Sawah - rice field	Lubawang	Banyuglugur	Situbondo
30.	T.030	AA	- 3					7	428.901	12,433.243			0.85	410.336	415.780	0.987	Sungai=river, Sawah=rice field	784	Sawah - rice field	Lubawang	Banyuglugur	Situbondo
31.	T.031	AA	+ 0					7	380.185	12,813.428			0.60	393.985	404.543	0.974	Sawah=rice field	784	Sawah - rice field	Bloro	Besuki	Situbondo
32.	**T.032**	**CC**	**+ 0**	**27**	**23**	**34**	**L**	1	428.755	13,242.183	2,197.712	440.953	-	412.497	404.470	1.020	Jalan=road, sungai=river, Sawah=rice field	**1156**	Sawah - rice field	Bloro	Besuki	Situbondo
33.	T.033	AA	+ 0					1	431.365	13,673.548			-	437.693	430.060	1.018	Jalan=road, Sawah=rice	784	Sawah - rice field	Jatibanteng	Jatibanteng	Situbondo
34.	T.034	AA	+ 0					1	459.362	14,132.910			-	442.922	445.364	0.995	Jalan=road, Sawah=rice field	784	Sawah - rice field	Blimbing	Besuki	Situbondo
35.	T.035	AA	+ 3					1	466.415	14,599.325			-	476.901	462.889	1.030	Jalan setapak=footpath, Sawah=rice field	784	Sawah - rice field	Blimbing	Besuki	Situbondo
36.	T.036	AA	+ 3					1	411.815	15,011.140			-	462.112	439.115	1.052	Sawah=rice field	784	Sawah - rice field	Blimbing	Besuki	Situbondo
37.	**T.037**	**CC**	**- 3**	**25**	**33**	**54**	**L**	7	442.906	15,454.046	2,289.499	461.671	0.40	399.232	427.361	0.934	Sawah	**1156**	Sawah - rice field	Widoropayung	Besuki	Situbondo
38.	T.038	AA	+ 3					7	461.979	15,916.025			0.40	461.669	452.443	1.020	Sungai=river, Jalan=road, Sawah=rice field	784	Sawah - rice field	Jetis	Besuki	Situbondo
39.	T.039	AA	+ 6					1	498.757	16,414.782			-	486.942	480.368	1.014	Sawah=rice field	784	Sawah - rice field	Jetis	Besuki	Situbondo
40.	T.040	AA	+ 6					1	484.716	16,899.498			-	486.995	491.737	0.990	**gai Deluwang=Deluwang river**, Sawah=rice f	784	Sawah - rice field	Jetis	Besuki	Situbondo
41.	T.041	AA	+ 0					1	401.141	17,300.639			-	379.520	442.929	0.857	Jalan=road, Sawah=rice field	784	Sawah - rice field	Dawuhan	Suboh	Situbondo
42.	**T.042**	**BB**	**+ 6**	**04**	**54**	**18**	**L**	1	447.011	17,747.650	1,774.595	446.941	-	517.076	424.076	1.219	Sungai=river, Sawah=rice field	**1156**	Sawah - rice field	Dawuhan	Suboh	Situbondo
43.	T.043	AA	- 3					1	391.072	18,138.722			-	369.434	419.042	0.882	=road, **Kampung=kampong,** Sawah=rice	784	Sawah - rice field	Gunungmalang	Suboh	Situbondo
44.	T.044	AA	+ 0					1	466.197	18,604.919			-	459.521	428.635	1.072	Sawah=rice field	784	Sawah - rice field	Gunungmalang	Suboh	Situbondo
45.	T.045	AA	+ 6					1	470.315	19,075.234			-	460.670	468.256	0.984	**Kampung-kampong**, Sungai=river, Sawah=rice field	784	Sawah - rice field	Suboh	Suboh	Situbondo
46.	**T.046**	**CC**	**+ 0**	**28**	**58**	**07**	**R**	1	425.365	19,500.599	**2,583.379**	**430.943**	-	473.991	447.840	1.058	Jalan-road, sungai=river, Sawah=rice field	**1156**	Sawah - rice field	Gunungputri	Suboh	Situbondo
47.	T.047	AA	+ 0					1					-	406.774	427.955	0.951		784	Sawah - rice field	Gunungputri	Suboh	Situbondo

48.	T.048	AA	+ 0					7	430.544	19,931.143	**2,583.379**	**430.943**	1.20	414.272	430.527	0.962	Sawah=rice field	784	Sawah= rice field	Selomukti	Mlandingan	Situbondo
49.	T.049	AA	+ 0					1	430.510	20,361.653			-	431.191	430.510	1.002	Sawah=rice field	784	Semak = bush	Selomukti	Mlandingan	Situbondo
50.	T.050	AA	+ 0					1	430.510	20,792.163			-	438.727	440.599	0.996	Sungai=river, Sawah=rice field	784	Sawah= rice field	Selomukti	Mlandingan	Situbondo
51.	T.051	AA	+ 0					1	450.687	21,242.850			-	440.975	433.225	1.018	Sawah=rice field	784	Sawah= rice field	Selomukti	Mlandingan	Situbondo
52.	**T.052**	**CC**	**- 3**	**16**	**04**	**12**	**R**	7	415.763	21,658.613			0.40	366.274	386.451	0.948	Jalan=road, Sungai=river, Sawah=sawah	**1156**	Sawah= rice field	Selomukti	Mlandingan	Situbondo
53.	T.053	AA	- 3					7	357.138	22,015.751	**1,623.315**	**408.908**	1.20	379.310	386.833	0.981	Jalan=road, Sungai=river, Sawah=rice field	784	Sawah= rice field	Sumberpinang	Mlandingan	Situbondo
54.	T.054	AA	+ 0					1	416.528	22,432.279			-	421.467	415.539	1.014	Sawah=rice field	784	Sawah= rice field	Sumberpinang	Mlandingan	Situbondo
55.	T.055	AA	+ 3					2	414.549	22,846.828			-	434.226	424.825	1.022	Jalan=road, Sungai=river, **Kampung=kampong**, Sawah=rice field	784	Sawah= rice field	Sumberpinang	Mlandingan	Situbondo
56.	**T.056**	**CC**	**+ 3**	**21**	**15**	**49**	**L**	7	435.100	23,281.928			4.80	448.030	466.742	0.960	Jalan=road, Sungai=river, Kampung=kampong, Sawah=rice field	**1156**	Sawah= rice field	Sumberpinang	Mlandingan	Situbondo
57.	T.057	AA	- 3					1	498.383	23,780.311	**2,553.245**	**431.819**	-	439.118	425.000	1.033	Sungai=river, Sawah=rice field	784	Sawah= rice field	Trebungan	Mlandingan	Situbondo
58.	T.058	AA	- 3					1	351.616	24,131.927			-	437.991	388.308	1.128	Sawah=rice field	784	Ladang=field	Trebungan	Mlandingan	Situbondo
59.	T.059	AA	- 3					1	424.999	24,556.926			-	329.961	424.999	0.776	Sungai=river, Sawah=rice field	784	Sawah= rice field	Trebungan	Mlandingan	Situbondo
60.	T.060	AA	+ 3					1	424.999	24,981.925			-	447.028	424.999	1.052	Sungai=river, Sawah=rice field	784	Sawah= rice field	Trebungan	Mlandingan	Situbondo
61.	T.061	AA	+ 3					1	424.999	25,406.924			-	477.583	426.624	1.119	**=kampong**, Jalan=road, Sungai=river, Sawa	784	Sawah= rice field	Selowogo	Bungatan	Situbondo
62.	**T.062**	**DD**	**+ 3**	**58**	**13**	**19**	**L**	1	428.249	25,835.173			-	478.620	452.325	1.058	**Kampung=kampong**, Sawah=rice field	**1521**	Sawah= rice field	Selowogo	Bungatan	Situbondo
63.	T.063	AA	+ 3					1	476.400	26,311.573	**1,905.948**	**476.487**	-	456.741	476.400	0.959	Jalan=road, Sawah=rice field	784	Sawah= rice field	Selowogo	Bungatan	Situbondo
64.	T.064	AA	+ 3					2	476.400	26,787.973			-	446.731	476.487	0.938	**pung=kampong,** Jalan=road, Sawah=rice	784	Sawah= rice field	Selowogo	Bungatan	Situbondo
65.	T.065	AA	+ 6					3	476.574	27,264.547			-	493.984	476.574	1.037	Sawah=rice field	784	Sawah= rice field	Selowogo	Bungatan	Situbondo
66.	**T.066**	**DD**	**+ 6**	**36**	**49**	**56**	**L**	5	476.574	27,741.121			-	468.692	460.255	1.018	Jalan=road, Sungai=river, Sawah=rice field	**1521**	Sawah= rice field	Selowogo	Bungatan	Situbondo
67.	T.067	AA	+ 0					1	443.935	28,185.056	**3,002.000**	**429.079**	-	427.007	436.871	0.977	Sungai=river, Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
68.	T.068	AA	+ 0					1	429.807	28,614.863			-	439.864	430.374	1.022	Jalan=road, Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
69.	T.069	AA	- 3					1	430.941	29,045.804			-	406.400	427.097	0.952	Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
70.	T.070	AA	+ 0					1	423.252	29,469.056			-	431.232	421.756	1.022	Jalan=road, Sungai=river, Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
71.	T.071	AA	+ 0					2	420.259	29,889.315			5.80	426.631	427.063	0.999	Jalan=road, Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo

72.	T.072	AA	+ 0					1	433.867	30,323.182	3,002.000	429.079	-	436.883	426.903	1.023	Sawah=rice field	784	Sawah= rice field	Bungatan	Bungatan	Situbondo
73.	T.073	CC	- 3	23	38	53	R	1	419.939	30,743.121	2,235.807	456.454	\-	397.410	403.249	0.986	Jalan=road	1156	Sawah= rice field	Bungatan	Bungatan	Situbondo
74.	T.074	AA	- 3					1	386.559	31,129.680			-	342.474	382.479	0.895	Sungai=river	784	Ladang=field	Pasirputih	Bungatan	Situbondo
75.	T.075	AA	+ 6					1	378.398	31,508.078			-	462.302	434.068	1.065	Sawah=rice field, Ladang=field	784	Ladang=field	Pasirputih	Bungatan	Situbondo
76.	T.076	AA	+ 6					7	489.737	31,997.815			2.50	497.031	495.425	1.003	h=school, Kampung=kampong, Ladang=fiel	784	Sawah= rice field	Pasirputih	Bungatan	Situbondo
77.	T.077	AA	+ 6					7	501.113	32,498.928			2.50	496.491	490.557	1.012	Sawah=rice field	784	Semak=bush/Pohon	Pasirputih	Bungatan	Situbondo
78.	T.078	CC	+ 3	21	40	30	R	2	480.000	32,978.928	1,592.593	418.411	-	312.880	415.026	0.754	=road, Kampung=kampong, Sawah=rice	1156	Semak=bush	Pasirputih	Bungatan	Situbondo
79.	T.079	AA	- 3					1	350.052	33,328.980			-	459.648	356.085	1.291	Sungai=river, Semak=bush, Ladang=field	784	Ladang=field	Pasirputih	Bungatan	Situbondo
80.	T.080	AA	- 3					1	362.118	33,691.098			-	452.577	442.234	1.023	Semak=bush, Pohon Kesambi=kesambi tree	784	Semak=bush/Pohon	Pasirputih	Bungatan	Situbondo
81.	T.081	AA	+ 0					1	522.349	34,213.447			-	328.292	440.212	0.746	Sungai=river, Pohon Jati=teak tree	784	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
82.	T.082	CC	+ 9	18	12	44	R	1	358.074	34,571.521	2,242.974	463.963	-	523.628	449.892	1.164	Pohon Jati=teak tree	1156	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
83.	T.083	AA	+ 9					1	541.710	35,113.231			-	349.094	440.543	0.792	Sungai=river, Pohon Jati=teak tree	784	Semak=bush/ Pohon	Pasirputih	Bungatan	Situbondo
84.	T.084	AA	- 3					1	339.375	35,452.606			-	467.296	393.385	1.188	n Kesambi=kesambi tree, Pohon Jati=teak	784	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
85.	T.085	AA	- 3					1	447.394	35,900.000			-	471.545	433.169	1.089	Sungai=river, Pohon Jati=teak tree	784	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
86.	T.086	AA	- 3					1	418.944	36,318.944			-	593.327	457.248	1.298	Sungai=river, Pohon Jati=teak tree	784	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
87.	T.087	CC	- 3	23	48	41	R	1	495.551	36,814.495	1,478.579	402.346	-	390.039	494.176	0.789	ngai=river, Semak=bush/ Pohon Jati=teak tr	1156	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
88.	T.088	AA	+ 0					1	492.800	37,307.295			-	424.570	492.800	0.862	Sungai=river, Pohon Jati=teak tree	784	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
89.	T.089	AA	- 3					1	492.800	37,800.095			-	417.430	492.890	0.847	Sungai=river, Pohon Jati=teak tree	784	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
90.	T.090	CC	+ 0	23	03	24	R	1	492.979	38,293.074	2,984.556	399.652	-	562.063	458.588	1.226	Semak=bush, Pohon Jati=teak tree	1156	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
91.	T.091	AA	- 3					1	424.197	38,717.271			-	433.260	406.168	1.067	Sungai=river, Pohon Jati=teak tree	784	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
92.	T.092	AA	- 3					1	388.138	39,105.409			-	257.215	377.868	0.681	Semak=bush, Pohon Jati=teak tree	784	Semak=bush/Pohon Jati=teak	Pasirputih	Bungatan	Situbondo
93.	T.093	AA	- 3					1	367.597	39,473.006			-	446.744	423.056	1.056	ai=river, Pohon Jati=teak tree Pohon Turi=tu	784	Semak=bush/ Pohon Turi=turi	Pasirputih	Bungatan	Situbondo
94.	T.094	AA	- 3					1	478.514	39,951.520			-	355.481	366.086	0.971	Sungai=river, Pohon Turi=turi tree	784	Semak=bush/ Pohon Turi=turi	Klatakan	Kendit	Situbondo
95.	T.095	AA	- 3					1	253.658	40,205.178			-	277.672	324.953	0.855	Semak=bush, Pohon Turi=turi tree	784	Semak=bush/ Pohon Turi=turi	Klatakan	Kendit	Situbondo

96.	T.096	AA	- 3					1	396.247	40,601.425	2,984.556	399.652	-	439.315	309.686	1.419	Sungai=river, Turi=turi tree, **Pohon Jati=teak tree**	784	**Semakbush/Pohon Jati=teak**	Klatakan	Kendit	Situbondo
97.	T.097	AA	- 3					1	223.125	40,824.550			-	432.872	338.103	1.280	**Pohon Jati=teak tree, Pohon Kesambi=kesambi tree**	784	**Semak=bush/ Pohon**	Klatakan	Kendit	Situbondo
98.	**T.098**	**BB**	**- 3**	**02**	**33**	**03**	**L**	1	453.080	41,277.630			-	632.573	461.024	1.372	Sungai=river, **Pohon Kesambi=kesambi tree**	**1156**	**Semak=bush/ Pohon**	Klatakan	Kendit	Situbondo
99.	**T.099**	**BB**	**+ 9**					1	468.967	41,746.597	2,351.177	470.360	-	105.762	472.681	0.224	Sungai=river, Ladang=field, **Pohon Kesambi=kesambi tree**	**1156**	Ladang=field	Klatakan	Kendit	Situbondo
100.	**T.100**	**BB**	**+ 9**					1	476.395	42,222.992			-	831.127	471.234	1.764	Sungai=river, Ladang=field, **Pohon Jati=teak tree**	**1156**	**Semak=bush/Pohon Jati=teak**	Klatakan	Kendit	Situbondo
101.	**T.101**	**BB**	**+ 12**					1	466.073	42,689.065			-	235.290	472.127	0.498	Sungai=river, **Pohon Jati=teak tree**	**1156**	**Semak=bush/Pohon Jati=teak**	Klatakan	Kendit	Situbondo
102.	T.102	AA	+ 6					1	478.181	43,167.246			-	454.536	469.871	0.967	Sungai=river, Jalan=road, Ladang=field, **Pohon Jati=teak tree**	784	Kebun Tebu = sugar cane	Klatakan	Kendit	Situbondo
103.	**T.103**	**BB**	**+ 6**	**03**	**06**	**30**	**R**	7	461.561	43,628.807			4.00	430.179	449.185	0.958	alan=road, Ladang=field, **Pohon Jati=teak tre**	**1156**	**Semak=bush/Pohon Jati=teak**	Klatakan	Kendit	Situbondo
104.	T.104	AA	+ 6					2	436.808	44,065.615	879.724	439.894	-	494.328	439.862	1.124	**on Jati=teak tree, Pohon Kesambi=kesambi**	784	**Semak=bush/ Pohon Kesambi**	Klatakan	Kendit	Situbondo
105.	**T.105**	**BB**	**+ 0**	**09**	**52**	**12**	**R**	1	442.916	44,508.531			-	393.333	436.615	0.901	Sungai=river, Jalan=road, **Pohon Kesambi=kesambi tree**	**1156**	**Semak=bush/ Pohon**	Klatakan	Kendit	Situbondo
106.	T.106	AA	+ 0					2	430.313	44,938.844	6,681.553	448.739	-	446.062	439.335	1.015	Jalan=road, **Pohon Kesambi=kesambi tree, Pohon Jati=teak tree**	784	**Semak=semak/ Pohon Jati=teak**	Klatakan	Kendit	Situbondo
107.	T.107	AA	+ 0					1	448.356	45,387.200			-	448.589	450.002	0.997	**Pohon Jati=teak tree**, Ladang=field	784	Ladang=field	Klatakan	Kendit	Situbondo
108.	T.108	AA	+ 0					7	451.647	45,838.847			1.00	450.809	450.829	1.000	Jalan=road, Ladang=field, Sawah=rice field	784	Sawah=rice field	Klatakan	Kendit	Situbondo
109.	T.109	AA	+ 0					1	450.010	46,288.857			-	419.766	430.195	0.976	Sawah=rice field, Ladang=field	784	Ladang=field	Klatakan	Kendit	Situbondo
110.	T.110	AA	+ 3					7	410.379	46,699.236			1.40	457.870	447.330	1.024	Jalan=road, Ladang=field	784	Ladang=field	Klatakan	Kendit	Situbondo
111.	T.111	AA	+ 3					6	484.280	47,183.516			1.40	472.243	473.517	0.997	Sungai=river, Ladang=field, Sawah=rice field	784	Sawah=rice field	Kendit	Kendit	Situbondo
112.	T.112	AA	+ 3					6	462.754	47,646.270			2.00	472.364	478.567	0.987	Jalan=road, Sungai=river, Sawah=rice field	784	Sawah=rice field	Kilensari	Panarukan	Situbondo
113.	T.113	AA	+ 6					7	494.380	48,140.650			4.00	455.786	425.005	1.072	Jalan=road, Sungai=river, Sawah=rice field	784	Kebun=field	Kilensari	Panarukan	Situbondo
114.	T.114	AA	+ 0					6	355.629	48,496.279			-	370.785	392.817	0.944	Sawah=rice field, Ladang=field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
115.	T.115	AA	+ 0					6	430.004	48,926.283			0.20	430.584	428.503	1.005	Sawah=rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
116.	T.116	AA	+ 0					7	427.001	49,353.284			5.00	427.577	443.004	0.965	Sawah=rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
117.	T.117	AA	+ 3					7	459.007	49,812.291			4.00	472.905	462.505	1.022	Sawah=rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
118.	T.118	AA	+ 3					7	466.002	50,278.293			2.80	474.319	461.393	1.028	Jalan=road, Sawah=rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo
119.	T.119	AA	+ 0					7	456.784	50,735.077			3.40	404.927	455.896	0.888	Sawah = rice field	784	Sawah=rice field	Paowan	Panarukan	Situbondo

120.	**T.120**	**CC**	**+ 0**	**22**	**57**	**37**	**L**	1	455.007	51,190.084	**6,681.553**	**448.739**	-	483.545	437.881	1.104	Jalan=road, Ladang=field, Sawah=rice field	**1156**	**bu=sugar cane**	Paowan	Panarukan	Situbondo
121.	T.121	AA	- 3					7	420.754	51,610.838	**4,703.240**	**430.994**	0.10	394.035	439.432	0.897	Sungai=river, Sawah=rice field	784	Sawah = rice field	Paowan	Panarukan	Situbondo
122.	T.122	AA	+ 0					7	458.109	52,068.947			1.00	456.663	458.091	0.997	Jalan Setapak=footpath, Sawah=rice field, Semak=bush/ **Pohon Jati=teak tree**	784	**Semak=bush/Pohon Jati=teak**	Paowan	Panarukan	Situbondo
123.	T.123	AA	- 3					1	458.072	52,527.019			-	495.896	431.819	1.148	ngai=river, Semak=bush/ **Pohon Jati=teak tr**	784	**Semak=bush/Pohon Jati=teak**	Paowan	Panarukan	Situbondo
124.	T.124	AA	+ 6					1	405.566	52,932.585			-	407.899	435.523	0.937	h, **Pohon Jati=teak tree, Pohon Kesambi=ke**	784	**Semak=bush/Pohon**	Paowan	Panarukan	Situbondo
125.	T.125	AA	+ 6					1	465.479	53,398.064			-	451.942	412.840	1.095	ver, Jalan=road, **Kampung=kampong,** Lad	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
126.	T.126	AA	- 3					1	360.201	53,758.265			-	341.176	388.715	0.878	Sungai=river, Ladang=field	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
127.	T.127	AA	+ 0					1	417.228	54,175.493			-	340.140	409.680	0.830	Sungai=river, Ladang=field	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
128.	T.128	AA	- 3					1	402.132	54,577.625			-	489.106	410.486	1.192	Jalan=road, Ladang=field	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
129.	T.129	AA	- 3					1	418.839	54,996.464			-	375.807	443.861	0.847	ungai=river, Semak=bush/ Pohon Turi=turi tre	784	Semak=bush/ Pohon Turi=turi	Sumberkalak	Panarukan	Situbondo
130.	T.130	AA	+ 6					1	468.882	55,465.346			-	426.005	448.430	0.950	Jalan Setapak=footpath, Sungai=river, Ladang=field	784	Ladang=field	Sumberkalak	Panarukan	Situbondo
131.	**T.131**	**BB**	**+ 9**	**01**	**22**	**42**	**R**	1	427.978	55,893.324			-	740.111	445.170	1.663	Jalan Setapak, Kebun, Ladang	**1156**	**Tb. Batu Kapur = limestone**	Kotakan	Situbondo	Situbondo
132.	**T.132**	**BB**	**+ 0**					1	462.361	56,355.685	**1,410.085**	**401.213**	-	145.987	432.805	0.337	Jalan, Ladang	**1156**	Ladang=field	Kotakan	Situbondo	Situbondo
133.	T.133	AA	- 3					1	403.249	56,758.934			-	530.494	473.862	1.120	Jalan, **Kampung**, Sungai, Ladang	784	Ladang=field	Kotakan	Situbondo	Situbondo
134.	**T.134**	**CC**	**- 3**	**11**	**07**	**34**	**L**	1	544.475	57,303.409			-	473.978	503.260	0.942	Sungai, Ladang	**1156**	Tnh. Kosong=empty	Sliwung	Panji	Situbondo
135.	**T.135**	**BB**	**+ 9**	**06**	**20**	**47**	**R**	1	462.044	57,765.453	**462.044**	**462.044**	-	399.842	339.510	1.178	Jalan, Sungai, Ladang	**1156**	Tnh. Kosong / Rumput=grass	Adirejo	Panji	Situbondo
136.	T.136	AA	+ 3					1	216.975	57,982.428	**5,084.184**	**444.698**	-	336.646	266.978	1.261	**SUTT 150 kV Bondowoso - Situbondo**	784	Ladang=field	Adirejo	Panji	Situbondo
137.	**T.137**	**BB**	**- 3**					1	316.981	58,299.409			-	263.517	385.878	0.683	Sungai=river, Ladang=field	**1156**	Ladang=field	Battal	Panji	Situbondo
138.	T.138	AA	+ 3					1	454.775	58,754.184			-	621.877	464.917	1.338	Jalan Setapak=footpath, Ladang=field	784	Ladang=field	Panji Kidul	Panji	Situbondo
139.	T.139	AA	+ 9					1	475.058	59,229.242			-	349.025	479.652	0.728	Jalan=road, Ladang=field	784	Ladang=field	Battal	Panji	Situbondo
140.	T.140	AA	+ 12					1	484.246	59,713.488			-	505.234	469.532	1.076	Jalan Setapak=footpath, **Kampung-kampong**, Sungai=river, Ladang=field,	784	Ladang=field	Klampokan	Panji	Situbondo
141.	T.141	AA	+ 6					1	454.818	60,168.306			-	426.495	447.446	0.953	Jalan=road, Ladang=field, Sawah=rice field	784	Ladang=field	Klampokan	Panji	Situbondo
142.	T.142	AA	+ 3					1	440.074	60,608.380			-	471.707	436.391	1.081	Ladang=field	784	Ladang=field	Klampokan	Panji	Situbondo
143.	T.143	AA	+ 3					1	432.708	61,041.088			-	398.273	440.989	0.903	Jalan=road, Ladang=field	784	Ladang=field	Klampokan	Panji	Situbondo

144.	T.144	AA	- 3					1	449.270	61,490.358	5,084.184	444.698	-	495.921	459.138	1.080	Sungai=river, Ladang=field	784	Ladang=fied	Curahcotok	Kapongan	Situbondo
145.	T.145	AA	+ 3					1	469.005	61,959.363			-	466.387	498.078	0.936	Sungai=river, Ladang=field	784	Ladang=fied	Curahcotok	Kapongan	Situbondo
146.	T.146	AA	- 3					1	527.150	62,486.513			-	526.916	445.137	1.184	Sungai=river, Jalan=road, Ladang=field	784	Ladang=fied	Kandang	Kapongan	Situbondo
147.	**T.147**	**BB**	**+ 0**	**09**	**10**	**10**	**R**	1	363.124	62,849.637			-	400.268	440.121	0.909	Jalan=road, Ladang=field	**1156**	Ladang=fied	Kandang	Kapongan	Situbondo
148.	T.148	AA	- 3					1	517.118	63,366.755	803.422	448.696	-	298.838	401.711	0.744	Sungai=river, Ladang=field, Sawah=rice field	784	Sawah =rice field	Kandang	Kapongan	Situbondo
149.	**T.149**	**BB**	**+ 9**	**07**	**55**	**17**	**L**	1	286.304	63,653.059			-	505.614	434.160	1.165	Ladang=field, Sawah=rice field	**1156**	Ladang=fied	Kandang	Kapongan	Situbondo
150.	T.150	AA	+ 9					1	582.015	64,235.074	4,754.197	447.881	-	532.297	471.082	1.130	ngai=river, Jalan Setapak=footpath, Ladang=fi	784	Ladang=fied	Kandang	Kapongan	Situbondo
151.	T.151	AA	+ 0					1	360.148	64,595.222			-	320.240	402.310	0.796	Jalan=road, Ladang=field	784	Ladang=fied	Kandang	Kapongan	Situbondo
152.	T.152	AA	+ 3					1	444.471	65,039.693			-	453.525	453.434	1.000	Sungai=river, Ladang=field	784	Tnh. Kosong / Rumput=grass	Kandang	Kapongan	Situbondo
153.	T.153	AA	+ 0					1	462.396	65,502.089			-	437.434	457.248	0.957	Sungai=river, Ladang=field	784	Tnh. Kosong / Rumput=grass	Kandang	Kapongan	Situbondo
154.	T.154	AA	- 3					1	452.100	65,954.189			-	528.714	436.821	1.210	an Setapak=footpath, Sungai=river, Ladang=fi	784	Ladang=fied	Sletreng	Kapongan	Situbondo
155.	T.155	AA	- 3					1	421.542	66,375.731			-	346.084	361.125	0.958	Sungai=river, Ladang=field	784	Ladang=fied	Sletreng	Kapongan	Situbondo
156.	T.156	AA	- 3					1	300.708	66,676.439			-	311.870	351.380	0.888	Jalan=road, Ladang=field	784	Ladang=fied	Sletreng	Kapongan	Situbondo
157.	T.157	AA	+ 0					1	402.052	67,078.491			-	440.152	403.478	1.091	Sungai=river, Ladang=field	784	Ladang=fied	Sletreng	Kapongan	Situbondo
158.	T.158	AA	+ 3					1	404.904	67,483.395			-	424.983	436.815	0.973	Jalan=road, Ladang=field	784	**Kebun Mangga=man**	Sletreng	Kapongan	Situbondo
159.	T.159	AA	+ 3					1	468.726	67,952.121			-	474.676	461.931	1.028	ai=river, Jalan=road, Ladang=field, Kebun=ga	784	Ladang=fied	Arjasa	Arjasa	Situbondo
160.	**T.160**	**DD**	+3	**31**	**11**	**08**	**R**	1	455.135	68,407.256			-		441.328	0.000	Jalan=road, Ladang=field	1521	Ladang=fied	Arjasa	Arjasa	Situbondo
161.	T.161	AA	+ 3					1	427.52	68,834.776	5,237.140	441.430	-	338.430	374.880	0.903	Jalan Aspal&Rumah=asphal road & houses	784	Belukar=shrub	Arjasa	Arjasa	Situbondo
162.	T.162	AA	+ 0					1	322.24	69,157.016			-	461.620	404.530	1.141	Jalan Tanah=dirt road	784	Belukar=shrub	Korun	Arjasa	Situbondo
163.	T.163	AA	+ 3					1	486.82	69,643.836			-	432.350	450.200	0.960	Curah=ravine	784	langga=mango p	Lamongan	Arjasa	Situbondo
164.	T.164	AA	+ 3					1	413.58	70,057.416			-	409.260	436.705	0.937	Curah=ravine	784	langga=mango p	Lamongan	Arjasa	Situbondo
165.	T.165	AA	+9					1	459.83	70,517.246			-	507.44	458.050	1.108	Jalan Tanah=dirt road	784	langga=mango p	Lamongan	Arjasa	Situbondo
166.	T.166	AA	+3					1	456.27	70,973.516			-	423.28	458.100	0.924	Curah=ravine	784	ebu=sugar cane p	Bukolan	Arjasa	Situbondo
167.	T.167	AA	+3					1	459.93	71,433.446			-	449.08	229.965	1.953		784	Kebun Tebu&Cabe=su	Bukolan	Arjasa	Situbondo

168.	T.168	AA	+3					1	430.43	71,863,876			-	442.90	447.530	0.990		784	Kebun Tebu&Sawah=s	Tegalsari	Arjasa	Situbondo
169.	T.169	AA	+6					1	464.63	72,328.506			-	476.87	454.520	1.049	Sungai=river,Jalan Aspal=asphalt road	784	Sawah&Kebun Cabe=rice &	Kedungdowo	Arjasa	Situbondo
170.	T.170	AA	+3					1	444.41	72,772.916	5,237.140	441.430	-	419.60	439.955	0.954	Sungai=river	784	Sawah=rice field	Kedungdowo	Arjasa	Situbondo
171.	T.171	AA	+3					1	435.5	73,208.416			-	443.14	435.740	1.017	Jalan Aspal=asphalt road	**784**	Sawah=rice field	Baltok	Arjasa	Situbondo
172.	T.172	DD	+3	54	50	21	L	1	435.98	73,644.396			-	449.84	441.870	1.018	Sungai=river	1521	Kebun Cabe&Sawah=c	Baltok	Arjasa	Situbondo
173.	T.173	AA	+0					1	447.76	74,092.156			-	425.53	451.620	0.942	Sungai=river	**784**	Sawah=rice field	Bukolmanis	Jangkar	Situbondo
174.	T.174	AA	+6					1	455.48	74,547.636			-	499.21	471.915	1.058	Sungai =river	784	Sawah=rice field	Sopet	Jangkar	Situbondo
175.	T.175	AA	+3					1	488.35	75,035.986			-	445.29	447.385	0.995	Sungai=river	784	ebu=sugar cane p	Sopet	Jangkar	Situbondo
176.	T.176	AA	+0					1	406.42	75,442.406	3,450.280	438.503	-	399.99	428.710	0.933		784	Kebun Jagung	Pariaan	Jangkar	Situbondo
177.	T.177	AA	+6					1	451.00	75,893.406			-	490.57	451.510	1.087	Jalan Aspal=asphalt road	784	Kebun Jagung&Sawah	Pariaan	Jangkar	Situbondo
178.	T.178	AA	+0					1	452.02	76,345.426			-	425.71	439.855	0.968		784	Belukar=shrub	Pariaan	Jangkar	Situbondo
179.	T.179	AA	+0					2	427.69	76,773.116			-	365.71	374.625	0.976	Sungai=river	784	ebu=sugar cane p	Mojosari	Jangkar	Situbondo
180.	T.180	DD	+0	49	13	30	L	5	321.56	77,094.676			-	377.20	388.080	0.972	Jalan Aspal-asphalt road	1521	Sawah=rice field	Mojosari	Jangkar	Situbondo
181.	T.181	AA	+3					2	454.60	77,549.276			-	461.66	453.510	1.018		784	Sawah=rice field	Trigonco	Asembagus	Situbondo
182.	T.182	AA	+3					1	452.42	78,001.696			-	457.61	461.740	0.991	Sungai=river	784	ebu=sugar cane p	Mojosari	Jangkar	Situbondo
183.	T.183	AA	+6					1	471.06	78,472.756			-	491.65	472.625	1.040	Sungai=river	784	ebu=sugar cane p	Mojosari	Jangkar	Situbondo
184.	T.184	AA	+6					1	474.19	78,946.946			-	455.35	472.505	0.964	Jalan Aspal=asphalt road	784	ebu=sugar cane p	Raasan	Asembagus	Situbondo
185.	T.185	AA	+6					1	470.82	79,417.766			-	504.02	472.715	1.066	ng=kampong road,Rel Kereta Api&Sungai=ri	784	Sawah=rice field	Parante	Asembagus	Situbondo
186.	T.186	AA	+0					2	474.61	79,892.376	8396.010	479.702	-	427.73	470.265	0.910	Jalan Kampung=kampong road	784	Sawah=rice field	Raasan	Asembagus	Situbondo
187.	T.187	AA	+6					2	465.92	80,358.296			-	499.61	465.685	1.073	Jalan Kampung=kampong road	784	ebu=sugar cane p	Parante	Asembagus	Situbondo
188	T.188	AA	+3					3	465.45	80,823.746			-	447.61	466.420	0.960	an Aspal&Rel Kereta Api=asphalt road & rail w	784	ebu=sugar cane p	Awar-awar	Asembagus	Situbondo
189.	T.189	AA	+3					5	467.39	81,291.136			-	461.31	475.495	0.970		784	ebu=sugar cane p	Awar-awar	Asembagus	Situbondo
190.	T.190	AA	+9					5	483.60	81,774.736			-	508.00	465.505	1.091	Rel Kereta Api=rail way	784	ebu=sugar cane p	Awar-awar	Asembagus	Situbondo
191.	T.191	AA	+0					1	447.41	82,222.146			-	416.84	223.705	1.863	Sungai=river, Jalan Aspal = asphalt road	784	Belukar=shrub	Randu Agung	Banyu Putih	Situbondo

193.	T.192	AA	+6					2	466.96	82,689.106			-	495.22	472.400	1.048		784	Ilalang=reed	Randu Agung	Banyu Putih	Situbondo
193.	T.193	AA	+6					2	477.84	83,166.946			-	479.44	469.920	1.020		784	Ilalang=reed	Randu Agung	Banyu Putih	Situbondo
194.	T.194	AA	+3					2	462.00	83,628.946			-	444.83	461.715	0.963		784	ebu=sugar cane	Randu Agung	Banyu Putih	Situbondo
195.	T.195	AA	+3					2	461.43	84,090.376	8,396.010	479.702	-	445.15	459.320	0.969	Sungai=river	784	Kebun Jagung=corn	Sodung	Banyu Putih	Situbondo
196.	T.196	AA	+9					1	457.21	84,547.586			-	497.61	454.300	1.095		784	ebu=sugar cane	Sodung	Banyu Putih	Situbondo
197.	T.197	AA	+3					2	451.39	84,998.976			-	458.87	471.550	0.973	Jalan Aspal=asphalt road	784	ebu=sugar cane	Sodung	Banyu Putih	Situbondo
198.	T.198	CC	+9	15	17	29	L	1	491.71	85,490.686			-	477.69	464.310	1.029	lan Kampung&Sungai=kampong road and riv	1156	Kebun Jagung=corn	Sodung	Banyu Putih	Situbondo
199.	T.199	AA	+0					1	436.91	85,927.596			-	381.14	419.925	0.908	Jalan Kampung=kampong road	784	ebu=sugar cane	Sodung	Banyu Putih	Situbondo
200.	T.200	AA	+0					1	402.94	86,330.536			-	409.42	415.825	0.985	Jalan Kampung=kampong road	784	Kebun Cabe=chili field	Batu Ampar	Banyu Putih	Situbondo
201.	T.201	AA	+0					3	428.71	86,759.246			-	442.04	429.600	1.029	lan Kampung&Sungai=kampong road and riv	784	Kebun Cabe	Sumber Rejo	Banyu Putih	Situbondo
202.	T.202	AA	+3					1	430.49	87,189.736			-	444.88	424.060	1.049	Jalan Kampung=kampong road	784	Kebun Cabe&Tebu chili	Sumber Rejo	Banyu Putih	Situbondo
203.	T.203	AA	+0					1	417.63	87,607.366	4,288.980	430.200	-	380.21	429.790	0.885	Sungai,Jalan Aspal=river, asphalt road	784	Kebun Jagung=corn	Sumber Anyar	Banyu Putih	Situbondo
204.	T.204	AA	+3					1	441.95	88,049.316			-	509.34	445.620	1.143	Jalan Aspal=asphalt road	784	Kebun Kacang=pea	Sumber Anyar	Banyu Putih	Situbondo
205.	T.205	AA	+6					1	449.29	88,498.606			-	449.21	457.310	0.982	Jalan Aspal=asphalt road	784	Kebun Jagung=corn	Sumber Anyar	Banyu Putih	Situbondo
206.	T.206	AA	+6					1	465.33	88,963.936			-	435.09	434.175	1.002	n Kampung&Rumah=kampong road and hou	784	Kebun Jagung=corn	Kopian	Banyu Putih	Situbondo
207.	T.207	AA	+0					2	403.02	89,366.956			-	395.18	407.865	0.969		784	emak-semak=shr	Kopian	Banyu Putih	Situbondo
208.	T.208	DD	+3	35	30	0	R	1	412.71	89,779.666			-	394.05	391.195	1.007		1521	Sawah=rice field	Sumber Waru	Banyu Putih	Situbondo
209.	T.209	AA	+0					1	369.68	90,149.346	965.270	327.948	-	312.81	325.585	0.961	Kampung=kampong road,Jalan Aspal=asph	784	Kebun Cabe=chili field	Sumber Waru	Banyu Putih	Situbondo
210.	T.210	AA	+0					2	281.49	90,430.836			-	300.61	297.795	1.009	Sungai=river	784	Kebun Cabe=chili field	Sumber Waru	Banyu Putih	Situbondo
211.	T.211	DD	+6	46	38	15	R	2	314.10	90,744.936			-	361.77	367.025	0.986		1521	Kebun Cabe=chili field	Sumber Waru	Banyu Putih	Situbondo
212.	T.212	AA	+6					1	419.95	91,164.886	720.210	374.726	-	337.96	360.105	0.939	Jalan Aspal=asphalt road &Rumah=houses	784	emak-semak=shr	Sumber Waru	Banyu Putih	Situbondo
213.	T.213	DD	+0	39	44	0	R	1	300.26	91,465.146			-	325.76	349.830	0.931		1521	emak Belukar=bu	Sumber Waru	Banyu Putih	Situbondo
214.	T.214	AA	+6					1	399.40	91,864.546	6,253.840	394.026	-	373.62	390.100	0.958		784	emak Belukar=bu	Sumber Waru	Banyu Putih	Situbondo
215.	T.215	AA	+9					1	380.80	92,245.346			-	403.71	190.400	2.120		784	emak Belukar=bu	Sumber Waru	Banyu Putih	Situbondo

216.	T.216	AA	+6					1	405.10	92,650.446	6,253.840	394.026	-	409.09	403.550	1.014		784	Ilalang=reed	Sumber Waru	Banyu Putih	Situbondo
217.	T.217	AA	+12					1	402.00	93,052.446			-	417.62	399.000	1.047		784	Ilalang=reed	Sumber Waru	Banyu Putih	Situbondo
218.	T.218	AA	+9					1	396.00	93,448.446			-	412.42	407.500	1.012		784	emak-semak=bus	Sumber Waru	Banyu Putih	Situbondo
219.	T.219	AA	+6					1	419.00	93,867.446			-	373.33	383.450	0.974		784	emak-semak=bus	Alas Baluran	Banyu Putih	Situbondo
220.	T.220	AA	+6					1	347.90	94,215.346			-	353.73	360.300	0.982		784	emak-semak=bus	Alas Baluran	Banyu Putih	Situbondo
221.	T.221	AA	+6					1	372.70	94,588.046			-	412.15	381.040	1.082		784	emak-semak=bus	Alas Baluran	Banyu Putih	Situbondo
222.	T.222	AA	+9					1	389.38	94,977.426			-	378.99	393.290	0.964		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
223.	T.223	AA	+6					1	397.20	95,374.626			-	396.01	403.450	0.982		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
224.	T.224	AA	+12					1	409.70	95,784.326			-	449.66	426.255	1.055		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
225.	T.225	AA	+6					1	442.81	96,227.136			-	386.21	432.240	0.894		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
226.	T.226	AA	+9					1	421.67	96,648.806			-	437.27	404.935	1.080		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
227.	T.227	AA	+6					1	388.20	97,037.006			-	330.58	353.750	0.935		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
228.	T.228	AA	+6					1	319.30	97,356.306			-	373.04	340.990	1.094		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
229.	T.229	BB	+6	8	0	0	R	11	362.68	97,718.986			-	348.50	364.690	0.956		1156	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
230.	T.230	AA	+9					1	366.70	98,085.686	1,910.530	383.575	-	399.86	391.300	1.022		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
231.	T.231	AA	+6					1	415.90	98,501.586			-	439.29	402.900	1.090		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
232.	T.232	AA	+6					1	389.90	98,891.486			-	382.54	382.345	1.001	Sungai=river	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
233.	T.233	AA	+6					1	374.79	99,266.276			-	319.15	369.015	0.865	Sungai=river, Jalan Aspal=asphalt road	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
234.	T.234	BB	+6	1	18	0	R	1	363.24	99,629.516			-	404.86	366.985	1.103	Sungai=river	1156	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
235.	T.235	AA	+6					1	370.73	100,000.246	2,043.220	412.707	-	397.31	397.715	0.999		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
236.	T.236	AA	+6					1	424.70	100,424.946			-	353.63	415.495	0.851	Sungai=river	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
237.	T.237	AA	+12					1	406.29	100,831.236			-	462.66	392.595	1.178	Sungai=river	784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
238.	T.238	AA	+12					1	378.90	101,210.136			-	404.66	420.750	0.962		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
239.	T.239	DD	+15	43	1	0	R	1	462.60	101,672.736			-	507.17	231.300	2.193	Sungai=river	1521	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo

									453.13	102,125.866	4,193.410	424.176					Sungai=river					
241.	T.240	AA	+6					1					-	427.58	455.755	0.938		784	Semak Belukar=	Alas Baluran	Banyu Putih	Situbondo
									458.38	102,584.246							Sungai=river					
241.	T.241	AA	+6					1					-	395.39	399.585	0.990		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									340.79	102,925.036												
242.	T.242	AA	+12					2					-	401.57	380.370	1.056		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									419.95	103,344.986												
243.	T.243	AA	+6					1					-	359.76	413.470	0.870		**784**	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									406.99	103,751.976												
244.	T.244	AA	+15					1					-	447.74	428.280	1.045		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									449.57	104,201.546							Sungai=river					
245.	T.245	AA	+12					1					-	436.75	457.085	0.956		**784**	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									464.60	104,666.146							Sungai=river					
246.	T.246	AA	+9					2					-	425.33	422.205	1.007		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									379.81	105,045.956												
247.	T.247	AA	+12					1					-	442.80	399.680	1.108		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									419.55	105,465.506												
248.	T.248	AA	+6					1					-	372.14	410.095	0.907		784	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									400.64	105,866.146												
249.	T.249	DD	+6	31	30	0	R	1					-	411.64	444.170	0.927		1521	emak Belukar=bu	Alas Baluran	Banyu Putih	Situbondo
									487.70	106,353.846	3,465.700	393.760					Sungai=river, Jalan Aspal=asphalt road					
250.	T.250	AA	+12					1					-	437.32	417.150	1.048		784	mak Belukar=shr	Alas Baluran	Banyu Putih	Situbondo
									346.60	106,700.446							Sungai=river					
251.	T.251	AA	+9					1					-	404.58	365.350	1.107		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									384.10	107,084.546												
252.	T.252	AA	+9					1					-	355.96	374.100	0.952		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									364.10	107,448.646							Sungai=rivers					
253.	T.253	AA	+6					1					-	390.42	395.450	0.987		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									426.80	107,875.446							Sungai=river					
254.	T.254	AA	+12					1					-	412.98	401.950	1.027		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									377.10	108,252.546							Sungai-river					
255.	T.255	AA	+6					1					-	326.73	367.450	0.889		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									357.80	108,610.346												
256.	T.256	AA	+9					1					-	465.47	379.950	1.225		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									402.10	109,012.446							Sungai=river					
257.	T.257	AA	+6					1					-	324.16	360.750	0.899		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									319.40	109,331.846												
258.	T.258	DD	+0	43	59	19	R	1					-	283.65	284.090	0.998		1521	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									248.78	109,580.626	2,338.910	342.821					Jalan Aspal=asphalt road					
259.	T.259	AA	+0					1					-	258.73	271.880	0.952		784	mak Belukar=shr	Alas Baluran	Banyu Putih	Situbondo
									294.98	109,875.606												
260.	T.260	AA	+0					1					-	470.75	322.510	1.460		784	mak Belukar=shr	Alas Baluran	Banyu Putih	Situbondo
									350.04	110,225.646												
261.	T.261	BB	+0					1					-	161.01	337.030	0.478		1156	mak Belukar=shr	Alas Baluran	Banyu Putih	Situbondo
									324.02	110,549.666												
262.	T.262	AA	+0					1					-	335.46	342.490	0.979		784	Hutan=forest	Alas Baluran	Banyu Putih	Situbondo
									360.96	110,910.626												
263.	T.263	AA	+0					1					-	386.28	180.480	2.140		784	Sawah=rice field	Watu Kebo	Wongsorejo	Banyuwangi

264.	T.264	AA	+0					1	385.98	111,296.606	2,338.910	342.821	-	368.29	380.065	0.969		784	Sawah=rice field	Watu Kebo	Wongsorejo	Banyuwangi
265.	T.265	DD	+0	55	13	35	R	1	374.15	111,670.756			-	379.10	399.585	0.949		1521	Sawah=rice field	Watu Kebo	Wongsorejo	Banyuwangi
266.	T.266	AA	+0					1	425.02	112,095.776	1,737.370	435.271	-	404.44	425.935	0.950	Jalan Aspa=asphalt road	784	Semak-semak	Watu Kebo	Wongsorejo	Banyuwangi
267.	T.267	AA	+6					1	426.85	112,522.626			-	466.19	424.945	1.097		**784**	Ladang=field	Watu Kebo	Wongsorejo	Banyuwangi
268.	T.268	AA	+0					1	423.04	112,945.666			-	401.62	442.750	0.907		784	Kebun Jagung=corn	Watu Kebo	Wongsorejo	Banyuwangi
269.	T.269	CC	+6	18	37	56	L	1	462.46	113,408.126			-	496.24	448.780	1.106	Jalan Desa=village road	**1156**	Kebun Jagung=corn	Watu Kebo	Wongsorejo	Banyuwangi
270.	T.270	AA	+0					1	435.10	113,843.226	1,695.970	425.262	-	391.39	434.970	0.900		784	Kebun Jagung=corn	Sidowangi	Wongsorejo	Banyuwangi
271.	T.271	AA	+3					1	434.84	114,278.066			-	466.42	435.000	1.072		784	Kebun Jagung=corn	Sidowangi	Wongsorejo	Banyuwangi
272.	T.272	AA	+0					1	435.16	114,713.226			-	384.87	413.015	0.932		784	Kebun Jagung=corn	Sidowangi	Wongsorejo	Banyuwangi
273.	T.273	DD	+6	35	42	29	L	1	390.87	115,104.096			-	487.60	435.475	1.120		1521	Kebun Jagung=corn	Sidowangi	Wongsorejo	Banyuwangi
274.	T.274	AA	+6					1	480.08	115,584.176	5,435.190	455.436	-	486.47	474.980	1.024	Jalan Desa=village road	784	Ladang=field	Sidowangi	Wongsorejo	Banyuwangi
275.	T.275	AA	+0					1	469.88	116,054.056			-	414.70	435.090	0.953		784	emak-semak=bus	Alas Rejo	Wongsorejo	Banyuwangi
276.	T.276	AA	+0					1	400.30	116,454.356			-	418.53	425.080	0.985		784	Kebun Jagung=corn	Alas Rejo	Wongsorejo	Banyuwangi
277.	T.277	AA	+3					1	449.86	116,904.216			-	453.64	434.020	1.045		784	Kebun Jagung=corn	Alas Rejo	Wongsorejo	Banyuwangi
278.	T.278	AA	+0					1	418.18	117,322.396			-	429.70	450.160	0.955	Jalan Desa=village road	784	Ladang=field	Wongsorejo	Wongsorejo	Banyuwangi
279.	T.279	AA	+6					1	482.14	117,804.536			-	484.11	491.055	0.986	Jalan Desa=village road	784	Kebun Jagung=corn	Wongsorejo	Wongsorejo	Banyuwangi
280.	T.280	AA	+6					1	499.97	118,304.506			-	518.38	484.975	1.069	Jalan Desa=village road	784	Kebun Jagung=corn	Wongsorejo	Wongsorejo	Banyuwangi
281.	T.281	AA	+3					1	469.98	118,774.486			-	419.43	449.955	0.932		784	Ladang=field	Wongsorejo	Wongsorejo	Banyuwangi
282.	T.282	AA	+3					1	429.93	119,204.416			-	463.80	439.990	1.054		784	emak-semak=bus	Wongsorejo	Wongsorejo	Banyuwangi
283.	T.283	AA	+3					1	450.05	119,654.466			-	429.65	445.860	0.964		784	Kebun Jagung=corn	Wongsorejo	Wongsorejo	Banyuwangi
284.	T.284	AA	+6					1	441.67	120,096.136			-	454.80	442.410	1.028		784	Ladang=field	Wongsorejo	Wongsorejo	Banyuwangi
285.	T.285	BB	+3	5	29	25	L	1	443.15	120,539.286			-	431.22	431.585	0.999		1156	emak-semak=bus	Wongsorejo	Wongsorejo	Banyuwangi
286.	T.286	AA	+0					1	420.02	120,959.306	6,250.400	423.157	-	409.18	434.990	0.941		784	Ladang=field	Wongsorejo	Wongsorejo	Banyuwangi
287.	T.287	AA	+6					1	449.96	121,409.266			-	503.48	224.980	2.238		784	Kebun Jagung=corn	Alas Buluh	Wongsorejo	Banyuwangi

288.	T.288	AA	+3					1	484.97	121,894.236	6,250.400	423.157	-	431.42	425.075	1.015	Jalan Desa=village road	784	emak-semak=bus	Alas Buluh	Wongsorejo	Banyuwangi
289.	T.289	AA	+0					1	365.18	122,259.416			-	370.42	392.590	0.944		784	emak-semak=bus	Alas Buluh	Wongsorejo	Banyuwangi
290.	T.290	AA	+0					1	420.00	122,679.416			-	412.69	419.950	0.983		784	mak Belukar=shr	Alas Buluh	Wongsorejo	Banyuwangi
291.	T.291	AA	+0					1	419.90	123,099.316			-	415.38	409.940	1.013		**784**	mak Belukar=shr	Alas Buluh	Wongsorejo	Banyuwangi
292.	T.292	AA	+0					1	399.98	123,499.296			-	380.42	374.955	1.015		784	emak-semak=bus	Alas Buluh	Wongsorejo	Banyuwangi
293.	T.293	AA	+0					1	349.93	123,849.226			-	412.12	419.985	0.981		**784**	emak-semak=bus	Alas Buluh	Wongsorejo	Banyuwangi
294.	T.294	AA	+3					1	490.04	124,339.266			-	476.57	455.035	1.047		784	emak-semak=bus	Bengkak	Wongsorejo	Banyuwangi
295.	T.295	AA	+0					1	420.03	124,759.296			-	409.55	440.010	0.931		784	emak-semak=bus	Bengkak	Wongsorejo	Banyuwangi
296.	T.296	AA	+6					1	459.99	125,219.286			-	498.09	450.000	1.107		784	Tegalan=dry land	Bengkak	Wongsorejo	Banyuwangi
297.	T.297	AA	+0					1	440.01	125,659.296			-	388.50	410.010	0.948		784	Tegalan=dry land	Bengkak	Wongsorejo	Banyuwangi
298.	T.298	AA	+0					1	380.01	126,039.306			-	389.57	390.410	0.998	Jalan Perhutani=Perhutani road	784	Tegalan=dry land	Bengkak	Wongsorejo	Banyuwangi
299.	T.299	AA	+0					1	400.81	126,440.116			-	393.51	375.190	1.049	Jalan Perhutani=Perhutani road	784	Tegalan=dry land	Bengkak	Wongsorejo	Banyuwangi
300.	T.300	CC	+0	25	15	0	L	1	349.57	126,789.686	1,360.410	453.587	-	400.92	401.050	1.000		1156	mak Belukar=shr	Bangsring	Wongsorejo	Banyuwangi
301.	T.301	AA	+3					1	452.53	127,242.216			-	420.39	449.615	0.935		784	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
302.	T.302	AA	+3					1	446.70	127,688.916			-	404.46	453.940	0.891		784	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
303.	T.303	EE	+3	60	35	10	R	1	461.18	128,150.096	2,451.230	423.036	-	538.10	445.005	1.209	Jalan Desa=village road	1521	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
304.	T.304	AA	+6					1	428.83	128,578.926			-	352.24	445.125	0.791	Crossing Tower	784	Ladang=field	Bangsring	Wongsorejo	Banyuwangi
305.	T.305	AA	+3					1	461.42	129,040.346			-	540.18	454.495	1.189		784	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
306.	T.306	AA	+0					1	447.57	129,487.916			-	274.28	415.235	0.661		784	emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
307.	T.307	AA	+3					1	382.90	129,870.816			-	556.91	419.790	1.327		784	Ladang=field	Bangsring	Wongsorejo	Banyuwangi
308.	T.308	BB	+6					1	456.68	130,327.496			-	183.56	365.255	0.503		1156	Kebun Jagung=corn	Bangsring	Wongsorejo	Banyuwangi
309.	T.ANCR.j			77	37	42	L	1	273.83	130,601.326			-						emak-semak=bus	Bangsring	Wongsorejo	Banyuwangi
													-									
													-									

2. Gilimanuk – New Kapal (Antosari) Section

NO	TOWER NUMBER	TOWER TYPE	ANGLES				FOUND. CLASS APPR.	ACT. SPAN	PROGRESSIVE DISTANCE	SPAN TENSION	EQUIV. SPAN	SPAN WEIGHT	SPAN WIND	SPAN WT/WD	CROSSING REMARKS	AREA TOWER	CONDITIION OF TOWER LOCATION	WILAYAH = region DESA / KELURAHAN / VILLAGE	KECAMATAN / SUBDISTRICT	KABUPATEN / DISTRICT
			°	'	"	L/R		(M)	(M)	(M)	(M)	(M)	(M)			(M2)				
1	T.01	DD +0	43	40	15	L						349.510	191.395	1.826		1521	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
								382.79	382.79											
2	T.02	AA +0										352.020	399.750	0.88		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
								416.71	799.50											
3	T.03	AA +0										476.630	413.390	1.15		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
								410.07	1209.57											
4	T.04	AA +0										390.950	412.565	0.95		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
								415.06	1624.63											
5	T.05	AA +0										418.860	414.775	1.01		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
								414.49	2039.12											
6	T.06	AA +0										444.04	414.16	1.07		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
								413.82	2452.94	4510.88	410.40									
7	T.07	AA +3										355.05	413.73	0.86		784	Kebun Jati = teak plantation	Cekik	Gilimanuk	Gilimanuk
								413.63	2866.57											
8	T.08	AA +0										460.99	413.83	1.11		784	Kebun Jati = teak plantation	Melaya	Melaya	Jembrana
								414.02	3280.59											
9	T.09	AA +0										394.03	414.04	0.95		784	Kebun Jati&Sengon=	Melaya	Melaya	Jembrana
								414.06	3694.65											
10	T.10	AA +0										406.81	414.26	0.98		784	Kebun Jati&Sengon=	Melaya	Melaya	Jembrana
								414.45	4109.10											
11	T.11	AA +0										478.32	408.12	1.17		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
								401.78	4510.88											
12	T.12	CC +0	29	15	19	L						371.94	433.78	0.89		1521	Kebun Jati = teak garden	Melaya	Melaya	Jembrana
								465.77	4976.65						Sungai &Jurang = river & valley					
13	T.13	AA +0										395.06	432.15	0.91		784	Kebun Jati = teak garden	Melaya	Melaya	Jembrana
								398.52	5375.17	1360.67	458.98									
14	T.14	AA +15										469.46	447.45	1.05		784	Kebun = garden	Melaya	Melaya	Jembrana
								496.38	5871.55						Jurang = valley					
15	T.15	BB +15										534.83	511.79	1.05		784	Kebun = garden	Melaya	Melaya	Jembrana
								527.19	6398.74											
16	T.16	AA +6										484.22	497.26	0.97		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
								467.33	6866.07											
17	T.17	AA +3								1696.26	449.11	420.49	438.27	0.96		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
								409.20	7275.27											
18	T.18	AA +0										363.53	350.87	1.04		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
								292.54	7567.81											
19	T.19	BB +0	0	0	0							441.90	317.50	1.39		1156	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
								342.45	7910.26											
20	T.20	AA +9										306.67	364.38	0.84		784	Kebun Jati&Sengon	Melaya	Melaya	Jembrana
								386.30	8296.56	1224.89	423.74				Sungai = river					
21	T.21	AA +12										393.60	441.22	0.89		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
								496.14	8792.70						Jalan Desa & Rumah = village road and houses					
22	T.22	BB +12										607.44	496.08	1.22		784	Kebun Jati&Sengon =	Melaya	Melaya	Jembrana
								496.01	9288.71	7	4									

									496.01	9288.71	993.67	496.84									
23	T.23	AA	+6						497.66	9786.37			360.69	496.84	0.73	Jalan = road	784	Kebun=garden	Melaya	Melaya	Jembrana
24	T.24	BB	+0	6	10	12	L		400.13	10186.50	400.13	400.13	458.77	448.90	1.02	Jalan = road	1156	Kebun = garden	Melaya	Melaya	Jembrana
25	T.25	BB	+9						459.83	10646.33	1349.87	450.27	511.83	429.98	1.19	Jalan Desa & Rumah = village road and houses	784	Kebun = garden	Melaya	Melaya	Jembrana
26	T.26	AA	+9						453.35	11099.68			464.24	456.59	1.02	Jalan Desa & Rumah = village roads and houses	784	Kebun = garden	Melaya	Melaya	Jembrana
27	T.27	BB	+0						436.69	11536.37	436.69	436.69	310.61	445.02	0.70	Sungai=river	784	Kebun = garden	Narusasari	Melaya	Jembrana
28	T.28	BB	+0						477.22	12013.59	2719.07	454.10	563.59	456.96	1.23		784	Kebun = garden	Narusasari	Melaya	Jembrana
29	T.29	AA	+0						461.32	12474.91			434.25	469.27	0.93		784	Kebun = garden	Narusasari	Melaya	Jembrana
30	T.30	AA	+0						428.08	12902.99			454.26	444.70	1.02		784	Kebun = garden	Narusasari	Melaya	Jembrana
31	T.31	AA	+9						435.04	13338.03			428.44	431.56	0.99		784	Kebun = garden	Narusasari	Melaya	Jembrana
32	T.32	AA	+9						461.02	13799.05			467.53	448.03	1.04		784	Kebun = garden	Narusasari	Melaya	Jembrana
33	T.33	AA	+3						456.39	14255.44			456.39	458.71	0.99	Jalan Aspal & Rumah = asphalt road and houses	784	Kebun = garden	Narusasari	Melaya	Jembrana
34	T.34	BB	+9	1	12	0	R		430.84	14686.28	1787.76	448.71	446.74	443.62	1.01	Jalan Aspal,Sungai&Rumah = Asphal road, river & houses	1156	Kebun = garden	Narusasari	Melaya	Jembrana
35	T.35	AA	+6						463.65	15149.93			428.35	447.25	0.96	Jalan Aspal,Sungai&Saluran Irigasi = Asphal road, river & irigation canal	784	Kebun = garden	Warnasari	Melaya	Jembrana
36	T.36	AA	+6						418.57	15568.50			398.58	441.11	0.90		784	Kebun = garden	Warnasari	Melaya	Jembrana
37	T.37	AA	+12						474.70	16043.20			482.29	446.64	1.08	Jalan Aspal & Rumah = asphalt roads and houses	784	Kebun = garden	Warnasari	Melaya	Jembrana
38	T.38	BB	+12						495.12	16538.32	5358.16	448.00	518.58	484.91	1.07	Jalan Aspal&Saluran Irigasi = Asphal road & irigation canal	784	Kebun = garden	Warnasari	Melaya	Jembrana
39	T.39	AA	+6						433.10	16971.42			428.30	464.11	0.92		784	Kebun = garden	Warnasari	Melaya	Jembrana
40	T.40	AA	+3						456.89	17428.31			427.66	445.00	0.96	Jalan Kampung,Sungai&Rumah = Village road, river & houses	784	Kebun = garden	Warnasari	Melaya	Jembrana
41	T.41	AA	+9						444.71	17873.02			468.76	450.80	1.04	Jalan Aspal,Sungai&Rumah = Asphal road, river & houses	784	Kebun = garden	Warnasari	Melaya	Jembrana
42	T.42	AA	+6						448.21	18321.23			483.54	446.46	1.08	Sungai = river	784	Sawah = rice field	Warnasari	Melaya	Jembrana
43	T.43	AA	+9						422.61	18743.84			420.31	435.41	0.97	Jalan Aspal = asphalt roads	784	Kebun = garden	Ketiman	Melaya	Jembrana
44	T.44	AA	+0						455.64	19199.48			428.00	439.13	0.97	Sungai = river	784	Kebun = garden	Ketiman	Melaya	Jembrana
45	T.45	AA	+3						461.40	19660.88			449.44	458.52	0.98	Jalan Aspal = asphalt roads	784	Sawah = rice field	Ketiman	Melaya	Jembrana
46	T.46	AA	+9						457.52	20118.40			484.65	459.46	1.05	Sungai = river	784	Kebun = garden	Ketiman	Melaya	Jembrana
47	T.47	AA	+12										426.09	441.80	0.96		784	Kebun = garden	Ketiman	Melaya	Jembrana

									457.52	20118.40						Sungai = river					
47	T.47	AA	+12										426.09	441.80	0.96		784	Kebun = garden	Ketiman	Melaya	Jembrana
									426.07	20544.47						Jalan Aspal, Sungai & Rumah = asphal roads, river and houses					
48	T.48	AA	+12										402.78	418.86	0.96		784	Kebun = garden	Ketiman	Melaya	Jembrana
									411.64	20956.11						Jalan Aspal&Rumah = Asphal road & houses					
49	T.49	AA	+0										394.88	428.45	0.92		784	Kebun = garden	Manistutu	Melaya	Jembrana
									445.25	21401.36						Sungai = river					
50	T.50	BB	+0	4	10	0	R						389.09	396.98	0.98		1156	Kebun = garden	Manistutu	Melaya	Jembrana
									348.71	21750.07	1686.90	428.86				Jalan Batu = stone roads					
51	T.51	AA	+3										457.47	407.61	1.12		784	Kebun = garden	Manistutu	Melaya	Jembrana
									466.51	22216.58						Jalan Aspal & Rumah = Asphal road & houses					
52	T.52	AA	+6										490.44	459.58	1.07		784	Kebun = garden	Manistutu	Melaya	Jembrana
									452.65	22669.23						Jalan Aspal, Sungai & Saluran Irigasi = Asphal road, river & irigation canal					
53	T.53	AA	+0										387.75	435.84	0.89		784	Kebun = garden	Manistutu	Melaya	Jembrana
									419.03	23088.26						Saluran Irigasi = irigation canal					
54	T.54	BB	+15										519.05	445.93	1.16		784	Kebun = garden	Manistutu	Melaya	Jembrana
									472.82	23561.08	1863.58	470.48				Jalan Beton=concrete roads					
55	T.55	AA	+15										441.50	485.04	0.91		784	Kebun = garden	Manistutu	Melaya	Jembrana
									497.26	24058.34						Jalan Beton&Sungai					
56	T.56	AA	+12										391.79	449.31	0.87		784	Kebun = garden	Manistutu	Melaya	Jembrana
									401.36	24459.70						Jalan Beton = concrete roads					
57	T.57	AA	+0										471.50	446.75	1.06		784	Kebun = garden	Manistutu	Melaya	Jembrana
									492.14	24951.84						Jalan Aspal & Sungai = Asphal road & river					
58	T.58	DD	+0	32	11	0	R						469.24	427.20	1.10		1521	Kebun = garden	Manistutu	Melaya	Jembrana
									362.25	25314.09	4790.00	471.20									
59	T.59	AA	+0										418.50	364.27	1.15		784	Kebun = garden	Berangbang	Negara	Jembrana
									366.29	25680.38						Jalan, Rumah = road, houses					
60	T.60	AA	+0										367.25	461.87	0.80		784	Kebun = garden	Manggis/Baler Bale Agung	Negara	Jembrana
									557.45	26237.83						lan, Rumah, Sungai = road, hoses, riv					
61	T.61	AA	+3										572.63	526.75	1.09		784	Kebun = garden	Baler Bale Agung	Negara	Jembrana
									496.05	26733.88						lan, Rumah, Sungai = road, hoses, riv					
62	T.62	AA	+3										406.38	417.00	0.97		784	Kebun = garden	Pancar Dawo/Pendem	Negara	Jembrana
									337.95	27071.83						Jalan, Rumah = road, houses					
63	T.63	AA	+9										301.19	352.49	0.85		784	Kebun = garden	Pancar Dawo/Pendem	Negara	Jembrana
									367.03	27438.86						Sungai = river					
64	T.64	AA	+3										414.2	424.01	0.98		784	Sawah = rice field	Pendem/Pendem	Negara	Jembrana
									480.99	27919.85						lan, Rumah, Sungai = road, hoses, riv					
65	T.65	AA	+0										448.14	417.99	1.07		784	Kebun = garden	Pancar Dawo/Pendem	Negara	Jembrana
									354.98	28274.83						lan=road, Rumah=houses, SUTM 20K					
66	T.66	AA	+0										534.69	503.49	1.06		784	Sawah = rice field	Sawe/Dahwaru/Batu Agung	Negara	Jembrana
									652.00	28926.83						Sungai = river					
67	T.67	AA	+3										598.3	568.90	1.05		784	Kebun = garden	Batu Agung/Batu Agung	Negara	Jembrana
									485.80	29412.63						lan=road, Rumah=houses, SUTM 20K					
68	T.68	AA	+6										510.87	407.51	1.25		784	Kebun = garden	Sawe/Batu Agung	Negara	Jembrana
									329.21	29741.84											
69	T.69	BB	+6										191.85	344.59	0.56		1156	Kebun = garden	Banjar Petanahan/Jembrana	Negara	Jembrana
									359.96	30101.80	2512.92	426.91				Jalan, Rumah = road, houses					
70	T.70	AA	-3										395.09	394.50	1.00		784	Kebun = garden	Batu Agung	Negara	Jembrana
									429.04	30530.84						Jalan = road					
71	T.71	AA	-3										424.93	393.99	1.08		784	Kebun = garden	Batu Agung	Negara	Jembrana
									358.94	30889.78						Sungai = river					
72	T.72	AA	+3										385.95	407.98	0.95		784	Kebun = garden	Paras Tegeh/Dongeng Tukadaya	Jembrana	Jembrana
									457.02	31346.80						Jalan, Rumah = road, houses					
73	T.73	AA	+6										450.83	473.51	0.95		784	Kebun = garden	Banjar Kepuh/Mendoyo Dauh Tukad	Jembrana	Jembrana
									490.00	31836.80						Jalan, Rumah = road, houses					
74	T.74	AA	+6										532.28	453.98	1.17		784	Kebun = garden	Banjar Kepuh/Mendoyo Dauh Tukad	Jembrana	Jembrana
									417.96	32254.76						Jalan, Rumah, Sungai					
75	T.75	DD	+0	26	16	23	L						328.08	378.94	0.87		1156	Kebun = garden	Banjar kepuh	Jembrana	Jembrana
									339.92	32594.68						Jalan, Rumah = road, houses					
76	T.76	AA	+3										338.82	377.51	0.90		784	Kebun = garden	Mendoyo Dauh Tukad	Jembrana	Jembrana
									415.10	33009.78						an = road, Rumah=houses, SUTM 20					
77	T.77	AA	+3										496.33	485.04	1.02		784	Kebun = garden	Pancasari/Mendoyo	Mendoyo	Jembrana
									554.98	33564.76						lan=road, Rumah=houses, SUTM 20K					
78	T.78	AA	+6										601.02	562.47	1.07		784	Kebun = garden	Poh Santen	Mendoyo	Jembrana
									569.06	34134.72						Jalan, Rumah = road, houses					

									569.96	34134.72						Jalan, Rumah = road, houses					
79	T.79	AA	+0										462.63	505.03	0.92		784	Kebun = garden	Pregung/Banjar Pertapan Kajo	Mendoyo	Jembrana
									440.10	34574.82						Jalan=road					
80	T.80	AA	+9								4792.02	494.96	562.87	474.56	1.19		784	Kebun = garden	Pregung/Banjar Pertapan Kajo	Mendoyo	Jembrana
									509.01	35083.83						lan=road, Rumah=houses, SUTM 20K					
81	T.81	AA	+12										410.73	519.49	0.79		784	Kebun = garden	Pertapan/Pregung/Banjar Pertapan Kajo	Mendoyo	Jembrana
									529.96	35613.79						Sungai, Rumah= river, houses					
82	T.82	AA	+3										519.33	464.99	1.12		784	Kebun = garden	Tegal Cangkring/Pertapan	Mendoyo	Jembrana
									400.01	36013.80						Jalan, Rumah, SUTM 20KV					
83	T.83	AA	+3										520.43	469.50	1.11		784	Kebun = garden	Tegal Cangkring/Pertapan	Mendoyo	Jembrana
									538.98	36552.78						Jalan, Sungai = road, river					
84	T.84	AA	+6										384.42	516.49	0.74		784	Kebun = garden	Dsn. Penyaringan, Ds. Banjar Penyaringan	Mendoyo	Jembrana
									494.00	37046.78						lan, Rumah, Sungai = road, hoses, riv					
85	T.85	BB	+0										554.68	467.00	1.19		1156	Kebun = garden	Dsn. Banjar Baler Pasar, Ds. Pergung	Mendoyo	Jembrana
									440.00	37486.78						Sungai = river					
86	T.86	AA	+0										424.95	410.22	1.04		784	Kebun = garden	Dsn. Tibubeleng Tengah, Ds.	Mendoyo	Jembrana
									380.44	37867.22						lan=road, Rumah=houses, SUTM 20K					
87	T.87	AA	+0										334.59	398.49	0.84		784	Kebun = garden	Ds. Tibubeleng Kelod, Kel. Mendoyo	Mendoyo	Jembrana
									416.54	38283.76											
88	T.88	AA	+3										497.71	434.78	1.14		784	Kebun = garden	Ds. Banjar Penyaringan, Kel.	Mendoyo	Jembrana
									453.02	38736.78											
89	T.89	AA	+9										467.55	486.51	0.96		784	Sawah = rice field	Dsn. Munduk Anggrek Barat, Ds. Yehembang	Mendoyo	Jembrana
									520.00	39256.78						Jalan=road, SUTM 20KV					
90	T.90	AA	+0										435.56	453.50	0.96		784	Kebun = garden	Dsn. Munduk Anggrek Barat, Ds. Yehembang	Mendoyo	Jembrana
									387.00	39643.78						Jalan=road, SUTM 20KV					
91	T.91	AA	-3								5437.01	475.30	430.25	421.02	1.02		784	Kebun = garden	Ds. Yehembang Kauh, Kel. Mendoyo	Mendoyo	Jembrana
									455.04	40098.82						Jalan=road, SUTM 20KV					
92	T.92	AA	+0										468.32	442.52	1.06		784	Kebun = garden	Dsn. Banjar Munduk Anggrek Kaje, Ds.	Mendoyo	Jembrana
									430.00	40528.82											
93	T.93	AA	+3										440.73	483.22	0.91		784	Kebun = garden	Ds. Yehembang Kauh, Kel. Mendoyo	Mendoyo	Jembrana
									536.43	41065.25						Jalan=road, SUTM 20KV, Sungai=river					
94	T.94	AA	+3										600.77	581.19	1.03		784	Kebun = garden	Ds. Yehembang Kauh, Kel. Mendoyo	Mendoyo	Jembrana
									625.94	41691.19						alanr=road, Rumah=house, Sungai-riv					
95	T.95	AA	+0										495.79	524.27	0.95		784	Kebun = garden	Ds. Yehembang Kauh, Kel. Mendoyo	Mendoyo	Jembrana
									422.60	42113.79						Jalan=road, SUTM 20KV, Sungai=river					
96	T.96	AA	+6										374.66	396.30	0.95		784	Kebun = garden	Ds. Banjar Kaleran Sekar, Kel. Mendoyo	Mendoyo	Jembrana
									370.00	42483.79						Jalan=road, Rumah=house,SUTM 20KV					
97	T.97	CC	+0	14	13	34	R						458.73	400.00	1.15		1156	Kebun = garden	Dsn. Banjar Kaleran, Ds. Banjar Sekar	Mendoyo	Jembrana
									430.00	42913.79						Jalan=road, Rumah=house,SUTM 20KV					
98	T.98	AA	+0										381.37	399.50	0.95		784	Kebun = garden	Ds. Yehembang, Banjar Sekar Buana	Mendoyo	Jembrana
									368.99	43282.78											
99	T.99	AA	+0										366.85	342.07	1.07		784	Kebun = garden	Dsn. Kaleran, Ds. Yehembang	Mendoyo	Jembrana
									315.14	43597.92											
100	T.100	AA	+0										505.77	385.48	1.31		784	Kebun = garden	Dsn. Kaleran, Ds. Yehembang	Mendoyo	Jembrana
									455.82	44053.74						Jalan=road, Rumah=house,SUTM 20KV					
101	T.101	BB	+0								3506.74	433.48	31.00	373.89	0.08		1156	Kebun = garden	Ds. Yehembang	Mendoyo	Jembrana
									291.96	44345.70											
102	T.102	BB	+0										523.90	307.50	1.70		784	Kebun = garden	Dsn. Tegek Gede, Ds. Yehembang Kangen	Mendoyo	Jembrana
									323.03	44668.73											
103	T.103	AA	-3										330.75	348.52	0.95		784	Kebun = garden	Dsn. Tegek Gede, Ds. Yehembang Kangen	Mendoyo	Jembrana
									374.00	45042.73						Jalan=road, Rumah=house,SUTM 20KV					
104	T.104	AA	+3										523.51	462.10	1.13		784	Kebun = garden	Ds. Tipusambe	Mendoyo	Jembrana
									550.20	45592.93											
105	T.105	AA	+12										376.20	473.90	0.79		1156	Kebun = garden	Ds. Yehembang Kangin	Mendoyo	Jembrana
									397.60	45990.53						Jalan = road					
106	T.106	BB	+9	4	46	50	L						517.46	467.22	1.11		1,521	Kebun kelapa = coconut	Ds. Yehembang Kangin	Pekutatan	Jembrana
									536.83	46527.36						Sungai = river					
107	T.107	AA	-3								,358.29	410.69	463.635	468.856	0.989		784	Kebun kelapa = coconut	Yeh Sumbul	Pekutatan	Jembrana
									400.88	46928.24						Jalan = road					
																		Kebun coklat =			

									400.88	46928.24	1,3	41				Jalan = road					
108	T.108	AA	-3										410.679	410.731	1.000		784	Kebun coklat = chocolate	Yeh Sumbul	Pekutatan	Jembrana
									420.58	47348.82						Jalan = road					
109	T.109	CC	+0	14	48	9	R						449.895	431.515	1.043		1,156	Sawah = rice field	Yeh Sumbul	Pekutatan	Jembrana
									442.46	47791.28						Jalan = road					
110	T.110	AA	+0										500.614	462.339	1.083		784	Kebun cengkeh=clove	Yeh Sumbul	Pekutatan	Jembrana
									482.23	48273.51						Jalan, Sungai = road, river					
111	T.111	AA	+9								2,140.64	432.53	406.481	459.936	0.884		784	Sawah = rice field	Medewi	Pekutatan	Jembrana
									437.65	48711.16											
112	T.112	AA	-3										407.614	414.894	0.982		784	Sawah = rice field	Medewi	Pekutatan	Jembrana
									392.14	49103.30											
113	T.113	AA	-3										394.189	389.145	1.013		784	Sawah = rice field	Medewi	Pekutatan	Jembrana
									386.16	49489.46						Jalan = road					
114	T.114	CC	-3	16	27	44	R						434.047	360.199	1.205		1,156	Sawah = rice field	Medewi	Pekutatan	Jembrana
									334.23	49823.69						Jalan = road					
115	T.115	AA	+9										272.609	374.929	0.727		784	Kebun coklat = chocolate	Medewi	Pekutatan	Jembrana
									415.60	50239.29						Sungai = river					
116	T.116	AA	-3										486.653	434.072	1.121		784	Campuran = mix garden	Pulukan	Pekutatan	Jembrana
									452.55	50691.84						Jalan, Sungai					
117	T.117	AA	+3										420.482	451.276	0.932		784	Campuran = mix garden	Pulukan	Pekutatan	Jembrana
									450.01	51141.85						Jalan, Sungai					
118	T.118	AA	+3								3,451.05	440.10	454.181	448.268	1.013		784	Campuran = mix garden	Pekutatan	Pekutatan	Jembrana
									446.52	51588.37						Jalan = road					
119	T.119	AA	+6										452.067	410.271	1.102		784	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
									374.02	51962.39						Sungai = river					
120	T.120	AA	+15										464.713	435.590	1.067		784	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
									497.11	52459.50						Sungai=river					
121	T.121	AA	+12										501.015	489.076	1.024		784	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
									481.01	52940.51											
122	T.122	CC	-3	18	11	7	L						451.934	493.504	0.916		1,156	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
									506.03	53446.54	5,369.55	450.99									
123	T.123	AA	+12										465.750	481.185	0.968		784	Perkebunan karet = rubber	Pekutatan	Pekutatan	Jembrana
									456.37	53902.91											
124	T.124	AA	+6										463.145	453.177	1.022		784	Kebun sengon = sengon plantation	Pekutatan	Pekutatan	Jembrana
									450.00	54352.91											
125	T.125	AA	-3										438.023	449.708	0.974		784	Kebun sengon=sengon	Pekutatan	Pekutatan	Jembrana
									449.38	54802.29						Jalan = road					
126	T.126	AA	+0										459.569	464.522	0.989		784	Kebun Jati = teak plantation	Pekutatan	Pekutatan	Jembrana
									479.66	55281.95						Jalan=road, 20kv					
127	T.127	AA	+9										437.639	432.144	1.013		784	Campuran = mix garden	Pangyangan	Pekutatan	Jembrana
									384.65	55666.60						Jalan = road					
128	T.128	AA	+3										453.857	411.520	1.103		784	Peternakan sapi = livestock of cow	Pangyangan	Pekutatan	Jembrana
									438.38	56104.98						Jalan, Sungai = road, river					
129	T.129	AA	-3								5,369.55	450.99	356.340	437.427	0.815		784	Peternakan sapi = livestock of cow	Pangyangan	Pekutatan	Jembrana
									436.48	56541.46						Jalan, Sungai = road, river					
130	T.130	AA	-3										440.026	435.203	1.011		784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
									433.94	56975.40						Jalan = road					
131	T.131	AA	+0										483.963	460.123	1.052		784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
									486.29	57461.69						Rumah, jalan = house, road					
132	T.132	AA	+6										475.142	442.842	1.073		784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
									399.35	57861.04						Rumah, jalan = house, road					
133	T.133	AA	-3	1	26	9	R						392.536	424.177	0.925		784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
									449.02	58310.06						Jalan = road					
134	T.134	BB	-3	2	56	19	L						399.629	437.944	0.913		1,156	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
									426.85	58736.91						Jalan = road					
135	T.135	AA	+6										445.914	401.514	1.111		784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
									376.12	59113.03						Jalan, sungai					
136	T.136	AA	-3								1,857.63	375.82	331.012	375.745	0.881		784	Kebun coklat = chocolate	Gumbrih	Pekutatan	Jembrana
									375.43	59488.46						Jalan = road					
137	T.137	AA	-3										435.258	361.579	1.204		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
									347.66	59836.12						Sungai = river					

									347.66	59836.12						Sungai = river					
138	T.138	AA	-3										221.999	339.614	0.654		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
									331.57	60167.69						Jalan = road					
139	T.139	CC	+3	24	5	37	L						440.378	363.208	1.212		1,156	Campuran = mix garden	Pengeragoan	Pekutatan	Jembrana
									394.91	60562.60	770.72	385.71				Jalan = road					
140	T.140	AA	+0										333.037	385.360	0.864		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
									375.81	60938.41											
141	T.141	DD	-3	37	16	10	R						480.811	403.790	1.191		1,521	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
									431.77	61370.18	4,811.90	411.71				Jalan, Sungai = road, river					
142	T.142	AA	-3										415.838	399.580	1.041		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
									367.39	61737.57											
143	T.143	AA	+9										278.656	368.550	0.756		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
									369.71	62107.28											
144	T.144	AA	-3										422.800	321.175	1.316		784	Kebun coklat = chocolate	Pengeragoan	Pekutatan	Jembrana
									272.64	62379.92											
145	T.145	AA	+3										290.194	370.135	0.784		784	Kebun coklat	Pengeragoan	Pekutatan	Jembrana
									467.63	62847.55						Jalan, sungai = road, river					
146	T.146	AA	+9										525.476	460.220	1.142		784	Sawah = rice field	Lalang linggah	Selemandeg barat	Tabanan
									452.81	63300.36											
147	T.147	AA	+15										444.373	416.550	1.067		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									380.29	63680.65						Jalan = road					
148	T.148	AA	-3										360.714	377.175	0.956		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									374.06	64054.71											
149	T.149	AA	+3										385.490	413.615	0.932		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									453.17	64507.88						Jalan, sungai = road, river					
150	T.150	AA	+6										347.545	430.975	0.806		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									408.78	64916.66											
151	T.151	AA	+6										526.908	437.510	1.204		784	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
									466.24	65382.90											
152	T.152	AA	-3										386.951	416.825	0.928		784	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
									367.41	65750.31						Jalan = road					
153	T.153	CC	+3	14	8	18	L						421.169	446.825	0.943		1,156	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
									526.24	66276.55	1,029.17	514.98				Jalan = road					
154	T.154	AA	+6										461.360	514.585	0.897		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									502.93	66779.48						Sungai=river					
155	T.155	BB	-3										680.441	609.310	1.117		1,156	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									715.69	67495.17	1,389.95	695.90				Jalan = road					
156	T.156	AA	+3										722.718	694.975	1.040		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									674.26	68169.43						Jalan = road					
157	T.157	CC	+9	20	30	38	L						477.564	526.290	0.907		1,156	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									378.32	68547.75	1,037.13	572.64									
158	T.158	AA	-3										429.805	518.565	0.829		784	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									658.81	69206.56											
159	T.159	DD	+9	39	32	8							780.165	497.045	1.570		1,521	Campuran = mix garden	Lalang linggah	Selemandeg barat	Tabanan
									335.28	69541.84	335.28	335.28				Sungai = river					
160	T.160	BB	+0										400.121	525.680	0.761		1,156	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
									716.08	70257.92	716.08	716.08				Jalan, Sungai					
161	T.161	BB	+0										625.106	555.450	1.125		1,156	Kebun coklat = chocolate	Lalang linggah	Selemandeg barat	Tabanan
									394.82	70652.74	1,788.38	454.40				Jalan = road					
162	T.162	AA	+3										350.811	421.715	0.832		784	Kebun coklat = chocolate	Lumbung	Selemandeg barat	Tabanan
									448.61	71101.35						Jalan, Sungai					
163	T.163	AA	-3										496.236	484.455	1.024		784	Campuran = mix garden	Lumbung	Selemandeg barat	Tabanan
									520.30	71621.65						Jalan, Sungai					
164	T.164	AA	+3										406.501	472.475	0.860		784	Campuran = mix garden	Antosari	Selemandeg barat	Tabanan
									424.65	72046.30						Jalan, Sungai					
165	T.165	BB	+9	6	13	25	R						507.786	381.010	1.333		1,156	Kebun coklat = chocolate	Antosari	Selemandeg barat	Tabanan
									337.37	72383.67											
166	T.166	AA	+0										261.936	342.385	0.765		784	Kebun coklat =	Antosari	Selemandeg barat	Tabanan

									337.37	72383.67								chocolate			
166	T.166	AA	+0										261.936	342.385	0.765		784	Kebun coklat = chocolate	Antosari	Selemandeg barat	Tabanan
									347.40	72731.07	1,131.70	387.12				Jalan = road					
167	T.167	AA	-3	1	43	41	R						373.484	397.165	0.940		784	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									446.93	73178.00						Jalan = road					
168	T.168	BB	-3	3	35	38	L						454.630	434.090	1.047		1,156	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									421.25	73599.25						Jalan = road					
169	T.169	AA	+0	1	51	57	R						378.640	424.575	0.892		784	Kebun sawo=spodilla	Antosari	Selemandeg barat	Tabanan
									427.90	74027.15						Jalan, Rumah					
170	T.170	AA	+0								1,961.70	405.10	466.523	419.125	1.113		784	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									410.35	74437.50						Jalan, Sungai					
171	T.171	AA	-3										381.379	420.265	0.907		784	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									430.18	74867.68						Sungai=river					
172	T.172	AA	+0										377.481	351.100	1.075		784	Sawah = rice field	Antosari	Selemandeg barat	Tabanan
									272.02	75139.70											
173	T.173	FF	-3														1,521	Sawah=rice field	Antosari	Selemandeg barat	Tabanan
									80.00	75219.70											
	GITET ANTOSARI																		Antosari	Selemandeg barat	Tabanan
									75,219.70												

Appendix 8: Due Diligence Review Components 3 and 4

1. Introduction

151. The proposed Java-Bali 500 kV Power Transmission Crossing Project (the Project) consists of six components located in East Java and Bali provinces:

Component 1: Paiton substation extension, East Java.
Component 2: Paiton to Watudodol 500 kV overhead Transmission Line (TL) (including portions through Baluran National Park), East Java.
Component 3: Watudodol (East Java) to Segara Rupek overhead sea crossing 500 kV TL.
Component 4: Segara Rupek to Gilimanuk overhead 500 kV TL (through Bali Barat National Park), Bali.
Component 5: Gilimanuk to New Kapal overhead 500 kV TL, Bali.
Component 6: New Kapal 500/150 kV distribution substation, Bali.[41]

152. Components 1, 2, and 5 will be co-financed by ADB and PLN; Components 3 and 4 will be financed directly by PLN; and Component 6 will be co-financed by ADB, PLN and the ASEAN Infrastructure Fund (AIF). While not technically AFs, the Paiton Power Plant Complex (Java Power Grid) and the Bali Distribution System are important to the success of the Project and have also been reviewed.

153. The due diligence review was undertaken based on site visits, consultations with PLN, key government agencies and Udayana University, and a review of readiness in terms of technical and legal aspects and AMDAL progress. The review has been incorporated into the draft EIA report.

2. Description of Facilities

2.1 Component 3: Watudodol to Segara Rupek Overhead Sea Crossing 500 kV TL

154. Component 3 will construct a 2.68 km 500 kV double circuit TL overhead crossing of the Bali Strait from Watudodol (Java side) to Segara Rupek (Bali Side), and will be funded by PLN.[42] The crossing and anchor towers on the Bali side will be located within the Wilderness Zone of Bali Barat National Park; works under the component will require a permit under GoI Regulation No. 28/2011 on the Management of Nature and Conservation Areas.

155. At 363 m high on the Java side and 376 m high on the Bali side, these will be the tallest such towers in the world. However, there are a number of similar power crossing towers around the world and the technology is proven.[43] The above water minimum conductor clearance is 70 m, while the design clearance is 74.5 m.

156. Figure 1 show the location of the TL overhead sea crossing across the Bali Strait, Figure 2 shows a conceptual plan of the sea crossing, and Figure 3 shows the profile of the 500 kV overhead sea crossing towers. Figure 4 shows the view from near the crossing tower site on Bali side looking towards East Java.

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[41] Component 7 (upgrading or extension of twenty-six 150kV substations in Java and Bali), was added recently to the Project, and has been assessed through a separate environmental review (see Appendix 9).
[42] This refers to the distance from crossing tower mast to crossing tower mast.
[43] For example, similar projects include: Jiangyin Crossing - 346 m, PRC; Nanjing Crossing - 257m, PRC; Orinoco Crossing - 240m, Venezuela; Zhujiang Crossing - 235m, PRC; Wuhu Crossing - 229m, PRC; Elbe Crossing - 227m, Germany; Chusi Crossing -226m, Japan; Osaki Channel Crossing-223m, Japan; Suez Canal Crossing-221m, Egypt; and Lingbei Crossing - 214m, Japan.

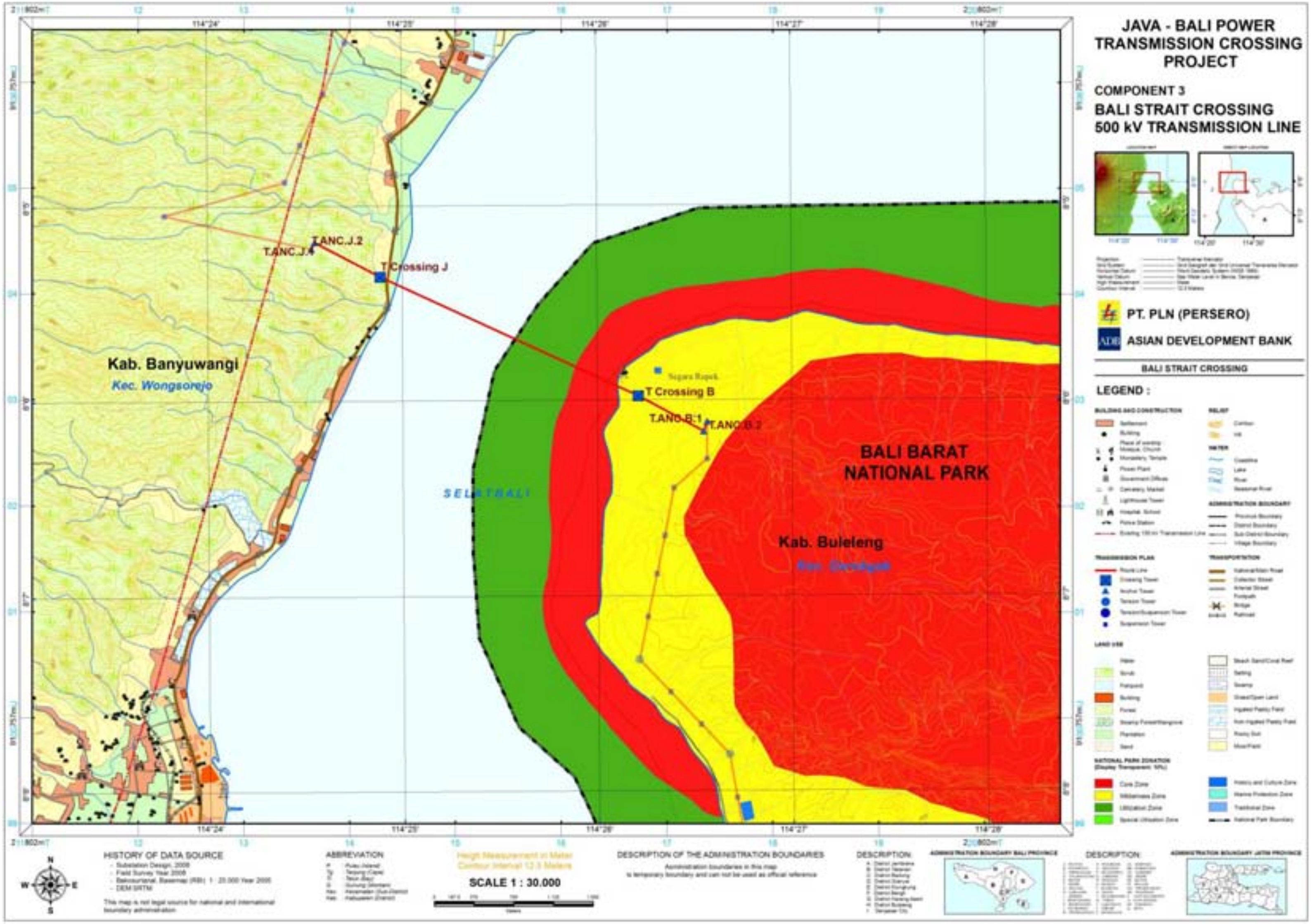

Figure 1: Watudodol to Segara Rupek TL Overhead Sea Crossing, Component 3

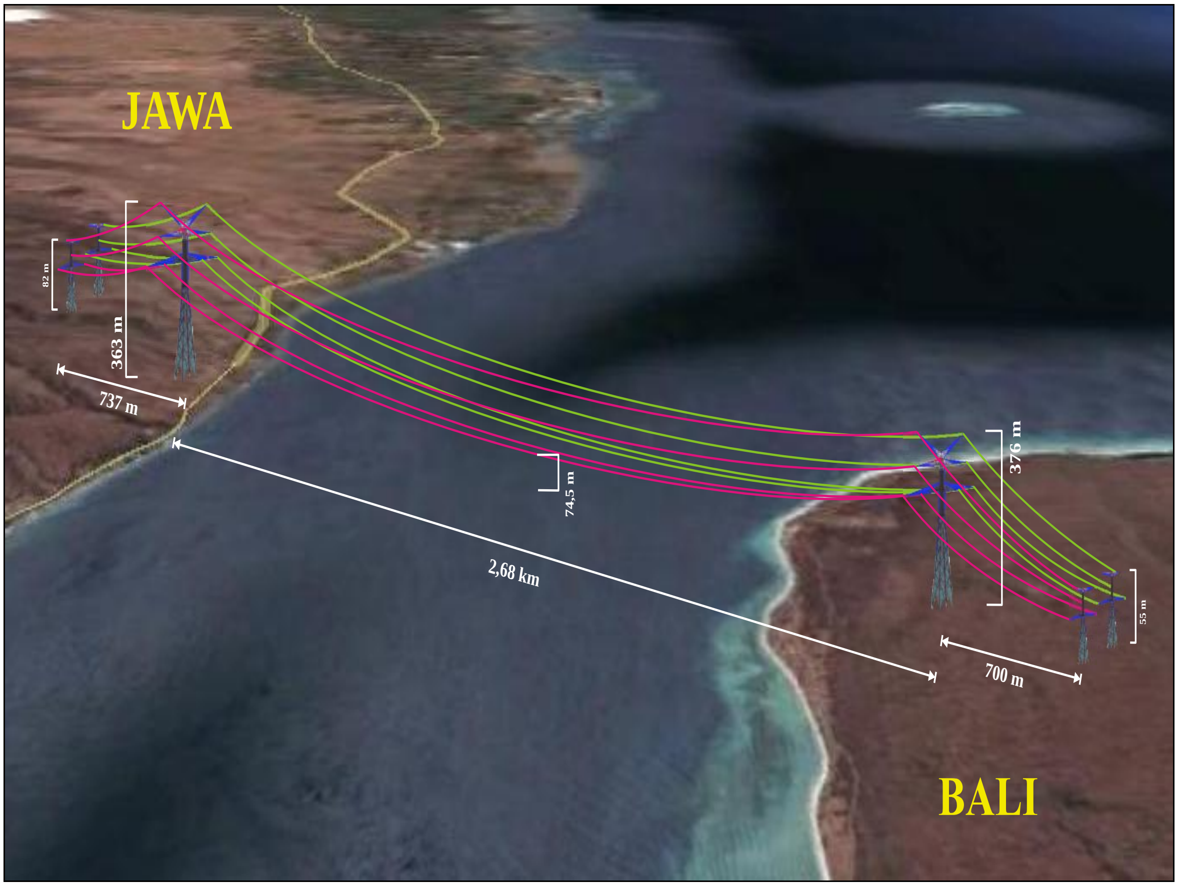

Figure 2: Conceptual Diagram of Bali Strait Overhead Sea Crossing, Component 3

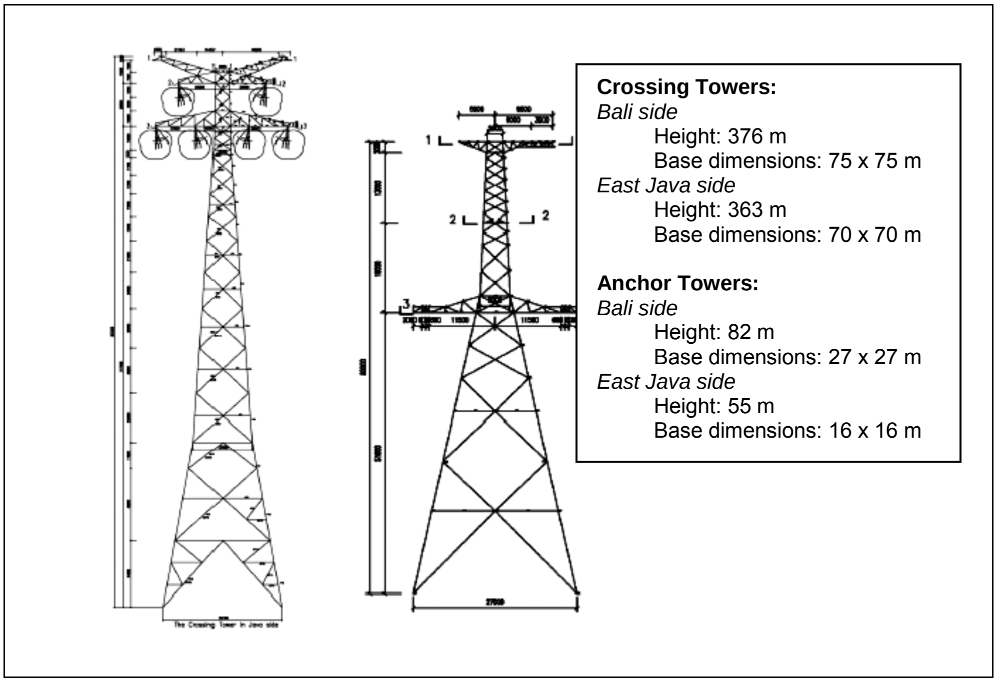

Figure 3: Profile of 500 kV Bali Strait Overhead Sea Crossing Towers, Component 3

Figure 4: Near Crossing Tower site on Bali side, looking towards East Java

157. PLN has signed a contract with a six company Chinese/Indonesian consortium to construct the sea crossing. The three Chinese companies will be primarily responsible for design, manufacture and erection; the three Indonesian companies will be primarily responsible for civil

works and facilities.[44] The contract was signed on 18 October 2011 and the Notice to Proceed is expected in early 2012; however physical works will not start until the Project AMDAL has been approved. The total contract period is 24 months.

2.2 Component 4: Segara Rupek to Gilimanuk TL

158. Component 4 will construct 10.44 km of 500 kV double circuit TL through the Bali Barat National Park from Segara Rupek to Gilimanuk (24 transmission towers in total), and will be funded by PLN. The TL will pass through the national park's Wilderness, Marine, Traditional and Utilization zones, and will cross Gilimanuk Bay where it will pass through mangrove ecosystems, including the construction of transmission towers on one mangrove islands. Works under the component will require a permit under GoI Regulation No 28/2011 on the Management of Nature and Conservation Areas. Figures 5 to 7 show various site locations, while Figure 8 presents a Component 4 location map.

2.3 Access Roads and Transportation

159. The crossing and anchor towers (Towers T. Crossing B and T. Anc. B1 and B2, Component 3) and transmission towers 3 to 20 and 23 to 26 are within easy access of an existing park road. Under the Collaborative Agreement process PLN has proposed establishing a jetty near tower 7 or 8, which will allow for easy transport of building materials and equipment to the site while minimizing heavy transportation through the park. After Project construction is finished, the jetty will be used by the park authority for patrol and other purposes.

Figure 5: Mangroves on south end of Gilimanuk Bay, near suspension tower site

[44] The Indonesian companies are: PT Tehate Putratunggal, PT Airlanggatama Nusantara Sakti, and PT Wijaya Karya (Persero) TBK; the Chinese companies are Changshu Fengfan Power Equipment Co Ltd, Guangdong Power Transmission and Transformation Engineering Co, North China Power Engineering Co Ltd,

Figure 6: Burung and Gadung Islands, Gilimanuk Bay

Figure 7: Site of proposed dock, near Component 4 Tower No. 8

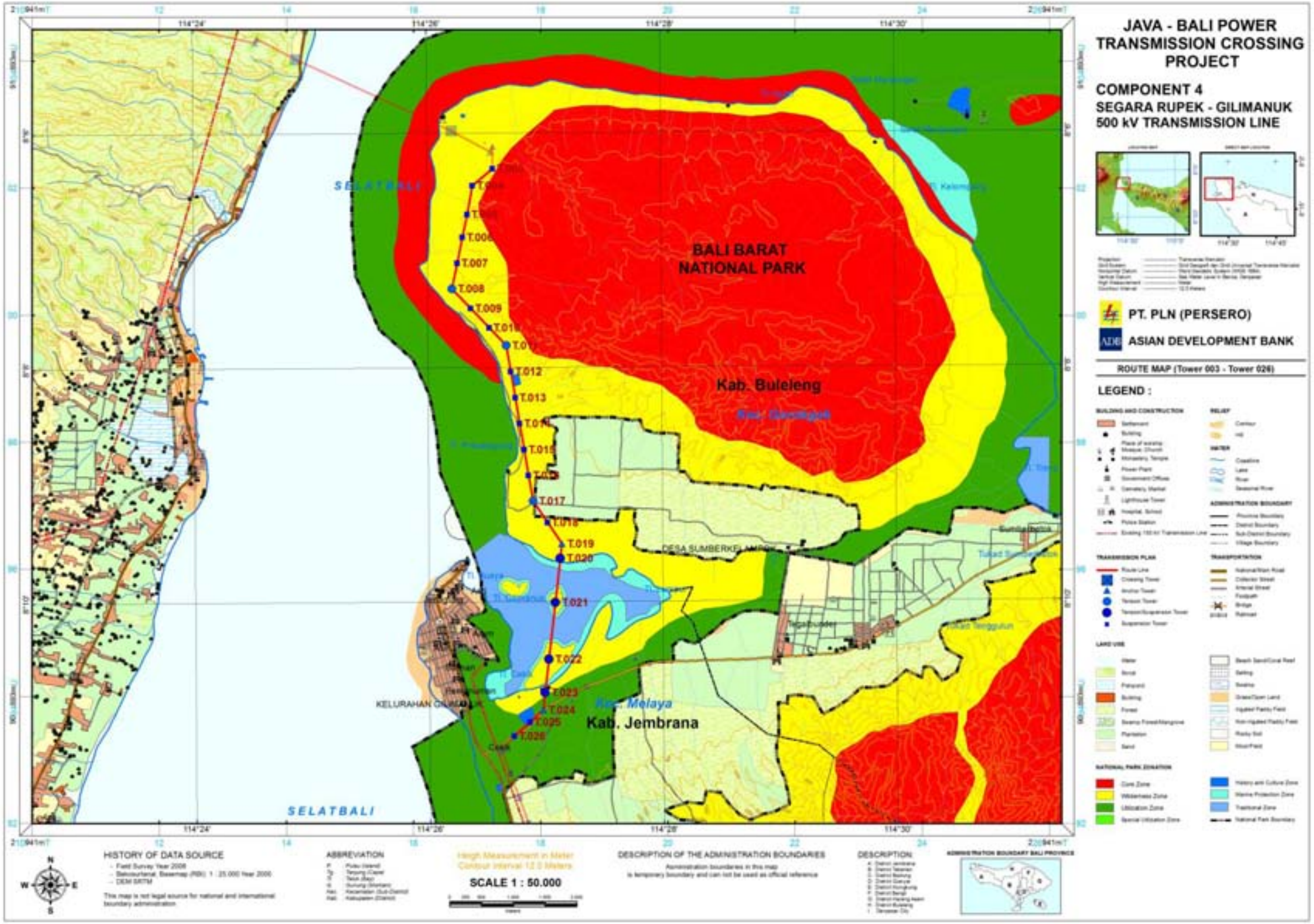

Figure 8: Segara Rupek to Gilimanuk TL, Bali Barat National Park (Component 4)

2.4 Towers

160. Component 3 and 4 will include the following tower types:

- Suspension towers:
  - straight alignment or up to 2° change in direction;
  - from 50 to 75 m high;
  - weight of approximately 38 t (including load transferred from the towers); and,
  - base dimension from 15 x 15 m to 25 x 25 m (225 m^2 to 625 m^2).

- Tension (angle) towers:
  - up to 15° change in direction;
  - from 60 to 84 m high;
  - weight of approximately 46 t (including load transferred from the towers); and,
  - base dimension from 30 x 30 m to 42 x 42 m (600 m^2 to 1,764 m^2).

- 1 Bali Straight crossing towers:
  - 363 m high on East Java side, and 376 m high on Bali side;
  - weight of approximately 450 t each (including load transferred from the towers); and,
  - base dimension of 70 x 70 m on the Bali side (4,900 m^2) and 75 x 75 m on the Java side (5,625 m^2).

- 2 Bali Strait crossing anchor towers:
  - 2 x 55 m high on the East Java side
  - 2 x 82 m high on the Bali side;
  - base dimension of 27 x 27 m on the Bali side (729 m^2); and,
  - base dimension of 16 x 16 m on the Java side (256 m^2).

- 2 anchor towers and 4 tension/suspension towers for crossing Manuk Bay:
  - 2 x 74 m high anchor towers, base dimension 34 x 34 m (1,156 m^2); and,
  - 4 x 50 to 75 m high suspension towers, up to 25 x 25 m (225 m^2 to 625 m^2).

2.5 Paiton Power Complex

161. The Paiton Power Complex is located approximately 100 km southeast of Surabaya on the north coast of East Java. It will be the primary power source for the proposed Java-Bali TL, though over time the wider Java power grid may be used to meet future demand. Power from the complex will feed into the Paiton Substation, a major 500 kV pooling substation which will be expanded under Component 1 of the Project.

162. The Paiton Power Complex currently consists of eight state and private coal-fired units (400 to 815 MW) with a total capacity of 4,735 MW. Unit 3 will start operation in 2012, and Unit 4 is currently empty but will be developed in the future, bringing the total number of power plants to nine. The complex currently runs at a capacity factor of between 60 to 80%, and has sufficient power to meet the demand from the proposed interconnection TL; therefore no additional capacity will be required as a result of the Project. Table 1 provides an overview of the complex, Figure 9 shows two of the power units, and Figure 10 shows due diligence consultations held at the complex.

Table 1: Paiton Power Complex

Unit No	Fuel	Capacity (MW)	Owner/Operator	Year Operation Started	Approved AMDAL?	Emission Control Devices
1	Coal	400	PLN	1984	Yes	Low NOx Burners, ESP
2	Coal	400	PLN	1984	Yes	Low NOx Burners, ESP
3	Coal	815	PT IPMOMI (Consortium of International Power, Mitsui, TEPCO)	2012	Yes	Low NOx Burners, FGD, ESP
4				Will be developed in the future		
5	Coal	615	PT Java Power (Consortium of Siemes, YTL Power, PowerGen)	2000	Yes	Low NOx Burners, ESP
6	Coal	615	PT Java Power (Consortium of Siemes, YTL Power, PowerGen)	2000	Yes	Low NOx Burners, ESP
7	Coal	615	Paiton Energy (Consortium of International Power, Mitsui, TEPCO, PT BHP)	1999	Yes	Low NOx Burners, ESP
8	Coal	615	Paiton Energy (Consortium of International Power, Mitsui, TEPCO, PT BHP)	1999	Yes	Low NOx Burners, ESP
9	Coal	660	PLN	Under construction	Yes	Low NOx Burners, ESP
TOTAL		4,735 MW				

Notes: BLHD = Badan Lingkungan Hidup Daerah, Provinsi Jawa Timur (Provincial Environmental Agency - East Java Province); FGD = Flue Gas Desulphurization; ESP = Electrostatic Precipitator.

Figure 9: Units 5 and 6 (1220 MW), Paiton Power Complex, East Java

Figure 10: Discussion with power plant officials at Paiton Power Plant Complex

2.6 Bali Power Distribution System

163. Power will be transferred from the 500/150 kV New Kapal substation (Component 6) to the Bali region through existing 150 kV transmission lines and then to the distribution network. PLN's distribution system in Bali has adequate capacity to distribute the power from the 500 kV TL, and through its distribution development plan PLN will further enhance capacity in the future.

3. Bali Barat National Park

3.1 Location and Geography

164. Bali Barat National Park is located on the north western portion of Bali island about 60 km west of Denpasar, between 114°25' - 114°34' E and 8°05' - 8°15' S (Figure 11). It lies within Buleleng and Jembrana Kabupatens, and has an area of 19,002.89 ha (about 5% of Bali's total land area), consisting of 15,587.89 ha of land and 3,415 ha of ocean. The original park was approximately 77,000 ha in area and extended much further to the east than it does today; the modern boundaries of the park were established under MoF Decree SK.No.493/Kpts-II/95. The Park is surrounded by six villages with varied ethnic populations (Balinese, Javanese, Madurese and Bugis). Administratively these villages are either governed by the districts of Buleleng or by Jembrana.

3.2 Zoning

165. According to the Director General of PHKA Decision No.SK.143/IV-KK/2010, Bali Barat is divided into seven zones;

Core Zone
Area: 8,023 ha consisting of 7,568 ha and 455 ha of marine waters.
Objectives:
- Protection of biodiversity.
- Only research and science activities allowed.

Wilderness Zone
Area: 6,174 ha.
Objectives:
- Buffer zone for core zone.
- Research and science activities and limited tourism allowed.

Utilization Zone
Area: 4,294 ha consisting of approximately 1,645 ha of land area and 2,746 ha of marine waters.
- Research and science activities and limited tourism allowed, as well as construction of tourism facilities, some infrastructure, natural resource utilization, and other uses that support the conservation of natural resources and ecosystems.

Maritime Zone
Area: 222 ha
Objectives:
- Protection of marine biodiversity.
- Research and science activities and limited tourism allowed.

Cultural Utilization Zone
Area: 51 ha
Objectives:
- This zone can be developed and utilized for cultural or religious purposes.

Traditional Zone
Area: 311 ha
Objectives:
- Traditional use by the communities which have a historical dependence on natural resources.

Special Utilization Zone
Area: 4 ha
Objectives:
- Provides for land uses that were pre-existing before the Park was established, including community activities, telecommunications, transportation and power facilities.

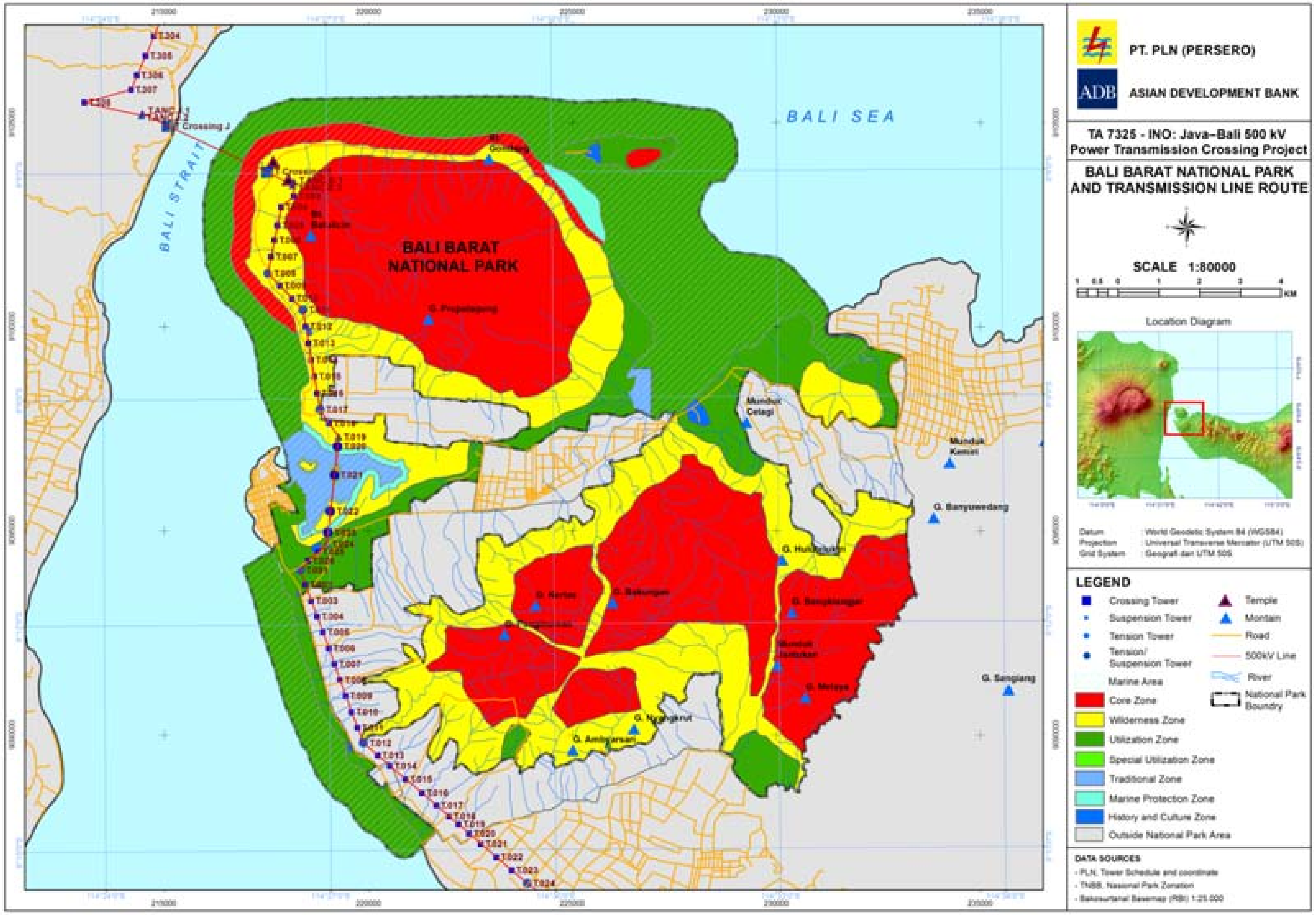

Figure 11: Bali Barat National Park Location and Project RoW

3.3 Topography and Climate

166. Bali Barat Park is mountainous and has steep and undulating topography, though the RoW makes uses of the flatter near shore area (Figure 12). Altitude ranges from sea level to 1,414 masl. The peninsular Prapat Agung, with its extensive web of footpaths, is the most accessible part of the park.

167. Bali Barat National Park has a tropical monsoon climate. The rainy season lasts from October to April and the dry season from May to September. Average temperature is 33°C, and rainfall varies between about 950 to 1550 mm/year.

3.4 Ecosystems

168. The Bali Barat National Park includes savanna, monsoon forest, mangrove forest, montane and mixed-monsoon forests, sea grasses, coral reefs, sandy beaches, and both shallow and deep sea waters. Given its relatively small area the Park is rich in biodiversity.

3.5 Flora

169. The Park has 175 species of plants, 14 of which are endangered or protected species (Table 2) such as Bayur *(Pterospermum javanicum),* Ketangi *(Lagerstroemia speciosa),* Burahol *(Stelechocarpus burahol), S*andalwood *(Santalum album), and* Rosewood *(Dalbergia latifolia)*.

3.6 Fauna

Birds

170. Bali Barat National Park has approximately 160 species of avifauna and is an important bird-watching site. The endemic Bali Starling or Rothschild's Myna *(Leucopsar rothschildi),* one of the most endangered species of birds in the world, is the Park mascot. According to Birdlife International (2012) it has likely long been uncommon (numbers in the early 1900s, the period of discovery, have been retrospectively guessed at 300-900), but has declined drastically in population and range. Illegal poaching reduced numbers to a critically low level in 1990 when the wild population was estimated at approximately 15 birds. Conservation intervention coupled with the release of a few captive-bred birds raised this to between 35 and 55. However, despite excellent breeding success and continuing conservation efforts, the population continues to fluctuate and fell to six birds in 2001. According to Park officials there are currently an estimated 14 individuals in the wild, and the Bali Starling is designated as Critically Endangered by IUCN and is listed in Appendix I of CITES. Trade even in captive-bred specimens is strictly regulated though illegal poaching and sales continue to be a major threat. Due to its critically endangered and protected status, the black market price per bird is US$ 1,000 – 4,000.

There are currently two rehabilitation centers in the Park attempting to establish viable populations in the wild.

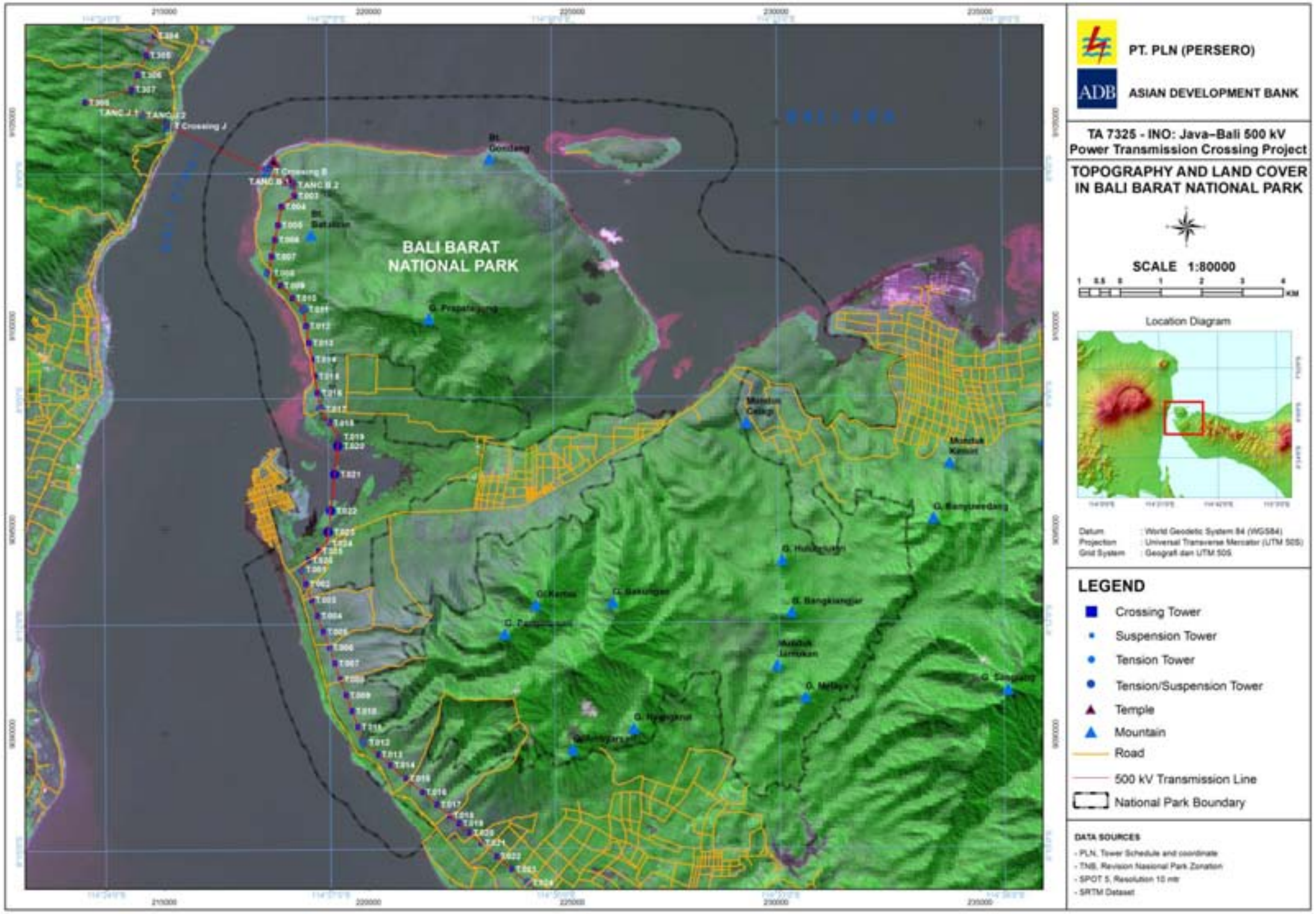

Figure 12: Bali Barat National Park Topography

Table 2: Protected Vegetation in Bali Barat National Park

No.	Scientific Name	Local Name	Conservation Status
1.	*Pterospermum javanicum*	Bayur	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
2	*Antidesma bunius*	Buni	Tanaman langka
3	*Langerstroemia speciosa*	Bungur	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
4	*Steleochocarpus burahol*	Burahol	Rare
5	*Santalum album*	Cendana	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
6	*Aleuritas moluccana*	Kemiri	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972
7	*Sterculia foetida*	Kepah, Kepuh (Bali)	Rare IUCN
8	*Schleichera oleosa*	Kesambi	Rare IUCN
9	*Diptercocaus Hasseltii*	Kruing bunga	Rare BTNBB
10	*Garcinia dulcis*	Mundu	Rare IUCN
11	*Alstonia scolaris*	Pulai	Rare IUCN
12	*Manilkara kauki*	Sawo kecik	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972)
13	*Dalbergia latifolia*	Sono keling	Rare (IUCN; Protected by Minister for Agriculture SK No. 54/Kpts/Um/2/1972)
14	*Cassia fistula*	Trengguli	Rare

Source: Bali Barat National Park.

171. Other avifauna mostly consists of sea and shore birds, the most conspicuous being the Brown Boobies and Lesser Frigate birds. There are two colonies of Terns that nest on a sandy cay at the entrance to Teluk Lumpur (also known as Mud Bay) whilst the Frigates and Boobies roost on Pulau Burung. The number of White Starlings left in the wild is unknown.

172. Other birds reported in the National Park include: Yellow-vented Bulbul *(Pycnonotus goiavier),* Black-naped Oriole *(Oriolus chinensis),* Pied Fantail *(Rhipidura javanica),* Edible-nest Swiftlet *(Collocalia fuciphaga),* White-bellied Swiftlet *(Collocalia esculenta),* Pacific Swallow *(Hirundo tahitica),* Crested Treeswift *(Hemiprocne coronata),* White-breasted Wood-Swallow *(Artamus leucorhynchus),* Barn Swallow *(Hirundo rustica),* Red-rumped Swallow *(Hirundo daurica),* Long-tailed Shrike *(Lanius schach),* Striated Warbler *(Megalurus palustris),* Collared Kingfisher *(Halycon chloris),* Sacred Kingfisher *(Halycon sancta),* Javan Kingfisher *(Halycon cyaniventris),* Small Kingfisher *(Alcedo caerulescens),* Rufous-backed Kingfisher *(Ceyx rufidorsus),* Stork-billed Kingfisher *(Pelargopsis capensis),* Racket-tailed Treepie *(Crypsirina temia),* Dollarbird *(Eurystomus orientalis),* Savanna Nightjar (*Caprimulgus affinis*), Collared Scops-Owl *(Otus bakkamoena),* Crested Serpent-Eagle *(Spilornis cheela),* Javan Turtle-Dove *(Streptopelia bitorquata),* Banded Pitta *(Pitta guajana),* Mangrove White-eye *(Zosterops chloris),* Lesser Adjutant *(Leptopilus javanicus), and* Great Thick-Knee *(Esacus magnirostris).*

Animals

173. A variety of animals can be found in the National Par, including Banteng *(Bos javanicus),* Wild Boar *(Sus scrofa),* Rusa Deer *(Cervus timorensis),* Long-tailed Macaque *(Macaca fascicularis),* Ebony Leaf Monkey *(Trachypithecus auratus),* Barking Deer or Muntjac *(Muntiacus muntjak),* Hawksbill Turtle *(Eretmochelys imbricata),* Leopard Cat *(Prionailurus bengalensis),* Pangolin or Trenggiling *(Manis javanicus),* Large Flying Fox or Kalong *(Pteropus vampyrus),* Black Giant Squirrel *(Ratufa bicolor),* and Water Monitor *(Varanus salvator).* The Critically Endangered Hawksbills Turtle (*Eretmochelys imbricata*) are frequently sighted along the north coast. Table 3 lists protected fauna in the Park.

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Table 3: Protected Fauna in Bali Barat National Park

Sl. No.	Scientific Name	Local Name	Conservation Status
1	*Leucopsar rothschildi*	Jalak Bali	Rare; Protected
2	*Manis javanicus*	Trenggiling, Kesih (Bali)	Rare; Protected , Category II (CITES)
3.	*Ratufa bicolor*	Jelarang, Kapan-kapan (Bali)	Rare; Protected , Category II (CITES)
4	*Hystric branchyura*	Landak	Rare
5	*Felis marmorata*	Kueuk	Rare; Protected by the population descended
6	*Cervus timorensis*	Menjangan	Protected; Category II (CITES)
7	*Bos javanicus*	Banteng	Rate; Endangered, Category III Vulnerable
8	*Trangulus javanicus*	Pelanduk, Kancil (Bali)	Rare; Protected by the population descended
9	*Varanus salvator*	Biawak	Rare
10	*Lepidochelys olivceae*	Penyu rider	Rare; Protected

Source: Bali Barat National Park.

Corals

174. 110 species of coral belonging to 18 families were recorded in 1988, including 22 species of the mushroom coral family (*Fungiidae*), and least 27 species of *Acropora* coral found in a small 2 ha area.

3.7 TL Alignment through Baluran National Park

175. Approximately 11.80 kms of the proposed alignment of components 3 and 4 will pass through the Wilderness and Utilization zones of Bali Barat National Park (Figure 11 and Table 7). It should be emphasized that there will be no towers or construction in the Core Zone, it is only passed overhead by conductors in a narrow core zone strip in the northwest area of the Park.

176. The majority of the RoW in the Park will be passing through the Wilderness Zone but Park Authorities report that in the area of the TL presence of wildlife other than birds is rare. Of critical importance is that the TL and crossing tower are not in an area occupied by the Bali Starling (*Leucopsar rothschildi*). The main habitat area for Bali Starling in the wild and for release through the captive breeding program is in the Berumbun Peninsula close to Menjangan Island, approximately 10 km to the east of the main Crossing Tower.

177. The RoW will also pass across Manuk Bay (Component 4). Towers will be placed on one mangrove island and on two mangrove flats within the marine protection zone.

178. The Bali side crossing tower will be in proximity to three temples: i) Pura kahyangan Jagat (Segara Rupek); ii) Pura Segara (Pasiraman Agung) and, (iii) Pura Luhur (Payogan Agung).

179. The land use in the Utilization Zone is mostly mixed forest vegetation. According to the park authority, the presence of wildlife in Utilization Zone is very rare, and there are no reports of endangered species of flora and fauna in the zone.

180. There are no migratory paths of wildlife along the proposed alignment reported by the park authority.

Table 7: TL RoW Area within Bali Barat National Park

TL RoW Area within Bali Barat National Park (Components 3, 4 and 5)	**RoW Length m**	**RoW Width m**	**RoW Area m^2**	**RoW Area Ha**
Core Zone	360	34	12,224	1.22
Wilderness Zone	8,425	34	286,454	28.65
Utilization Zone	1,998	34	67,945	6.79
Special Utilization Zone	-	-	-	-
Traditional Zone	561	34	19,088	1.91
Marine Protection Zone	373	34	12,689	1.27
History and Culture Zone	83	34	2,823	0.28
Total	**11,800**		**401,215**	**40.12**

Note: Based on GIS analysis and data provided by PLN (2012).

4. Assessment of Potential Impacts and Issues

181. Approximately 11.80 km of the proposed alignment of components 3 and 4 will pass through Bali Barat National Park (Figure 11), including the Bali side of the Bali Strait crossing and anchor towers of Component 3; and towers 3 to 26 of Component 4. The RoW will encompass a total of 40.12 ha (see Table 7). It should be noted that there will be no towers or construction in the Core Zone, it is only passed overhead by conductors in a narrow core zone strip in the northwest area of the Park. There are no migratory paths of wildlife along the proposed alignment reported by the park authority.

182. There are a number of environmental and social issues associated with Components 3 and 4:

Routing through Wilderness Zone

The TL will pass through and require tower construction in the Wilderness Zones (Zona Rimba) but Park Authorities report that in the area of the TL presence of wildlife other than birds is rare. Of critical importance is that the TL and crossing tower are not in an area occupied by the Bali Starling (*Leucopsar rothschildi*). The main habitat area for Bali Starling in the wild and for release through the captive breeding program is in the Berumbun Peninsula, approximately 10 km to the east of the main Crossing Tower. The main crossing tower base will need up to 1 ha land size (100 x 100 m). Some access roads will also need to be constructed. Construction will encroach on the habitat of birds especially in the base of the main tower.

Construction in Sensitive Ecological Environments
The RoW will also pass across Gilimanuk Bay (Component 4) and towers will be placed on one mangrove island (Gadung Island) and on two mangrove flats within the marine protection zone. Stringent construction measures will need to be undertaken to minimize adverse impacts to mangroves and birds.

Religious Sensitivity
The Bali side crossing tower will be within 350 m of the Segara Rupek Temple, the largest and most important of 3 temples in the vicinity (Figure 41). The temple is visited by the Governor annually and by the Hindu community on a monthly basis during full and new moons. The temple can only be reached by a small rough road through the National Park along the coastline. Special permission from the Governor of Bali has been obtained.

Figure 41: Segara Rupek Temple, Bali Barat National Park

183. There are no significant issues associated with the Paiton Power Complex. The complex currently runs at a capacity factor of between 60 to 80%, and has sufficient power to meet the demand from the proposed interconnection TL; therefore no additional capacity will be required as a result of the Project.

184. There are also no significant issues associated with the PLN's distribution system in Bali. The distribution system has adequate capacity to distribute the power from the 500 kV TL, and through its distribution development plan PLN will further enhance capacity in the future.

5. Status of Environmental Clearance and Approvals

185. PLN has recruited the Environmental Research Center of the University of Udayana in Denpasar Bali to undertake the Project AMDAL process. The AMDAL will cover the entire Project including Components 2 and 3. A draft AMDAL ToR was prepared by PPLH which underwent extensive review and revision. The TOR includes:

i) scope of the study;
ii) type of activities of the project that may cause impact to environment, including impacts on biodiversity;
iii) environmental parameters likely to be affected by the project'
iv) method of data collection and analysis;
v) potential and important impact identification; and,
vi) methods of impact prediction and evaluation.

186. Approval of the ToR by MoE was received in July 2012. The ANDAL report was finalized in September 2012 and submitted to the MoE, which issued the AMDAL or Environmental Permit of the Project in April 2013.

187. PLN has also received a Forest Rent Use Approval in Principle Permit from the Ministry of Forestry (MoF) for TL construction activities inside Bali Barat National Park, and at the time of report preparation is negotiating a Collaborative Support agreement with the Park to offset negative impacts of the TL on the Park's biodiversity and to support Park conservation activities.

188. With respect to the Paiton Power Complex, all existing power plants have an approved AMDAL and are equipped with at minimum low NOx burners and electrostatic precipitators. No additional environmental clearances are required.

189. Given the scale of works, no environmental assessment was required for the existing Bali secondary distribution network.

6. Conclusion and Recommendations

190. There are no significant due diligence issue associated with the Paiton Power Complex or the Bali electrical distribution network. However, there are environmental issues associated with Components 2 and 3. PLN is in the process of preparing an AMDAL that will address the identified issues. The TOR for the AMDAL is quite comprehensive and covers impacts to be assessed including biodiversity, alternatives assessment and public participation, and includes detailed methodologies for data collection and analysis.

191. PLN has also received a Forest Rent Use Approval in Principal Permit for TL construction activities inside Bali Barat National Park, and is negotiating a Collaborative Support agreement with the Park which will offset negative impacts of the TL on the Park's biodiversity and support Park conservation activities. PLN is also engaged in ongoing public participation and outreach including discussions with the Hindu Dharma Society on issues associated with the proximity of the crossing tower to existing temples.

192. It is concluded that based on progress to date, a satisfactory process is in place to ensure that environmental and social issues will be adequately addressed for Components 2 and 3.

193. It is recommended that:

i) Once drafts of the AMDAL report and the Collaborative Agreement between PLN and the Bali Barat National Park Authority are finalized ADB should review both carefully to ensure compliance with its Safeguard Policy Statement (SPS) requirements, including the principle of no net loss of biodiversity, and they should be incorporated into a revised Project EIA.

ii) Special attention should be paid to ensuring that good international construction practices are utilized in mangrove areas.

iii) PLN should continue to engage in public consultations and outreach with religious organizations and civil society.

194. Table 10 presents a summary of the due diligence review.

Table 10: Summary of Due Diligence Review of Components 3 and 4

Component / Associated Facility	Capacity / Details	Key Issues	Status of Environmental Review and Clearances
Component 3: Watudodol - Segara Rupek Overhead Sea Crossing TL	2.68 km of 500 kV double circuit, quadruple dove conductor overhead sea crossing TL, East Java and Bali (tower to tower crossing width is 2.68 km) Component will be financed by PLN. Involves the construction of two crossing towers (363 m high on the Java side and 376 m high on the Bali side). The crossing and anchor towers on the Bali side will be located within the Wilderness Zone of Bali Barat National Park. PLN has received good support from local Government of Bali for the Project including this component.	**Routing through Bali Barat National Park** The Bali side Crossing and Anchor Towers will be in the Wilderness Zones (Zona Rimba). **Religious Sensitivity** The Bali side Crossing Tower will be within 350 m of the Segara Rupek Temple, . Special permission from the Governor of Bali has been obtained.	PLN has recruited the Environmental Research Center of the University of Udayana in Denpasar Bali to undertake the Project AMDAL process. The AMDAL ToR was prepared by PPLH and was approved by the MoE in July 2012. Preparation of the AMDAL was undertaken in parallel to the development of the ToR, and is expected by the end of September 2012. The AMDAL will cover all six Project components, including Component 3. PLN has also received an Approval In Principle Permit for TL construction activities inside Bali Barat National Park, and has negotiated a Collaborative Agreement with the Park to offset negative impacts of the TL on the Park's biodiversity and to support Park conservation activities. A biodiversity study will be undertaken to develop the Collaborative Agreement in more detail.
Component 4: Segara Rupek - Gilimanuk TL	10.50 km of 500 kV double circuit, quadruple dove conductor, overhead TL through Bali Barat National Park, Bali Component will be financed by PLN. Involves the construction of 10.44 km of 500 kV double circuit TL through the Bali Barat National Park from Segara Rupek to Gilimanuk (24 transmission towers in total). PLN has received good support from local Government of Bali for the Project including this component.	**Routing through Wilderness Zone** The TL will pass through and require tower construction in the Wilderness Zones (Zona Rimba) and will also cross the core zone, traditional zone, and marine protection zone. **Construction in Sensitive Ecological Environments** The RoW will also pass across Gilimanuk Bay (Component 4) and towers will be placed on one mangrove island (Gadung Island) and on two mangrove flats within the marine protection zone.	PLN has recruited the Environmental Research Center of the University of Udayana in Denpasar Bali to undertake the Project AMDAL process. The AMDAL ToR was prepared by PPLH and was approved by the MoE in July 2012. Preparation of the AMDAL was undertaken in parallel to the development of the ToR, and is expected by the end of September 2012. The AMDAL will cover all six Project components, including Component 4. PLN has also received an Approval In Principle Permit for TL construction activities inside Bali Barat National Park, and has negotiated a Collaborative Agreement with the Park to offset negative impacts of the TL on the Park's biodiversity and to support Park conservation activities. A biodiversity study will be undertaken to develop the Collaborative Agreement in more

Component / Associated Facility	Capacity / Details	Key Issues	Status of Environmental Review and Clearances
			detail., and to develop best international practices for working in Gilimanuk Bay.
Paiton Power Plant Complex	The complex consists of eight state and private coal-fired units (400 to 815 MW) with a total capacity of 4,735 MW. The Paiton Power Complex will be the primary power source for the proposed Java-Bali TL, though over time the wider Java power grid may also be used to meet future demand. The complex has sufficient power to meet the demand from the proposed interconnection TL; therefore no additional capacity will as a result of the project	No significant issues. All power plants have approved AMDALs, and the complex has sufficient capacity, including back-up from the wider Java power grid.	All power plants have AMDALs approved by Badan Lingkungan Hidup Daerah, Provinsi Jawa Timur (Provincial Environmental Agency - East Java Province). Power plants at minimum are equipped with Low NOx Burners and Electrostatic Precipitators. The PT IPMOMI Power Plant, due to open in 2012, will also be equipped with Flue Gas Desulphurization.
Distribution System	Bali Distribution System	No significant issues. PLN’s distribution system in Bali has adequate capacity to distribute the power from the 500 kV TL, and through its distribution development plan will further enhance capacity in the future.	EIA not required. Distribution network improvement included in PLN’s master plan.

Appendix 9: Due Diligence Review of Component 7

Upgrading and Extension of 26 substations, Java Bali 500 kV Transmission Line Project

I Introduction

Component 7 is a recent addition to the Java Bali Transmission Line Project. The component will either extend or upgrade 26 existing 150 kV substations through the provision of new 150kV/20kV 60 MVA transformers (substation extension) or replacement of existing lower capacity transformers with new 150kV/20kV 60 MVA transformers (substation upgrading). The component will improve the reliability, quality and efficiency of power supply in the Java-Bali grid, and ensure substation capacity in Bali to distribute the power transmitted by the Project. The component will be co-financed by PLN and IDB (see Figure 3.11 in main report).

This is an environmental review of Component 7, and is based on site visits to substations in Bali and Java undertaken in July 2012. The purpose of the review is to assess environmental impacts that may occur during Component 7 implementation, including land acquisition, PCB issues, health impacts from electromagnetic fields (EMFs), pollution from transformer oil, etc., and to develop appropriate mitigations. The environmental review results will be incorporated into the Project EIA.

PLN's decision to either extend or upgrade substations with new 150kV/20kV transformers for electricity distribution is based on existing and forecast electricity demand in the substation service area and the availability of extension land. As extension involves installation of new transformers, no used transformers requiring disposal will be generated with substation extensions.

When the extension of substations through new transformers is not appropriate due to the unavailability of land or lack of current or future demand, then existing transformers will be upgraded to 150 kV/ 20 kV. The existing transformers will be removed and transported to another location in Indonesia where the electricity consumption is still low and can be handled by the existing transformer. Thus, no used transformers requiring disposal will be generated by either substation extension or upgrading.

II Component Description

Table 1 provides an overview of the Component 7 activities.

III Site Survey

In July 2012 a site survey was undertaken of 7 of the 26 Component 7 substations, which is considered to be a representative sampling:

1. Negara substation, District of Jembrana, Bali
2. Gilimanuk substation, District of Gilimanuk, Bali
3. Tanggul substation in District of Jember, East Java
4. Lumajang substation in District of Lumajang, East Java
5. Undaan substation in the city of Surabaya, East Java
6. Alta Prima substation in District of Gresik, East Java
7. Sampang substation in the District of Madura, East Java

Table 1: List of 26 substations to be extended/upgraded, Component 7

No	Substation	Voltage	Scope of Work	Capacity MVA	Cost Million USD	COD	Status	District/ Regent
1	Payangan	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Bali Province
2	Gilimanuk	150/20 kV	Upr, 1 TB, 1 Trf	30	1.67	2017	Plan	Bali Province
3	Negara*	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Bali Province
4	New Sanur	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Bali Province
5	Undaan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Surabaya
6	Babadan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Sidoarjo
7	Sengkaling	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Malang
8	PLTA Tulungagung	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Tulungagung
9	Trenggalek	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Trenggalek
10	Sekarputih	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Mojokerto
11	Ngoro	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Jombang
12	Siman	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Jombang
13	Cerme	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2016	Plan	Gresik
14	Sidoarjo	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2016	Plan	Sidoarjo
15	Sby. Selatan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Surabaya
16	New Pacitan	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Pacitan
17	Banaran	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Kediri
18	Tanggul	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2017	Plan	Jember
19	Lumajang	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Lumajang
20	Jaya Kertas	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Nganjuk
21	Sampang	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2017	Plan	Madura
22	Manyar	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2017	Plan	Surabaya
23	Blimbing	70/20 kV	Upr, 1 TB, 1 Trf	30	1.26	2017	Plan	Malang
24	Alta Prima*	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2018	Plan	Gresik
25	Ngawi	150/20 kV	Ext, 1 TB, 1 Trf	60	2.10	2018	Plan	Ngawi
26	Gili Timur	150/20 kV	Upr, 1 TB, 1 Trf	60	1.67	2018	Plan	Madura
	Total			**1500**	**49.48**			

Notes: Source: PLN (2012) and field survey (2012). List is indicative and subject to change.

- Upr: Existing transformer to be upgraded. Will be done within the substation, does not require land acquisition.
- Ext: Substation to be extended with new transformer, requires a small extension of the substation.
- BT: Bay Transformer.
- Trf: Trafo Transformer.

Substation has been surveyed by the environmental team. (blue)
Substation may be replaced with another by PLN. (pink)

* Further to discussions during the site visits, the following changes may be made based on technical aspects and local electricity consumption: extension of Negara substation to be changed to upgrading, and upgrading of Alta Prima substation is to be changed to extension.

The survey took into account the following issues:

1. Existing conditions: a) land acquisition issues, involuntary resettlement and compensation for lost assets (i.e. trees or crops); b) PCB risks; solid waste disposal; handling of transformer oils, etc.
2. During constructions stage: storage, handling, use and disposal of hazardous materials such as transformer oils; soil and water contamination; PCB risks; health and safety risks; removal of vegetation and earthworks and construction activities including access ways and construction platforms; and solid waste.
3. Operational Stage: Operating and Maintenance (O & M); storage, handling, use and disposal of hazardous materials such as transformer oils; EMF exposure to workers and community; and solid wastes.
4. GoI Regulation and PLN Standard Operating Procedures (SOPs) to undertake environmental health and safety control and monitoring during construction and operation.

IV Site Visit Findings

Site visit findings are summarized in Table 2. Annex A presents typical site visit photos, Annex B presents existing transformers equipment and environmental conditions at each substation.

IV Impacts and Mitigations

1. **Existing conditions**:
    a. There are no resettlements issues in the substations to be extended. Land area is available for transformer extension in Undaan Substation and Alta Prima Substation, and is also available for a control room if required.
    b. There are no environmentally sensitive areas that will be affected by the substation upgrading or extension.
    c. There are no risks associated with PCB handling or disposal. PCBs have been banned since 1970, and the substations assessed were constructed after that year. Handling of transformer oil is adequate through periodic testing and monitoring from the control room.
    d. Some existing substation transformers do not have adequate spill containment berms. This is important to address during the replacement of existing or installation of new transformers.

2. **During construction:**
    a. Storage, handling and disposal of hazardous materials:
        i. For new installations restrictions on the use of PCBs will be included as a requirement in the design and bidding contract documents.
        ii. For replacement (upgrading) of existing transformers, transformers oils will be removed prior to transportation and either reused or taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available.
    b. All new transformers, either for substation extension or upgrading, will be equipped with suitably sized impervious spill containment berms made of precast and reinforced concrete in accordance with relevant national standards.
    c. For replacement (upgrading) of existing transformers, transformers oils will be removed prior to transportation, tested, and either reused or taken for recycling at designated recycling facilities, if available, or for disposal at designated waste disposal facilities if recycling is not available.

d. Spoil from excavation for the transformer bases will be only a minor impact since the volume of soil excavated is a very small. Other construction wastes will also be minimal. Spoil will be reused to the extent possible and appropriate spoil and waste disposal will be a requirement in the design and bidding contract documents.

Table 2: Site Visit Findings, Component 7, Java Bali Transmission Line Project, 22 – 26 July 2012.

No	Environment Issues	150 kV GIs (Substations) Visited in Java Bali GI Negara Jembrana	GI Gilimanuk Gilimanuk	GI Tanggul Jember	GI Lumajang Lumajang	GI Undaan Surabaya	GI Alta Prima Gresik	GI Sampang Madura
1	Extension/Upgrade	Upr	Upr	Upr	Upr	Ext	Ext	Upr
2	Notes				May be changed to Ext	Only need Trf, already have TB		
3	Resettlement?	No	No	No	No	No	No	No
	Land for extension							
	Land Required (m^2)	NA	NA	NA	NA	58 x 15 m	58 x 15 m	NA
	Land Available m^2)	NA	NA	NA	NA	Available	Available	NA
	Land Status?	NA	Dist. Gov.	NA	NA	PLN	Alta Prima	NA
4	New Transformer Capacity	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA	150 kVA 20 KVA 60MVA
5	Existing Transformers							
	Quantity	2	2	2	2	1	2	2
	Capacity MVA	15/30	10/10	30/60	30/60	60	30/ 30	20/60
	Capacity used (%)	50	30/60	80/25	90/50	80	80/80	70/70
	Brand Name	ALSTOM	Unindo	Unindo	Unindo	Pauwels	Xian/TELK	Unindo
	Factory	Unindo Indonesia	Indonesia	Pasti Indonesia	Xian	Indonesia	China/China	Pauwel Germany
	Year Constructed	1983/1986	1987/2006	1997/2002	1990/1997	1996	1996/2006	1993/2009
6	Hazardous Materials							
	PCBs	No	No	No	No	No	No	No
	Transf. oil leakage	No	No	No	No	No	No	No
	Others ?	No	No	No	No	No	No	No
	Monitoring	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months	Oil test / 6 months
7	Sensitive Areas:							
	Surrounding landuse	Padi field	Close to Bali Barat Nat. Park	Cane field, Village	Village	Shops and Offices	Industrial Areas	Garden and village
	Environmentally sensitive areas?	No	No	No	No	No	No	No
8	Regulations & SOP Is there PLN & GoI regulations for :							
	Health and Safety	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Hazardous Material	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	EMF	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3. During Operation:

a. Transformers will be operated according to Government of Indonesia and PLN Standard Operating Procedures (SOPs), thereby mitigating risks associated with storage, handling, use and disposal of hazardous materials such as transformer oils; and health and safety issues including EMF exposure to workers and the local community. Regulations and SOPs related to emergency response and readiness and occupational health and safety are presented in Annex C.
b. Transformer oil performance and quality will be monitored and managed by control room operators and through routine testing and analysis.

V Conclusion

Based on the survey results there are no resettlement issues expected with Component 7. There is no risk associated with PCB handling or disposal as PCBs have been banned since 1970, the substations assessed were constructed after that year, and restrictions on the use of PCBs in new transformers will be included as a requirement in the design and bidding contract documents. All transformers, either for substation extension or upgrading, will be equipped with water tight spill containment berms made of precast and reinforced concrete in accordance with relevant national standards. Minor impact from construction spoil and wastes are localized and short-term and can be mitigated through appropriate disposal. Operational risks associated with emergencies, hazardous materials and health and safety will be addressed through the application of GoI regulations and PLN SOPs, and transformer oil performance and quality will monitored and managed by control room operators and through routine testing and analysis. Overall it is concluded that Component 7 will have minimal negative environmental impacts, and it is recommended that the component proceed with the application of the mitigation measures and PLN SOP and GoI regulations referenced in this report.

Annex A: Typical substation pictures taken during Component 7 site visit.

Figure 1. Gilimanuk substation area – Bali. Space for extension is available.

Figure 2. Tanggul Substation area - Jember. Space for extension is available

Figure 3. Typical substation area.

Figure. 4. Sampang Substation Area. Space available for extension or upgrading.

Figure 5. Control room Undaan substation – Surabaya. Space for extention is available.

Figure 6. Control room Alta Prima substation - Jember. Space for extention is available.

Figure 7. Typical new 150/20 kV 60 MVA transformer at Lumajang substation.

Figure 8. 150/20 kV 60MVA transformer at Sampang substation.

Figure 9. Existing 150/20 kVA 60MVA transformer at Tanggul – Jember.

Figure 10. Existing 150/20 kVA, 30 MVA transormer at Tanggul – Jember.

Figure 11. Oil spill containment berm. Oil will flow to an under ground chamber in emergency situations. Negara substation – Bali.

Figure 12. Oil spill containment berm at Tanggul Substation.

Figure 13. Alta Prima Substation. Typical health and safety equipments available at every substation.

Figure 14. Typical Zero Accident Achievement Board placed in every substation as part of Health and Safety monitoring.

Annex B: Survey Results of Existing Substation Transformers and Environmental Conditions and Issues

Gardu Induk (Substation) NEGARA

Existing Equipment

No.	Equipment	Description of the Equipment	Images
1.	Transformer I	ALSTOM; Manufacture: 1983; 150/20 KV; 15 MVA; Note: In year 2012-2013 PLN has a project to replace the transformer with 30 MVA transformer	
2.	Transformer II	UNINDO; Manufacture: 1986; 150/20 KV; 15 MVA; Oil used: 10.500 Kg; Oil Type: Shell Diala s2 ZU-1 Note: In year 2012-2013 PLN has a project to replace the transformer with 30 MVA transformer	

Environment

No.	Environment	Description of the equipment	
1.	Inside Substation	• There is no issue of land acquisition • No need expanding area for upgrading since new transformer will be placed in old transformer location • Issue: transformer will be replaced in location with no oil management (no oil traps)	
2.	Surrounding Substation	• Topography: flat • Front: rice field, irrigation and main road ± 50 m • Behind: rice field • Left side: rice field and river ± 500 m • Right side: rice field and settlement	

Gardu Induk (Substation) GILIMANUK
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	UNINDO; Manufacture: 1986; 150/20 KV; 10 MVA; Oil used: 9000 Kg; Oil Type: ? Assembled: 1987 Used Capacity: 30%	
2.	Transformer II	UNINDO; Manufacture: 1986; 150/20 KV; 10 MVA; Oil used: 9000 Kg; Oil Type: ? Assembled: 2006 Used Capacity: 60%	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • Issue: transformer doesn’t have oil management (no oil traps)	
2.	Surrounding Substation	• Topography: flat • Front: road and settlement • Behind: swamp/mangrove (Bali Barat National Park) • Left side: PLTG and Swamp/mangrove (Bali Barat National Park) • Right side: Road settlement	

Gardu Induk (Substation) TANGGUL
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	PASTI under license of POUWELS International; Manufacture: 1996; 150/20 KV; 30 MVA; Oil used: 18.750 kg; Oil Type: ? Assembled: 1997 Used Capacity: 80%	
2.	Transformer II	UNINDO; Manufacture: 2003; 150/20 KV; 60 MVA; Oil used: 21.000 kg; Oil Type: Shell Diala B Assembled: 2003 Used Capacity: 25%	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • The extension area (new transformer and bus) will be built inside the substation • One of transformer has oil leak traps and tank 	

2.	Surrounding Substation	• Topography: flat • Front: road • Behind: sugar cane field • Left side: settlement and sugar cane field • Right side: sugar cane field	

Gardu Induk (Substation) LUMAJANG
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	UNINDO; Manufacture: 1986; 150/20 KV; 10 MVA; OIL Used: 21.500 Kg; Oil Type: NYMAS Assembled: 2011 Used Capacity: 50%	
2.	Transformer II	XIAN; Manufacture: 1995; 150/20 KV; 30 MVA; OIL Used: 17000 Kg; Oil Type: ? Assembled: 1995 Used Capacity: 90% <u>Note:</u> In year 2012 PLN has a project to replace the transformer with 60 MVA transformer 	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • Issue: transformer has oil trap but the oil will infiltrate directly to soil	
2.	Surrounding Substation	• Topography: flat • Front: road, rice field and settlement • Behind: rice field and settlement • Left side: Irrigation, rice field and settlement • Right side: settlement	

Gardu Induk (Substation) UNDAAN
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	POUWELS; Manufacture: 1996; 150/20 KV; 60 MVA; OIL Used: 26.100 Kg; Oil Type: Total Isofoltine II-TP Assembled: 1996 Used Capacity: 80% Note: This substation type: GIS (Gas Insulated Substation), all equipment is inside the building The substation use Gas SF-6	

			
2.	Transformer II	No transformer Note: All component for transformer II have been set (Ex: Transformer Bay), except the transformer	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition	
2.	Surrounding Substation	• Topography: flat • Front: road and river 200 m • Behind: settlement • Left side: settlement • Right side: settlement	

Gardu Induk (Substation) ALTA PRIMA
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	XIAN; Manufacture: 1995; 150/20 KV; 30 MVA; OIL Used: 17.000 Kg; Oil Type: ? Assembled: 1996 Used Capacity: 80% Consumer: industry	

2.	Transformer II	TELK; Manufacture: 1986; 150/20 KV; 30 MVA; OIL Used: 17.955 Kg; Oil Type: ? Assembled: 2006 Used Capacity: 75% Consumer: house hold	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • Issue: transformer doesn't have oil management (no oil traps)	
2.	Surrounding Substation	• Topography: flat • Front: road and Open area • Behind: Industry • Left side: Industry • Right side: Industry	

Gardu Induk (Substation) SAMPANG
Existing Equipment

No.	Equipment	Description of the equipment	Photo
1.	Transformer I	UNINDO; Manufacture: 1991; 150/20 KV; 20 MVA; OIL Used: 11.800 Kg; Oil Type: Shell Dial S2 ZU-1 Assembled: 1993 Used Capacity: 70%	
2.	Transformer II	POUWELS; Manufacture: 2009; 150/20 KV; 60 MVA; OIL Used: 16.500 Kg; Oil Type: Shell Dial S2 ZU-1 Assembled: 2009 Used Capacity: 50%	

Environment

No.	Environment	Description of the equipment	Photo
1.	Inside Substation	• There is no issue of land acquisition • Issue: transformer doesn't have oil management (no oil traps)	
2.	Surrounding Substation	• Topography: flat • Front: road and settlement • Behind: Settlement and tobacco plantation • Left side: Settlement and tobacco plantation • Right side: Settlement and open land	

Appendix 10: MoF Forestry Rent Use Permit in Principle

MENTERI KEHUTANAN
REPUBLIK INDONESIA

16 Januari 2012

Nomor : S.24 /Menhut-IV/2012
Lampiran : 1 (satu) lembar peta
Perihal : Permohonan Izin Pinjam Pakai dan Izin Kolaborasi untuk Pembangunan SUTET 500 kV Jawa – Bali *Crossing*

Kepada Yth.
General Manager PT PLN (Persero)
Unit Induk Pembangunan Jaringan Jawa Bali
di
Semarang

Sehubungan surat General Manager Proyek Induk Pembangkit dan Jaringan Jawa, Bali dan Nusa Tenggara (PIKITRING JBN) PT PLN (Persero) kepada Menteri Kehutanan Nomor: 433/130/PIKITRING JBN/2011 tanggal 12 April 2011 perihal tersebut di atas, bersama ini disampaikan hal-hal sebagai berikut:

1. Melalui surat tersebut, GM PIKITRING JBN (saat ini menjadi PT PLN (Persero) Unit Induk Pembangunan Jaringan Jawa Bali/ UIPJJB) memohon izin kolaborasi pemanfaatan kawasan hutan di Zona Pemanfaatan Taman Nasional (TN) Baluran dan TN Bali Barat untuk pembangunan Saluran Udara Tegangan Ekstra Tinggi (SUTET) 500 kV Jawa-Bali *Crossing*.
2. Permohonan tersebut, telah didukung beberapa dokumen antara lain:
   a. Rencana kerja Pembangunan Kawasan Hutan;
   b. Peta Citra Landsat 7 ETM skala 1:50.000;
   c. Rekomendasi Ketua DPRD Provinsi Bali, melalui surat Nomor: 593/2827/DPRD tanggal 23 September 2010;
   d. Rekomendasi Gubernur Bali, melalui surat Nomor: 671/3719/Bappeda tanggal 06 Oktober 2010;
   e. Surat Direktur Utama PT PLN (Persero) Nomor: 02943/130/DIRUT/2010 tanggal 25 Oktober 2010;
   f. Rekomendasi Bupati Probolinggo, melalui surat Nomor: 650/778/426.301/2010 tanggal 03 Desember 2010;
   g. Rekomendasi Bupati Situbondo, melalui surat Nomor: 522/0232/431.202.4.1/2010 tanggal 16 Desember 2010;
   h. Rekomendasi an. Gubernur Jawa Timur melalui surat Nomor: P.2T/08/14.06/XII/2010 tanggal 21 Desember 2010;
   i. Pertimbangan Teknis Dirut Perum Perhutani melalui surat Nomor: 20/0443/Agr/Dir. tanggal 25 Januari 2011;
   j. Pernyataan Kesanggupan Pembiayaan Proses Pinjam Pakai dan Pola Kolaborasi Kawasan Hutan untuk Pembangunan Sutet 500 kV Jawa-Bali Crossing, melalui surat Nomor:143 S.Pn/131/PI KITRING JBN/2011 tanggal 14 April 2011.

3. Rencana pembangunan SUTET 500kV yang melintasi TN Baluran dan TN Bali Barat, telah dilakukan pengecekan lapangan tanggal 06-09 Desember 2011 oleh Tim dari Puslit Biologi-LIPI dan Ditjen PHKA sebagaimana tertuang dalam Berita Acara Pengecekan Lapangan tanggal 09 Desember 2011, antara lain:
   a. TN Baluran: terdapat 49 tower (luas tapak ±3,25 Ha) dan lintasan ROW sepanjang ±18,6 KM (luas 59,4 Ha), 2 tower di zona rimba dan 47 tower di zona pemanfaatan khusus.
   b. TN Bali Barat: terdapat 29 tower luas tapak tower ± 4,1 hektar, dan lintasan ROW sepanjang ± 11,8 KM (42,9 hektar), 22 tower di zona rimba dan 7 tower di zona pemanfaatan. Jarak terdekat tapak tower dengan tempat ibadah (Pura Segara Rupek) adalah ± 350 meter, yaitu *Tower Crossing* Bali (TCB) dan seluruh lintasan ROW tidak melalui areal tempat ibadah (Pura).
4. Berdasarkan Pasal 43, Peraturan Pemerintah RI Nomor 28 Tahun 2011 tentang Pengelolaan KSA dan KPA, bahwa jaringan listrik untuk kepentingan nasional dikategorikan sebagai pembangunan strategis yang tidak dapat dielakkan, sehingga pelaksanaannya dapat dilakukan melalui mekanisme kerjasama.
5. Mempertimbangkan hal-hal tersebut, maka permohonan Saudara untuk pembangunan tower dan jaringan SUTET 500kV yang melintasi TN Baluran dan TN Bali Barat dapat disetujui dengan syarat agar PT PLN (Persero) meminimalkan kerusakan lingkungan, antara lain: tidak membangun *camp* di kawasan, menggeser tapak pada area terbuka, membuat jembatan sementara di mangrove, dan pengamanan satwa dengan menghindari bentuk tower yang menjebak satwa.
6. Selanjutnya disusun naskah perjanjian kerjasama efektivitas pengelolaan TN Bali Barat dan TN Baluran, berpedoman pada Keputusan Menteri Kehutanan Nomor 390/Kpts-II/2004 tentang Tata Cara Kerjasama di bidang KSDAH&E dan Peraturan Menteri Kehutanan Nomor P.19/Menhut-II/2004 tentang Kolaborasi Pengelolaan KSA/KPA.

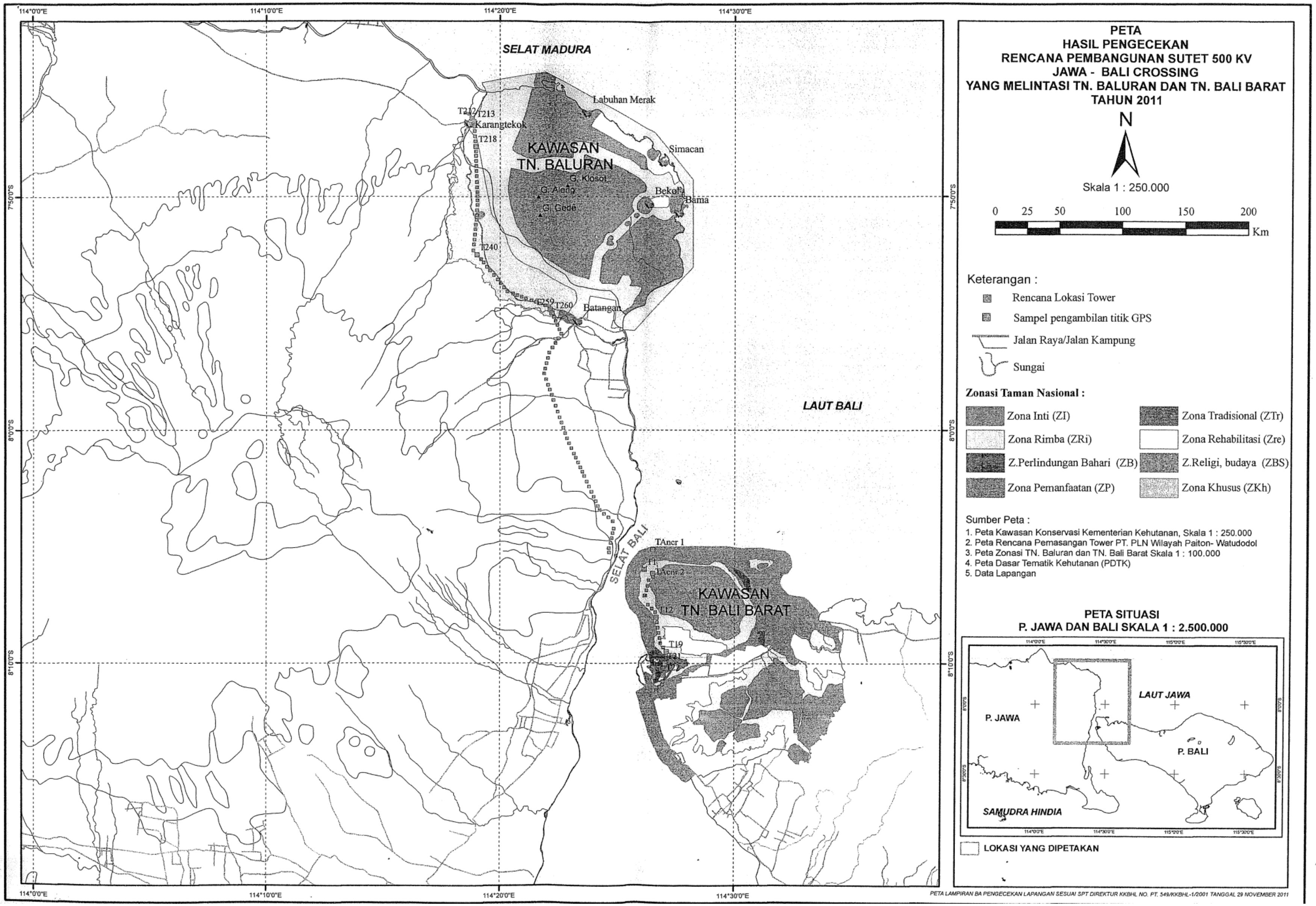
Atas perhatian Saudara, disampaikan terima kasih.

Menteri Kehutanan,

Zulkifli Hasan, S.E., M.M.

Tembusan:
1. Gubernur Jawa Timur
2. Gubernur Bali
3. Direktur Utama PT PLN (Persero)
4. Sekretaris Jenderal Kementerian Kehutanan
5. Direktur Jenderal Perlindungan Hutan dan Konservasi Alam
6. Direktur Jenderal Planologi Kehutanan
7. Direktur Kawasan Konservasi dan Bina Hutan Lindung
8. Kepala Balai TN Baluran
9. Kepala Balai TN Bali Barat.

A12_Seksi Pemolaan\a. Surat\Jawa-Bali Crossing.doc


PETA
HASIL PENGECEKAN
RENCANA PEMBANGUNAN SUTET 500 KV
JAWA - BALI CROSSING
YANG MELINTASI TN. BALURAN DAN TN. BALI BARAT
TAHUN 2011
N
Skala 1 : 250.000
0 25 50 100 150 200 Km
Keterangan :
Rencana Lokasi Tower
Sampel pengambilan titik GPS
Jalan Raya/Jalan Kampung
Sungai
Zonasi Taman Nasional :
Zona Inti (ZI)
Zona Tradisional (ZTr)
Zona Rimba (ZRi)
Zona Rehabilitasi (Zre)
Z.Perlindungan Bahari (ZB)
Z.Religi, budaya (ZBS)
Zona Pemanfaatan (ZP)
Zona Khusus (ZKh)
Sumber Peta :
1. Peta Kawasan Konservasi Kementerian Kehutanan, Skala 1 : 250.000
2. Peta Rencana Pemasangan Tower PT. PLN Wilayah Paiton- Watudodol
3. Peta Zonasi TN. Baluran dan TN. Bali Barat Skala 1 : 100.000
4. Peta Dasar Tematik Kehutanan (PDTK)
5. Data Lapangan
PETA SITUASI
P. JAWA DAN BALI SKALA 1 : 2.500.000
LAUT JAWA
P. JAWA
P. BALI
SAMUDRA HINDIA
LOKASI YANG DIPETAKAN
SELAT MADURA
LAUT BALI
SELAT BALI
KAWASAN TN. BALURAN
KAWASAN TN. BALI BARAT
Labuhan Merak
Simacan
Bekol
Bama
Karangtekok
Batangan
G. Klosot
G. Aleng
G. Gede
T212
T213
T218
T240
T259
T260
TAncr 1
TAcnr 2
T1
T12
T19
114°0'0"E
114°10'0"E
114°20'0"E
114°30'0"E
7°50'0"S
8°0'0"S
8°10'0"S
PETA LAMPIRAN BA PENGECEKAN LAPANGAN SESUAI SPT DIREKTUR KKBHL NO. PT. 549/KKBHL-1/2001 TANGGAL 29 NOVEMBER 2011

Appendix 11: Public Consultation Photos

Image 1: Discussions with Village Head at Paitan

Image 2: Orientation of Team for Public Consultation and Focus Group Discussions

Image 3: Discussion with Head of General Affair of Bali Barat National Park

Image 4: Focus Group Discussion at Sub District of Mlandingan

Image 5: Public Consultation in Progress in Bali Province

Image 6: Public Consultation in Sub district of Jembrana, Jembrana Regency

Image 7: Public Consultation in Progress in Sub District of Selemadeg, Tabanan Regency

Image 8: Discussion with Head Village of Sudimara, Tabanan Sub District, Tabanan regency

Due Diligence Consultations, Components 3 and 4

Image 1: Discussion with Power Plant Officials at Paiton Power Plant

Image 2: Discussion with PLN Distribution Company Officials

Image 3: On side discussion with Bali Barat National Park Authorities

Image 4: Discussion with PLN Distribution Company Officials in Bali

Appendix 12: Public Consultation Signed Attendance Sheets

4. List of Participants (Daftar Peserta)

Sl No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L/P)	Signature (Tanda tangan)
1	I Wayan Sumerta	Kaur PM	47	L	
2	GST PT Wirata	Kaur PMD	42	L	
3	I NGh Ranu Parthu	Sekdes D.T. Ag	46	L	
4	I Km Cakra	Sekdes Pakutatan	45	L	
5	I Nyoman Mantra	Sekdes Yeh Kuning	57	L	
6	I Gede Sudendra	Sekdes Penyaringan	42	L	
7	I Wayan Sumadra	Plt Sekdes Pengeragoan	28	L	
8	Kamarudin	Kaur Umum	41.	L	
9	MD. Boster	SEKDES Pengyangan	50	L	
10	Haerudin	Sekdes [illegible]	49	L	
11	I Komang Nawa Wuaya	Sekdes [illegible]	45	L	
12	I Putu Widiantara	Kasi [illegible]	40	L	

4. List of Participants (Daftar Peserta)

Sl No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L/P)	Signature (Tanda tangan)
1	I Wy. Guntur.	Perbekel Antasari	43	L	
2	I Wy Dika - S	— — Mambang	48	L	
3	I PT. SUANTARA	[illegible]	47	L	
4	[illegible]	[illegible]	40	[illegible]	
5	[illegible]	[illegible]	44	L	
6	[illegible]	[illegible]	37	L	
7	[illegible]	[illegible]	50	L	
8	I Wy Suarama	Kepala [illegible]	50	L	
9	[illegible]	[illegible]	44	L	
10	[illegible]	[illegible]	51	L	
11	[illegible]	[illegible]	49	L	
12	[illegible]	[illegible]	44	L	
13	[illegible]	[illegible]	46	L	
14					
15					
16					

4. List of Participants (Daftar Peserta)

Sl No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L/P)	Signature (Tanda tangan)
1	MENGAH DHARMA	[illegible] SEKADARMA	47 th.	L.	[illegible]
2	Saharudin	Kadus	42 Th	L	[illegible]
3	Gamarudin	Sekdes	50 Th	L	[illegible]
4	Ni Nyoman Sudarni	Staff Desa	26 th	P	[illegible]
5	[illegible]	[illegible] Desa	28 Th	P	[illegible]
6	[illegible]	Sek Desa	[illegible]	L	[illegible]
7					
8					

4. List of Participants (Daftar Peserta)

Sl No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L/P)	Signature (Tanda tangan)
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6					
7					
8					
9					
10					
11					
12					
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14					
15					
16					
17					
18					

4. List of Participants (Daftar Peserta)

KEC. KEDIRI – TABANAN

Sl No	Name (Nama)	Profession (Pekerjaan)	Age (Umur)	Sex (L / P)	Signature (Tanda tangan)
1	I WY Muliarta	Sekdes Nyitdah	32 th	L	
2	I Gd. Pt. Sriarkaha	Perbekel Bandar Gede	52 th.	L	
3	I MD Artawa . ST	Sekdes Bengkel	45 Th.	L	
4	I GP. Pugeh	Perbekel Buwit	46 Th	L	
5	IDA BAGUS MADE SUARDATA	PERBEKEL KABA²	46 TH	L.	
6	IKT SUHARJANA	PERBEKEL CEPAKA	41 th	L	
7	MD. SUBRATA	CAMAT KEDIRI		L	
8					
9					
10					
11	DESA BUDUK - MENGWI, BADUNG				
12	KT. BUDHARMANYA	SEKDES. BUDUK	60 TH	L	
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30					

Focus Group Discussion (FGD) GROUP I

4. List of Participants (Daftar Peserta)

No	Nama	Pekerjaan	Usia	Jenis Kelamin	No. Telp/ HP	Tanda Tangan
1.	Hermanto	Kades Bungatan	48	LK		
2.	Ahmad	Kades Blimbing	46	LK		
3.	Saleh Hartadi	KAdes	43	LK		
4.	Suyono	Kades Suboh	35	LK		
5.	Sidi yanto	BPD Jetis	40	LK		
6.	Edy Santoso	Sekdes Pasir Putih	42	LK		
7.	Ridwan	Sekdes Langkap	42	LK		
8.	Asfandi	Kades Bloro	51	LK		
9.	Agus Suhartono	Kades Langkap	45	LK		
10.	Subkhan	Kades Mlandingan	51	LK		
11.	Djainul	Kades Bletok	55	LK		
12.	Burhanuddin	Kades Kalimas	44	LK		
13.	Mulani Fatah	Kades Mlandingan Wetan	44	LK		
14.	Jayandi	Kades banyuglugur	48	LK		
15.	Sholehuddin	Kades Mlandingan Kulon	47	LK		
16.	Fauzan	Kades Bhinar	48	LK		
17.	Sutoyo	Kades Selo Mukti	43	LK		
18.						
19.						
20.						

Note: Use additional sheets for information and list of participants

(Catatan : Gunakan lembar tambahan untuk informasi dan daftar peserta)

FGD GROUP II

4. List of Participants (Daftar Peserta)

No	Nama	Pekerjaan	Usia	Jenis Kelamin	No. Telp/ HP	Tanda Tangan
21.	Yoyok	Kepala desa klastakan		Laki2	081358079555	
22.	Andi Zakas	Sekdes Paowan		Laki2	0888 0360 7271	
23.	H. Sukarto	Kep.des Sumber kalak panarukan		Laki2	0812 49945 896	
24.	Badri	Kaur ardirejo		Laki2	081358 1091 28	
25.	Usman	Kepdes Panji Lor		Laki2	0852 339 18877	
26.	Untung S	Kep.des Kapongan		Laki2	0852 32 631593	
27.	H. Ferzia	Kepdes Pelean		Laki2	081251237727	
28.	Subiantoro	Kepdes Arjasa		Laki2	081 33615 6550	
29.	Yoyok	Kep des ketowan, arjasa		Laki2	0813 580 79 555	
30.	Moh Hafit	Kedung dowo, arjasa		Laki2	81 336 754 119	
31.	Sukarwi	Cukahkalak Asembagus		Laki2	081336 211 591	
32.	H. Kholili	mojosari		Laki2	0812348 6037	
33.	Basriyanto	Awor-awor		Laki2	0338 5503556	
34.	Ina kusweni	PKK Kec. panji		Pr	0817 969 1546	
35.	amiharjuni	PPL		Laki2	085258261816	
36.	sahur	Tokoh masy		Laki2		
37.	sugeng	Tokoh masy		Laki2	085258827049	
38.	a. pujiarto	Tokoh masy		Laki2	081252691737	
39.	mirjo	Tokoh masy		Laki2		
40.						
41.						
42.						

Note: Use additional sheets for information and list of participants

(Catatan: Gunakan lembar tambahan untuk informasi dan daftar peserta)

FGD GROUP III

4. List of Participants (Daftar Peserta)

No	Nama	Pekerjaan	Usia	Jenis Kelamin	No. Telp/ HP	Tanda Tangan
43.	H. Didik Santoso, SH	Bag. Pemerintahan	43	LK		
44.	M. Rochim	PLN AJB Banyuwangi	38	LK		
45.	Andik Harianto	PLN AJB BAnyuwangi	35	LK		
46.	Sugiharto	PLN UPT Jember	49	LK		
47.	Busaini	BPD	53	LK		
48.	M. Basuni	Kades Kelir	40	LK		
49.	Slamet Utomo	Kades Ketapang	38	LK		
50.	Ahmad S.	Kec. Kalipuro	42	LK		
51.	Hariono	Kec. Kalipuro	40	LK		
52.	Budi Priyambodo	Kel. KAlipuro	40	LK		
53.	A. LAtif	Kel. Giri	36	LK		
54.	Idhum Kholid	Polri	50	LK		
55.	Suko Proyanto	Kel. Klatak	49	LK		
56.	Agus Setyabudi	Baluran	50	LK		
57.	Sumaryono	Kalipuro	55	LK		
58.	H. Kamari	Tomas	56	LK		
59.	Kunawi	BPD	45	LK		
60.	Noviyani Utami	TN Baluran	41	PR		
61.	Sulistowati	DS. wongsorejo	38	PR		
62.	Heni W	Ds. Alas buluh	35	PR		
63.	Abdul HAdi	Ds. Alas Buluh	32	LK		
64.	Imam Eka Martin	Kades Wonorejo	42	LK		
65.	Abdurahman	kades	35	LK		
66.	Ach Toha	Kades	40	LK		
67.	Suparto	Kades	35	LK		

Note: Use additional sheets for information and list of participants

(Catatan : Gunakan lembar tambahan untuk informasi dan daftar peserta)

Appendix 13: Due Diligence Stakeholder Consultations and National Park Site Visits
Java Bali 500 kV TL Project
Minutes of Key Meetings, Environment Due Diligence Review[45]

1. Coordination Teleconference, ADB IRM (9 January 2012) 10.00 am

Participants:

Aruna Wanniachchi, Senior Energy Specialist, Southeast Asia Energy Division (SEEN), ADB
Genandrialine L. Peralta, Senior Safeguards Specialist (Environment), Southeast Asia Energy Division (SEEN), ADB
Amin Huq, Project Management Advisor (Energy), ADB IRM
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB

Summary:

1. No need for additional gaps analysis, focus should be on gathering necessary data, assessing categorization and EIA revision.
2. ADB Senior Safeguards Specialist (Environment) will do input to the PAM.
3. Check IUCN red list to see if any species affected.
3. Create better rapport with PLN than TA consultants had.
4. Revised EIA must be endorsed by PLN, including EMP budget, though no comments or endorsement has been received to date on the TA outputs including the EIA.
5. Conduct proper due diligence of Components 3, 4 and 7.
6. Draft revised EIA to be submitted by mid-February (update: subsequently revised to end of February).

2. Coordination Meeting, ADB IRM (9 January 2012), 11.00 am

Participants:

Naning Mardiniah, Social Safeguards Staff Consultant, ADB IRM
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB

Progress of Project Status:

1. Ministry of Forestry will sign a Principal permit letter for the Java Bali TL once the Ministry of Environment signs the AMDAL approval. On the other hand, the Ministry of Environment will approve the AMDAL once the Ministry of Forestry has approved the Principal permit letter, a chicken-egg situation. (Update: Ministry of Forestry has now provided the Principle permit letter).
2. TOR (KA-ANDAL) is not yet approved by KLH Commission Team. Some minor corrections have to be undertaken by Udayana University.
3. Some social data in the RP prepared by VisionRI need to be clarified.
4. Public consultation undertaken by VisionRI; consultation was also undertaken by Udayana University.
5. It is not clear to what extent Environmental Team of VisionRI undertook field trips. Data should be verified.
6. TOR status and AMDAL schedules to be clarified by KLH.

[45] Separate reports are being prepared for the field visits to Baluran and Bali Barat National Parks.

3. PT PLN (PERSERO) Meeting: 9 January 2012, 2.00 pm

Participants:

Indira, Head Environment and Social Unit , PLN Head Office
Marina Kurniati, Environmental Specialist, PLN Head Office
Suroso Isnandar, Systems Planning Division, PLN Head Office
Amin Huq, Project Management Advisor (Energy), ADB IRM
Naning Mardiniah, Social Safeguards Staff Consultant, ADB IRM
Pramod Agrawal, Social Safeguards Advisor (Consultant), ADB
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB

Summary:

1. ADB Environment Team field trip objectives and data gathering.
2. KLH: AMDAL status and time line - TOR is not yet approved by KLH; there are environment issues in Baluran National Park and Bali Barat National Park; and social issues at the Crossing Tower at Segara Rupek (Bali) due to temples being close to the main and anchor towers.
3. Not yet finalized in Bali whether TL will be a combined or separate system.
4. Type of towers is also is being reviewed.
5. Status of Ministry Forestry and Ministry of Environmental Approval is not clear yet. ADB Environmental Team will discuss with KLH.
6. ADB Environmental Team request GIS map and data from PLN:
   - RBI Base Map
   - Zonation Map for Baluran National Park and Bali Barat National Park
   - Forest Cover
   - Land Use Map
   - List of GPS Coordinates for all towers from Paiton to New Kapal (New Line and Existing Line)
   - Satellite Imagery Map.
7. ADB Environment Team will meet with Udayana University to discuss progress of TOR and AMDAL.
8. PLN will give the maps required by ADB Team if the maps are available. Mr. Suroso says the maps and data will be prepared by Mr. Supriyono, PLN Semarang.
9. During construction PLN will use SOP for safety.
10. In some area below transmission line, CSR (Corporate Social Responsibility) Policy will be applied by PLN.
11. Mr. Aminul Huq ADB has asked to PLN for updated project description with confirmed design within one week.

4. KLH Meeting, 10 Jan 2012, 10.00. a.m.

Participants:

Laksmi, Head of AMDAL Division KLH
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB

Summary:

1. ADB conducting due diligence review and revision of the TA-7325 Java Bali 500 kV Transmission Crossing Project EIA prepared by VisionRI.
2. KLH has made the project review an internal priority.

3. KLH has undertook a Commission meeting to review the TOR (KA-ANDAL) in October 2011. There are minor revision to the TOR be undertaken by Udayana University.
4. Ministry of Environment will release a recommendation letter at the latest 3 months after AMDAL documents completed and submitted to KLH.
5. Recommendation Letter will be signed by Ministry of Environment only after Ministry of Forestry Signed the Principal Permit Letter for TL construction in Baluran National Park and Bali Barat National Park.
6. KLH raised the issue of the sensitivity of the main crossing tower in Segara Rupek (Bali). The crossing and anchor towers are close to 3 temples; in Bali should not construct any building higher than a temple within 2 km of the temple.
7. PLN should undertake public consultation and coordination with PHDI Bali Province (highest religious organization in Bali). (Update: Governor of Bali has approved construction of the crossing and anchor towers, after consultation with PHDI and Majelis Pakraman).
8. ADB team will share the revised EIA when it is completed.

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5. PLN Office, Surabaya, 10 January 2012

Participants:
PLN Jakarta: Ibu Indira
PLN East Java: Mr. Sahlan, Mr. Yayan, Mr. Huda,
PLN Bali: Ms Ninda, Ms. Retno, Mr. Nur, Erfan, Irfan.
ADB : Ms Naning M, Pramod A. Ashley B, Akhmad.S.

Summary:
1. ADB conducting due diligence review and revision of the TA-7325 Java Bali 500 kV Transmission Crossing Project EIA prepared by VisionRI.
2. Tentative schedules for ADB Environmental Team and Social Team Field Trips.
3. ADB Environmental Team request to PLN:
   - Base Map
   - Zonation Map for Baluran National Park and Bali Barat National Park.
   - Forest Cover
   - Land Use Map
   - List of GPS Coordinate Tower Data from Paiton to New Kapal.
   - Satellite Imagery Map
   - Meeting with Udayana University to discuss progress of TOR and AMDAL TA-7325 Java Bali Transmission Line 500 kV Interconnection
4. PLN will check the data required by ADB Team and will inform as soon as PLN get the data.
5. ADB Environmental and Social Teams will do a separate field trip because different set of data will be collected.
6. Land Acquisition Presentation by Mr. Djarot Weida Muliawan (BPN Surabaya): land area definition; land measurements; land requirements defined; spatial planning, etc. There is a new regulation where land acquisition is now a BPN responsibility. Formerly, land acquisition was a local government responsibility.

6. Meeting With Udayana University, 17 Jan 2012, 9.00 am. Venue: PSLH Office, Udayana University

Participants:

Prof.Ir. Made Sudiana Mahendra.MappSc. Prodi Magister Ilmu Lingkungan Udayan University.
I Wayan Arthana, Ir. MS. PhD.Team Leader AMDAL of Java Bali Transmission Line
Siladharma, Ir. Ms. PhD (PPLH – Secretariat)
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB
Ridwan GIS Expert (Consultant),ADB

1. ADB conducting due diligence review and revision of the TA-7325 Java Bali 500 kV Transmission Crossing Project EIA prepared by VisionRI.
2. Discussion regarding TOR (KA-AMDAL) revision, AMDAL timeline and challenges during preparation. TOR is still being revised. Udayana willing to share the TOR to ADB Team as soon as the TOR completed.
3. Key environmental Issues in Java Bali Transmission Line, based on AMDAL Team perceptions: impacts on water quality at Suspension Tower in Watu Dodol; the slope of land contour at sub-project 6 in Kapal; erosion and sedimentation; equipment and material transportation; negative perception due to construction of transmission line; cultural heritage issues mainly in Bali (temple); EMF impacts.
4. Mitigation and EMP proposed in AMDAL: water quality is mitigated based on SOP of PLN; do not work during rainy seasons; good site management; maintain air quality by good construction practices; apply safety equipment; cut and fill management for suspensions tower and main towers.
5. Environmental Team ADB has updated the data, surveys, design, tower coordinates, etc. The data available can be share with Udayana University and can be applied in the AMDAL document if required.
6. Udayana University has also some base maps required by ADB Environmental Team. Environmental Team requests:
   - RBI Base Map for Bali and East Java
   - Forest Cover
   - Land Use Map.
   - Satellite Imagery Map.
7. Udayana willing to share the data and map they have and will accept update data and information from ADB Environmental Team
8. Data sharing will be undertaken at Udayana University in coming days.

7. Technical Meeting Regarding Java-Bali 500 kV Transmission Line, 16 January 2012, Bappeda Office, Bali

Participants:

Bappeda
PLN
Dewan Perwakilan Rakyat Daerah (DPRD)
Udayana Technical Team
District Government Staff
ADB Environment Team (observers only)

Chief of Bappeda opened the meeting

1. The Governor of Bali has released an Approval Letter dated 6 October 2011 for the construction of the 500 KVA TL within Bali Barat National Park (e.g. from Segara Rupek to Gilimanuk. It will be a stand-alone 500 kV line fully separate from the existing 150 kV TL.
2. An Approval Letter for the TL from Gilimanuk to New Kapal (Antosari) has not yet been released by the Governor. It has not yet been decided whether the TL will be a separated system or combined with the existing 150 kV TL.
3. Udayana University has conducted a technical study on the advantages and disadvantages of the combined and separate TLs. Based on the technical study, the separate TL is much better than a combined TL.

Udayana Presentation: (see attached PowerPoint)

Discussion:

DPRD Bali:
Legislative member recommends to build a separate system.

Bappeda Bali Province:
Bappeda proposes a combined system due to social issues and aesthetic impacts of towers; too many towers will decrease tourism in Bali.
They propose that the combined TL be built in a new alignment, and once functioning properly the existing 150 kV TL should be demolished.

District of Singaraja:
They agree with a combined TL. To avoid failures and break downs during operation, they recommend the use of high-quality cables and equipment.

District of Jembrana:
They agree with a combined TL, but District Jembrana should have a guarantee from PLN that the villages in the district will get enough electricity in the future (e.g. no electricity shortages in Jembrana).

District of Buleleng:

a. They feel the best alternative is a combined TL designed for functionality and also for aesthetics (e.g. to look like a statue, for example), and using the highest quality cable.
b. TL alignment should be matched to District Spatial Planning (RTRW).

PU (Public Works):
They agree to separate TLs, this issued has been discussed in the last meeting.
PLN should consider social aspects, community health and political issues.

Majelis Pakraman (Village religious leader)
Majelis Pakraman agreed to construct TL using separate systems.

   a. AMDAL Team should also include social experts.
   b. PLN should also consider political aspects inside local communities.

PLN
PLN has asked the Governor and the Bali Legislature to recommend the 500 kV TL be constructed as a stand-alone separate system, as there are advantages in terms of providing a reliable power supply and the design and other technical aspects including RoW have already

been developed. If a combined systems is recommended, it will need re-design, surveys, calculations and other aspects that will require a considerable time extension.

Bappeda:
Bappeda will send a letter to DPRD to ask for a recommendation letter from DPRD regarding a combined or separate TL. The letter will be sent at the latest next Monday (1 week).

The meeting was closed by the Chief of Bappeda.

Java Bali 500 kV TL Project, Environment Due Diligence Review
Field Report on Site Visits to Baluran and Bali Barat National Parks

A. Field Trip to Baluran National Park (12 Jan 2012)

Participants:

Mr. Ruswanto, Head of Section, Baluran National Park
Ms. Novi, Technical Staff, Baluran National Park
Sofan, Gatot, Baluran National Park Forest Guards
Indira, Head Environment and Social Unit, PLN Head Office
Naning Mardiniah, Social Safeguards Staff Consultant, ADB IRM
Pramod Agrawal, Social Safeguards Advisor (Consultant), ADB
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB
Ridwan, GIS Expert (Consultant), ADB

1. Presentation by Ibu Novi

Baluran National Park is strategically located on the main Surabaya-Banyuwangi Road. It is easy to reach, either from the Island of Bali or from Surabaya. When first arriving in the Park, visitors will be greeted by groups of long-tailed macaques (*Macaca fasciculari*) that inhabit an area of 25 thousand hectares. It has a relatively dry climate and consists of lowland forests, savanna, mangrove forests and hills, with Mount Baluran (1,247 m) as its highest peak. About 40% of the Park is occupied by savanna ecosystems.

Mammals in the park include the Endangered Banteng (*Bos javanicus javanicus*), the Vulnerable Timor Deer (*Rusa timorensis*), the Endangered Asian Wild Buffalo (*Bubalus bubalis*), Wild Boar (*Sus scrofa*), the Endangered Dhole (*Cuon alpinus*) and the Leopard (*Panthera pardus*). Mammal populations in the Park have declined significantly in recent years, especially the Banteng. Numbers seem more stable for predators such as Dhole and Leopard, though there has been no park wide census, and this conclusion is based observations from officers in the field. It is known that that the number of Dhole in one group could be as high as 36.

The Banteng is the flagship species for the Park. However, numbers have been declining dramatically since 2003. The following table shows the estimated Banteng population for 1997 - 2007.

Banteng	Years							
	1997[*1]	**1998**[*2]	**2000** [*3]	**2002** [*4]	**2003**[*5]	**2005**[*6]	**2006** [*7]	**2007**[*8]
Population	282	115	219 – 267	81 – 115	21	28 – 47	CC : 15 JK_12	34

Source: Baluran National Park (2009), census methods with Line Transect Sample Count, with 16 transects. Conducted in November (rainy season).

Some of the factors causing the decline in the Banteng population include:

- Decreased water supplies, especially in the dry season, potentially as a result of climate change.
- Changes in habitat (land cover) and the invasion of *Acacia nilotica*.
- Human activities in the park region.

- Hunting including by firearms, traps and poison.
- Predators, such as the Dhole.

2. Transmission Line Java – Bali 500 kV Crossing Baluran National Park

PLN plans to construct a 500 kV transmission line across Baluran National Park. The transmission line will run parallel to an existing 150 kV transmission line. Most of towers will be built in what is currently teak plantations (perhutani ownership). The teak plantations will eventually be harvested and then replanted with native species.

Towers 212 to 260 are in the Park. Under the current zoning 2 towers (T-212 and T-213) are in the wilderness zone and the remainder are in the utilization zone, but in the very near future the zoning will be changed. Towers 212 to 214 will then be in the special utilization zone, towers 215 to 240 will be in the wilderness zone, and towers 240 to 260 will be in a combination of wilderness and utilization zones. Rare animals will need to cross under the transmission line during the dry season to search for water, including the Banteng, Timor Deer, and Wild Boar.

3. Impact of Transmission Line Construction

- For each tower base construction will involve cutting and clearing of teak trees and other vegetation.
- Material and equipment transportation may disturb animals especially the Banteng.
- Banteng and other animal will likely not pass through a construction area when searching for water.

4. The project requires Ministry of Environment and Ministry of Forestry Approval.

Based on Indonesia Government Regulation No 28/2011 for strategic function, the construction of such transmission line can be implemented through an AMDAL approved by the Ministry of Environment and a collaborative permit from the Ministry of Forestry. The AMDAL study is underway (TOR soon to be finalized), and the Approval in Principle for the Collaborative Permit has been obtained from the Ministry of Forestry, though details of the support to be provided to the Park by PLN still needs to be agreed upon.

Below is a list of activities that may be supported by PLN under the collaborative permit process (based on informal discussion with Ibu Novi):

- Adding a pool for drinking water Banteng (bull) including pumps and solar power for electricity in the Banteng home range.
- Provide firefighting equipment.
- Provide forest fire watch towers.
- Captive breeding facilities for Banteng.

6. Mitigation Efforts during Tower Construction

- Construction of the towers should be one-by-one (consecutive, not simultaneous) so that Banteng will still able to cross the alignment where construction is not taking place.
- Towers should be design so as not to be a Banteng trap
- Tower construction only during daytime.
- Pruning of the trees.

B. Follow-up Field Trip to Baluran National Park (21 Jan 2012)

Participants:

Mr. Indra Arunal, Head of Baluran National Park.
Ms. Novi, Technical Staff of Baluran National Park:
Sofan, Gatot, Baluran National Park Forest Guards
Ervan Technical Staff PLN Surabaya
Ashley Bansgrove, Environment Safeguards Advisor (International Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (National Consultant), ADB
Ridwan, GIS Expert (National Consultant), ADB
Gene Peralta, Senior Safeguards Specialist (Environment), ADB Manila

Presentation on Banteng Population in Baluran National Park

Presented by: Indra Arunal:

Background
The Banteng is the flag species of Baluran National Park. There has been a drastic decline in population of Banteng in the Park since 2002 to the present (from 300 to 20). Ministry of Forestry has a target to halt the decline and increase the Banteng population in Baluran National Park by 3% by 2014.

Main Problem
Loss of habitat due to invasion by *Acacia nilotica*; lack of grass; lack of water sources; and, hunting.

Conservation Activities Undertaken to Date
Eradicate acacia nilotica; build solar power station for conservation center and water pumps; savannah restoration and replanting of grass; maintenance of the restored savanna; and, routine patrol to prevent poaching**.**

Planned Conservation Activities
Continuing eradication of *Acacia nilotica*; continuing maintenance of the restored savanna; Continuing patrols; increasing number of drilled wells with solar pumps; planting grass; implementation of captive breeding.

Implementation of Captive Breeding
A proposal has been submitted to Taman Safari Indonesia to obtain two female Banteng. They will be transported from Taman Safari to Baluran Park. A wild male will then be captured from the Park (e.g. females from Safari and one male from Baluran). A captive breeding program will then be initiated. The breeding pen has already been established but requires some additional small modifications, and food supply needs to be arranged.

Total Cost Estimate: IDR 423,000,000. (47,000 USD)

After the presentation the ADB team continued to the Banteng Conservation Center.

During the field trip some issues regarding Banteng conservation were discussed, including solar technology, capacity building, cooperation with international organizations, etc. GIS data on current and planned zoning, forest cover and Banteng habitat was also obtained.

C. Field Trip to Bali Barat National Park (13 Jan 2012)

Participants

Joko Waluyo Chief of Section 2 Buleleng Bali Barat National Park
Herri Kusumah Negara, Staff of Forest Ecosystem Development
Martin, Reza Ramadhan: Bali Barat National Park Forest Guard.
Indira, Head Environment and Social Unit, PLN Head Office
Naning Mardiniah, Social Safeguards Staff Consultant, ADB IRM
Pramod Agrawal, Social Safeguards Advisor (Consultant), ADB
Ashley Bansgrove, Environment Safeguards Advisor (Consultant), ADB
Akhmad Supiarma, Environment Safeguards Advisor (Consultant), ADB
Ridwan, GIS Expert (Consultant), ADB

1. Overview

Bali Barat National Park is one of the nature conservation areas in Bali which still has native ecosystems and is the last habitat for the Critically Endangered Bali Starling (*Leucopsar rothschildi*). Established in 1941, its current status is based on Minister of Forestry Decree No. 493/Kpts-II/1995 dated 15 September 1995, which established the Bali Barat National Park with an area of 19002.89 ha area consisting of 15587.89 ha of land and 3415 hectares of waters. The parks is located in the Jembrana and Buleleng districts.

Bali Barat National Park is managed by a zoning system. In accordance with the Director-General SK PHKA No.SK.143/IV-KK/2010 September 20, 2010 regarding Zoning Bali Barat National Park, the park is divided into several zones including core zone area of ± 8,023.22 ha,
wilderness zone ± 6,174, bahari protection zone ± 221.741 ha, utilization zone ± 4294.43 ha, zone cultural and religion and history zone ± 50.570 ha , special zone ± 3.967 ha and traditional zone 310.943 ha. Bali Barat National Park can be used for science, research, support aquaculture, tourism and recreation.

2. Endangered Bali Starling population

The Bali Starling is endemic and critically endangered. In a 2008 census undertaken by Bali Barat National Park Officers 32 remained in the wild, in 2011 this number was reduced to only 14. Factors affecting the Bali Starling include habitat quality; presence of predators; disease; animal competitors; natural age related deaths; and human poaching. A diverse range of predators hunt the Bali Starling, including the White Belly Eagle (*Haliaetus loeucogaster*), Snake Eagle (*Spilornis Chela*), Dragonflies Eagle (*Microhierak fringilarius*), Monitor Lizard (*Varanus gauldi*), snakes, etc. Due to its critically endangered and protected status, in the black market the price is up to Rp 40 million rupiah/bird, which leads to poaching. Currently, there are 124 Bali Starling in the captive breeding center.

3. Java – Bali 500 kV Transmission Line Crossing Bali Barat National Park

PLN plans to construct a transmission line across Bali Barat National Park. The transmission line will run parallel to an existing 150 kV transmission line. Most towers will be built in the wilderness zone (Segara Rupek to Gilimanuk). The main crossing tower with a height of 376 m will also be built in the wilderness zone of the national park.

The main crossing tower base will need a land size of 100 x 100 m = 10,000 sqm. Some access roads will also need to be constructed. Construction will encroach on the habitat of birds especially in the base of the main tower. One of the impact due to main crossing tower construction is its proximity to 3 temples:

- Pura kahyangan Jagat (Segara Rupek) – the biggest one
- Pura Segara (Pasiraman Agung).
- Pura Luhur (Payogan Agung).

Due to these adverse impacts to the biodiversity of Bali Barat National Park, permits from Ministry of Forestry and Ministry of Environment are required.

4. Significant Construction Impacts

- Since the main crossing tower is close to 3 temples (see above), public consultation should be undertaken with PHDI (Association of Hindu Religion Indonesia) and Majelis Sakraman (Village Group of Hindu in Bali).
- Cutting of trees at main tower, anchor towers, and all towers in National Park areas, and trimming of trees in the RoW.
- Mangrove areas at Pulau Burung and Pulau Gadung will be cut for Suspension Tower base.
- Access road preparation for most tower construction will open the forestland.
- The activities will disturb bird and other animal habitats, especially the habitat of the Bali Starling.
- Cut and fill will produce mud and soil in significant quantity.
- The very high main crossing tower will influence the aesthetics of the Bali Strait and may have a negative impact on the temple users.

5. Mitigations During Tower Construction

- Temporary port is proposed to be built in Segara Rupek beach. The material and equipment will pass and be downloaded in this port, reducing truck transportation through the park.
- Public consultation to Hindu religious organizations.
- Construction to be undertaken in daytime.
- Compensation mangroves areas should be replanted in other park areas through the collaborative agreement with PLN.
- Stringent management for soil and waste material should be undertaken to minimize the impact on the park.
- Construction of the towers should be one-by-one (consecutive, not simultaneous) so that birds have time to relocate to surrounding areas.

6. Collaborative Permit between BBNP With PLN

Ministry of Forestry has signed letter on Collaboration Permit for construction of Transmission Line in Bali Barat National Park No 24/Menhut-IV/2012 with some requirements including Collaboration Permit between PLN and BBNP. The Collaborative Permit for both parks has reached the Approval in Principle stage, though the detailed items for support from PLN to the parks has not yet been agreed upon and is under active discussion.

Appendix 14: Project Public Communication Framework

Public Communications Framework for the Java-Bali Transmission Project in Indonesia

Date: August 2012

Introduction

1. The purpose of this document is to provide a Framework to support PLN Indonesia and its contractors in preparing a communication strategy and communication plan for its transmission project in East Java and in Bali. It provides some guidance on the components of a general communication strategy and the elements of a communication plan. This could be used later in preparing a communication plan specific to Java and to Bali and the overall Indonesian context.

2. The Framework provides information about ADB Public Communication Policy (PCP 2011) which stipulates compulsory requirements for PLN, contractors and implementing partners as well as general communication principles, target audiences, key messages, and some tools and activities. This document is a prelude to developing a comprehensive communication strategy and materials.

3. In order to obtain the maximum impact of communication efforts, it is imperative to follow the following guidelines:
   (i) Activities need to be timely,
   (ii) Information used must be accurate,
   (iii) Activities should be coordinated closely,
   (iv) The right audience(s) should be targeted,
   (v) Messages should interest the target audience(s),
   (vi) Activities should be appropriate in terms of resources spent and expected impact

ADB Public Communications Policy

4. Paragraph 26 of PCP aims to enhance stakeholders' trust in and ability to engage with ADB, and thereby increase the development impact of ADB operations. The policy promotes transparency, accountability, and participatory development. It establishes the disclosure requirements for documents ADB produces or requires to be produced. The fundamentals of the policy are as follows:

(i) **Proactive disclosure**. ADB shall proactively share its knowledge and information about its work, as well as its opinions, with stakeholders and the public. The ADB website will be the primary vehicle for proactive disclosure. As appropriate, information may also be disclosed using other means.

(ii) **Presumption in favor of disclosure**. The policy is based on a presumption in favor of disclosure. All documents that ADB produces or requires to be produced may therefore be disclosed unless they contain information that falls within the exceptions of the policy.

(iii) **Right to access and impart information and ideas.** ADB recognizes the right of people to seek, receive, and impart information and ideas about ADB-assisted activities. ADB shall provide information in a timely, clear, and relevant manner. Information shall be given to affected people and other stakeholders, including women, the poor, and other vulnerable groups early enough for them to provide meaningful inputs into project design and implementation.

(iv) **Country ownership**. ADB recognizes the importance of country ownership of the activities it supports in its developing member countries. Thus, before disclosing certain documents, the views of developing member countries shall be considered with regard to contents as well as timing of their disclosure.

(v) **Limited exceptions**. Disclosure is subject to limited exceptions. ADB will disclose all information that it produces or requires to be produced unless such information falls within the exceptions of the policy.

(vi) **Right to appeal**. The policy recognizes the right of those requesting information to a two-stage appeals process when they believe that ADB has denied their request in violation of its policy. To enhance the credibility of the appeals process, the second stage will be independent from ADB.

5. Paragraph 47 of PCP aims to facilitate dialogue with affected people and other interested stakeholders, including women, the poor, and other vulnerable groups, information about sovereign and nonsovereign projects and programs (including environmental and social issues) shall be made available to them in a manner, form, and language(s) understandable to them and in an accessible place.

6. ADB shall work closely with the borrower or client to ensure that such information is provided and feedback on the proposed project design is sought, and that a project focal point is designated for regular contact with affected people and other interested stakeholders. This process will start early in the project preparation phase, allowing their views to be adequately considered in the project design, and continue at each stage of project or program preparation, processing, and implementation. ADB shall ensure that the project or program design allows for stakeholder feedback during implementation. ADB shall ensure that relevant information about major changes to project scope and likely impacts is also shared with affected people and other interested stakeholders.

7. Paragraph 48 of PCP supports the requirements in para. 47, ADB will assist DMC governments and private sector clients in developing a project or program communications strategy, which will be an integral part of consultation and participation by affected people and other interested stakeholders. Such a strategy would help borrowers and clients to involve affected people in the design and implementation of ADB-assisted activities, and increase involvement of grassroots and civil society organizations in the development process by detailing how to engage in dialogue with affected people and broaden public access to information. This will be done by indicating in various documents, such as the consultation and participation plan or the project administration manual, the following:

   (i) the types of information to be disclosed;
   (ii) the mechanisms for public notice, including language and timing; and
   (iii) the responsibility for implementing and monitoring of information disclosure and dissemination.

8. Paragraphs 49-50 of PCP reinforce ADB's environmental and social safeguard requirements on information disclosure to affected people which are the same for

sovereign and nonsovereign projects. The borrower and/or client shall provide relevant environmental, resettlement, and indigenous peoples information, including information from the documents to affected people in a timely manner, in an accessible place, and in a form and language(s) understandable to them. This information can be made available as brochures, leaflets, or booklets in language(s) understandable to affected people. For illiterate people, other suitable communications methods will be used.

9. Paragraph 51 of the PCP on Environment states the requirements under the Safeguard Policy Statement (SPS 2009) wherein ADB shall post on its website the following documents submitted by the borrower and/or client:

(i) a draft environmental impact assessment (EIA) report for an environment category A project, at least 120 days before Board consideration;
(ii) a draft environmental assessment and review framework, where applicable, before appraisal;
(iii) the final EIA or initial environmental examination (IEE), upon receipt by ADB;
(iv) a new or updated EIA or IEE, and a corrective action plan, if any, prepared during project implementation, upon receipt by ADB; and
(v) the environmental monitoring reports, upon receipt by ADB.

10. Paragraph 52 of the PCP on resettlement reinforces the requirements under the SPS 2009 that ADB shall post on its website the following documents submitted by the borrower and/or client:

(i) a draft resettlement plan and/or resettlement framework, endorsed by the borrower and/or client before appraisal
(ii) the final resettlement plan endorsed by the borrower and/or client after the census of affected persons has been completed;
(iii) a new or updated resettlement plan, and a corrective action plan, if any, prepared during project implementation, upon receipt by ADB; and
(iv) the resettlement monitoring reports, upon receipt by ADB.

General Communication Strategy

11. Communication activities to be funded under the project should have two components: media relations strategy and development communications strategy. On the media front, communications plan aims to mitigate potential adverse publicity arising from the project and minimize inaccurate or sensational reporting. It also promotes awareness of the benefits of the project among stakeholders and the general public. On the Development Communication side, the strategy will assist in providing avenues for affected people, concerned civil society organizations and other groups to receive adequate information about the project and the resettlement activities in a timely manner, as well as providing space for sharing their concerns and feedbacks with ADB and the Government. The communication strategy and participation plan should support each other and not planned nor implemented in isolation.
12. Communications activities should take account of the (a) methods of communication and messages to be compatible with prevailing social or religious norms in the place where the communication activity is carried out, (b) activities should respect the local environment, (c) promote environment for two way dialogues among stakeholders, and (d) in all communication activities, the local language(s) and reader-friendly materials should be used.

13. This provides a generic sample of the various components of a communication strategy, as follows

- Overall communication objectives
- Target groups
- Specific objectives for each target group, related to the action's objectives and the phases of the project cycle
- Key messages
- Main activities that will take place during the period covered by the communication and participatory plan, including details of the nature of the activities and the responsibilities for delivering the activities
- Most appropriate communication channel for each target groups (media, interpersonal communication, online etc.)
- Completion of the communication objectives and indicators of achievement for the different tools proposed
- Provisions for feedback (when applicable) with details of assessment forms or other means used to get feedback on the activity from participants
- Human resources including person-days required to implement the communication activities and team members responsible for communication activities
- Financial resources such as budget required to implement the communication activities, which should be included in the financing agreement.

Elements of a Communication Plan

14. Different activities may be appropriate at different stages of the project cycle. In any event, communication activities should focus on achievements and the impact of the action, not on administrative and procedural milestones. These elements may be useful when drafting the communication plan, as well as in the absence of a formal plan. Before initiating any information, communication or participatory activity, contractors, implementing partners, along with Project Officer, should contact the External Relations and Information Officer of ADB country resident missions and that of the Borrower. Some key elements of the communication plan might include:
    Media communication plan
    - Press releases
    - Press conferences
    - Press visits
    - Holding statement
    - Multimedia (photographs, audiovisual productions, infographics)
    - Cell phones and SMS
    - Impact stories
    - Web sites and social media
    - Leaflets, brochures and newsletters

    a. Development communication and participation plan

    - Public consultations and town hall meetings
    - Household visits and interpersonal communications
    - Focus group meetings
    - Reader-friendly materials
    - Website and social media

References

Public Communications Policy (2011), ADB
Safeguards Policy Statement (2009), ADB
Communication and Visibility Manual For European Union External Actions (2009)

Appendix 15: Bird Species in Gilimanuk Bay

Number of bird species observed within the transmission line RoW in Gilimanuk Bay

Species	grids						Status	
	6	5	4	3	2	1	GOI	IUCN
Haliaetus leucogaster	X						P	LC
Spilornis cheela	X	X		x		x	P	LC
Cinnyris jugularis	X	X	x		x	x	P	LC
Spizaetus cirrtatus						x	P	LC
Ictinaetus malayensis	X						P	LC
Microhierax fringillarius		X				x	P	LC
Falco moluccensis		X					P	LC
Parus mayor	X	X	x	x	x	x		LC
Gallius varius	X	X	x	x	x	x		LC
Rhipidura javanica			x				P	LC
Pavo muntius	X	X	x	x	X	x	P	EN
Turnix suscitator		X		x	x	x		LC
Collocalia linchi	X	X	x	x	x	x		LC
Amaurornis phoenicurus						x		LC
Treron grisericauda			x					LC
Treron vernans			x					LC
Ducula aenea	X	X	X	X	x	x		LC
Arachnothera robusta							P	LC
Streptotelia bitorquata	X	X	x	x	x	x		LC
Streptotelia chinensis	X	X	x	X	x	x		LC
Geopelia striata					x			LC
Chalcophans indica				x	x	x		LC
Psittacula alexandri					x	x		LC
Cuculatus saturates			x					LC
Cacomantis sepulcralis	X							LC
Apus nipalensis						x		LC
Centropus bengalensis	X		x	x	x	x		LC
Caprimulgus affinis	X					x		LC
Hemiprocne longipennis	x	X	x	x	x	x		LC
Halcyon chloris			x	x	x	x	P	LC
Macrops philippinus	X							LC
Merops leschenault	X	X		x	x	x		LC
Anthracoceros albirostris	X	X		x	x		P	LC
Megalaima javensis			x				P	LC
Megalaima haemacephala		X		x	x	x		LC
Picus puniceus				x		x		LC

Dendrocopus moluccensis	x		x			x		LC
Hirundo tahitica	X	X						LC
Lalage nigra	X		x					LC
Pericrocotus cinnamomeus					x	x		LC
Pericrocotus flammeus	X	X	x		x			LC
Hemipus hirundinaceus			x					LC
Aegithina tiphia	X	X	x	x		x		LC
Pycnonotus aurigaster	X	X	x		x	x		LC
Pycnonotus goiavier	X	X	x	x	x	x		LC
Lanius schach	X	X			x	x		LC
Enicurus leschenault			x		x	x		LC
Pelorneum capistratum					x	x		LC
Macronous flavicollis					x			LC
Prinia familiaris	X	X	x		x			LC
Orthotamus sutorius	X		x	x		x		LC
Orthotomus ruficops	x	x	x	x	x	x		LC
Hypothymis azurea				x				LC
Rhipidura javanica			x				P	LC
Dicaeum trochileum	X	X	x		x			LC
Cynniris jugularis	X	X	x		x	x	P	LC
Lonchura leucogastroides		X			x			LC
Lonchura punctulata					x			LC
Aplonis panayensis						x		LC
Oriolus chinensis	X			x				LC
Dicrurus macroercus	X			x	x			LC
Dicrurus leucophaeus			x	x	x			LC
Artamus leucorynchus	X	X			x			LC
Crypsirina temia						x		LC
Total Species each block	33	29	31	25	35	36		

LC: Least Concerned, IUCN

List of bird species in Gilimanuk Bay

Scientific name	Local name	Inglish	Location	IUCN	GOI
Ardea cinerea Linnaeus, 1758	Cangak Abu	Grey Heron	Gilimanuk bay, Terima bay, Banyuwedang, Brumbun	LC	NP
Ardea sumatrana Raffles, 1822	Cangak Laut	Great-billed Heron	Gilimanuk bay, Terima bay	LC	NP
Ardea purpurea Linnaeus, 1766	Cangak Merah	Purple Heron	Gilimanuk bay, Terima bay	LC	NP
Egretta intermedia (Wagler, 1829)	Kuntul Perak	Intermediate Egret	Teluk Gilimanuk,	NE	P
Egretta garzetta (Linnaeus, 1766)	Kuntul Kecil	Little Egret	Gilimanuk bay, Terima bay	NE	P
Egretta sacra (J. F. Gmelin, 1789)	Kuntul Karang	Reef Egret	Gilimanuk bay, Terima bay	NE	P
Ardeola speciosa (Horsfield, 1821)	Blekok Sawah	Javan Pond-heron	Gilimanuk bay, Terima bay, Banyuwedang	NE	P
Butorides striatus (Linnaeus, 1758)	Kokokan Laut	Striated Heron	Gilimanuk bay, Terima bay	NE	NP
Nycticorax nycticorax (Linnaeus, 1758)	Kowak malam Abu	Black-crowned Night-heron	Gilimanuk bay,	NE	NP
Ixobrychus flavicollis (Latham, 1790)	Bambangan Hitam	Black Bittern	Gilimanuk bay, Kotal	NE	NP
Mycteria cinerea (Raffles, 1822)	Bangau Bluwok	Milky Stork	Prapat Agung, Gilimanuk bay, Tegal Bunder	VU	P
Leptoptilos javanicus (Horsfield, 1821)	Bangau Tongtong	Lesser Adjutant	Prapat Agung, Gilimanuk bay, Tegal Bunder	VU	P
Charadrius veredus	Cerek Asia***	Oriental Plover	Teluk Gilimanuk	LC	NP
Numenius minutus Gould, 1841	Gajahan Kecil	Little Curlew	gilimanuk bay	LC	P
Numenius arquata	Gajahan Besar	Eurasian curlew	Gilimanuk bay, Terima bay, Banyuwedang	NT	NP
Numenius phaeopus (Linnaeus, 1758)	Gajahan Penggala	Whimbrel	Gilimanuk bay, Terima bay, Banyuwedang	NE	P
Limosa limosa (Linnaeus, 1758)	Birulaut Ekor-hitam	Black-tailed Godwit	Gilimanuk bay, Terima bay, Banyuwedang	NE	NP
Tringa hypoleucos	Trinil Pantai	Common Sandpiper	Gilimanuk bay, Terima bay, Banyuwedang	NE	NP
Tringa brevipes	Trinil ekor kelabu	Grey tailed tattler	Gilimanuk bay, Terima bay, Banyuwedang	NE	NP
Tringa glareola	Trinil semak	wood sandpiper	Gilimanuk bay, Terima bay, Banyuwedang	LC	NP
Calidris ruficollis	Kedidi leher merah	Rufous necked stint	Gilimanuk bay, Terima bay, Banyuwedang	LC	NP
Himantopus leucocephalus Gould, 1837	Gagang bayang Timur	White-headed Stilt	Gilimanuk bay, banyuwedang	LC	P
Burhinus giganteus	Wiliwili Besar	Great Thick-knee	Gilimanuk bay, prapat agung, Terima bay, brumbun, kotal,banyuwedang	NT	P
Sterna hirundo Linnaeus, 1758	Daralaut Biasa	Common Tern	Gilimanuk bay, Terima bay	LC	P
Sterna bergii Lichtenstein, 1823	Daralaut Jambul	Great Crested Tern	Prapat agung , gilimanuk bay	LC	P
Sterna bengalensis	Dara Laut Benggala	Lesser Crested	Gilimanuk bay, banyuwedang	LC	NP

		tern			
Alcedo coerulescens Vieillot, 1818	Rajaudang Biru	Small Blue Kingfisher	gilimanuk bay, terima bay, banyuwedang, brumbun, kotal	LC	P
Todirhampus sanctus Vigors & Horsfield, 1827	Cekakak Australia	Sacred Kingfisher	Gilimanuk bay, Terima bay	NE	P
Todirhampus chloris Boddaert, 1783	Cekakak Sungai	Collared Kingfisher	cekik, bon lalang sumbeejo, terima bay, gilimanuk bay	NE	P
Saxicola caprata (Linnaeus, 1766)	Decu Belang	Pied Bush-chat	Gilimanuk bay, Terima bay	NE	NP
Pachycephala grisola	kancilan bakau	mangrove whistler	Tegal bunder, terima bay, gilimanuk bay, banyuwedang, brumbun	LC	NP
P=protected, NP=not protected					

Source; Herry Kusumanegara, 2013

Appendix 16: PLN Standard Operating Procedures for Environmental Management, Emergency Preparedness and Response and Health and Safety

1. PLN Procedures for Emergency Readiness and Response for Power Stations

1. Pro-SMK3-009_Fire Emergency Response
   This procedure consists of actions that require emergency response of fire, explosion or any emergencies, and severe injuries to workers in company operations.
2. Pro-SMK3-011_Emergency Information
   This procedure consists of the potential emergencies that may occur in the PLN operation unit and maintenance facilities. The following information should always be on the notice board at the power house; the emergency and first aid officer's name, contact telephone numbers, emergency evacuation maps.
3. Pro-SMK3-012_Emergency Situation
   This procedure consists of fire, explosion, bomb threat, suspicious package, hazardous materials spills / toxic emissions, the threat of riots, motor vehicle accidents and other hazards.
4. Pro-SMK3-005_Training and Competence
   This procedure describes the responsibilities of the Department of Personnel and Administration and to implement procedures: to assess the capacity and training needs as well as guidance to train operations staff.
5. Pro-SMK3-001_ Risk Identification
   This procedure describes how to identify hazards, risk assessment, including how to overcome the risk as a result of the activities, products and services.
6. Pro-SMK3-010_First Aid In Accidents
   This procedure describes first aid procedure and facility in company to ensure that emergency situation is handled properly in case of employee wounded or fall sick during performing works, including visitor to company’s premise.
7. Pro-SMK3-013_Portable Fire Extinguisher Management
   This procedure describes technical information and management for portable fire extinguisher required by all employees especially those with exposure to operation and maintenance.
8. Pro-SMK3-014_Accident Investigation
   This procedure consists of procedures for reporting on an incident, accident and occupational diseases for PLN employees, contractors and visitors.
9. Pro-SMK3-015_Hazard Reporting
   Hazards Reporting applicable for any problems health and safety issue reporting except for worker injuries. This procedure applies to all employees and contractors.

2. Occupational Health and Safety PLN for Power Substations

1. Pro-SMK3-K3 016_Workplace Inspection
   This procedure consists of occupational health and safety workplace inspections for all departments of the region, reporting, evaluation and follow-up of inspection results.
2. Pro-SMK3 023_Health and Safety Signal
   This procedure applies to all signals about the health, safety and good working environment, permanent and temporary.
3. Pro-SMK3 021_Lock Out Tag-Out
   This procedure consists of installation of Lock Out system and Tag Out of equipment and vehicles during repairs or damage.

4. Pro-SMK3-022_Control of Personal Protective Equipment (PPE)
   This procedure applies to all personal protective equipment used by workers, visitors, contractors or others who work in areas with potential hazardous work.
5. Pro-SMK3-027_Work Environment Monitoring
   This procedure applies for the oversight of the work environment due to the impact of electromagnet radiation in switchyard areas.
6. Pro- SMK3-026_Health Monitoring
   This procedure applies to all workers in the PLN in particular the work on areas that potentially contain harmful toxins.
7. Pro-SMK3 030_Occupational Health Issue Management
   This procedure is to solve all the problems of health and safety in an effectively and immediately.
8. Pro-SMK3-032_Toxic and Hazardous Materials Handling
   This procedure addresses all aspects related to hazardous materials handling, including safe handling, storage and transportation of hazardous material

3. GoI Regulations and SOP Health and Safety for Substations.

1. Undang Undang Keselamatan Kerja No 1 Tahun 1970
2. Prosedur Pelaksanaan Pekerjaan Pada Instalasi Listrik Tegangan Tinggi / Extra Tinggi (Dokumen K3) No: P3B/PRO/TIMSOP/601/PK 3.
3. Buku Petunjuk Operasi dan Pemeliharaan Peralatan Penyaluran Tenaga Listrik. PLN, GI Undaan, Surabaya , 2003.
4. Prosedur Pengoperasian Gardu Induk Undaan No P3B/PET/RJTB/UPT.SBY.12/OP61.
5. Panduan Pemeliharaan Trafo Tenaga, P3B/O & M/Trafo/001.01.